Shrawley Wood

History and Natural History

A nationally important Small-leaved Lime wood in Worcestershire

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Contents

page	title	Authors
iii	Contents list	
v	Preface	Harry Green
vi	Foreword	George Peterken
viii	Acknowledgements	Harry Green
1	Introduction	Harry Green
2	Location map	Richard Pumphrey
3	Gallery	Harry Green
23	Some History of Shrawley Wood: Owning Shrawley Wood	Peter Byfield, Linda Mainwaring
37	Oliver's Mount	Francesca Llewellyn
40	Ownership of Shrawley Wood Timeline	Francesca Llewellyn, Peter King, Hugh Milner
42	Some History of Shrawley Wood: Limewoods	Peter Byfield, Linda Mainwaring
65	Some History of Shrawley Wood: Hearts of Oak	Peter Byfield, Linda Mainwaring
76	Some History of Shrawley Wood: People in the Wood	Peter Byfield, Linda Mainwaring
82	Some History of Shrawley Wood: Tales of Two Rivers	Peter Byfield, Linda Mainwaring
96	LiDAR assisted Reconstruction of Industrial Activity in the Dick Brook Valley	Richard Pumphrey
103	Astley Forge Mill	Francesca Llewellyn
104	Pools in Shrawley	Francesca Llewellyn
109	Timeline for Shrawley Wood	Francesca Llewellyn, Hugh Milner
118	Shrawley the Word	Hugh Milner
122	Words Related to the Lime Tree (*Tilia* spp.) Their Period of Use, Derivation and Definition.	Hugh Milner
123	Places ending in ‘ley’ within about 12 miles, 20 km of Shrawley, Worcestershire	Hugh Milner
124	Back to the Beginning	Richard Pumphrey
125	The prehistory and history of Greater Redmarley and its environs	John Hemingway
133	Medieval Shrawley Wood	Peter King
137	Early Modern Shrawley Wood	Peter King
144	The Vernons of Hanbury and Shrawley	Andrew Harris
149	Introduction to the Shrawley Wood Books	Francesca Llewellyn, Peter King , Richard Pumphrey
153	Glossary and Derivations of Terms found in The Wood Books (and related documents)	Hugh Milner
167	Shrawley Wood 1700-1763	Richard Pumphrey
171	The Parish of Shrawley during the Rectorship of the Revd. Mr Daniel Piercy 1764 – 1782	Richard Pumphrey
177	Shrawley Wood - Jonsons Grove 1780	Hugh Milner, Richard Pumphrey
180	Shrawley Wood 1764-1850	Richard Pumphrey
200	The Coppices and Binds of Shrawley Wood	Richard Pumphrey
206	The Names of Coppice Binds (Coupes) within Shrawley Wood	Hugh Milner
209	Shrawley Wood 1875-1897	Richard Pumphrey
219	Recent times	Hugh Milner
228	The Summer House	Francesca Llewellyn
230	Analysis of a tree felling notebook dated 18 Sept 1945	Hugh Milner
235	Horse-drawn Shrawley Wood: Access, Extraction and Dispatch	Richard Pumphrey, Hugh Milner
242	Remote clients and despatch routes for Shrawley Wood Produce, 1764-1897	Richard Pumphrey
246	Oak Loss from and Replanting in Shrawley Wood	Hugh Milner
249	Products from Shrawley Wood	Hugh Milner
250	A Record of Poles Produced from Shrawley Wood	Hugh Milner

252	Topography, Hydrology, Geology and Soils	Roger Clooney
258	LiDAR	Richard Pumphrey
266	Historical maps of Shrawley Wood	Richard Pumphrey
273	Measuring and mapping the Trees of Shrawley Wood	Richard Pumphrey
284	Trees of Shrawley Wood Appendix	Richard Pumphrey
294	Small-leaved lime regrowth and regeneration in Shrawley Wood	Richard Pumphrey
302	The ability of Small-leaved Limes to produce viable seed and seedlings and the relevance of Climate Change	Mike Averill
305	Shotgrove	Richard Pumphrey
314	Shotgrove through the Centuries	Hugh Milner
315	Shrawley Wood from a Different Point of View	Richard Pumphrey, Robert Somer
323	Drone study of Phenology in Shrawley Wood	Richard Pumphrey
330	DNA fingerprinting reveals genetic diversity and spatial patterns in *Tilia cordata* in Shrawley Wood	Kirsten Wolff, Richard Pumphrey, Samuel Logan
337	Trees and Woody Shrubs in Shrawley Wood	John Day, Hugh Milner
340	Shrawley Wood – Invasive Exotic Species	Hugh Milner
341	Himalayan Balsam control in Shrawley Wood from 2002-2020	Phil Rudlin
351	The history of Small-leaved Lime at Shrawley Wood and in the wider landscape.	Suzi Richer
355	The Flora of Shrawley Wood	Roger Maskew
362	Shrawley Wood – Vascular Flora; Timeline for all records 1700 – 2020	John Day
375	The birds of Shrawley Wood: the influence of coppicing	Harry Green
408	The birds of Shrawley Wood: selected species accounts	Harry Green
419	Appendix to chapters on birds. Main collections of bird records for Shrawley Wood since 1946.	Harry Green
431	The invertebrates of Shrawley Wood with reference to Small-leaved Lime *Tilia cordata* Miller and its developmental history.	Paul Whitehead
449	The invertebrate fauna of two bole cavities in Small-leaved Lime *Tilia cordata* Miller at Shrawley Wood, Worcestershire	Paul Whitehead
471	*Issus muscaeformis* (Schrank, 1781) (Hemiptera, Issidae) new to Worcestershire with observations on the early nymphal stages	Paul Whitehead
476	The Flies of Shrawley Wood	Mick Blythe
491	Land Caddis in Shrawley Wood	Harry Green
498	The Fungi of Shrawley Wood	John Bingham
512	Lichens of Shrawley Wood	Trevor Duke
518	Lichens of Shrawley Wood: illustrations	Trevor Duke
524	Mosses and Liverworts of Shrawley Wood	John Day
554	Dick Brook: History and Ecology	Mike Averill, Francesca Llewellyn
561	Aquatic fauna and flora of the New Pool in Shrawley Wood	Will Watson
565	Dragonflies in Shrawley Wood	Mike Averill
567	Lepidoptera of Shrawley Wood	Tony Simpson
570	The Hymenoptera of Shrawley Wood	Geoff Trevis
575	Woodlice, millipedes and centipedes (Isopoda, Diplopoda and Chilopoda) of Shrawley Wood	Gary Farmer
577	The True Bugs – Hemiptera – of Shrawley Wood	Gary Farmer
581	The grasshoppers, crickets and earwigs (Orthoptera) of Shrawley Wood	Gary Farmer
583	Molluscs in Shrawley Wood	Rosemary Hill
585	Mammals	Harry Green
592	Tailpiece	Harry Green
594	Index	Richard Pumphrey

Preface

Harry Green



The lime is surely the queen of the woods. Who does not love to sit under her leaves in summer, when the whole mighty vault of her greenery is alive with the hum of bee choirs.

From *The Eloquent Silence* by W. P. Hodgkinson referring to Shrawley Wood. Picture by Roger Plant.

I first visited Shrawley Wood around 1980 but I cannot recall why I was there or for what purpose! The visit was probably stimulated by my friend the late Noel King, Area Regional Officer in the old Nature Conservancy Council (NCC) and organised through Cyril Powick who worked on forestry in the wood for many years. I was also aware of bird ringing studies in the Wood using mist nets being made by Simon Walker and colleagues especially in the northern section of the wood owned by Forestry Commission.

I was fascinated to see the lime coppice near Wood House and round the lakes and inevitably discussed it and its birds with friend and colleague Rob Fuller at the British Trust for Ornithology who was deep into studies of the changing bird populations during the growth of hazel coppice is several woodlands. I soon arranged for him to visit and during our wandering round the wood we realised it presented an opportunity for a somewhat unusual study. There were three adjacent plots each of around 10 ha, each consisting of almost only Small-leaved Lime *Tilia cordata*: one of very old coppice; one of recently cut coppice and one of very old coppice that had been singled about 20 years previously by selecting one stem from each coppice stool to grow on as a tree. These stools had probably not been cut for at least 40 years before singling.

The opportunity presented was to follow the changes in bird populations in each plot for a period of time. This turned into a ten year study described in the chapter on Birds and Coppice in this book.

The method of study was directed at assessing numbers of breeding birds, especially summer warblers, by using a mapping method. For this sort of survey it is usual to make eight visits between April and July but neither of us could fit that into our working lives with other commitments. Instead we chose a weekend in late May every year, visiting each plot three times, rotating the visits between us, and mapping the birds we saw and heard while walking a standard route. Later analysis gave an estimate of the number of territories occupied by each bird species.

This study meant that for ten years on one weekend every May we were deeply immersed in an amazing and unusual woodland and its birds. There were occasions when Rob could not visit so I did the surveys on my own. Although not far from the village and Wood House the two plots near the House were rarely visited by people. I remember wandering along feeling far from the buzz of human life and at peace in a very beautiful wood. The bright green of new lime leaves reflected in the still waters of the lakes, vast carpets of bluebells, white patches of Wild Garlic, sunlight and shadow, woodpeckers drumming and birds singing. On one warm weekend after rain the vegetation in the open paths seethed with insects especially beetles which amazed me as I knew little about invertebrates at the time.

I soon discovered that Shrawley Wood was the best surviving Small-leaved Lime wood in Britain. Oliver Rackham, the man who changed the way we look at woodland history through his books that blended botany and ecology with the study of historical documents, visited Shrawley Wood in 1985. A photograph of the old coppice he took on his visit then graced the dust cover of the revised edition (1990) of his book *Trees and Woodland in the British landscape* and more of his photographs of the Wood taken that day appeared in his subsequent books. I learnt many things about this wonderful tree also called Linden and, by Oliver Rackham, Pry, in his book *Ancient Woodland its History, Vegetation and Uses in England* (1980). I also discovered the many papers by Donald Pigott – Mr Lime Tree himself –summarised in his book *Lime-trees and Basswoods* (2012). He had visited Shrawley Wood but I have never met him although in correspondence he was always courteous and helpful and on occasion provided definitive answers to our questions.

The bird surveys in Shrawley Wood undoubtedly stoked one of my long-running natural history obsessions. I wanted to know ever-more about the wonders of Small-leaved and other lime trees. I became involved with the Worcestershire Flora Project (1987-2004) which eventually produced a new *Flora of Worcestershire*. (Maskew 2014). Much of the data on distribution of all the county plant species was gathered through planned visits by a group of botanists to 2×2 km (tetrads) of the National Grid. I tagged along, often with

an insect catching net, and it soon became apparent to me there was more Small-leaved Lime in west Worcestershire than I had ever dreamed of. It grew in many woods, especially in their boundaries, and in many hedgerows (thrashed by flail-mowers) probably because they are remnant boundaries of woodland assarts created for farming in the distant past. It was a common tree in many of the Teme Valley dingle woods occurring as maiden trees, ancient pollards and overgrown coppice. Some of these woods also contained the nationally much scarcer Large-leaved lime *Tilia platyphyllos* as a wild native and not as planted trees. Many botanical heads were scratched trying to recognise natural hybrids between the two species akin to the commonly planted street lime *Tilia* × *europaea*.

I explored the books by Edmund Lees written in the 1800s in ponderous but lyrical Victorian English. Finding information in the hundreds of pages in his books (all lacking an index) was and still is a hard task but Lees clearly understood the distribution of lime trees in west Worcestershire long before we re-discovered it between 1980 and 2000.

I discussed these things with many people and on several occasions mentioned limes to Jill Butler, then at The Woodland Trust. It would be wonderful, I thought, if we could arrange a gathering in Worcestershire of local and national lime people to share information on these remarkable trees and to visit woods. But nothing came of it (we were both busy people) until one day she mentioned that retired forester Hugh Milner had gathered together a group seeking out limes surviving in woods, especially amongst conifers, and working to conserve them; The Limewood Working Group.

The time had come! A visit to Worcestershire by members of that group was arranged for 16-17 July 2009 and together with local naturalists, conservationists and owners visited several woods: Shrawley Wood, Areley Wood, Suckley Hills Wood (now called Blackhouse Wood) and the contiguous Crews Hill Wood. One outcome from the intense informal discussions that happened as we walked round was that producing a book about Shrawley Wood was a highly desirable. There followed a perfect storm of emails about lime trees and Shrawley Wood.

The next important event was a meeting of the "Shrawley Wood Sub-Group" held at Astley Village Hall 28th June 2013. Just before that meeting I put together nearly 50 A4 pages of emails filled with information and enthusiasm for lime trees. At the meeting the contents of a book on Shawley Wood were discussed and the method of publication agreed. Many of those present agreed to write specific chapters and the suggested plan was to publish by April 2015 at the latest and to cover history, natural history and forestry history.

The sub-group then met on several occasions in subsequent years to discuss progress, hear of research and to visit the Wood. The idea of publishing in 2015 was soon forgotten. The whole project was simply too large and undertaken by people working voluntarily without financial gain. All the authors were busy people with many commitments. The chapters gradually came together but the outbreak of the Covid19 pandemic with the associated restrictions during 2020 and 2021 took their toll and slowed progress. 2015 became 2022, 13 years after the first meeting.
In those 13 years I have encountered many lime-obsessed people and made new friends. It had been a fascinating journey and despite some transient disagreements the core group have stuck together in reasonable harmony. In recent years there were times when I thought the book would never be finished. We were very fortunate to be joined by Richard Pumphrey in 2017 who had the time, computer expertise and enthusiasm to help pull us through including writing several chapters himself. In the one on *Measuring and Mapping trees* he writes:

"On 7th March 2017 a group of us gathered in Shrawley Wood to begin a survey of the trees. I joined this group as a novice, knowing nothing of forestry and somewhat hazy about how to tell a Small-leaved lime Tilia cordata *from any other sort."*

Has my lime-obsession died? No! I'm still fascinated to discover more but the ravages of ageing now make it difficult for me to tramp the woods and to remember where I have filed information, new and old.

Have we achieved our aim? Yes and no. We have compiled ***A*** *History and Natural History of Shrawley Wood*. Not ***THE*** *History and Natural History of Shrawley Wood*. There are gaps in the natural history accounts – we simply did not have the information or the time and expertise to cover everything. The Vernon archive at The Hive in Worcester probably holds many fascinating facts about the people who knew and worked in Shrawley Wood in the past. As for limes, further DNA studies and investigation of root systems and fungi will reveal how trees and other plants interact with one another.

Hopefully this book will push other people into an obsession with lime trees!

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FOREWORD

Shrawley Wood is the wood where I first realised that not all woodland was like the woods of my youth, the New Forest, the hornbeam woods of the north-west London hinterland and the oak woods of west Wales. After chancing on Miles Hadfield's 1963 paper in *Quarterly Journal of Forestry*, I drove there as soon as I could. My notes, which I sent to the Nature Conservancy, were effectively the start of my career in woodland conservation. Five years later, my first task as a newly-appointed woodland ecologist at Monks Wood was to survey the private portions of the Wyre Forest and suggest management options. During the course of this I was taken out to dinner by Norman Hickin at a hotel that was then in the top ten of the *Good Food Guide* and next day addressed a discussion in the grand home of one of the Wyre Forest owners at which the then-rare treat of salmon sandwiches was served. Truly, the woods of the west Midlands were not just interesting ecologically, but represented the good life.

Shrawley is a large, ancient, coppice that was utterly dominated by Small-leaved Lime until parts were reforested with conifers after the Second World War. It had long been famous amongst mycologists, but it was also the most lime-dominated of lime woods in Britain and one where, in the 1960s, lime could be seen regenerating from seed. It remained well-known amongst Worcestershire Naturalists, but it deserved to be appreciated more widely. Now, thanks to local naturalists and historians and Hugh Milner's Limewood Working Group it has attracted spectacularly detailed attention.

There is a long tradition of books about well-wooded districts. One thinks of the many volumes about the New Forest (e.g., Tubbs 2001), the early accounts of Epping Forest (Buxton 1898), the studies of Hatfield Forest and Helford River by Oliver Rackham (1989, 2019), as well as the recent colourful and detailed account of the natural history of the Wyre Forest (Westwood *et al* 2015). Books about individual woods, though, are not regarded as commercial propositions. Sure, Lessness Abbey Woods (Marriott 1925) was taken on by a national publisher, but Lady Park Wood (Peterken and Mountford 2017) was produced by a not-for-profit publisher; Silva Gars (Grass and Bastow Woods)(Crowther 1930) and Lower Woods (Martin and Martin 2014) were locally printed; and Northaw Great Wood (Sage 1967), Hayley Wood (Rackham 1975) and Monks Wood (Steele and Welch 1973) were sponsored by respectively the local authority, the County Naturalist Trust and the Nature Conservancy. In short, it is a considerable achievement to get this Shrawley Wood book into print.

Single-wood books are easily dismissed as parochial, of no general significance, but this one is important. By going into great detail, it shows us just how much can be known about an individual wood and how little we know about those woods we visit just once, casually or as part of a survey. How strange that, in 1967, after a full day walking around making notes, I felt I knew Shrawley Wood well! Detailed, single-wood studies not only set standards but also enrich the participants. While they study one wood in depth they will have come to understand all woods. The studied wood forms a reference point against which other woods are compared and this monograph gifts this reference point to others.

Readers will be immediately struck by the exceptional quality of the design and the variety of illustration, both of which will daunt and set standards for later accounts. They will also appreciate the balanced, interdisciplinary combination of historians, naturalists, archaeologists and foresters from which we gain a clear understanding of an ancient, semi-natural wood as the joint creation of natural processes and the actions of people over millennia. Shrawley certainly has over 900 years of continuous existence and may well have been derived directly from pre-Neolithic forest cover. It consists of species, soils and hydrology that have been tweaked but not substantially altered by use, cultivation and building, but its shape, structure and very existence has been determined by the actions of generations of people living near and far.

Each reader will find features of particular interest and value. The historical studies generously extend to the geographical and social context. They are blessed with the survival of 58 wood books and Estate Account Books from the 18th and 19th centuries, from which the management of the wood and its output can be detailed and from which we see the immense variety of products at the height of coppicing. We even get to know some of the woodmen and can trace their family connections and how the wood supported the people of the parish and further afield. A multitude of local terms emerges that shows how much more Robert Macfarlane (2015) might have collected in *Landmarks*. Ownership passed from the community into a sequence of private hands, each of whom had different impacts on the wood and its people. The 20th century stands out as an almost complete break with the long history of the wood.

On the natural history side, the response of birds to the coppice cycle has been the subject of a scientific investigation and the published paper is reproduced here together with comprehensive background notes about local birds. The land caddis, which I have always associated with Norman Hickin and Wyre Forest, also occurs in Shrawley and several nearby woods, so it is good to have an account of this rare species. An interesting feature for me is that Shrawley's plants have been recorded well enough to be sure that several species have become extinct, not just herbs and ferns, but also crab apple and spurge laurel. The losses of open-space plants from former coppice woods is not appreciated as much as it should be, so I will value having this worked example to cite. Another botanical highlight is the documentation of Himalayan Balsam invasion: Shrawley, as it happens, is where I first became aware that this introduced species was spreading out from river banks. The fungi, for which the wood was originally famous amongst naturalists, still seem to be richly represented, with 1130 species on record, but, as John Bingham says, such a long history of recording should allow us to discover more about the dynamics of fungi in woodland if a modern 'fungal blitz' can be organised over several years.

But the highlight is inevitably the monograph-within-a-monograph of Small-leaved Lime, once the forgotten tree. I call it that because one is hard-pushed to find any mention of the species in Sir Arthur Tansley's classic *The British Islands and their Vegetation* (Tansley 1939) and even in the 1960s it was possible to read a report by a Nature Conservancy officer on the central Lincolnshire lime woods that classified them as oak woods, albeit with hardly any oak and a great deal of lime. Shrawley Wood itself was scheduled as an SSSI in 1952, but it was described as an oakwood and scheduled for its fungi. Even the modern National Vegetation Classification obliges us to describe Shrawley as an example of the W10 *Quercus robur-Pteridium aquilinum-Rubus fruticosus* community.

Lime, however, has certainly been a substantial presence in the wood since the early Medieval period. We know this from pollen deposited in the mud of a pond located on the margin of the wood, which also indicates that coppicing started (because lime pollen production largely ceased) in the post-Norman centuries. The historical contributions make clear that it has been what Peter Byfield and Linda Mainwaring called 'a really useful tree', and this is backed up by comprehensive and wide-ranging detail. The study of lime growth, which includes soil excavations to determine the connections between stools, must be more comprehensive than anything else available. It confirms that seedling regeneration has been less important than vegetative regeneration, even though seed germinates readily enough. Drone shots of the woodland canopy are

astonishing, especially those taken after snow, and informative. We see the canopy structure, the groups of Geans (Wild Cherry *Prunus avium*) and other minority species, the seasonal changes in the limes, the pattern of leaf emergence and hints of the clonal structure of the limes. They include a phenology study that gives substance to informal field observations of leafing times that I've long used to detect clonal links between nearby individuals. A parallel DNA study of selected plots provides some confirmation of clonal structure and implies that some clones may be millennia-old.

So, why is Small-leaved Lime so abundant? Even now, I'm, not sure we can give a complete answer. One factor must be that Shrawley Wood's origins go back to the wildwood, though it is hard to prove that. Another, obviously, is that lime is suited to the wood's soils and hydrology. Both these points, however, could be made about many woods that contain lime, but as small populations or as a minority part of a mixture, not an overwhelming dominant. Perhaps this is a case of positive reinforcement: with so much lime in the wood there must have been an incentive to use it, and, once uses were established, a further incentive to help lime and hinder competing trees by informal means that would not register in the records. This happened commonly enough with south-eastern Beech woodland, the southern hazel coppices and the western oakwoods. Perhaps Shrawley Wood is a rare instance of the same process benefiting lime.

George Peterken
25 January 2022

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It is important to recognise the great enthusiasm of those who contributed to the email storm that followed the visit to Worcestershire by The Limewood Working Group and continued around the group meetings that got things going. The enthusiasm and support of lime tree people has been great stimulus to those who have done most of the work of drawing the book together.

The beginning.
Representatives from The Limewood Working Group visited Worcestershire 16-17 July 2009 and met with local lime enthusiasts in lime-rich woodlands. The Shrawley book project sprang from this visit. Several meetings put the book on track.

It is useful to record who was involved and their relevant affiliations

Worcestershire people
Harry Green. Local naturalist, Worcestershire Wildlife Trust trustee, a member of the Worcestershire Biological Centre Board. A member of the Worcestershire Flora Project, the Worcestershire Ancient tree project and committee member of both Worcestershire Recorders and the Wyre Forest Study Group.
Bert Reid. Local naturalist, Worcestershire Wildlife Trust trustee, a member of the Worcestershire Biological Centre Board. a leading member of the Worcestershire Flora Project, and committee member of Worcestershire Recorders. (deceased).
Rosemary Winnall. Local Naturalist, Worcestershire Wildlife Trust trustee, leading member of the Wyre Forest Study Group.
Brett Westwood. Local Naturalist, a leading member of the Worcestershire Flora Project. Committee member of Worcestershire Recorders and of the Wyre Forest Study Group. Broadcaster with BBC Radio 4 Natural History Unit
John Bingham. Local Naturalist and mycologist. Committee member of Worcestershire Recorders and of the Wyre Forest Study Group. Working for Natural England as Conservation Officer covering parts of Worcestershire.
John Tilt. Local naturalist. A leading recorder with the Worcestershire Ancient Tree Project, Transect organiser for West Midlands branch of Butterfly Conservation
Helen Woodman. Reserves Manager Worcestershire Wildlife Trust.
Bob Steele. Owner of Suckley Hills Woods.
John Mathews. Assists Bob Steele.
Richard Boles, Forestry England, Forester for Shrawley Wood based at the Wyre Forest Office.

Limewood Working Group who attended
Hugh Milner. Head Forester, Woodland Agent, Chair of Limewood Working Group, Royal Forestry Society committee member.
Jonathan Stokes. Director of the Tree Council, Naturalist.
Roger Clooney. Historian, Naturalist, Limewood Working Group member
Ted Green. Ancient Tree Forum founder, Royal Forestry Society committee member, mycologist.
Jill Butler. Woodland Trust (Retd), Tree Officer, Ancient Tree Forum
George Peterken. Ecologist, Woodland Expert.

Shrawley Wood Sub-Group – Meeting held at Astley Village Hall 28th June 2013
Present:
Clare Badham. Local Historian and Archaeologist.
Pete Byfield. Historian, Woodsman, Limewood Working Group member
Terry Chandler. Local Historian.
Roger Clooney.
Harry Green.
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IN MEMORY.
Three people who are no longer with us contributed many biological records from Shrawley Wood in the fairly recent past especially for birds:
Fred Fincher MBE 1901-1995,
Gordon Simmons (1918-1974),
Simon Walker (1956-2008).

Fred Fincher
Fred Fincher provided Shrawley Wood records 1946-1980, Gordon Simmons in the early 1960s and Simon Walker.1975-1985



01. Fred Fincher examining a Small-leaved Lime trunk heavily peck marked by Great-spotted Woodpeckers in Randan Wood near Chaddesley Corbett, Worcestershire. Harry Green.

Fred was a founder of the Worcestershire Nature Conservation Trust (WNCT) later renamed the Worcestershire Wildlife Trust as a signatory on the founding documents and a Council member for many years. He was the naturalist who knew the County and important sites for conservation.



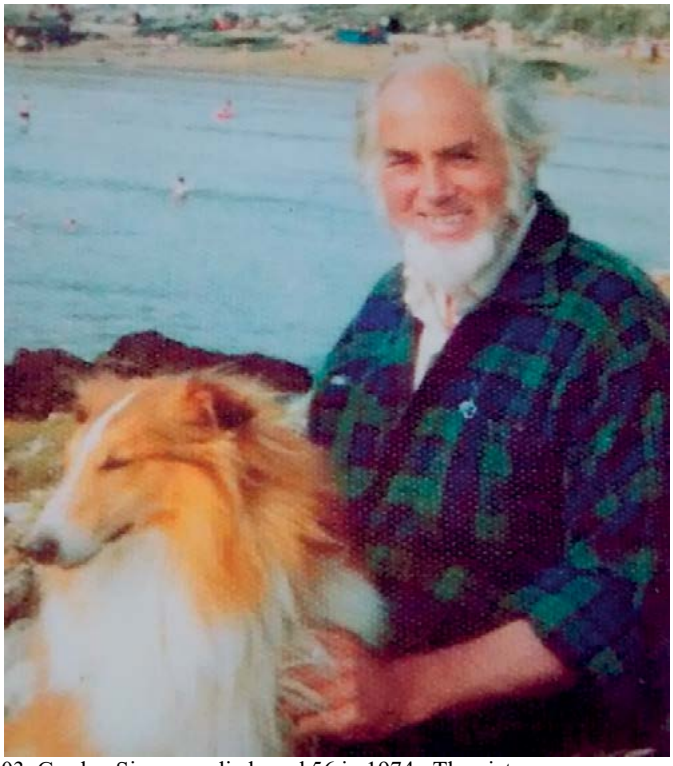
02. Fred Fincher in typical pose on a fungus foray at Pepper Wood, Worcestershire. John Bingham.

Fred was probably the most versatile naturalist Worcestershire has ever produced. He visited Shrawley Wood on many occasions and recorded his sightings in his hand-written Journals between 1946 and 1980. His full Journal runs from 1920 to 1980 and he wrote in it nearly every day of his life. He also wrote at least 1000 words a

week for 30 years for the *Bromsgrove Messenger* - about 1.5 million words! He produced many reports on surveys of sites for the West Midlands Trust after it was formed in 1958, and for the Worcestershire Nature Conservation Trust after 1968. He wrote and edited the Trust's first newsletters for about the first ten years, and these often contained long notes on natural history.

He was an outstanding botanist and mycologist with wide natural history knowledge of many other groups.

Gordon Simmons



03. Gordon Simmons died aged 56 in 1974. The picture was supplied by his family.

He was a lecturer at Worcester College which eventually became Worcester University. He taught students both natural history and forestry at Shrawley Wood with experimental clearance and tree planting described elsewhere in this book. He was Honorary Educational Officer with the WNCT serving on Council and undertaking practical and educational work especially at the Knapp & Papermill Reserve at Alfrick.

Gordon Simmons - publications.
Most of these contain information on Shrawley Wood.

Simmons, Gordon Edward. 1965. *Field Studies*. Illustrated by Asgeir Scott and the author. Longmans.
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Simmons, G. E. 1972. *The why of our trees*. Chatto and Windus,
Simmons, Gordon Edward. 1976. *Plant and animal habitats in town and country*. Blandford Press.
Simmons, G.E. & Keen, D.H. 1976. *What on Earth are We Doing?* (Ladybird conservation books) Ladybird Books Ltd.
Simmons, G. E. 1970. *The changing face of Shrawley Wood, Worcestershire.* Worcester College of Education. *Quarterly Journal of Forestry* 64:60-4.
Simmons, Gordon E. 1970. *Shrawley Wood, Worcestershire: A Study in Colonisation after Clearing and Replanting.* Worcester College of Education. *Countryside* 1970 pp 320-323 and 362-366.

Simon Walker

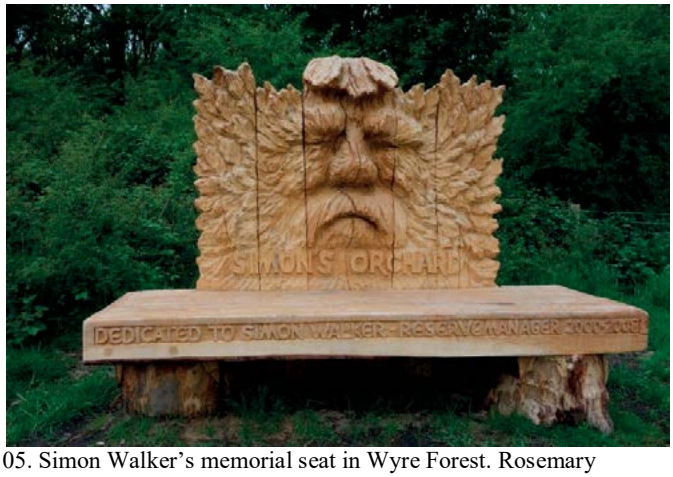


04. Simon Walker. Photo taken on a visit to the Treshnish Islands in Scotland in 2004. Andrew Carter.

Simon was a keen bird ringer who undertook many special projects in Worcestershire and elsewhere. He was always keen that the results were used for wildlife conservation. Through ringing and supporting observations he recorded a clear picture of the breeding birds in the northern part of Shrawley Wood, an area regenerating after war time clearance and in part planted with conifers.

On the 27th December 2008, Simon died peacefully aged 56 and as was his wish, at home with his family. Simon had, over the last few months, been suffering from oesophageal cancer.

In the later part of his life he worked as warden in the Wyre Forest for Natural England undertaking practical and survey work. An orchard was named after him graced with a special seat.



05. Simon Walker's memorial seat in Wyre Forest. Rosemary Winnall.

Introduction

Harry Green

Shrawley Wood is ancient woodland situated near the River Severn about seven miles north of Worcester and a few miles south of Stourport-on-Severn. It was managed for centuries as coppice-with-standards woodland. Unusually the coppice was and in part still is of Small-leaved Lime *Tilia cordata*. The standard trees were mainly oak *Quercus* spp.. In the past local people used the Wood to produce many different things ranging from timber to lime bast used to make rope, to oak bark for tanning. The Wood played an important part in the life of the nearby village of Shrawley.

As demands changed owners experimented by planting patches of conifers and Sweet Chestnut *Castanea sativa*. Many oaks were felled over many years without replanting.

In WW2 the northern part of the wood was cleared felled leaving, 'devastated woodland'. The great gale in March 1946 blew over many of the remaining oaks especially in the south part of the wood near Wood House and the lakes. The northern part of the wood was sold to the Forestry Commission in 1961 and large areas were planted with conifers , mainly Douglas Fir *Pseudotsuga menziesii*, while Small-leaved Lime coppice regenerated in other parts and in the privately owned area by the lakes near Wood House.

The importance of the site for natural history, especially fungi, was appreciated by eminent Victorian naturalists and also by local naturalist Fred Fincher.

Shrawley Wood was first designated Site of Special Scientific Interest (SSSI) in 1955. *"An extensive piece of oak woodland valued particularly for its fungi"*. This surprisingly inadequate description is understandable as it reflects old knowledge, extensive wartime felling and scrub re-growth. My old copy has a handwritten note from Fred Fincher: *"needs revision"* (See chapter Acknowledgements for information on Fred Fincher).

The 1971 SSSI schedule states "*Remnants of a formerly more extensive woodland consisting mainly of Small-leaved Lime (*Tilia cordata*) coppice lying on Lower Keuper Sandstone (Triassic). This site is believed to be the only major example of this type of woodland surviving in the Midlands today and is also noted for its fungi"*. The Map with the designation shows the extensive area of post-war devastated woodland and scrub in north of the Wood. That area was purchased by the Forestry Commission in 1961 for conifer plantations and is excluded from the SSSI.

The 1975 designation remained the same.

1986 saw a major revision. Notification Date: 12 May 1986. *Shrawley Wood lies on the western bank of the River Severn between Worcester and Stourport. The site overlies Keuper sandstone from which the soils are derived. They are slightly acidic on the plateau but become more neutral to alkaline on the slopes and valley bottom.*

The site has been selected as a large tract of ancient woodland almost completely dominated by coppiced small-leaved lime Tilia cordata*. This type of woodland is a feature of eastern England and its occurrence here is unusual in the West Midlands. The woodland also has a long history of management with records going back to the beginning of the eighteenth century.*

A small section of the wood has Pedunculate Oak Quercus robur *standards amongst the lime coppice. Downy birch* Betula pubescens *is common and Pedunculate Oak, Rowan* Sorbus aucuparia *and Ash* Fraxinus excelsior *occur sporadically throughout the wood. Sweet Chestnut* Castanea sativa *has been introduced in small numbers. In the wetter areas along the streams and in the vicinity of a system of artificial pools, Alder* Alnus glutinosa *is the dominant species.*

On the slightly acidic soils of the plateau the ground flora is dominated by Bracken Pteridium aquilinum*, Foxglove* Digitalis purpurea *and Bluebell* Hyacinthoides non-scripta*. On the more alkaline slopes Dog's Mercury* Mercurialis perennis*, Enchanter's Nightshade* Circaea lutetiana *and Ramsons* Allium ursinum *become more abundant. Many interesting and locally uncommon plants occur within the ground flora, including Herb Paris* Paris quadrifolia*, Giant Bellflower* Campanula latifolia*, Broad-leaved Helleborine* Epipactis helleborine *and Lily-of-the-Valley* Convallaria majalis*. Two rarities, Wood Fescue* Festuca altissima *and Spreading Bellflower* Campanula patula *are also present. The streams and pools included in this site add to the site's conservation value. Here Opposite-leaved Golden-saxifrage* Chrysosplenium oppositifolium *and Large Bitter-cress* Cardamine amara *are present in the waterside communities and the rare Soft Hornwort* Ceratophyllum submersum *occurs in one of the pools. Over 400 species of fungi have been recorded in the woodland.*

The wood is important for its breeding birds which include the three native species of woodpecker, and in the coppiced lime a large number of Garden Warblers Sylvia borin*. The last mentioned are the subject of a long term population study (see Chapter on Birds and Coppice in this book). Dipper* Cinclus cinclus *and Kingfisher* Alcedo atthis *occur along the streams and ponds.*

A rare slug Limax tenellus*, a characteristic species of ancient woodland, has been found* (see chapter on Molluscs in this book).

This text recognises the great natural history value of the woodland and is also quoted in the 1991 Management Plan between Nature Conservancy Council & Forestry Commission and is the basis of English Nature's *Views on Management* 2003

Although not in the published *Nature Conservation Review* (NCR) Shrawley Wood was subsequently added to that list of NCR sites which is sub-titled *The selection of biological sites of national importance to nature conservation in Britain* (Ratcliffe 1977). Despite the ravages of wartime forestry and weather the nature conservation importance Shrawley Wood was, at last, recognised.

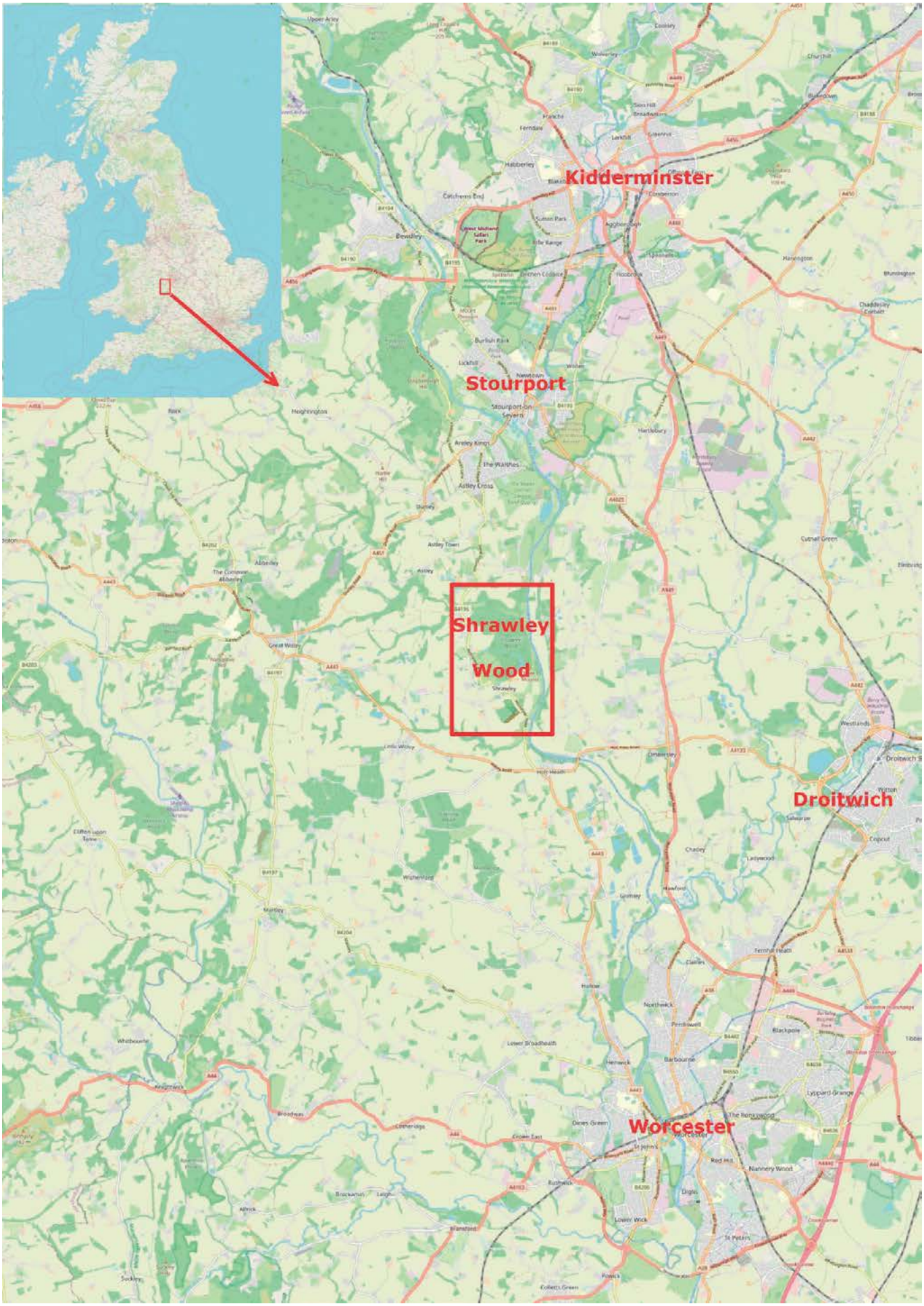
In 1992 the Forestry Commission and English Nature (now named Natural England) agreed a management plan for the north part of the wood owned by the Commission. The main aims were to maintain, enhance, and re-establish rotational lime coppice, to remove conifers in the longer term and to encourage research and educational use.

Following felling and clearance after wind-blow in the southern privately owned area in the 1940s lime coppice was allowed to re-grow. In the late 1970s about 10 ha were re-coppiced.

The above paragraphs give a sketchy over-view mainly of the natural history of Shrawley Wood. They set the scene. This book contains detailed chapters on both history and natural history. It is of course incomplete but it brings together more information than ever before on a nationally important woodland. More on its history lurks in archives. More details of natural history remain to be revealed.

Reference

Radcliffe, D. 1977. *A Nature Conservation review. The selection of biological sites of national imoortance to nature conservation in Britain.* Two volumes. Cambridge University Press.



01. Location of Shrawley Wood (Open Street Map data). Shrawley Wood is mapped in greater detail on the inside back cover.

GALLERY

Harry Green

These pictures show Shrawley Wood in the surrounding landscape and provide a snapshot of its internal appearance. Further pictures and relevant information are in the main chapters.



01. Shrawley Wood from the west 20th October 2015. Conifer plantations are dark green. The paler shades are mainly Small-leaved Lime in various stages of growth ranging from recent coppice to tall trees. There is an intermingling of oak, birch and other trees.
Andy & Jean Young.



02. Shrawley Wood from the south. 28th April 2015. The L-shaped woodland slightly to the left in the foreground is Shotgrove Coppice.
Andy & Jean Young.



03. Shrawley Wood from south-east 28th May 2020. The L-shaped woodland lower left is Shotgrove Coppice. Andy & Jean Young.



04. Shrawley Wood from the east 21st May 2020. River Severn in the foreground. Andy & Jean Young.



05. Shrawley Wood from the north-east 29th September 2018. Astley Wood is on the left separated from Shrawley Wood by Dick Brook and its narrow flood plain. Blocks of Small-leaved Lime appear brownish as the leaves have changed colour due to the 2018 drought. Andy & Jean Young.



06. Shrawley Wood from the south 29th September 2018. Blocks of Small-leaved Lime appear brownish as the leaves have changed colour due to the 2018 drought. Lime leaves usually turn yellow in autumn. Dark green bands are conifer plantations. River Severn is to the right and Stouport-on-Severn in the distance. Andy & Jean Young.



07. Shrawley Wood from the north. Winter picture showing the River Severn in flood. Shrawley Wood is mid-central to the right of the flooded river. Picture from the Environmentl Agency web site.



08. Shrawley Wood from the east. 18th January 2015. The Dick Brook is in the centre foreground winding away between the remains of Astley Wood to the right and Shrawley Wood to the left. This picture clearly shows the dark green conifers planted post-war on 'devastated woodland" from which all mature trees and small-leaved lime coppice had been cut down in the 1940s. The bands of leafless trees are mainly Small-leaved Lime with scattered oak, birch, and a few other species. Willows along the brook. Andy & Jean Young.



09. Shrawley Wood Small-leaved Lime canopy 22 June 2017 tinged yellow by flowers. Conifers to the left.
Original drone picture by Robert Somer.



10. Shrawley Wood singled coppice. Note low bramble field layer beneath the trees. 16th September 2016. Harry Green.



11. Shrawley Wood. Sping bluebells in area of Small-leaved Lime coppice about 80 years old. This area is on private land and not open to visitors. Roger Plant



12. Shrawley Wood. Small-leaved Lime coppice with bluebells and surveyors. 30th April 2015. Harry Green.



13. Shrawley Wood. Small-leaved Lime coppice about 28 years old. 11th May 2016. Harry Green.



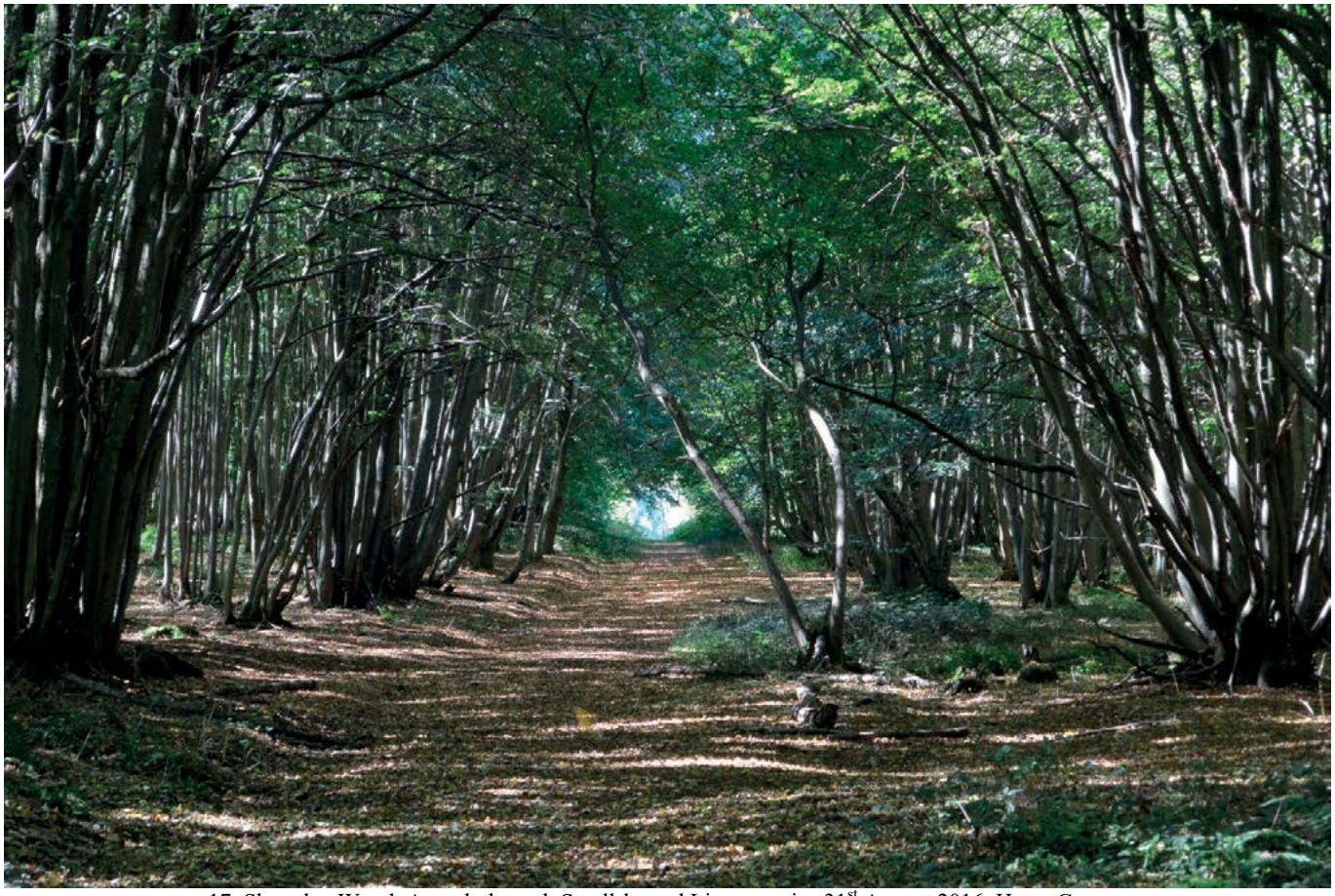
14. Shrawley Wood. A view of the main pools bordered by Small-leaved Lime trees and other species. The steep banks rising on both sides are old coppiced lime 31st May 2018. William Watson



15. Shrawley Wood. Marsh at the apex of one arm of the main pools. The track is bordered by Ramsons *Allium ursinum*. 25April2019. Harry Green.



16. Shrawley Wood. Old coppiced Small-leaved Lime in deep summer shade after the bluebells have died back from the spring flush. 4th July 2009. Harry Green.



17. Shrawley Wood. A track through Small-leaved Lime coppice 31st August 2016. Harry Green.



18. Shrawley Wood. Path through Small-leaved Lime coppice on a winter evening. Roger Plant.



19. Shrawley Wood. Coppiced Small-leaved Lime on the bank running down to path beside the Dick Brook which is to the left (north) of the picture. 3rd May 2015. Note that some of the old stools have been worked on short trunks probably because of the difficulty of working on a steep bank. Harry Green



20. Shrawley Brook. Three of the authors of this book deep in discussion on the track by Dick Brook on 27th June 2017.



21. Shrawley Wood. The initiation of this book perhaps being discussed at the gathering in a big Small-leaved Lime coppice stool on the 17th July 2009.



22. Shrawley Wood. Lime and oak woodland above the quarry on the east side of the Wood 12th May 2017. Harry Green.



23. Shrawley Wood. Small-leaved Lime woodland in the east side of the Wood 12th May 2017. Harry Green



24. Shrawley Wood east side above the quarry situated in the steep slope overlooking the River Severn flood plain. Small-leaved Lime woodland bordering open areas of bracken. 15th May 2017. Harry Green



25. Shrawley Wood big Small-leaved Lime stools on either side of an ancient trackway probably used for timber extraction in the past. Roger Plant.



26. Shrawley Wood. The line of Small-leaved Lime pollards 27th November 2013. Harry Green.



27. Shrawley Wood. A big Small-leaved Lime stool 10th. May 2017. Harry Green



28.Shrawley Wood. A tall old Small-leaved Lime coppice stool that has survived within conifer plantation. 16th. September 2016. Harry Green.



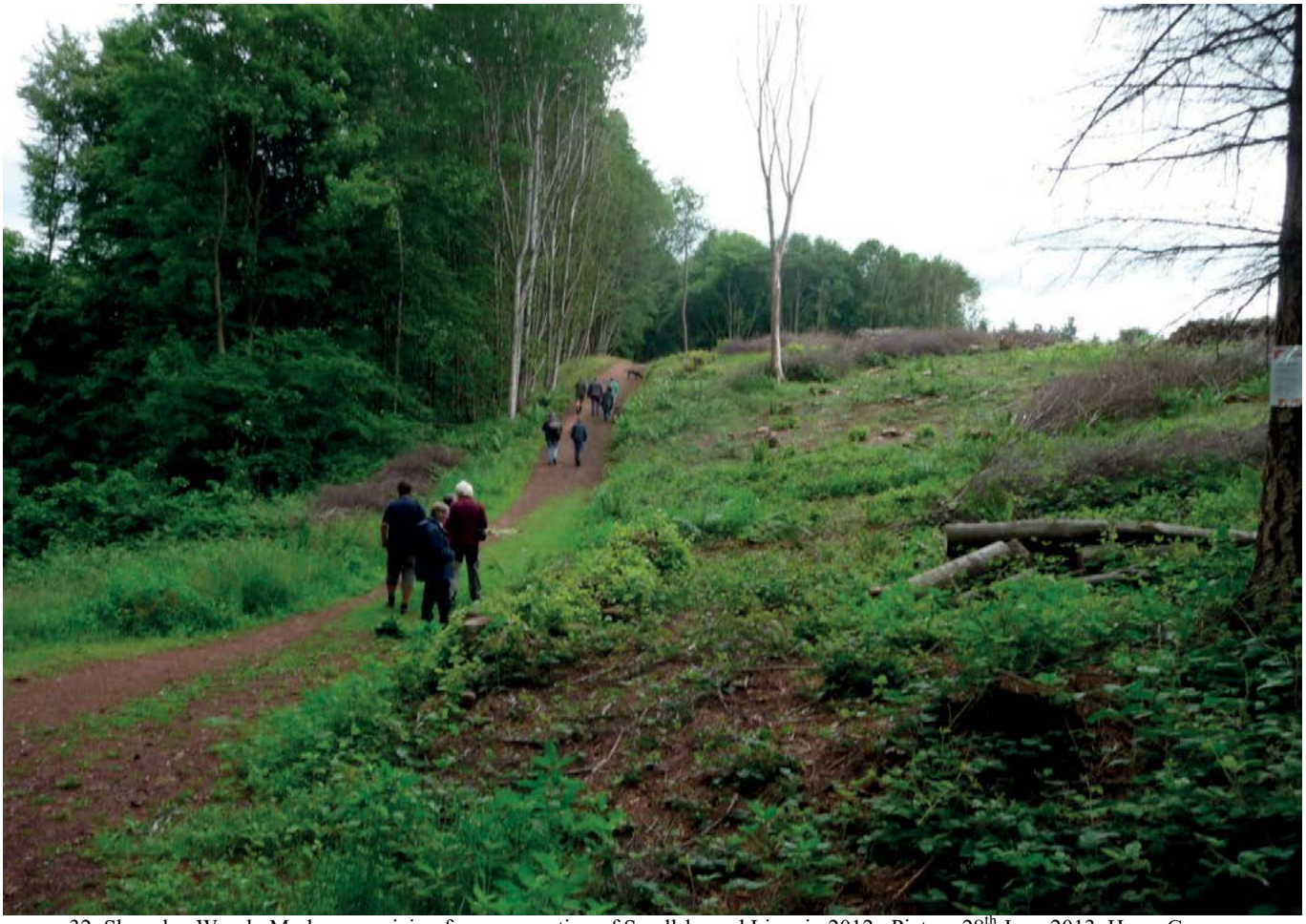
29. Shrawley Wood.. Small-leaved Lime surviving amongst conifers and growing again after conifers had been thinned letting in light. 16th September 2016 Harry Green



30.



31. Shrawley Wood. These two pictures were taken during 1969-1970 by the late Gordon Simmons who taught students in Shrawley Wood at that time. They show part of the Wood that had been 'devastated' by felling in the 1940s and purchased by the Forestry Commission. Extensive areas were planted with conifers (mainly Douglas Fir) and the young saplings can be seen in the lower picture. The distribution of the conifers in the 2020s can be seen well in the aerial photographs 06 and 08 on the fourth page of this Gallery.
These pictures were kindly supplied by Gordon Simmons' family.



32. Shrawley Wood. Modern coppicing for conservation of Small-leaved Lime in 2012. Picture 28th June 2013. Harry Green.



33. Shrawley Wood. Small-leaved Lime coppice regrowth in the area shown in the picture above. 13th April 2017. Harry Green.

Small-leaved Lime also reproduces by seed. The following pictures illustrate flowers, seed, seedlings and young saplings.



34. Shrawley Wood. Small-leaved Lime. Drone picture of top canopy showing abundant early flower bracts 24th. May 2018. Robert Somer.



35. Shrawley Wood. Small-leaved Lime in flower. Harry Green.



36. Shrawley Wood. Small-leaved Lime flowers. William Watson



37. Shrawley Wood. Small-leaved Lime flowers. William Watson



38. Shrawley Wood. Small-leaved lime bracts with seeds heads. Roger Plant



39. Shrawley Wood. Small-leaved Lime seedlings. 11th May 2016 Harry Green.



40. Shrawley Wood. Small-leaved Lime seedling 20th July 2012 Rosemary Winnall.



41. Shrawley Wood. A young Small-leaved Lime sapling probably 2-3 years old 11th May 2016. Harry Green.



42. The flood plain of the River Severn is to the east of Shrawley Wood. The plain is narrow adjacent to the Wood but wider on the opposite bank. It is dotted with big Small-leaved Lime trees and they form part of the west Worcestershire (and beyond) lime zone. Most have been pollarded in the past. This picture is of a particularly fine specimen photographed in winter on 24th March 2021 and seen on the next page in its spring finery. Roger Plant.



43. A fine pollarded Small-leaved Lime on the River Severn flood plain illustrated in winter on the previous page and shown here coming into leaf in Spring on 16th May 2021. Roger Plant.

Some History of Shrawley Wood

Peter Byfield and Linda Mainwaring

		page
1.	Owning Shrawley Wood	
	1.1. Looking back	24
	1.2. Urse the Bear	26
	1.3. Beauchamps, Pohers and Parks: Kings and Queens	27
	1.4. Making Shrawley Wood Pay	30
	1.5. Nationalisation	33
	1.6. Appendix: Oliver's Mound, written by Francesca Llewellyn	37
	1.7. Appendix: Ownership timeline compiled by Francesca Llewellyn, Peter King & Hugh Milner	40
2.	Limewoods	
	2.1. Lime Trees: an introduction	42
	2.2. Wildwood, Lime Decline and all that	45
	2.3. A Really Useful Tree	
	2.3.1. Flowers and Honey	51
	2.3.2. Cultural Services	51
	2.3.3. Lime Wood	51
	2.3.4. Lime Bast	53
	2.3.5. Foliage	55
	2.4. Beer, Hops and Heresy	58
	2.5. Working in a Limewood	60
3.	Hearts of Oak	
	3.1. Richard Vernon's Survey	65
	3.2. White Poles, Black Poles and Stores	67
	3.3. How long has this been going on?	68
	3.4. Stores and Maidens	70
	3.5. What kind of Oak?	72
	3.6. Heart of the Nation	74
	3.7. Counting the Trees	74
	3.8. The Final Clearance	75
	3.9. A Mysterious Postscript	75
4.	People in the Wood	76
5.	Tales of Two Rivers	82
	5.1. Sabrina or The River Severn	82
	5.2. Shrawley Wood and Crockery	86
	5.3. Roman Cinders and Pig Iron	87
	5.4. Captain Yarranton's Canal?	92
	5.5. Bricks	94
	5.6. Appendix: LiDAR-assisted Reconstruction of Industrial Activity in Dick Brook Valley written by Richard Pumphrey	96

Unless labelled to the contrary, all photos were taken by the authors and maps drawn by Richard Pumphrey.

Owning Shrawley Wood

For there is hope of a tree, if it be cut down, that it will sprout again, and that the tender branch thereof will not cease.
But man dieth, and wasteth away: yea, man giveth up the ghost, and where is he?[1]

Shrawley Wood has enjoyed an eclectic range of owners over the centuries. They've included Mercian kings, occasional bishops, a brace of Vikings, assorted Norman barons, Henry VIII's last wife, Temple lawyers, a cuckolded Marquis, and the woodsman's daughter. Mustering most of them within a few pages will need some compression.

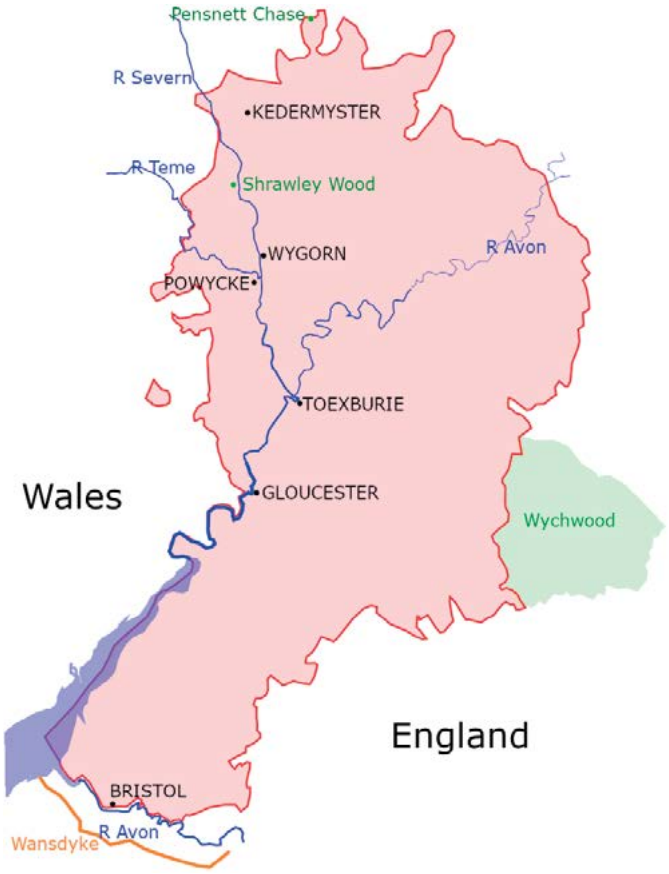
What do we mean by 'owning'? In the 18th and 19th centuries it might appear that ownership of Shrawley Wood conferred the right to do pretty much anything, subject only to the vagaries of fashion and the anxiety of heirs. But this was a time when clever lawyers were adept at constructing elaborate entails that contrived to control the future, with strict limits on the sale of land or exploitation of woodland.

By the 20th century, constraints on ownership had changed. The last private owner needed a license from the Forestry Commission to fell her own oak trees and earned the rebuke of Ministry of Agriculture officials for not cultivating parts in the way they would have liked.[2] At the present time, a draconian planning regime subjects the smallest building proposal to scrutiny - and conversion to agriculture would need another blockade by the Kriegsmarine. A large part of Shrawley Wood, in both the private and public parts, is designated a Site of Special Scientific Interest - a once timid creature that has grown in stature over the years. Bats, birds, badgers and butterflies have acquired inalienable rights that often trump the privileges of property.

Going back to, let's say, Stuart or Tudor times, there was the hidden hand of Parliamentary legislation – the Statute of Woods – that told woodland owners how long they had to enclose their coppices after cutting.[3]. And until the 17th century, most woodlands were encumbered – from an owner's point of view – with customary rights of one kind or another; Shrawley Wood was no exception. Not only were cattle put into the wood to browse but the local community apparently claimed the right to harvest coppice wood for payments favourable to themselves. Previously, at the time of Domesday, it seems they paid nothing at all. The lord of the manor may have enjoyed a kind of ownership but, in practice, the status was largely honorary.

In short, ideas of ownership have changed over the centuries and readers are asked to bear this in mind.

Looking Back
Once upon a time, Worcestershire was part of the Hwicce kingdom, a territory that probably stretched from Wansdyke, skirting the southern boundary of modern Bath, up to the southern suburbs of the West Midlands conurbation, including much of Gloucestershire and a small part of Oxfordshire.[4] (01)



01. Diocese of Worcester 1303-1435. The boundaries seem based on those of the Anglo Saxon Hwicce tribe and are similar to those of the preceding Dobunni.

Apparently independent in the early 7th century AD, it became a sub-kingdom of Mercia soon after, but retained a degree of autonomy for several centuries afterwards.[5]

The bounds of the Hwiccan kingdom were frayed and complex, indicative of ancient origins. For example, Wychwood in Oxfordshire has been bundled into Hwicce by some historians, but this is unlikely.[6] More probably, it was an adjacent territory over which Hwiccan people enjoyed grazing rights. A more clearly documented example was at the northern end of Hwicce, where grazing rights extended far north into what became Staffordshire as part of an intercommoned landscape called Pensnett Chase.[7] Conversely, territories north of Hwicce seem to have enjoyed grazing rights in the Clent hills. Some idea of these convoluted boundaries was still embodied in the 18th century 'Hundred' map of Worcester, which preserved some of these detached elements within and without the county.[8]

The precise origins of the Hwicce are lost in the mists of history, but long before most historians finally discarded notions of Anglo-Saxon invaders completely displacing indigenous Britons, the Hwicce were reckoned a synthesis of both.[9] When Roman power waned there may have been – there must have been – changes in land ownership and social organisation, but there's no evidence of

1 King James Bible: Job 14.7/10
2 The National Archives [TNA] MAF 32/75/80. *National Farm Survey 1941-3. Shrawley*. Ruth Vernon (later Mrs Horton) was farming 40 acres – probably the former Kings Binde of Shrawley Wood
3 Arguably, this wasn't so much an imposition or restriction but rather a device to help them deal with the ancient liability of browsing rights
4 For the most recent appraisal of 'Hwicce' boundaries - and especially a hitherto less certain boundary south of the River Avon - see Manco, Jean. *Dobunni to Hwicce* in Bath Past. (Online: Last revised 5 Dec 2004; accessed 10/10/2016)
5 Skipp, Victor. 1979. *The centre of England* 255p London. Eye Methuen (The regions of Britain series), especially pp 108-112
6 Schumer, B. 1999. *Wychwood – the evolution of a wooded landscape*. pp84/5
7 Bayley, Charles H. (ed). 1882. The Rent Rolls of Lord Dudley & Ward in 1701. Privately printed. p13 Testimony of Edward Atkins, Woodman.
8 Bowen, Emmanuel. nd. An accurate map of the county of Worcester divided into Hundreds. [British Library have a similar map at Maps 5800.(1) dated (1755?)]
9 Finberg, HPR. 1974. *The Formation of England*.Paladin.

complete disjuncture. It's likely that many ordinary British folk stayed much as they were while the more privileged suffered an influx of Anglo-Saxon newcomers. Overall there was sufficient continuity to make it possible some part of Shrawley Wood's customary management goes back a long way. Perhaps a very long way, given that the Hwicce territory was similar to that of the Dobunni, the Iron Age British tribe that preceded them.[1] [2] [3]
There's a tantalising reference to a place called '*Screfleh*' in 804. This relates to Deerhurst, an early Anglo-Saxon monastery that displaced Roman buildings alongside the tidal River Severn in what's now Gloucestershire. Land in Warwickshire and elsewhere was gifted to Deerhurst, some in perpetuity and other parts as a lease for the lives of named individuals. There's some ambiguity as to the status of the *Screfleh* gift.[4] The context suggests that *Screfleh* might be Shrewley, in Warwickshire, but the consensus among modern scholars seems to favour Shrawley in Worcestershire.[5] If this is the case, it's remarkable there's no hint in later centuries of any connection between Deerhurst and our wood.

Reliable accounts of the Worcestershire Shrawley don't go back any further than the late 12thC; the name doesn't feature in the Worcestershire Domesday book, either as woodland, manor or parish. The most likely explanation is that Shrawley was then part of Astley manor, its larger northern neighbour. In 2002, Penguin books published a complete modern translation of the Domesday folios and their entry for Astley woodland is intriguing but not immediately helpful. This simply says:- 'there is woodland rendering nothing'.[6] However, an earlier translation of Domesday Book, published by Phillimore in 1982, includes a photographic image of the original Latin text and alongside the 'Silva ĕ nil redd' (i.e. 'woodland rendering nothing') there is a scrawl in the margin:- "one league by half a league".[7] This is the full translation given on the opposite page in the Phillimore Domesday:

> ***Astley***. *St Taurin's Church hold from him [Ralph de Toni] Ernsy held it; he could go where he would. 6 hides which pay tax. Of these, St Taurin('s) holds 4 hides exempt and freed from every customary due which belongs to the king, as King William himself consented when Ralph gave it to the Saint. In lordship 2 ploughs:*
> *A church, a priest, 11 villagers, 3 smallholders and 1 rider; between them they have 11½ ploughs, 3 slaves.*
> *2 mills at 10s. At Worcester 2 burgesses at 2s; at Droitwich 1 salt-house which pays 18 measures of salt and 64d.*
> *Woodland which pays nothing. Woodland 1 league long and ½ league wide.*
> *Value of this manor before 1066, £10.; later and now 100s.*
> *Urso holds 1 hide from Ralph. He has 3 ploughs in lordship and 3 villagers, 15 smallholders and 2 free men with 7 ploughs. 4 slaves.*
> *2 mills at 20s.*
> *Value £3.10s*

Leaving aside the social implications of slaves and smallholders, what does this mean? Ralph de Toesny, William the Conqueror's hereditary standard bearer, owned the manor[8] but he had recently gifted the larger part to the church of St Taurin, in France.[9] A smaller part, a single hide, is leased to Urse – another Norman - who also happens to occupy Holt manor, immediately south of what became Shrawley. From what we know about Urse's descendants and their inheritance, it's almost certain Urse's hide became a separate manor – Shrawley - at some time during the later 11th or early 12th centuries.

The mention of '2 burgesses' at Worcester means Astley held two properties in the city; a comparison with similar holdings by manors elsewhere in the county might suggest a former association with the Church of Worcester.[10] The salt-house at Droitwich has woodland implications because wood was still the principal fuel used to evaporate brine to salt; some exports of Shrawley Wood faggots may relate to this. The church suggests Astley was a relatively important place – only four are mentioned for the whole county outside of Worcester itself. And most important of all, for our purposes, the wood at Astley is given specific dimensions.

There has been learned debate in the past about just how long a Worcestershire league might have been,[11] but there's now some consensus that a league hereabouts was 12 furlongs. This equates with a woodland 1½ miles long by ¾ wide. Mensuration that fits a conjoined Shrawley Wood and Astley Wood nicely.[12]

It's probably safe to assume that Shrawley was contained within the manor of Astley at the time of Domesday and the Astley woodland was later divided into Shrawley Wood and Astley Wood. In which case, our knowledge of ownership can be pushed back a couple of centuries and more, well into Anglo Saxon times. For this, we can thank an 11th century Worcester Priory monk by the name of Hemming. He was commissioned by Bishop Wulfstan II to 'record documentary proof as well as memories of the Church's former possessions, examine the cathedral archives to determine what properties had been stolen from the church'.[13] Hemming summarised these in a manuscript '*Codecellus possessionum'* explaining that he wrote to inform future prelates of the Church:-
'.....about the things which have been committed to their care, and to show them which lands justly belong (or ought to belong) to the church, and which have been unjustly seized by evil men—first, during the Danish invasions; later, by unjust royal officials and tax collectors; and most recently, by the violence of Normans in our own time, who by force, guile and rapine have unjustly deprived this holy church of its lands, villages and possessions, until hardly anything is safe from their depredations'[14]

1 Hamshere, JD. 1980. *Colonization and the Evolution of Rural Settlement in Worcestershire, prior to 1349*. Birmingham University D Phil p62 'The area ascribed to the Dobunni, as suggested by the distribution of their coinage, (citing D Allen. 1964. Belgic Dynasties of Britain and their Coins. Archaeological Journal 90 p46) shows a striking similarity to the area of the Anglo Saxon Hwicce tribe whose boundaries were ultimately selected for the medieval diocese of Worcester, thus predating the evolution of county boundaries by some two thousand years.'
2 For general discussion of boundaries see: Hooke, Della. 1985. *The Anglo-Saxon landscape of the Hwicce*; Hooke, Della. 1982. Pre-conquest estates in the WM, Prelimary Thoughts. In *Jnl of Historical Geography* 8: 227-44
3 Yeates, SJ. 2006. *Religion, Community and Territory. Defining religion in the Severn Valley and adjacent hills from the Iron Age to the Early Medieval Period*. British Archaeological Reports, British series 411(i-iii). Continuity of the Dobunni and Hwicce is a recurring theme, later focussed in a single volume *ibid.* 2008. The Tribe of Witches: The Religion of the Dubunni and Hwicce. In a review of the former, Della Hooke (see previous reference) cautioned 'To those schooled in caution during their archaeological training this book may come as something of a surprise'. However, Yeates's coverage is comprehensive as well as specu;ative.
4 Sims- Willams, Patrick. 1990. *Religion and Literature in Western England 600-800* CUP
5 Smith AH. 1956. *English Place Name Elements II*, EPNS 25-6 113-14 Cambridge; Ekwall, E. 1960. *Consise Oxford Dictionary of English Place Names*, 4th ed OUP. p420)
6 Williams, Anne & Martin, GH (eds). *Domesday Book - A Complete Translation.* Penguin 2002 p487
7 Thorn, Frank; Whitelaw, Elizabeth; Wood, Sarah; Thorn, Caroline; (General Editor John Morris). 1982. *Domesday Book*. Phillimore. p.176b
8 Huffman Joseph P. 1984. *Ralph III and the House of Tosny*. MA thesis Western Michigan University. Gives some background to Ralph de Tosny; see p40 for specific Worcester manors
9 Round JH. 1899. *Calendar of Documents preserved in France*, vol. I 918-1206, London (HMSO State Papers)
10 Hooke, Della. 1980. The hinterland and routeways of late Saxon Worcester: the charter evidence. *Carver, MOH (ed) Medieval Worcester, an Archaeological Framework*. *Transactions Worcestershire Archaeological Society 3rd ser., 7*, 38-49 p40
11 Round, JH. *Victoria County History Worcestershire I* pp271/2; Round, JH *ibid.* VCH Northampton 1 p280
12 Reid, Bert. 2004. Domesday Woodland in Worcestershire. *Worcestershire Record* no 17 pp 43-5; Grierson, Philip.1987. Weights and Measures in Williams, Anne et al (eds) *A General Introduction to Domesday Book*. London: Alecto Historical Editions. p80
13 Frank Thorn et al. *ibid.* Appendix 5
14 Transcribed and quoted by: Southern RW. 1973. Aspects of the European Tradition of Historical Writing: 4. Sense of the Past. *Transactions of the*

For Astley the evil man was a Dane named Ocea. This is Hemming's Astley entry from a transcription made in the early 18th century:-
'*De ÆSTLEGE*
Idem quoque RAULF quondam aliam villudam, ÆSTLEGE appellatam, à quodam Dano, OCEA nominee, injuste arreptam, et injustius possessam, similiter invasit, et ab ecclessie possession et Dominatione, vi et fortitudine Domini sui Willelmi comitis sussultus, subtraxit, sicque hec fancta eccleia jus dominationis ejusdem ville injuste perdidit.'[1]

Hemming provides strong evidence that Astley had once been owned by the church of Worcester and he makes a similar case for Ribbesford manor in Hwiccan times. Church ownership of the land south of Shrawley is well known – this was the *Weogorena leage*, a large tract of well-wooded land west of the River Severn. Hemming effectively extends this ancient territory northwards to Wyre Forest.[2] Modern landscape historian Della Hooke speculated on this link in her classic book on the Hwiccan landscape'[3], informing us that *Weogorena leage* was granted to the Worcester church by the 8th century[4] Mercian king Offa.[5]

According to Evesham historian CJ Bond, Wyre Forest once extended across the River Severn to encompass Ombersley Forest, lying opposite Astley and Shrawley.[6] As a legal forest this stretched from the outskirts of Worcester northwards to the River Stour[7]. The forest of Ombersley was disafforested – ceased to be a royal forest - in 1229[8], but the core of this territory remained as a large eponymous manor. This Ombersley had been gifted to the church in AD 706 by AEthelweard, subking of the Hwicce [9]; and Evesham Priory held it until the 16th century Dissolution. Like Astley and Shrawley, Ombersley had a long tradition of exploiting *Tilia cordata* for bast; remnants of once larger areas of lime wood remain to this day[10]. This contrasts with other woodlands on the east bank of the River Severn.

Apart from a common interest in lime bast, archaeologist Dr John Hemmingway has pointed out another remarkable congruence between place-names on either side of the river (p. 131). In medieval Astley, slightly west of the lime woods, there are the hamlets of Hillhampton, Glasshampton, Yarhampton, Woodhampton, Sandhampton and Oakhampton. And over the river in Ombersley, slightly east of the limewoods, there's Uphampton, Millhampton, Northampton, Sytchampton, Brookhampton, Dunhampton and Comhampton. Single 'hamptons' can be found elsewhere in Worcestershire and there are a few well-known examples around the country, but nothing like this well-balanced cluster. One that's likely to go back before 706AD. Could it have anything to do with *Tilia cordata*?

To get back to Astley. Theft of church land by Danish Vikings may conjure up images of wild axemen in bovine headgear mooring their long-boats beneath Shrawley Wood (it crossed this author's mind!), but Ocea arrived rather more decorously. There's a clue to this in a 1042 land charter that's witnessed by the great and good including "all the thegns of Worcestershire, both English and Danish.'[11] After Cnut acquired the English throne in 1016, he sent his nephew Hakon Herdelreid to administer the Worcester area[12] and many of his Danish compatriots followed. Hakon's personal rule was short lived but Danish influence continued; on the eve of the Norman Conquest their descendants made up a significant part of the county elite.[13] This apparently included Ocea.

It seems Ocea married a wealthy Gloucestershire lass by the name of Ealdgyth – in any event her son Earnsige succeeded Ocea and held Astley at the time of the Norman Conquest.[14] [15] Then the music stopped abruptly, and ownership changed again.

Urse the Bear
At the time of Domesday Book, a couple of decades after the Conquest, one Urse d'Abetot held the part of Astley that later emerged as Shrawley. A man of small importance in his native Normandy, he became Sheriff of Worcestershire, a powerful minister in William II's government and a founder of the political dynasty that became the Earls of Warwick (02). By the time of Domesday, Urse had acquired Salwarpe and Holt; together with Shrawley they made a large, conjoined territory. Emma Mason has suggested that 'Urse' (bear) was a nick-name related to his temperament, rather than a given name. His reputation for greed and grasping avarice was legend, at a time when ordinarily rapacious Norman newcomers were taken for granted.

Of course, the Norman Conquest had far-reaching and traumatic consequences throughout England - and Worcestershire wasn't exempt from much of this. Apart from Astley, large swathes of landscape changed hands and much of this was church property. However, in some sense, Hwicce lingered on; the old kingdom had a close association with the episcopal see[16] and Wulfstan, became the

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Royal Historic al Society Ser 5 23: 249-50 1973 [from BL Cotton Tiberius A xiii]

14 *Victoria County History Worcestershire* 4:232, quoting: Hearne, Thomas (ed) *Hemingi chatularium ecclesiæ Wigorniensis*, (2 vols) p256

1 Hearne, Thomas. 1723. Hemingi Chartularium Ecclesiææ Wigorniensis. Sheldonian Theatre, Oxford. pp255/6. Translates as*: ASTLEY Manor originally belonged to the church of Worcester, under whom it was held by Ocea, a Dane, from whom Ralph [de Barnack (Beornaco), sheriff of William Fitz Osbern, Earl of Hereford], wrested it, so that the church of Worcester lost possession of it.*

2 John Leland, in his Itinerary researched c.1538-43, describes Wyre Forest as extending from Holt on the Severn up as far as Bridgenorth. This stretches Wyre Forest as a legal entity somewhat but apparently preserves a widely held perception. See Chandler, J, 1993. John Leland's Itinerary: Travels in Tudor England. Stroud: Sutton. p517.

3 Hooke, Della. 2009. *The Anglo-Saxon landscape. The kingdom of the Hwicce.* Manchester University Press. p249 'Weogorena leage… which may initially have been part of the forest of Wyre'. See also pp 80, 108, 132, 166, 237

4 Hooke, D. 1990. *Worcs Anglo-Saxon Charter Bounds.* The Boydell Press 'Studies in AS History' series. pp69-78

5 There are some reservations about this supposed grant, but there's a record of conflict between the Bishop of Worcester and King Offa around the time when Offa was orchestrating an archbishopric based on Lichfield, severing direct links with Canterbury. Differences were resolved at the 787 Council of Brentford; a substantial gift of land might have played a part in this.

6 Bond CJ. 1973. The estates of Evesham Abbey: a prelimary survey of their medieval topography. *Vale of Evesham Historical Society Research Papers* vol 4 p49.

7 Nash T.1781. *Collections for the History of Worcestershire*. London: John Nichols. p.lxviii

8 *ibid.* ii p217

9 Sayers, Jane & Watkiss, Leslie. 2003. *Thomas of Marlborough. History of the Abbey of Evesham*. Oxford Medieval Texts Clarendon Press, Oxford. 116, p131

10 For example, northeast corner of Knight's Wood (GRSO8562); sporadically along the scarp above east bank of River Severn between Harford and Lincomb Lock. For 19th century confirmation see: Lees, Edwin.1867. The Botany of Worcestershire Worcs. Naturalists' Club. p16 – including description of massive 'coppard', indicative of ancient coppicing. For historical references to Ombersley 'bast' see: Guyatt, David. 1975. A Study of the Field Names and Landscape of Ombersley. Worcestershire Archaeological Service pp 62, 129, 159, 162; Scardellato, Gabriele Pietro. 1983. Ombersley. British Columbia PhD thesis 1983 p177 (copy in Worcestershire Archives and Archaeology Service (WAAS) 899:725 BA 9156). (on line p 171). WAAS 705:56 BA 3972 8 (iv) Book entitled "Extract of all (the) points of the customs of Ombersley" from 3 RI (1191/2) to 19 James I p65

11 Earle, J. 1888. *A Handbook to the Land Charters and other Saxonic Documents.* Oxford: Clarendon Press p242

12 Larson LM. 1910. The Political Policies of Cnut as King of England. *The American Historical Review* 5:4. p728

13 Williams, Anne. 1988. An Introduction to the Worcestershire Domesday. *The Worcestershire Domesday.* London: Alecto Historical Editions. p20

14 *ibid.* p23 citing Sawyer PH (ed). 1960. Evesham A, a Domesday Text *Worcestershire Historical Society Miscellany*, I 3-36

15 Thorn, Frank et al *ibid.*(footnote 49) gives 'Ernsy', which is closer to the Norman-French Domesday original; both the Penguin 2002 and Alecto Historical Editions (from which Penguin version is derived) give 'Earnsige')

16 Smith AH. 1965. The Hwicce. In *Frankiplegics Medieval & Linguistic Studies in honour of Francis Peabody Magouned*. Editors: Bessinger, Jess B & Creed, Robert P. See especially p46

only Anglo-Saxon bishop to keep his mitre.[1] The church of Worcester had weathered earlier storms, such as the Danish incursion and they survived the Conquest bruised and battered but still retaining large areas of land and exerting real influence.[2] Urse became the greatest secular power in Worcestershire but Bishop Wulfstan and his successors were able to hold firm against complete Norman hegemony.



02. The Warwickshire bear.

For example, the church land south of Shrawley known as *Weogorena leage* became part of the 'triple hundred' of Oldwaldslow and this was the Bishop of Worcester's exclusive domain; the sheriff of Worcestershire's writ did not run here.[3] Another example is Urse's building of a motte and bailey castle in the centre of Worcester, much of it on church land. In any other county town this would have been a *fait accompli*, but Bishop Wulfstan had sufficient clout to retrieve the church's lost acres and claim the castle that now went with them. Rivalry between post-Conquest secular power and Worcester prelates carried on for generations but there was one brief period of co-operation that has some bearing on Shrawley Wood.

In 1075 there was rebellion against William the Conqueror led by Waltheof, Earl of Northumbria; Ralph de Guader, Earl of East Anglia and Roger de Breteuil, Earl of Hereford. This wasn't simply a revival of Anglo-Saxon resistance to invasion - Ralph and Roger were both Normans and the latter's father had been the Conquerors closest friend. The underlying causes are complex and partly obscure but the immediate military situation was straight forward. To succeed, the rebels had somehow to join up and this meant Roger de Breteuil gaining control, from the western side, of the Severn Valley and especially the river crossings. Urse and Bishop Wulfstan joined forces with the Abbot of Evesham, owner of Ombersley on the opposite riverbank from Shrawley, to prevent this happening. Most remarkably, an Anglo-Saxon bishop mobilised the fyrd militia – the same 'territorial army' that had fought Danish and Norman incursion – to resist a Norman baron in the name of a Norman king!

We don't know anything about ensuing battles, except that this brief alliance between church and state was conclusive. Roger de Breteuil, Earl of Hereford was vanquished and it's probable that control of the Severn river crossings played an important part in his defeat.[4] As we'll see later, Shrawley Wood lies above such a river crossing and at some time a castle was built on the sandstone promontory, now known as Oliver's Mound, in the south-east corner of the wood. Although anything above ground level has long-since been robbed, 20th century excavation suggests a substantial structure of dressed stone. A tentative date for this construction is the second half of the 12th century but there's speculation the stone castle was preceded by a more austere fortification. A mott and bailey – like the hurried earth and timber redoubt Urse had built to secure Worcester – would have made perfect sense in 1075. Urse died in 1108 and his son Roger briefly succeeded him as sheriff of Worcestershire and owner of Shrawley Wood, but he was soon exiled for crimes unknown. Most of Urse's ill-gotten gains finished up in the hands of one Walter de Beauchamp who was fortunate enough to have married the great man's daughter, Emmeline.

Beauchamps, Pohers and Parks; Kings and Queens

When a specific place called Shrawley emerges from archival shadows in the latter part of the 12th century, some vestige of Toesny lordship still lingered[5] [6] but, for most practical purposes, ownership lies with the Beauchamp family. Thanks in large part to Urse's legacy and his daughter's choice of husband, the Beauchamps' ranked as the greatest secular power in the county with their epicentre at Elmley Castle, on the lower slopes of Bredon Hill. They also made active use of their property at Salwarpe and Holt; Salwarpe in particular features in early family chronicles.

Toesny lordship is last mentioned in 1210-12[7] but complete erasure soon followed.[8] This coincided with a record of Roger Poher, under-sheriff of Worcestershire and staunch ally of the Beauchamps, holding the Shrawley lordship as their under- tenant. Roger Poher's descendants remained as *de facto* lords of Shrawley until the mid-14th century, when the lordship reverts to the Beauchamps, accelerated by marriage. Records relating to the Poher family have been gathered together by Rod Sproat as part of his historical research for the community archaeology project at Oliver's Mound.[9]

Along with Shrawley manor, the Pohers held the castle mentioned above. No hint of a former building exists today, but thanks to the indefatigable efforts the Shrawley & District Local History Society – aided and abetted by specialist professionals and the National Heritage Lottery [10] - a fine turreted keep house has been conjured, by way of an artist's impression, from long-buried foundations. It's reproduced in Francesca's account of the castle (p. 37) and at a display board in the wood.

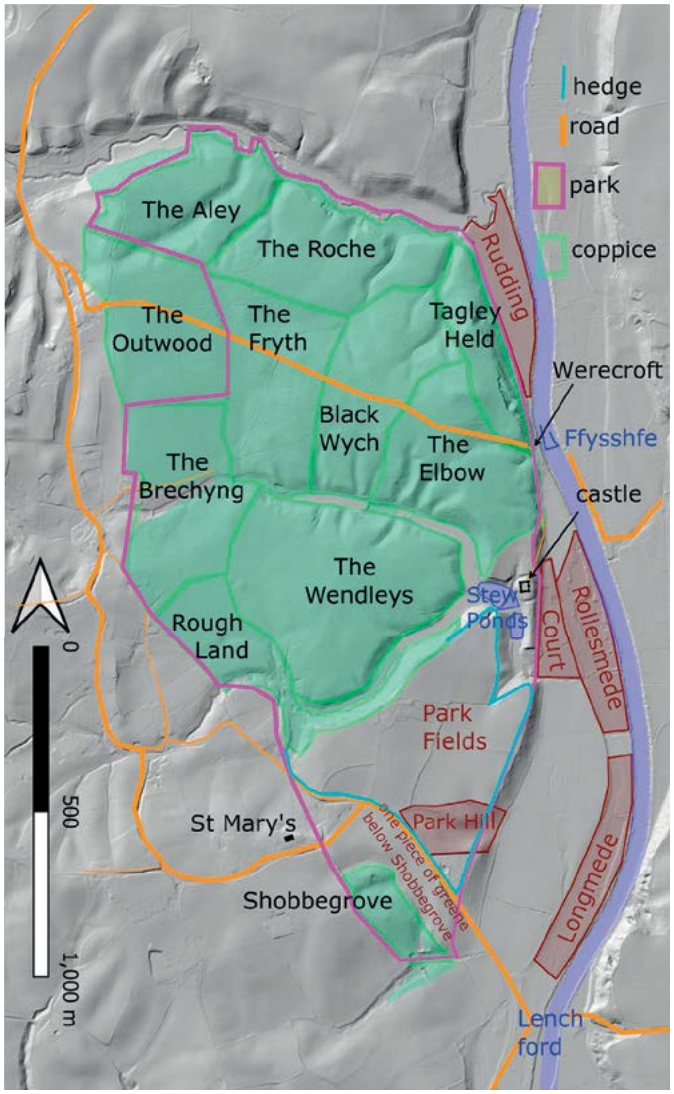
Why have a castle here? One theory suggests feudal extortion.[11] It's hard to imagine now, but before Holt lock was built downstream of Shrawley in the 19thC, a weir stretched from the bankside beneath Oliver's Mound, across to Ombersley on the far side. This provided a crossing point when river levels allowed and a foot ferry helped things along when they did not. Cattle being driven from Wales towards London and Droitwich salt heading westwards are likely to have crossed the river here. The importance of the River Severn itself as a conduit of trade is discussed in the chapter Tales of Two Rivers (pp.82-95). A castle at this nodal point presented an opportunity for taxes, tolls and tributes but this kind of activity was more prevalent in parts of continental Europe and there's no obvious English precedent. As described above, the most likely origin is military concern with incursion from the west, augmented in later years by a penchant for social prestige and gentrification.

Shrawley Castle lasted only until middle 14thC., apparently displaced by another Beauchamp crossing-place castle, downstream

1 Mason, Emma. 1991. *St Wulfstan of Worcester* Basil Blackwell
2 Hamshire *ibid.* p407
3 This arrangement is specifically enshrined in Domesday Book.
4 Williams A. 1995 English and the Norman Conquest. The Boydell Press. p60 fn 67

5 Habington, Thomas. 1899. *Survey of Worcestershire* (edited for Worcestershire Historical Society by John Amphlett of Clent) vol II pp422/3
6 *Victoria County History. Worcestershire*. i, p329 citing Evesham Chartulary
7 Red Book of the Exchequor (Rolls Series) p567 'Radulfus de Touni, iij milites et dimidium et quintem in Estham, Rudmerlega, La Bereve, Warneslega, La More, Scravelega, Sendeslega'
8 T*esta de Nevill* (Record Commission.), 42*b*
9 Sproat, Rod. *The History of Shrawley and Oliver's Mount* http://www.northwag.org/our-projects/community/oliver's-mound/olivers-mound-history. Accessed 4/3/2017
10 *Worcestershire Local History Forum Issue 50 Autumn 2011* p18:- 'Shrawley & District Local History Society held their final activity for the Local Heritage Fund's financing of the Archaeological dig at Oliver's Mound (Shrawley Castle) on 15th October at Shrawley Village Hall. They were granted a total of £48,000 in 2007'
11 Sproat, Rod *ibid.*

at Holt.[1] Archaeology suggests the occupants of Shrawley Castle had led a simple life: most of the utensils found during excavations were of local earthenware, with a dearth of more privileged crockery. Plebeian cattle bones outnumbered those of higher status deer.[2] The Pohers were knights and ladies and it's possible they lived elsewhere – perhaps the site of what is now Court Farm or some predecessor to the present Shrawley Wood House – but the splendid piece of archaeological reconstruction mentioned above suggests rather more than mere military function.



03. A tentative guess at the extent of the Park associated with the castle. Court Pool indicated on the 1839 tithe map may have been a remnant of the 1380/90 stew ponds (p. 107). The meadows mentioned in the Bailiff's report (Rudding, Rollesmede, Longmede are shown where fields with similar names were listed in the 1808[3] map of Shrawley Court and Curriers Estate. The ten coppices of Shrawley Wood are drawn as for the chapter Coppices & Binds (pp.200-205). Remnants of an ancient hedge are still to be found along the line marked as a hedge.

Wherever they lived, the Pohers enjoyed the benefit of a deer park. There's only a fleeting early reference to this in 1304, when Aline Poher rented out one third of her parkland in Shrawley,[4] but there are further references in succeeding centuries and it's unlikely they refer to different parks. In 1433, there's mention of: 'Sale of wood in the park in *capicia* called Blakewyche cost £23'. Blakewych was one of the Shrawley Wood 'binds' or coppice compartments. In 1480 and 1481, 30 shillings was paid for the sale of the herbage of the old park. These accounts also record wages paid to 15 customary tenants working for 24 days upon the enclosure of the park at a halfpenny a day 'according to ancient custom'.[5] Much later, there are references to an 'Old Park' and 'Nether Park' and to this day there's a field name 'Park Hills'.

Parts of various Lincolnshire limewoods were incorporated into parks and woodlands such as Bass Wood,[6] Minting Wood,[7] Barlings Park[8] and the Bullington and Goltho Woods;[9] all suggest they were part of a mosaic in which lime woods were linked with parkland pasture. Using these as a template for Shrawley Park, it's possible to conjecture that Aline's parkland linked the southern boundary of Shrawley Wood with Shopgrove.[10] The eastern boundary would have been along the River Severn's flood plains' scarp edge, where a pair of ancient small-leaved lime still retain an enigmatic presence. The specific binde that is mentioned as being in the park, Blakewych, has been tentatively placed by Richard Pumphrey in the centre, suggesting that all of Shrawley Wood was incorporated.

In 1390 some part of the Poher parkland was engineered to provide another item on the medieval diet menu. Fish. A second stew pond was added above the old one, which by then needed repairs to its head (dam). The stream feeding the first was dammed higher up to make the second, presumably for keeping fresh-water fish such as carp; similar combinations of deer park and fish pond can be found elsewhere in Worcestershire, for example at the Bishop of Worcester's former park at Grimley[11] and in the Ombersley limewood known as Linholt.[12] The construction costs are detailed on p. 107. Other works were paid at various rates: 2d for collecting hay, 1d for carrying services, ½d for hoeing the Lord's corn, ¼d for collecting nuts and apples: works for *boonrepe* (work for favour, with meal) 1d – for these last works the lord of the manor was probably calling in obligatory labour from his copyhold tenants. At some unknown time after, these feudal obligations were commuted to cash payments – rent, in effect.

[1] Salter, Mike. 2000. *The castles of Herefordshire and Worcestershire.* Wolverhampton: Folly. p82 Holt Castle predated the building of Shrawley Castle; it was held by Urse D'Abitot in 1086 . The oldest part of the existing building is a tower which is a relic of a house built by a John Beauchamp who was knighted and granted an estate in North Wales by RII in 1385.

[2] Clarke, Christopher. 2014. Small-scale Excavations at Shrawley Castle. In: *Transactions of the Worcestershire. Archaeological Society 3rd series,* 24: p150

[3] WAAS r705:27 BA438/16 Plans (rolled) relating to estates 18th-19th cent. (vi) A Plan of Shrawley Court and Curriers Estates in the County of Worcester. Young and Charlton Surveyors. 1808

[4] TNA Calendar of Inquisitions Ed I vol 4 235 (Writ 25 July 32 Edw I Edmund de Moruo Mari) p159: Shrauleye. A messuage, 45a. arable and 3a. meadow, a third part of a park, and 2 cutomers rendering ½ mark yearly, held of the earl of Warwick for ⅓ knight's fee

[5] TNA DL 29/645/106 1-2. Thanks to Dr Peter King for this reference. Bailiff's Account Roll dated 22nd June 1389/90, WRO Ref. 705:66. BA 4221/7.

[6] Mynard, Dennis C. 1969. Excavations at Somerby, Lincs 1957. In: *Lincolnshire History and Archaeology* 4:65; Beckwith, Ian. 1972. *The History of Fields and Farms in Gainsborough* The Making of Modern Gainsborough series, Gainsborough Urban District Council.pp11-12

[7] TNA. SC 12/10/59 Survey of Minting Park 1546/7

[8] Everson, Paul & Stocker, David. 2011. *Custodians of continuity?: the Premonstratensian Abbey at Barlings and the landscape of ritual* Sleaford: Heritage Trust of Lincolnshire pp 152, 288

[9] Everson, PL; Taylor, CC & Dunn CJ. 1991. *Change and continuity: rural settlement in NW Lincolnshire* pp vi, 53, 78/9. (Cocklode and Spring Woods in Bullington and Great West Wood in Goltho.)

[10] Field, RK. 1996. The Beauchamp Earls of Warwick and the Castle at Elmley. In: *Transactions Worcestershire. Archaeological Society 3rd ser* 15: 135-146. Describes the Beauchamp park at Elmley Castle; See especially p144 fn18 'The park, possibly created c. 1234, was compartmentalized into coppices, enclosed when young trees were growing, and open areas (laundes) with glades. It had 4 padlocked gates.'

[11] Aston, MA. 1982. Aspects of fishpond construction and maintenance in the 16th &17thC's with particular reference to Worcestershire. In *Field & Forest. An historical geography of Warwickshire & Worcestershire*. Editors: Slater, TR & Jarvis PJ. Norwich Geo pp257-280. Based on Journal of Prior William More of Worcester written between 1518 & 1535; fishponds as part of Cathedral Priory estates at Crowle, Grimley, Hallow & Battenhall. Highlights strong association of fishponds with parks.

[12] Bond CJ. 1973. The estates of Evesham Abbey: a prelimary survey of their medieval topography. In: *Vale of Evesham Historical Society Research Papers*. 4: 36/7



03. Gravestone attributed to Aline Poher that was found on Oliver's Mound and relocated to St Mary's graveyard.[1]

There's an almost credible legend that Aline le Poher, the last of the Shrawley Pohers on record, not only lived in the castle but died and was buried there. Apparently, she had been excommunicated in the early 14thC for heresy and as a consequence Aline couldn't be buried in consecrated ground (03);[2] her mortal remains lie at rest on the edge of Shrawley Wood to this day.[3] As we'll see, she wasn't the last incumbent of Shrawley Wood to be buried onsite.

In the second half of the 14thC Shrawley was under direct Beachamp lordship and so, for short periods, is the neighbouring parish of Astley. Shortly after the Norman Conquest, de Toni had given Astley to the French Priory of Saint-Taurin and they retained it for some of the time until 1390[4] – the exceptions being when England was at war with France and royal decree dictated the suppression of 'alien' monasteries. During these periods, the Beauchamps had custody. In 1389, the Astley manor of Saint Taurin priory was sold to the Earls of Warwick – successors to Beauchamp lordship in Shrawley – although the priory itself was disposed to the Bishop of Worcester's Westbury Priory in 1468.[5] Neither transfer included Astley Wood.



04. Thomas Beauchamp, Earl of Warwick, KG, from the Bruges Garter Book, 1430/1440, BL Stowe 594.[6]



05. The birth of Richard Beauchamp[7]

After the Pohers, there followed a century and a half of direct Beauchamp rule. Well, almost. As Earls of Warwick, the Beauchamps became major players in England's historic pageant and there were occasions when they lost their grip for a while and Shrawley Wood was seized by the king. These have turned out to be useful episodes for students of Shrawley Wood history because kings and queens were quite good at keeping records

We might start with Thomas Beauchamp, the 12th Earl of Warwick (04). He was appointed by parliament as Governor over the young King Richard II and later became a Lord Appellant, devoted to constraining royal government. When Richard II broke free from this, Thomas retired to his Worcestershire estates but he was invited back to London and spent sufficiently long in the Tower of London for one of the towers to be named after him. Shrawley became crown property but then, after Bolingbrook's success, Richard II spent some final months at Pontefact Castle where they omitted to feed him. And Shrawley Wood bounced back to the Beauchamps.

Thomas Beauchamp's successor, his son Richard, was born at Salwarp (05), just down the river from Shrawley Wood, in 1382. A late medieval illustrated biography, now in the British Library[8], records Richard's lifetime adventures which include Holy Land pilgrimage, fighting Frenchmen and suppressing Lollardy but for Shrawley Wood purposes the most important event was his daughter, Anne. She inherited the Beauchamp estates and married Richard Neville 'The Kingmaker' who became the 16th Earl of Warwick. To cut a long story short – and Anne has attracted more writers than almost any other female figure in English medieval history[9] – her husband, her children and their spouses fought fiercely over her inheritance, but she outlived them all. From sanctuary in Beaulieu Abbey an elderly Anne petitioned King Henry VII for the

1 Photograph by Richard Pumphrey

2 Masterman, SW. 1930. Excavations at Shrawley. In: *Worcestershire Archaeological Society Transactions.* 7: 81-82. According to SWM 'Researches by Canon RA Wilson relate that Aline le Poher of Shrauele was excommunicated, for that she 'obstinately despised the keys of the Church.' SWM then goes on to link this with 'The ancient stone coffin now lying in Shrawley Churchyard [that] was found near here [the Castle]'

3 In truth, Aline might be here or she might not. Either way, an interesting conjecture has been given new life by incorporation into the onsite interpretation board!

4 Calendar of Patent Rolls: Richard II. Vol. IV. 1388 - 1392

5 *Victoria County History Worecstershire* 2: 182

6 By Photo British Library; painted by or for William Bruges - http://prodigi.bl.uk/illcat/record.asp?MSID=7656&CollID=21&NStart=594, Public Domain, https://commons.wikimedia.org/w/index.php?curid=16936888

7 The manuscript states: *This pageant sheweth the birth of the famous Knight Richard Beauchamp Erle of Warwick which was born in the Manor of Salwarp in the Counte of Worastz the xxviii day the month of January the year of the incarnartion of our Lord Christ mxxxlxxxii*

8 The latest printed edition: Sinclair, Alexandra (editor). 2003. The Beauchamp Pageant. Richard III and Yorkist History Trust in Association with Paul Watkins. Donnington. The first plate portrays the nativity in a birthing room at Salwarpe; presumably the artist was not present at the time.

9 Examples include work by Philippa Gregory, Sharon Kay Penman, Jean Plaidy, Sandra Worth & Sandra Wilson.

return of her patrimony and a deal was done whereby a large part was added to the royal estate. As it happened, the king already had wardship of Shrawley Wood[1] but, thanks to Anne, this became a certain arrangement.[2] [3]



06. A portrait of Catherine Parr (1512–1548), sixth and last wife of Henry VIII of England by an unknown artist.[4]

Shrawley remained part of the king's estate[5] until, nearing the end of King Henry VIII's reign, Queen Consort Catherine Parr (06) acquired a lifetime interest as part of her marriage settlement.

Making Shrawley Wood Pay

Soon after Catherine Parr's acquisition, there was a scramble to acquire her interest in Shrawley[6] and William Sheldon became the effective owner. It's worth quoting the detail of this arrangement, because it illustrates the curious status of Shrawley Wood and the advowson[7] of the church as a separate entity from the rest of Shrawley manor:

> *Grant, in fee, for 1,578L 3s 2d, of the reversion of the lordship and manor of Shrawley, Worcs., as granted for life to the Queen Consort Katherine by pat. 25 Feb. 35 Hen VIII. Also grant of the lordship and manor of Surawley als. Shraveley the wood called Shrawley Woode in Shrawley, and the advowson of Shawley rectory….[and lands in Warks]*[8]

This distinction is confirmed in 1558, when William Sheldon sold 'the manor of Shrawley' to William Gower of Redmarley, but with Sheldon retaining both Shrawley Wood and the church advowson.[9] Gower acquired rather less than half of the parish, with the larger part – Shrawley Wood and some farmland – retained by Sheldon. The origin of this arrangement is a mystery but it may be relevant to record that the Pohers, sub-tenants in the early Beauchamp years, probably held the advowson when Shrawley Wood was apparently part of their park.[10] Going still further back, the hide occupied by Urse at the time of Domesday was rather small to encompass all of Shrawley[11] and it's tempting to consider that an apparent division of Shrawley into two parts is a legacy of this earlier time.

Despite split ownership, Shrawley Wood administration was still dealt with in the manorial court held by William Gower and his successors. Court rolls record the division each year of a 'bind' or coppice coupe among a number of people holding some share in the underwood. There's no record of any financial arrangement, but it seems that a number of people from Shrawley and Astley operate as a syndicate or co-operative to lease Shrawley Wood from William Sheldon and exploit the lime coppice they cut each season to make bast ropes. As will be seen in the chapter 'People in the Wood' pp.76-81, something of the sort has been going on since the 15thC and probably much longer.

In 1580, William Sheldon (07) bought out the remaining crown interest in Shrawley Wood and the church advowson, enabling him to sell both.[12] The buyer was William Childe and his son and from this point court records of activity within Shrawley Wood cease and there's only an occasional mention of maintaining the perimeter hedge. People from Astley and Shrawley continue to spin ropes from lime bast, but they no longer have the collective autonomy that seems to be implicit in previous relations with the owner; William Childe appears to be the first owner of Shrawley Wood to take the business of capitalist exploitation seriously. Shrawley Wood was owned by four generations of the Childe family and the first three confounded the present writer entirely by sharing William as their first name; the following paragraph therefore relies upon the scholarship of Dr Peter King.

In 1607 or 1608, the second William let Shrawley Wood to the third William for 21 years at the substantial rent of £160, taking a fine of £200. He reckoned the wood was worth £230 per year, giving his son a profit of selling £70 per year. The son was authorised to cut two bindes the first year to pay the fine and then one bind. Allowing for inflation, these sums still far exceed any apparent profit from Shrawley Wood derived by previous owners. Subsequently the third William Childe settled his property on the fourth generation of Childes to be associated with Shrawley Wood - his son Thomas; Thomas married in 164[2]3 and as part of the marriage settlement, the father retained a life interest in 'certain woodlands' held at a rent charge of £215.



07. William Sheldon.[13]

1 TNA SC6HENVI/989 lists Shrawley among possessions 'late of George Duke of Clarence, which came into hands of the king by reason of the minority of Edward Earl of Warwick 3-4HVII 1487-9.
2 Nevertheless, as late as 1544-6 Shrawley is still listed among 'Possessions of Richard earl of Warwick and Anne his wife, in the king's hands by reason of a fine levied by the said Anne'(TNA SC 6/HENVIII/4024). See also SC 6/HenVIII/4017 (1533-35); SC 12/16/89 'Valor of the Earl of Warwick's lands 18 HenVIII, 1526-27.
3 An apparent consequence of crown acquisition was an important Survey of Shrawley Wood that looks back at woodland management over previous decades. See 'People in the Wood' pp.76-81 and TNA E315/83/8
4 Wikimedia Commons
5 Wolfe, BP. 1970. *The Crown Lands 1461-1536: an aspect of Yorkist and Early Tudor Government.* George, Alan & Unwin.
6 TNA Rentals and Survey portfolio 23, no. 67; *Letters. and Papers. Henry VIII*, xx (1), 628, 639
7 That is, the right to appoint the church minister.
8 TNA Letters & Papers Foreign & Domestic HVIII vol 20: pt 2: 1545 [Page 117; Entry no 266] Wm Sheldon and John Draper of Temple Grafton, Warks.
9 Victoria County History IV, p338-9.
10 TNA E210/7619 John le Poer to J[j]ob the Clerk of Shrawley his kinsman. Grant of land in Worcester.
11 Hamshere *ibid.* pp247-258 deals with the size of Worcestershire hides at length. Within his assessment, there are examples of hides exceeding 2000 acres but the average for the 400 hides held by the Church of Worcester is 374.5 acres (p.253)
12 *Calendar of Patent Rolls*, 22 Elizabeth 1578-1580, no 1432
13 https://thesheldonchronicles.net/wp-content/uploads/2018/05/16-15-1WilliamII-1.jpg

Like many Worcestershire landowners, the third William Childe supported the losing side in the English civil war and in the aftermath he was obliged to pay a substantial fine to secure his estate. The ramifications of setting the fine are recorded in the National Archive, but suffice to say this was finally set in 1656 at 1,840£.[1] If claims made in the heat of litigation can be taken at face value, this penalty and the need to pay it came close to destroying Shrawley Wood.

In 1654, Thomas Child began a suit in London's Court of Chancery against his father, the third William Child.[2] Thomas complained that his father was not only cutting coppice at an unprecedented rate, far beyond the sustainable convention of one bind each year, he was 'agisting' as well – meaning he took payment for cattle to browse and graze in the wood. The terms of William Child's inheritance specified 'no impeachment for waste' meaning, in effect, that he could exploit the wood for his own best interests without regard for a sustainable future. If William Child chose to repay the loan he had taken out to pay his fine by cutting down the lime and then destroying the coppice stools by browsing there was nothing in the entail or marriage agreements to stop him. But Thomas had another ploy and, presumably, an astute lawyer. He invoked the Statute of Woods. This Tudor legislation laid down minimum terms for inclosing coppice woodland after it had been cut and for Shrawley limewood this meant seven years. William Child was putting cattle into the coppice binds much earlier than this and Thomas claimed that without a restraining order, parliamentary legislation would be flouted and the local economy damaged. And, incidentally, his own inheritance would be 'utterly destroyed'. Whether Thomas obtained his injunction isn't known, but Shrawley Wood survived to be sold three more times before the present day.

In 1663, Thomas Childe completed a process begun by other members of his family in buying out the manor of Shrawley that had become separated from Shrawley Wood back in 1558. In 1680 this re-united manor was then sold to Allan Cliffe of Great Witley, who in turn bequeathed it to his nephew, another Alan Cliffe. And then in 1700 the second Alan Cliffe sold this manorial package to Thomas Vernon, but before moving on to this next phase in Shrawley Wood's history, we'll devote a paragraph to the mystery of the amazing shrinking wood. So far, there has been no resolution of this curious confusion and any suggestions will be gratefully received. When Thomas Child took his father to court, for example, he's adamant that Shrawley Wood is 'one thousand and more acres' in extent.[3] In a succession of 17thC mortgage documents, Shrawley Wood is precisely delineated as 1040 acres. And in a note made in the early 18thC, an anonymous hand calculating the Shrawley estates overall area lists Shrawley Wood and Shopgrove again as 1040 acres. No doubt there's an element of 'follow my leader' in these figures and there may be some creative distortion inspired by self-interest or skulduggery and, as Roger Clooney has pointed out, there's a small difference between the modern statute acre and a 17thC customary acre.[4] But modern calculation suggests that the 17thC Shrawley Wood and Shopgrove combined could have been no more than 380 acres in total! At one time, the present writer fantasised that the once conjoined woods of Astley and Shrawley were somehow still perceived as a single entity – notions rightly dismissed by all and sundry. Still, it's a puzzle.

In 1700 Shrawley Wood was sold once again and, thanks in part to the legal ingenuity of complex entails and marriage settlements, this was to be the last time in more than two and a half centuries. The buyer was Thomas Vernon, often called in later life Counsellor Vernon. His ancestors and heirs, along with a wealth of detail about the estate are fully described in a remarkable history of the Worcestershire Vernons by Andrew Harris; this present account leans heavily on his erudition.[5]

Thomas Vernon's family had settled in Hanbury, 8 miles north-east of Shrawley in the 16th century and after obtaining some benefit from the disafforestation of the old royal forest of Feckenham they evolved into minor land-owning gentry. The Vernons emerged from the civil war with most of their assets intact, having made modest contributions to both sides without demonstrating excessive zeal for either. A fourth-generation Hanbury Vernon, Richard, became a Middle Temple lawyer and in 1656 his son Thomas was admitted, as a 17½ year-old pupil. to follow in father's footsteps.

When Thomas Vernon was able to plead in London's Court of Chancery he acquired a knack for winning and hence an ability to generate fees on a prodigious scale. Part of these he spent on building Hanbury Hall, now owned by the National Trust, and part was invested in property at Hanbury and elsewhere. Shrawley Wood, together with 247 acres of agricultural land in Shrawley, the right to nominate the vicar of Shrawley church, the fines paid by 36 copyholders whenever their land changed hands and a handful of 'head rents' for ancient freeholds cost him £13000 and was his largest single investment outside of the core Hanbury estate.[6] Altogether Thomas laid firm foundations for a property portfolio of more than 6,000 acres, ensuring high status as gentry for successive generations of Vernons through until the 20th century. He also left £80,000 in cash, a substantial charity for the support of village schools and the less prosperous inhabitants of Hanbury and Shrawley – and a good reputation both as lawyer and landlord.

Councillor Vernon and his wife Mary were not blessed with children, but there was an evident determination to keep this estate in the family name; the default heirs, his sister Elizabeth and her daughter Letitia, received legacies but they didn't inherit the land. Instead, Counsellor Thomas Vernon had groomed a second cousin as his heir and it was through this rather distant relative, Thomas Bowater Vernon, that the main property descended. Elizabeth's husband launched a legal challenge that eventually went so far as the House of Lords but Thomas Vernon's last will and testament stood firm.
By the terms of Thomas Vernon's will, the estate passed eventually to Emma Vernon and here the smooth flow of Shrawley Wood history through the 18th century was disturbed by turbulence. Emma married Henry Cecil – a good match with a man who eventually inherited the palatial Burghley House in Lincolnshire and became the 10th Earl of Exeter. But some years after this first marriage, Emma fell in love with a man of very modest means and prospects - the curate of Hanbury parish church, one William Sneyd. After some farcical shenanigans in a Birmingham hotel, she eloped with him.

Henry Cecil, meanwhile, was grief stricken and went into anonymous seclusion in a remote Shropshire village. Here he recovered himself sufficiently to marry, bigamously, the daughter of a small tenant farmer, one Sarah Hoggins. When he eventually inherited the Earldom, status and hard cash were instrumental in persuading Parliament to pass an Act permitting his divorce from Emma and enabling him to make an honest woman of his village bride. She was henceforth celebrated as "the Cottage Countess". During this time, Emma's curate lover died and she found another husband, but although the Vernon estates were her property, the settlement of her first marriage had vested them in Henry Cecil for his lifetime. As it turned out, the Marquis of Exeter didn't die until 1804; Shrawley Wood and the rest of the Vernon property were under his control for 50 years.

An early consequence of Emma's abandoning her first husband was that Henry Cecil – as he still then was – sold off the entire contents

1 TNA Deputy Keeper's Room *Calendar of the Committee for Compounding, etc. Domestic. 1643-1660*
2 TNA: C6/41/116 *Child v Child*
3 *Ibid.*
4 Pettit, Philip A.J.. 1968.*The Royal Forests of Northamptonshire. A study in their economy 1558-1714* Northamptonshire Record Society pp7-8. Pettit is talking specifically about woods within royal forests, where he finds that parochial acres used in early 17thC surveys range from 16½ poles to 18 and 21 poles.
5 Harris, Andrew. 2009. The Vernons of Hanbury – the rise and fall of a landed family.
6 Harris, Andrew. *ibid.* pp53/4

of Hanbury Hall in a marathon 8-day auction and pocketed the proceeds; the estate wasn't his to sell, but Emma's 'chattels' were his to do with as he pleased according to the quaint notions of matrimony then prevailing. Thereafter, Henry Cecil couldn't sell the estate, but he could exploit the income. Many of the estate farms were neglected and farm buildings fell into disrepair during this time but matters came to a head much later in 1803 when Emma and her second husband, John Phillips, bought an action in Chancery claiming that the estate timber was being plundered by the Marquis of Exeter – something expressly forbidden by his Divorce Act. To refute these allegations, the Marquis commissioned a survey of the estate timber from Richard Harvey and this provides a euphoric account of Shrawley Wood at the time.[1]

The Chancery case itself came to nothing, being ended by the Marquis's death. Thereafter, John and Emma Phillips (as she now was) had possession of the estate for their lives and John spent much of his own money in making good previous neglect, having reached an agreement with Emma's heirs that he would be repaid. John Phillips it was who transformed the oak population of Shrawley Wood with a large-scale planting programme favouring *Quercus robur.*[2]

Emma's principal heir was her cousin Thomas Vernon, but we'll hurry past him and three successive Vernon generations. All were stalwarts of the Worcestershire establishment, most sat as Justices of the Peace, served as officers in the county yeomanry, sat as Members of Parliament and dispatched game shot around Shrawley Wood to favoured friends in London. However, their direct impact on Shrawley Wood did not extend beyond the useful conservatism of leaving things much as they were. We'll move on to Sir Harry Vernon, second to last of the line.

Sir Harry was a forestry enthusiast, and he had a special affection for Shrawley Wood. At least, his children spent much of the holidays in a chalet built in the heart of the wood and these seem to have been remembered as fond family occasions. In 1906, Sir Harry showed Henry John Elwes – author of the monumental 'Trees of the British Isles' – around Shrawley Wood and observed glumly that the lime underwood didn't pay and he would be much better off replanting the lot with larch. Thank goodness he didn't, although accounts of the 1960's suggest that he did some innovative planting of trees such as European larch that have long since been harvested.

By 1906, Sir Harry had good cause to be thinking of what paid and what didn't. His long tenure at Hanbury Hall presided over the most catastrophic collapse in farm incomes – and ultimately farm rents – in centuries. This had virtually nothing to do with Sir Harry, who had a reputation for prudence, and everything to do with the repeal of the corn laws and, more recently, the canals, railways and steam ships that enabled North American farmers to export wheat cheaply. Worcestershire farmers, however efficient, simply couldn't compete with newly ploughed prairie lands, open markets and cheap transport. Annual rentals of around six thousand pounds a year for the Hanbury estate halved and despite some recovery around WWI they slid back again, reaching a nadir in the 1930's when wheat fetched just a fraction of the price enjoyed during the glory days of Victorian high farming. Unlike some other Worcestershire landowners - the largest in the late nineteenth century was Lord Dudley with his vast Witley Court acres, bankrolled by Black Country coal mines[3] – the Hanbury Estate had no industrial investments or lucrative urban assets to fall back on.

Indirectly, Shrawley Wood brought some relief for a while. In 1869 the Shrawley Wood House was rented out to a Scottish shipping magnate – James Allan, a beneficiary of transatlantic trade – and in due course his youngest daughter married Sir Harry's eldest son. The Vernon family's attachment to Shrawley Wood and the summer house may have played a part here. James Allan lent Sir Harry twenty four thousand pounds on mortgage and together with some sales of outlying property, this enabled the Vernons to weather the early storms and keep the key components of the Hanbury Estate together.

Local newspaper pictures start to become available in Sir Harry's time and they faithfully record Vernon benevolence. The dutiful squire and his good lady presided over village fetes, Christmas parties for village children at the Hall, annual dinners for tenant farmers, grand celebrations for all when Vernon family members got married and the license each year for village folk to gather dead wood in Shrawley Wood for firing at home. Lady Georgina Vernon worked tirelessly for cottage hospitals and her husband lent support for many a traditional good cause. Tempting to think of all this, perhaps, as the final, fading glory of the English landlord system. Patrician discipline and tradition tempered with goodwill, rising expectations and just a hint of democracy. Downton Abbey with less pomp. Shrawley's first social historian, Mrs Masterman, seemed to think so. And so did the last Vernon heir, Sir George.

Sir Harry Vernon had two sons and both left home to find their fortunes. The youngest, Hubert, joined the army and enjoyed the sporting life of a young subaltern in India before some serious colonial suppression in Matabeleland and then the Boer War. He came through this intact but returning to South Africa in more peaceful times, he died after a polo accident. George, the eldest, went to South America where he spent many years as a rancher and horse breeder – with a Boer War interlude as a trooper in an irregular unit of mounted yeomanry called Rimmington's Horse. Sometime around 1902 he returned to Hanbury Hall and three years later married Doris, daughter of James Allan of Shrawley Woodhouse. George and Doris Vernon farmed on their own account until after WWI, first in Worcestershire and then Suffolk, but when Sir Harry died, his eldest son inherited the title and the couple moved into Hanbury Hall, now as Sir George and Lady Doris.

As he got older, it seems Sir George became very fond of some domestic staff at Hanbury Hall; Andrew Harris deals with these matters very tastefully. Sir George had a particular affection for one of the parlour maids, Ruth Powick, whose father Cyril was the woodsman at Shrawley. According to one account, Lady Vernon came across her husband with Ruth on his knee, giving her elocution lessons; the outraged wife packed and left immediately, never to return until after Sir George's death.[4] Sir George continued a routine he had begun with his wife, travelling by banana boat each winter to South America or the Caribbean, but now taking Ruth as his secretary. Later he adopted her as his daughter and she changed her name accordingly. Outside of the winter months, Sir George conducted a bitter feud with the Hanbury Rector, principally over tithes, and took up his place as chair of the Droitwich Magistrates Bench, from where he conducted another fierce campaign, against speeding drivers.

On his last visit to warmer climes, in the winter of 1939/40, he went alone and returned apparently depressed and suffering with an ever-worsening heart condition. Estate finances were still deteriorating and Hanbury Hall was suffering badly. In 1938, he had offered Hanbury Hall to the National Trust after his death and, with some reluctance, they eventually agreed;[5] their agent James Lees-Milne has left a poignant description of neglect and dereliction witnessed during his last drive to Hanbury before the war.[6]

On May 11th 1940, suffering increasing pain and sleepless nights, Sir George took what he called 'the short cut'. He sent Ruth and the domestic staff shopping and then shot himself, having made careful stipulations for his burial. No churchyard or consecrated ground and no Hanbury parish priest. He had marked out a plot in the middle of

1 See 'Hearts of Oak' p.71

2 *ibid.*

3 Raybould, TJ. 1973. *The Economic Emergence of the Black Country.* David & Charles pp118-120, 124-5.

4 Lees-Milne, James. 1993. *People and Places: Country House Donors to the National Trust.* John Murray. p46

5 Harris, Andrew. 2009. *The Vernons of Hanbury – the rise and fall of a landed family* p216. Sir George was persuaded to include a couple of farms in with Hanbury Hall.

6 Lees-Milne, James. 1993. *People and Places: Country house Donors to the National Trust*. John Murray.

Shrawley Wood, alongside the ruins of the Summer House that had been the delight of his youthful years. He's still there today, his grave marked by a simple stone memorial. According to local legend he was wheeled there by Cyril Powick in a barrow.

Local legend can be cruel. It's clear from Lees-Milne's account that Sir George had been ostracised by the great and good for some time before his death.[1] Suicide would have alienated many more. One hostile story that did the rounds was that he killed himself to cheat internment as a pro-Nazi and a fervent supporter of Moseley's fascist Black Shirts. There's no evidence for this. He was, it seems, a man of trenchant opinions and robustly conservative instincts, but it's hard to imagine him drilling prospective storm troops in Shrawley Wood.

This much is true - apart from his understanding with the National Trust and a few conventional legacies, Sir George Vernon left everything he had to Cyril Powick's daughter, now known as Ruth Vernon. Almost immediately, there followed a game of musical chairs in which Lady Doris and her mother, who had been living at the Woodhouse in Shrawley Wood, moved into Hanbury Hall, where as Sir George's lawful wife still had a lifetime interest. Ruth, meanwhile, moved into the Shrawley Woodhouse, where she died as Ruth Horton[2] in 1980, having married a Longbridge motor engineer named Frederick Horton in 1946.[3] He lived there until his death in 1990. Ruth is commemorated in what is now the Millennium Green, by St Mary's Church (09), land gifted to the church by Frederick Horton following his death.

Not surprisingly perhaps, Lady Doris bore a great grudge against the person she habitually referred to as THE FEMALE, but when in 1952 the National Trust were completing their paperwork for Hanbury Hall, they needed the simultaneous signatures of Ruth Horton, as the lawful owner at that time, and Lady Doris, as life tenant. Ruth did this from a Droitwich solicitors office and Lady Doris from a near-derelict Hanbury Hall, with professional orchestration over the telephone. They didn't meet.

Nationalisation

Ruth Annie Horton sold the larger part of Shrawley Wood to the Forestry Commission in 1961.[4] As the largest single *Tilia cordata* wood in the British Isles, Shrawley Great Wood had survived the vagaries of diverse owners through the ages but here was something quite different. According to the 1947 survey of British woodland, *Tilia cordata* accounted for just over a thousand acres[5] and of these the largest part – in Worcestershire, Warwickshire, Essex, Suffolk and particularly Lincolnshire - had been acquired by the Forestry Commission with the specific intention of destroying the lime and replanting with conifers.

The Forestry Commission was set up after the First World War with the remit to reduce Britain's dependence on imported timber, especially in wartime – one bizarre consequence of the 1917 German submarine campaign had been a real threat to home coal production simply because of a pit-prop shortage. With limited funds, but using the efficient methods of 'scientific' forestry pioneered in Germany during the 19thC, they began extensive plantations of conifers, mainly on very low-value hill-farms and heathland. They also inherited relicts of former Royal Forest – the Forest of Dean and the New Forest were the largest examples – and although planting conifers here and in the Lake District stirred some controversy, the Commission weren't oblivious of the need for hardwoods. In the 1930's they acquired Bedford Purlieus, a mixed woodland, including small leaved lime, in the old Forest of Rockingham and they began a gentle restocking with oak and other broadleaves, declaring a similar policy for lowland woods in general.[6]

This changed after WWII. By the time the Forestry Commission acquired Shrawley Wood, they were reaching the peak of a ruthless coniferization policy. Along with motorways, tower blocks, industrial farming, nuclear power and hovercraft, rational rows of fast growing *Gymnospermae* were all billed as part of a progressive future. Folk with slide-rules assured any sceptics of certain profit. Ancient woodlands devastated by wartime felling were bought up wholesale for replanting and lime woods were especially attractive. Long-term leaf litter from *Tilia cordata* is kind to top soils, making them potentially more productive than less favoured woodlands and the difficulty of erasing old lime stools had been transformed by new and wonderfully effective systemic herbicides. Or so they thought. As it turned out, some old lime stools were more tenacious than expected; it's nice nowadays to find an old *Tilia cordata* soldiering on in the dense shade of about-to-be-harvested Douglas Fir, despite a heavy dose of diesel and 2,4,5-Trichlorophenoxyacetic acid nearly 70 years ago.[7] [8]And the conifer policy began to create a back-lash. First the Commission were obliged to employ a landscape architect in efforts to ward off criticism of harsh lines created by block-planting on hillsides.[9] Then came 'amenity planting' – usually lines of native hardwoods along rides and woodland edges to mask the industrial planting within. Naturalists became more assertive in pointing out the wholesale simplification of ancient, complex ecosystems and eventually these inconvenient truths were made incontrovertible by George Peterken and Oliver Rackham.[10] In the Lincolnshire limewoods, Peterken and the county Wildlife Trust persuaded the Forestry Commission to tread more lightly.[11] And in Shrawley Wood, the Wyre Forest District of the Commission paid some attention to the weak but well-meaning blandishments of the Nature Conservancy Council. The NCC had designated parts of Shrawley Wood as a Site of Special Scientific Interest[12] and although the Commission made it clear that economic forestry would always have priority, they agreed to be as helpful as they could. [13] [1] [2].

1 *ibid.* p47

2 According to Andrew Harris, she chose to be known as Ruth Vernon-Harris but in her paperwork with the Forestry Commission she is known as Ruth Annie Horton.

3 Harris, Andrew D. *The Vernons of Hanbury: the rise and fall of a landed family.* 2009. p216.

4 TNA: F37/35 *Forestry Commission: forestry histories and working plans. Wyre Forest, parts I, II & III with map and appendices 1960-1965* [in table of 'Acquisitions and Disposals' : '14.6.61 Ruth Annie Horton Shrawley Wood. Conveyance. 237.713a.']

5 Hadfield, Miles.1961. Limes**.** In: *Quarterly Journal of Forestry* 4: 308, quoting Forestry Commission Census Report no 1, where only 1,034a of lime were recorded for the whole British Isles, only 97a. of it described as 'pure'.

6 Peterken, GF & Welch RC (eds). 1975. *Bedford Purlieus: its history, ecology and management*. Monks Wood Experimental Station Symposium no 7. p191 'The planting [mainly oak, by FC in late 1930's] was part of a grand plan for broadleaf forestry in lowland Britain launched by Lord Robinson [d1953], the [Forestry] Commission's chair.'

7 TNA: F37/35 records the first use of 245T in Shrawley Wood c.1964. Use in the Lincolnshire limewoods was routine.

8 Anon. 1999. 'I'm the man that tried to poison the lime in Shrawley Wood. We sprayed it with gallons and gallons of 2, 4, 5-T; we couldn't kill the b__ stuff.' Cited in Rackham O. 2003. Ancient Woodland.(New Edition) Castlepoint Press. p523 (accompanying Fig 33-11(b).

9 *Staff .10 July 1997. "Dame Sylvia Crowe obituary". The Times. London, UK. p25 – via The Times Digital Archive 1785–2008*

10 Rackham, Oliver. 1976. *Trees and Woodland in the British Landscape*; followed by Rackham, Oliver. 1980. *Ancient Woodland: its history, vegetation and uses in England* Edward Arnold

11 See Lincolnshire Trust for Nature Conservation Newsletter (LTNC) as follows: Ball, ME. 1967. *Lime woodlands in Lincolnshire.* In: *LTNC Newsletter* 30: 4-7; Anon. 1970. (ed AE Smith) The Destruction of broad leaved trees by the Forestry Commission. In: *LTNC Newsletter* 36 p8/9; Anon. 1971. (eds AE Smith & DN Robinson) Conservation and the Forestry Commission. In: *LTNC Newsletter* 38:7/8; Peterken, GF. 1971. *Central Lincolnshire Woodlands* In: *LTNC Newsletter* 39:12-15; Tilner-Bassatt HAE. 1971. (District officer FC) The Forestry Commission in Lincolnshire. In: *LTNC Newsletter* 39:17-22.

12 Early Site of Special Scientific Interest designations had only very limited sanctions and for many practical purposes were almost advisory.

13 TNA 37/35: 208a of Shrawley Wood were scheduled for 'clearance and replanting' in 1964-1966, with the inference that up to 29 acres might be available specifically for nature conservation, less a small coup of Sweet Chestnut and another small plot set aside for education and experimental use by Worcester Training College.

In the years that followed, the fundamental precepts of post-war economic forestry came first into question and then into denial at the highest levels. The outcome of this remarkable *volte face* for Shrawley Wood are Hugh Milner's domain but it's pleasant to end this chapter with the following:

'*In June 1992 the Forestry Commission launched a new management plan to secure the future of "this national treasure", probably the best limewood in England. The aim is to provide areas of coppice wood and stands of lime trees with a range of different age classes. Some area will stay uncoppiced and elsewhere glades will be created. The diversity of young and old wood, light and shade will benefit a wide range of fauna and flora, especially protecting rare slugs and hoverflies.*

The scheme covers both lime wood and conifer plantations and is a welcome change from previous FC practises. Forest District Manager Ian Hickman says: "the plans drawn up with English Nature[3] *will put the wood back to work.*'[4]

The national treasure referred to is, of course, Shrawley Wood.

An Astley Wood Saga

Astley Wood (08) was mentioned briefly at the start of this chapter. The context was Domesday Book and the idea that Astley Wood and Shrawley Wood together constituted the '*one league by half a league'* (08) recorded as Astley's woodland in 1085. Rather more than a square mile that apparently had no value. At least, no value to the lord and worthless for taxation purposes.

Divided economic interest in medieval woodland was normal. Manorial tenants usually claimed the right to put cattle and horses into woodland for part of the coppice cycle and they took wood for fuel, fencing and repairs. Depending on locality, there might be additional customary claims for anything and everything from smelting iron to smoking kippers. The division was usually between the lord and manorial inhabitants but in larger 'wood pasture' areas parochial arrangements might be complicated when adjacent manors shared common rights in the same territory. When these shared commons were also royal forests there were further ramifications: monarchs claimed special privileges such as over-stocking with deer and judicial oversight. In short, the whole business of who could do what in woodland was often complicated.

The probable explanation for a 'woodland that pays nothing' is that all the economic benefits lay with local inhabitants exercising 'common rights'. Such a one-sided arrangement was unusual but not unknown. The Domesday scribes are silent as to whether the beneficiaries were a cabal of more prominent commoners taking the lion's share or a golden commonwealth with equal access for all. Perhaps it was something in between.

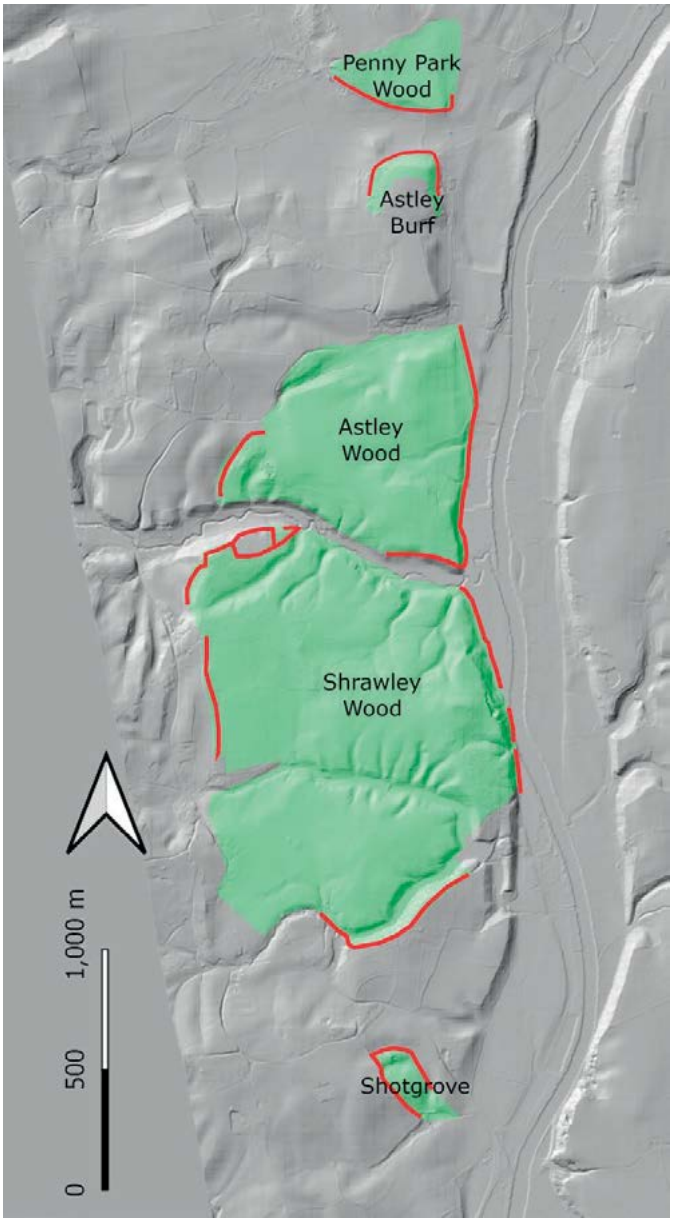
1 TNA 37/35: Annual Report Forest Year 63 (p6) 'We met Dr Pritchard again at Shrawley to discuss liaison with the NC over their SSSI in the wood, and the possibility of further of reservations, which would likely be on 'the steep NW boundary slope of Shrawley'

2 TNA 37/35 Chapter 28: Declares a policy of taking account of nature conservation but this 'does not necessarily mean that the status quo will be preserved in all SSSI's but there will be full consultation with the Nature Conservancy in the management of these areas. This will apply especially to Shrawley Wood, where major changes of species will be unavoidable in the interests of economic management.'

3 English Nature were successors to the previous Nature Conservancy Council. They now rejoice under the name 'Natural England'. By 1992, re-designation as a Site of Special Scientific Interest had considerably greater, mandatory, implications

4 Drewett, John & Roberts, John S. 1994. *Midland Woods & Forests: the Plants, Creatures, Character and History of Woodlands in the West Midlands, Warwickshire, Staffordshire, Shropshire and Worcestershire.* Quercus. p120

Astley Wood wasn't the only example of local lordship frustrated by common rights. Another was put on the record in 1435 when Elizabeth Beauchamp inherited the manor for a while. Astley Wood doesn't feature but there are '*200 acres of moor and pasture*' that are '*worth nothing yearly because of the common that various men have in it'*.[5] 300 acres of '*moor and pasture*' in Kidderminster are similarly worthless to Elizabeth.[6]



08. The relationship between Astley Wood and Shrawley Wood. The wood banks are represented by the red line

When Astley and Shrawley became separate manors – possibly at some time in the 12th century – the lord of Shrawley acquired considerable economic interests in his woodland domain, in contrast to Astley. The agency for this change may have been purchase, stealth or force majeure – most probably the last of these. However, it seems the Shrawley commoners didn't lose everything to the lord. Up until the late 16th century, individuals and groups of individuals, quite possibly acting on behalf of the wider manorial community, paid the lord each year for the right to cut all or part of a named bind - but these payments were apparently less than the full value. Not until the Child era did market economics come fully into play. Whether the earlier buyers were simply acquiring the right to cut lime coppice and use the bast - or birch and oak were part of the deal

5 Calendar of Inquisitions Post Mortem: Henry VI 1432 – 1437. p367. Worcestershire: Inquisition Worcester 9 February 1436

6 *ibid.*

- isn't clear. In any event, there's no record of either being exploited by the lord.

Along with the erosion of rights in Shrawley Wood, the Shrawley commoners probably lost most of their grazing rights. While the Astley commoners retained their 200 acres, the equivalent Shrawley land between Shrawley Wood and Shopgrove became a park and when this was dismantled in the early 15th century the area remained in private ownership. As mentioned previously, most of Shrawley Wood was also incorporated into the medieval park, although the Shrawley commoners didn't lose their right to browse livestock in the Wood – they apparently retained this right long after the park had gone.

The lord of Astley never muscled in on the customary rights of Astley commoners in the same way. Their part of the once conjoined woodlands remained, effectively, in common ownership. For a couple of centuries after Domesday, the lordship was vested in an 'alien' priory, the Abbey of St Taurinus, near Rouen, and it seems they were inclined to maintain the status quo.

There is evidence of woodland income to the lord during this period[1], but it was small compared to the size of Astley Wood and can be accounted for by woodland at Astley Burff, which was separate. According to the resident Prior of Astley, his domain overall was a poor one – he claimed it was worth nothing 'after expenses.'[2] It's possible 'six loads of firewood' given to the vicar of Astley church each year[3] came out of Astley Wood by virtue of 'common right'.
Apart from this vague possibility, there's no palpable archival reference to Astley Wood from the Domesday Book entry right up until the later 16th century. This includes periods when England was at war with France and St Taurinus was obliged to place its' property in the hands of an English 'caretaker'. Meaning the Beauchamps. Alien priories were finally suppressed by Parliament in 1414 but Astley, it seems. had already been sold to the Beauchamps not long before. In 1469 Astley spent another period under ecclesiastical lordship when they were given to the College of Westbury on Trim, in Gloucestershire. This was suppressed in 1544, Astley manor was acquired by a prominent government minister of the day, Sir Ralph Sadler.

According to one influential local source, Sadler promptly sold Astley on to Robert Blount in the same year[4], but the change of ownership was more prolonged than this – Sadler retained at least part of Astley up until 1571, when he sold out to Blount completely.[5] And when Robert Blount died in 1573, his will indicates that there have been substantial changes in the way that Astley land tenure was organised.

Astley ceased to be a feudal manor. Copyhold tenures were commuted to rent payments and Blount was no longer 'lord of the manor' but rather the landlord of a large estate. From the Worcestershire records, it isn't clear whether this change was initiated by Sadler or Blount but the outcome was certain – the manor that once 'paid nothing after expenses' was turned into a profitable enterprise. And Astley Wood ceased to be common woodland. Rights of common were transformed into 33 separate freehold properties.

Not only was Astley Wood divided into 33 parts. In much the same way that Shrawley Wood had a detached wood known as Shopgrove, there was a separate smaller wood known as 'Penny Park'; this too was privatised. Henceforth, the new owners held '*part of 'Astley Wood and Penney Park into 33 parts lately divided*'. In the early days, all except two of these parts had separate single owners but each 5½ acre plot could be bought and sold as freehold property. Some owners acquired two or three parts and, eventually, most were acquired by a single owner, the Cookes family.

This division of Astley Wood is unusual. The nearest equivalent that comes to hand is far away on the outskirts of London, in the former Epping Forest manor of Sewardstone. Here commoners had enjoyed the right to lop pollard trees for fuel 'time out of mind' but a change occurred in the 16th century. Common rights were commuted to specific allotments of pollards in designated areas of the forest. Coincidentally, there were 33 such allotments, each a tad short of 5½ acres.

Just like the Astley allotments, the right to lop pollards in specific area could be bought and sold and several plots changed hands over the centuries, until Victorian time. Then Thomas Fowell Buxton, a wealthy local landowner and Epping Forest lover, bought up all but two of these plots in order to stop what he considered the barbaric practise of lopping trees. His intentions were philanthropic, but this turned out to be a good investment. When the Epping Forest Act of 1878 enabled the Corporation of London to end lopping, they were obliged to pay compensation and Buxton was far and away the largest beneficiary. There's no record of how much he paid for his 31 allotments, 180 acres in all, but his compensation payment amounted to £4148 18s 6d.[6] When a pound was worth a pound.
This talk of Epping Forest might seem somewhat remote from Astley Wood, but it turns out there's an important connection between the two. Apart from the division into 33 parts and the allotment size of 5½ acres. And quite apart from the astute conversion of poor manorial assets into profit. The instigator of both was the same man, Ralph Sadler. Privy Counsellor, Secretary of State to King Henry VIII and ambassador to Scotland.

Sadler it was who paid Henry VIII for the wood rights in Sewardstone manor[7] and then bought out the commoners claims to lop fuel wood by providing them with specific allotments. Of course, they lost their claim to lopping in other parts of Sewardstone and these became Sadler's prerogative.

It might be argued that everybody benefited. In much the same way that everybody seems to have benefited in Astley – the Astley Wood commoners had customary rights converted to real estate and the lord transmuted a thin trickle of feudal benefits into regular payments of hard cash – not from Astley Wood but the agricultural parts of the manor.

The curious fragmented ownership of Astley Wood still operated in 1710, when lime bast ropes were still made in both woods. There are some more details of this in 'Limewoods' Thereafter, most of the former '33 parts' were gathered together under the aegis of the Cookes family and, eventually, most of the wood was converted to agriculture. Leaving just a curtilage of trees, including a copse of Sweet Chestnut and a few evocative Small Leaved Limes.

A fragment of Astley's medieval woodland legacy lingered on almost to the end of the Victorian era. Around 1700, John Sherriff left two of Astley Wood's thirty three allotments, 11 acres in all, to provide apprenticeships for the children of poor Bewdley inhabitants. By the 1820's or thereabouts this is still woodland but

1 TNA C 131/22/16. Debtor: Brother John Clerk, Prior of the Benedictine Priory of Astley, Worcs. Inquisition and return: Extent, only, not apparently for debt, made before John Aleyn, Sheriff of Worcs. on Sat. 8.4.1374. It has undergrowth worth 40s
2 *Ibid.*
3 Wilson, James M. The Worcester Liber Albus; glimpses of life in a great Benedictine monastery in the fourteenth century. Society for Promoting Christian Knowledge 1920. Pages 189-190. 1316. The income of a vicarage appropriated to an alien monastery

4 Woodhead, PG. Headmaster of Astley C of E School 1966-69. *A Guide to the History of Astley and the Parish Church of St Peter Research by PG Woodhead* (revised by PD Dingley, Headmaster 1969-81)
5 *Calendar of Patent Rolls, Elizabeth* V: *1569-1572*, no. 2309.

6 TNA WORK 9/65 Epping Forest Commissioners; Correspondence, papers and maps.
7 TNA CRES 2/261 Epping Forest: enquiries, etc by the Commissioners appointed to enquire into the state of the woods and forests. [Testimony by] Wm Sotherby Esq., Keeper of New Lodge Walk 14 Nov 1788. (Sadler paid KHVIII, but the grant of Sewardstone manor actually made by Edward VI)

the small leaved lime element is no longer at the forefront – the charity trustees simply specify that the lessee covenants:-

> *'to manage the said wood in a good and workmanlike manner, and at the end of the term to leave 50 store oaks, 20 oaks of the girth of 3 inches and 10 birch trees of the same girth, on every acre of the said wood.'*[1]

The lessee is Mr Cookes, who by this time owns the rest of Astley Wood; he pays the rental of £28 reliably and promptly. Later, towards the end of the 19th century, the charity carries on, but their rental income has gone down to £21. They still own the 11 acres, but most of Astley Wood, including their part, has been converted to agricultural land. Almost the last mention of Sherriff's Charity in the archive concerns an effort to divert the money towards financing a single scholarship to Bewdley Grammar School. The Trustees refuse, insisting on their role of supporting the disadvantaged with apprenticeship premiums that average £4-5 for each child.[2]



09. The memorial to Ruth Vernon Horton by Shrawley Church.

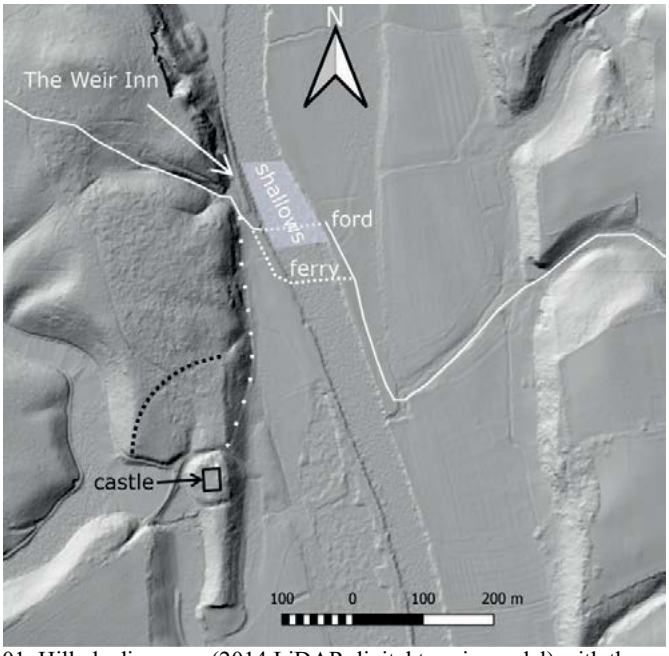
1 Reports of the Commissioners (Lord Brougham's Commission). 1895. *Charities in England & Wales 1818-1837* {TNA ZLIB 17/180} p398/9

2 WAAS 705:550 4600/499 (ii) c.10 account books of the following charities 1877-1890, of which the Astley Wood John Sherriff charity is one.

Oliver's Mound

F M Llewellyn

At the southeast corner of Shrawley Wood is a sandstone spur called the Court Hills or Oliver's Mound or Oliver's Mount. This is situated on the west bank of the River Severn, near Court Farm, overlooking the river, protected by deep valleys and in an ideal position to control the crossing point that was here in earlier times. This could have been the ancient trackway that connected the salt works at Droitwich with Wales. Nearby was the site of the Weir Inn and The Wyre which was one of the shallow shoals in the River Severn before being removed by dredging to deepen the channel of the river.[1] There is also a lot of marshy ground in the vicinity. The underlying geology is of Helsby Sandstone Formation and that is overlain by the Holt Heath Member which consists of poorly sorted gravels.



01. Hill-shading map (2014 LiDAR digital terrain model) with the outline of the castle taken from the Mastermans' account of their excavations. Easily defensible on three sides, the area to the north was probably kept free of trees for 120 metres (to the black dotted line) which remained the wood-edge on Dougharty's map of 1739 (chapter Historical Maps pp.266-272). The Weir shallows were 400 metres to the north and a trackway leading from the castle to them (sparse dots) is seen on the LiDAR. The white line is one possible route from Droitwich to the west; the close dots indicate the crossings.

It is thought that William Beauchamp of Elmley, who held a hide in Shrawley[2] built the castle or what is more likely a fortified manor house in the later part of the 12th century to protect the crossing point below. The Poer or Poher family were under-tenants of the Beauchamp family in Shrawley and quite possibly resided at Shrawley Castle. Sir William Poher was described by Habington as 'Lord of Shrawley'[3] and Roger Poer held a fee in Shrawley from William de Beauchamp, his overlord in the reign of Edward I.[4] In the Lay Subsidy Roll of 1280, William le Poer is paying 20s in tax.[5]

After William Poher died, without a male heir, his daughter, Alina le Poer, granted the property to Edmund and Margaret Mortimer of Wigmore Castle.[6] It is possible that the area that is now Shrawley Wood was at this time the park for the castle. The manor and the fortified manor house descended in the Mortimer family until Catherine Mortimer married Thomas Beauchamp, Earl of Warwick in 1337.[7] So the manor and lands passed to the Beauchamp family and then to the Neville family.[8] Finally in 1487, the lands passed to Henry VII and came under the control of the crown.[9]



02. Artist's impression of the castle, courtesy of Karen Hotchkiss.

However by 1344 Aline le Poer had died and the Beauchamp family decided to build a new castle at Holt a few miles downstream.[10] The 14th century tower here is thought to have been built by John Beauchamp, first Lord Beauchamp of Kidderminster.[11] The fortified manor house or castle at Shrawley became a ruin. It is quite likely that over the centuries, the castle site was plundered by the villagers of Shrawley for any useful building materials, so that very little remains. There does not seem to be any evidence for it being a fortified site during the Civil War, although it is recorded that many Worcestershire deserters hid in Shrawley Wood during that war.[12]

John Noake in his Rambler in Worcestershire of 1848[13] relates that a well and the remains of a spiral stone staircase were discovered in the fortress during some excavations a few years ago and a quantity of human bones was also dug up between the mounds and the river. The site is described during a visit to Astley and Shrawley in October 1881 as '*A range of eminence extends between Shrawley Wood and the Severn, one of these forming a tumulus bears the name "the castle" and is crowned with fir trees. It has the aspect of an old burying-place in Celtic times, and broken cists have been found here. It may afterwards have been made a fort to commend the river, which flows below it*.'[14]

In 1928 Mr and Mrs Masterman, after hearing stories from the local villagers about Oliver's Mound and that it may be the site of the ancient manor house *'yielded to the very strong temptation to do some tentative digging*.'[15] They soon found a wall of sandstone blocks 9 to 10 feet long and three courses deep along the side fronting the river. Pottery, bones and oyster shells were also found, so Sir George Vernon was approached and gave permission for more excavation work which was undertaken in 1929. Masterman reported that enough wall foundations were found to show that the castle consisted of a central tower, 27 feet square, an oblong chamber on the river side and an octagonal tower. Several lumps of iron slag were found by the base of the octagonal tower. The central tower was excavated to the floor of the lower chamber where traces of fire were found. The archaeological finds consisted of a spindle whorl of baked clay, a quantity of broken pottery with green glaze dating from the 14th century, the handle of a bone implement, a bronze coin which was a 14th century reckoning counter, and part of a sandstone capital, 9 in. high, and shaft ornamented with pollard pattern sculpture dating to the early 13th century.

In 2007, the Shrawley & District Historical Society obtained Heritage Lottery Funding for a season of excavations at Oliver's Mound. First of all a detailed geophysical survey of the site was carried out. These identified the areas and spoil heaps of the earlier excavations and also areas where there may be more stone walls. So in 2008 and 2009 the society, with the assistance of AOC

Archaeology Group and Archaeological Investigations Ltd (now Headland Archaeology), conducted archaeological investigations into the site.[16]

The excavations found evidence for three stone structures as well as floor surfaces made of stone slabs, cobbles and plain ceramic tiles. The cobbled surface was in poor condition, but may have been an interior floor. There was also a large yard surface. The earliest stone structure was a north-south orientated sandstone foundation made of large dressed facing stones with a rubble core. It had an internal surface made of flag stones and ceramic tiles. The second wall line, made of sandstone, was located 12m north-east of the first wall. Only a small part of this wall was excavated. The last structure found was of a C-shaped wall with two walls abutting it at right angles.

Evidence was also found for the period when the castle was abandoned. Sandstone rubble was found, as well as a quantity of stone roofing tiles and some ceramic ridge tiles, it is thought these had fallen *in-situ*. This implies that there was a substantial structure which collapsed after the castle went out of use.

The finds consisted of pottery which was found in a number of trenches and dated from the twelfth to the fourteenth centuries. Also found were a number of domestic animal bones as well as ash, charcoal and construction debris. Most of the pottery was locally made in Herefordshire or Worcestershire.

The excavations supported the historical background of a castle being built in the late twelfth century and then going out of use in the late fourteenth century. This gives Shrawley Castle an existence of about two hundred years. No evidence was found in this excavation for any later use, even in the Civil War period.

However, evidence was found for Masterman's excavations in 1929-30. All the deposits were removed from the areas where he excavated, although he did leave the masonry intact. Indications were also found that his efforts to backfill his trenches were poor. And doubt is cast on his reconstruction of the castle. If, as he shows in his plan,[17] the castle was 127 feet square, by implication, this would not fit onto the mound as it is today. The south-west tower cannot fit on to the steep slope in that corner.

Worcestershire has very few castles compared to other counties. Worcester and Hanley Castles were built by kings; Hartlebury and Alvechurch by Bishops of Worcester. By the early 12th century, the major baronial family in the county was the Beauchamp family. They built Elmley, Bengeworth and Holt castles. Shrawley was one of their lesser castles, built in the later phrase of castle construction and like Castlemorton and Leigh, is one of the smaller castles in Worcestershire. In the turbulent times of twelfth and thirteenth centuries, it would seem sensible to build a castle overlooking and protecting a river crossing especially one connecting with Wales. This recent excavation has led to a greater understanding of the Worcestershire landscape in the medieval period.

Why are the Court Hills now known as Oliver's Mound?
Why is the site now called Oliver's Mound or Mount and who was Oliver? I believe this is a case of making something rather ordinary more exciting! The early nineteenth century topographical guides to England either overlook Shrawley completely or provide very little information. In the three editions of Samuel Lewis's topographical dictionary, published between 1831 and 1848,[18] the article for Shrawley increases from nine lines in 1831 to two-thirds of a column in 1848 which includes the information that the Court Hills were probably occupied by a detachment of the parliamentary army.

The earliest account about the Court Hills is in Kenrick Watson's Statistical and General History of Worcestershire published in 1840.[19] He writes *Adjoining to the wood, on the southern side, immediately below Shrawley Court, are some artificial mounds, known by the name of the Court Hills or Oliver's Mound. They appear to have been intrenchments thrown up to command a ford, which crosses the river at this point in communication with a road leading through Ombersley to Worcester, and probably were occupied by a detachment of the parliamentary army immediately previous to the battle of Worcester. Although Cromwell's army may have occupied this pass, there appears to have been a fortification at this point, for the defence of the ford, long before the period of the rebellion*. This information has been quoted ever since, in directories, topographical guides and accounts of local history, but there is very little evidence that it is true.

His booklet, called Fasciculus III covering the parishes of Areley Kings and Shrawley was published 'under the superintendence of the statistical committee of the Worcestershire Natural History Society'. This society was founded in 1833 by Dr Charles Hastings and Edwin Lees. Hastings and Watson knew each other because Hastings in 1810, became apprenticed to two apothecaries Richard Jukes and Kenrick Watson in nearby Stourport.[20] Richard Jukes died in 1834 and Kenrick Watson in 1847 and both are buried in the churchyard of Lower Mitton, now Stourport-on-Severn. It is the writer's belief that when Watson was asked to write about the parish of Shrawley, he felt that in comparison to the nearby parish of Astley, Shrawley had so little written about it, that he needed to make the parish more interesting. Perhaps there was a local legend about the Court Hills, or perhaps Watson made the whole story up. He was right in stating that the fortification protected the crossing point here long before the period of the rebellion, but this was in the mediaeval period. But this is, I believe, the origin of the legend of Oliver Cromwell's involvement with the mound.

Fortunately for Shrawley, it would seem that it had little involvement in the English Civil Wars. Looking through contemporary literature for the period[21] and later calendars and other secondary sources[22], the only references to Shrawley Wood in the period do not mention anything more than it either being a place of refuge or a source of timber[23]. However in June, 1644, *his Majestie marched out of Worcester on that side of the Severne next Hereford, by the parish of..... [Hallow] .... then by Shrawley, a parish.... to Bewdley.*[24] Although the speculation about the use of the site in the Civil War period was a reason for the previous excavation in the 1930s[25], the recent archaeological excavations didn't find any evidence to support this[16]

I rather like Edwin Lees's statement in his 1856 book[26] *What "Oliver" was connected with the mound it is hard to say, for certainly Oliver Cromwell, though called in, as usual, by some authors, could have had nothing to do with the place. Some local Oliver "guiltless of his country's blood," here probably once claimed "suit and service;" for in old deeds a part of the adjoining parish of Witley is called "Redmarley Oliver," from a proprietor so named.*

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03. Oliver's Mound from above. 13 April 2018. The New Pool can be seen in the bottom left and the black cottonwood plantation in the top right. The white rectangle indicates the approximate position of the castle walls. The arrow indicates North.

Ownership of Shrawley Wood Timeline

Appendix to Owning Shrawley Wood

Compiled by Francesca Llewellyn, Peter King & Hugh Milner

Date	Ownership and or transfer
804	Aethelric, a Mercian noble, son of Aethelmund will bequeath Screfleh (Shrawley) to the estate of Deerhurst Minster
After 1066	Ralph de Tosny (or: Toeni, Todeni, Toni, Thony) with Urso d'Abitot as tenant of part
1086	Shrawley Wood is included in Astley Wood in the Domesday Book, extending thus from Court Farm to The Burf
1210-12	William Beauchamp held a fee[1] in Shrawley of Ralph de Tosny
1234-1297	Held by the Poer, Poher family as under tenants of the Beauchamps
1297	Aline Poher grants other property to Edmund Mortimer of Wigmore
1304	Edmund Mortimer and Margaret, his wife were jointly seised[2] of the manor
1309	Overlordship inherited by Alice, Robert de Tosny's sister, who later married Guy de Beauchamp Earl of Warwick
1327	Roger Mortimer, Earl of March to his daughter, who marries Thomas Beauchamp, Earl of Warwick
1337	Edmund's son and heir Roger 1st Earl of March granted the manor to his daughter Catherine in marriage to Thomas Beauchamp 11th Earl of Warwick: see 1397
1346	Thomas Beauchamp, Earl of Warwick holds a half knight's fee in Shrawley which Simon de Leybourn formerly held
1397	Manor held by Thomas, Earl of Warwick forfeits to the King who grants the Manor to John, Earl of Salisbury but Shrawley Wood and advowson are reserved from this sale: see 1399
1399	Forfeiture reversed on accession of Henry IV but Thomas, Earl of Warwick dies, seised[2] of Shrawley. Manor held by male line of the Earls and Dukes of Warwick until 1446
1427/8	Richard Beauchamp, Earl of Warwick holds a fee in Shrawley which Thomas Beauchamp previously held
1446-49	The manor is held by Ann, Countess of Warwick who died an infant
1449-71	Held by her Aunt Ann, wife of Richard Nevill, Earl of Salisbury and Warwick
1471	Manor settled on Richard Nevill's daughter Isabel, wife of George, Duke of Clarence
1476	Held by George, Duke of Clarence
1478	Walter Rufford, yeoman of the crown and king's servant during the minority of Edward, son and heir of Isabel, late Duchess of Clarence
1487	Anne, Countess of Warwick restored to the Warwick Estates and then surrenders to Henry VII. The manor is held by the crown until 1544
1527	Crown property, management responsibility passed to the Surveyors/ Masters of the Wood
1538	'The Lord's Wood' is mentioned[3]
1544, Feb 22	Manor granted to Queen Catherine (Parr) for life
1545, Feb	Lease of Manor is granted to William Sheldon of Weston[4], Warwickshire for 21 years from the lands of Queen Catherine Parr
1545, Aug 5	Reversion of the manor granted in fee by Henry VIII[5]
1548, Sep 8	William Sheldon of Weston, Warks granted in fee of the reversion of the lordship and the Manor of Shrawley as granted for life to Queen Consort Catherine in 1544 by Henry VIII
1558	William Sheldon, now of Beoley, sells the manor to William Gower but keeps the wood at a rent of £8 a year[6]
1570	William Sheldon to Ralph Sheldon
1579/80	Ralph Sheldon of Beoley obtained a licence to alienate the wood[7] Rent granted by Ralph Sheldon to William Childe 1st of Northwick
1597	William Childe 1st to his eldest son, William Childe 2nd
1607/08	William Childe 2nd lets the wood to William Childe 3rd for 21 years for a rent £160[8]
1627	Thomas Childe borrows £3,500[9] from Sir William Jones on Shrawley Woods and Shop Grove etc
1630	A dispute occurs over the rent of the wood
1632	Chancery proceedings ensue over the dispute of 1630
1640s	William Childe, as a Royalist, has estate sequestrated and has to pay a fine to compound for his delinquency
1663	Thomas Childe holds both the manor and Shrawley Wood
1679	Thomas Child's will records that Margaret Child is to have the wood at Shotgrove
1680	William Childe to Alan Cliffe. The other share of the manor
1687	Alan Cliffe to his nephew Allan Cliffe
1699	Alan Cliffe's nephew Allan Cliffe succeeds to the manor. Richard Vernon inspects Shrawley Wood
1700, May	Allan Cliffe to Thomas Vernon of the Middle Temple, lord of the manor of Hanbury for £13,000[10] for the Manor and advowson
1721, Feb 5	Thomas Vernon on his death to 2nd Cousin Bowater Vernon
1735, Nov 30	Bowater Vernon on his death to son Thomas Vernon
1771, Dec 9	Thomas Vernon on his death to daughter Emma Vernon
1776	Emma Vernon marries Henry Cecil, heir presumptive to the Earldom of Exeter. Henry didn't succeed to the title until 1793 after his and Emma's divorce
1791, Jun 10	Henry Cecil divorces Emma, keeping only a life interest in the Vernon properties
1791, Oct 13	Emma marries William Sneyd
1793, Aug 2	William Sneyd dies

1 i.e., property owing the military service by one knight.
2 Seized of = owned
3 Richard Vernon lists 'Kings Hill' bind in 1699, was this a memory?

4 Weston-by-Cherington in the parish of Long Compton; later of Beoley

5 William Sheldon was leasing it; did he buy the freehold?

6 Worth c.£3K in 2020 (measuringworth.com, accessed 9/7/2021)
7 Such licence was needed by tenants in chief until abolition of feudal tenures in 1640s, probably also including the wood.

8 Worth c.£31K in 2020
9 Worth c. £700K in 2020
10 Worth c. £2M in 2020

1795, Jan 28	Emma marries John Phillips
1804, May 1	Henry Cecil dies, Emma has next life interest
1818, Mar 21	Emma dies; her widower John Phillips enjoys life interest in Hanbury Hall until 1829, but Emma's cousin Thomas Shrawley Vernon becomes entitled subject to that
1825, Mar	Thomas Shrawley Vernon on his death to son Thomas Tayler Vernon
1835, Dec 22	Capt. Thomas Tayler Vernon on his death to son Thomas Bowater Vernon
1859, Sep 22	Thomas Bowater Vernon on his death to brother Harry Foley Vernon
1861	Vernon Land Agent Henry Clutton lives at Kings Hill, Shrawley
1877	Harry Foley Vernon buys the 37acre (15ha) Shrawley Court
1920, Feb	Sir Harry F Vernon Bt on his death to son Bowater George Hamilton Vernon
1938, Feb 17	Ruth Annie Powick of Shrawley changes her name by Deed Poll to Ruth Annie Vernon
1940, Jun 14	Sir Bowater George Vernon on his suicide to Ruth Annie Vernon
1946	Ruth Annie Vernon marries Frederick Horton
1961, Jun 14	Ruth Annie Vernon Horton sells 237 acres (96ha) of the north part of the wood to the Ministry for Agriculture Forestry and Fisheries (MAFF) to be administered by the Forestry Commission, a government department in its own right for £11 an acre (£27/ha), a total of £2609[1], a reduction in valuation from £15/ac because of the responsibility of erecting and maintaining a dividing high fence
1980, Oct 24	Ruth Annie Vernon Horton of Shrawley Wood House dies. Frederick Horton succeeds. She is buried at Hanbury. Her estate is valued at £3,028,853[2]
1990, Mar 19	Frederick Horton of Shrawley Wood House dies and is buried at Hanbury. His estate is valued at £5,755,180[3]
1990, Oct 1	The 44.55ha (110acs) at the south including Wood House is bought by Jacqueline Louisa Jeavons-Fellows, excluding the tomb of Sir George Vernon and the ruins of the adjacent Summer Cottage [which, in his youth, he loved to stay in]
2006, Jan 19	The 96 ha (237acs) at the north is transferred from MAFF, FC to the Department of the Environment, Fisheries and Rural Affairs (DEFRA), FC[4]
2017	The dividing fence between the ownerships is replaced by the Forestry Commission with a new deer fence. See 1961
2017, May	Mr John Jeavons-Fellows dies but see October 1st 1990
2020, June	The private part of Shrawley Wood, the Wood House and its parkland are put on the market for £5,000,000
2021, Mar	Shotgrove and the fields of Church Farm are put up for sale by private treaty

1 Worth c. £59K in 2020
2 Worth c. £13M in 2020
3 Worth c. £13M in 2020
4 This is merely a government reorganisation

Limewoods

Peter Byfield and Linda Mainwaring

One bright early morn' in the month of May
Under the Old Linden Tree
We Danced and we sang 'till the end of the day
Under the Old Linden Tree….

Old German folk song

Once upon a time, lindens or lime trees were part of the good life throughout northern Europe (01). Lime foliage nurtured cattle and sheep through parched summers and kept them alive in harsh winters. Bast fibres from lime bark stitched clothing, made footwear, wove textiles, made bags and baskets, caught fish, captured and kept animals, held boats together and rigged them to explore new lands.[1] They provided decorative bedspread for those who stayed at home.[2] Lime blossom provided medicine and the finest honey. Lime faggots warmed the home hearth and cooked in the kitchen. The wood was useful when lightness and stability were in demand - this included military shields and for some folk 'linden' became synonymous with warfare.

Given this wide utility, it's no surprise that lindens were sometimes venerated. Gods were conjured in sacred lime groves. Lime trees became emblematic of tribal cohesion and have been adopted as insignia of nationhood. More prosaically, Germanic towns and villages planted and preserved limes as splendid trees for dancing under. They still do. In their own way, so did previous generations of Shrawley villagers.[3]



01. Unter den Linden[4]

1 These and other *Tilia* utilities, bedspreads excepted, are expanded upon and referenced in 'A Really Useful Tree' below.
2 Herteig A. (ed). 1983. Conference of Waterfront Archaeology in North European Towns. No 2. Bergen Historisk Museum. Bergen. p127
3 Walker, Robert Oswald. 1982. The parish of Shrawley: to celebrate the ninth centenary of St Mary's church Online edition at www.shrawley.org.uk/shrawley-book.html. Section 3 p4 (p34). Before the mid-19th century, a riverside inn 'The Weyre' backed into the north eastern boundary of Shrawley Wood. Here the Worcestershire musician Julius Harrison collected the traditional dances 'Old Severn' and 'New Severn' to be incorporated into his orchestral 'Severn Suite'. Gwilliam, H W 1982 Severn Ferries and Fords in Worcestershire. Shrawley Ferry.
4 Image courtesy of the Hagströmer Medico-Historical Library, Karolinska Institute, University of Solna, Sweden.

In contrast to this former glory, a recent European review arrived at the following sombre scientific summary[5]:

'Tilia cordata … is a minor European broadleaved species with a wide but scattered distribution. Given its scarcity and low value in the wood market, it has received little attention from researchers and forest managers'.

They went on to say that lime had made a greater contribution to forest productivity in the past and might yet play an important future role in forest adaptation to climate change. Among the environmental benefits they attribute to lime trees, '*wide ecological tolerance*' and '*numerous ecosystem services*' stand out as particularly important. The authors suggest *Tilia cordata* has a bright future. We'll see.

Lime Trees: an Introduction.
Apart from Shrawley Wood, Lime trees of the genus *Tilia* almost girdle the temperate zones of earth's northern hemisphere, extending from the eastern side of North America, across Europe and Asia to Japan. They are not related to the tropical citrus fruit of the same name.

There are four limes native to Europe.[6] *Tilia dasystyla* can be found in the Caucasus and *Tilia tomentosa* (Silver Lime) favours warm weather along the Adriatic coast down towards Greece. Either may be plotting a march northward with climate change and Silver Lime has already found some favour with Dutch gardeners, but we'll ignore them hereafter. The other two species, Large Leaved Lime (*Tilia platyphyllos*) and Small-leaved lime (*Tilia cordata*) cover a much wider climatic range and there's a good deal of overlapping between them, but broadly speaking *platyphyllos* predominates towards the south and *cordata* towards the north. In Germany, they distinguish between *platyphyllos* as "summer lime" and *cordata* as "winter lime".

Both species occur in the British Isles but as Bentham and Hooker in their classic 'Handbook of the British Flora' admitted:-
'*limes are very puzzling, and no two authors are agreed as to their specific limits*'.[7]

They possibly had in mind Sir William Schlich, authoritative author of 'British Forestry', who didn't think any limes were native.[8] Another authority, Clapham, Tutin and Warburg, recognised Small-leaved lime as indigenous but they were very doubtful about Large Leaved Lime. As a naturalised species, distribution was confined to the Wye Valley and the shires of Gloucester, Hereford, Worcester, and Monmouth, together with an outlier on the Yorkshire limestones.[9] This very local and sporadic distribution suggested human agency. More recently, however, archaeological pollen samples have established beyond reasonable doubt that both limes are native to the British Isles.[10]

5 Tanguy, De Jaegere; Hein, Sébastion et al *A Review of the Characteristics of Small-Leaved Lime (Tilia cordata Mill) and their implications for Silviculture in a Changing Climate 2016-03-01*
Directory of Open Access Journals (Sweden)
6 Santamour F S & Jacot McArdle A Checklist of Cultivars of Linden (Tilia) Species. Journal of Arboriculture 11.5 1985
7 Hooker J D & Bentham G. 1954. Handbook of the British Flora. Ashford, Kent: L.Reeve 7th edition. p92
8 Schlich, Sir William. 1910. Schlich's Manual of Forestry. Fourth edition, revised. London: Bradbury, Agnew & Co p349
9 Clapham A R, Tutin T G, Warburg E F. 1952. Flora of the British Isles. Cambridge University Press. p366.
10 For example: Daffern, Nicholas. 2016. Two Palaeochannels, the Lime Decline, and the Identification of Worcester's First Stratified Neolithic Deposits: Worcester Area, Hylton Road, Worcester. *Transactions of the Worcestershire Archaeological Society* 3rd ser. 25. p144. The sequence whereby platyphylos was recognised as native is summarised by: Godwin,

Small and Large Leaved Lime have been planted throughout England and Wales and in Scotland, at least as far north as Perth, but the majority of lime trees covering this range are a nurseryman's hybrid of both – a variety called Common Lime. This was categorised botanically as *Tilia europaea* by Carl Linnaeus in 1753 and *Tilia vulgaris* by Fredrich Hayne in 1813; both names are still encountered but modern use seems to favour the more dignified form. Natural hybrids are known to occur,[1] but they're relatively rare and for most purposes it's safer to assume artificial origin.
Lime hybrids have a long history. Many of the fashionable tree avenues that embellished grand country estates in the late 17th and 18th centuries were of Common Lime, often using a nurseryman's cultivar from Holland to ensure regimented avenues of regular height and crown.[2] More plebeian Common Lime came to prominence in late Victorian times when burgeoning British cities began to appreciate the benefits of urban forestry. Apart from parks, cemeteries and large gardens, Common Lime became a favourite street tree, usually maintained by local councils as regularly-cut pollards. Several generations of urban allotment holders enjoyed free lime pea and bean sticks, but in recent times Common Lime has fallen from favour, in residential streets at least, because aphids thrive on the leaves in warm weather and drip 'honeydew' onto cars parked below.

The term 'linden' has broad currency throughout the Indo-European family of languages and the prefix 'lin' has deep historical roots, having become synonymous with fibres of different kinds as in 'linen' and 'lint'. In England, the term 'linden' was widely recognised and became embedded in local names such as Lincomb (Worcestershire), Lyndhurst (Hampshire), Lindsey (Suffolk) or Lindale (Cumbria), but this was augmented by dialect terms. In East Anglia, *Tilia cordata* is still known to woodsman as 'pry', whereas 'bass' is favoured in Lincolnshire. Basswood is the term that crossed the Atlantic to what became the United States. In Worcestershire and Gloucestershire, lime coppice is known as 'wittan', a word spelled in various ways in order to confuse those attempting archival research. It's possible that villages adjacent to Shrawley – Little Witley and Great Witley – have some derivation from this term.

Small-leaved lime has an erratic distribution in the British Isles. They seem never to have crossed the sea to Ireland until given a helping hand in modern times - and excitement over a find of ancient lime pollen in Scotland turned out to be evidence of long-distance Neolithic trade in lime honey.[3] In England, there are native populations in the Lake District[4], a more dispersed population in Yorkshire and a handful in County Durham[5] but anything northwards of this is probably planted. Further south, there are many examples of relatively small, often isolated communities but few areas where Small-leaved lime has a significant presence. There are clusters in Warwickshire, Rockingham Forest, Gloucestershire, Bedfordshire, Hampshire and elsewhere but, despite some fragmentation, three larger communities stand out. One extends from eastern Essex into Suffolk. Another lies on either side of the lower River Witham in Lincolnshire. And the third is north west Worcestershire, where Shrawley Wood can claim to be the most homogenous part of a scattered community. Shrawley is probably the largest single Small-leaved lime wood in the British Isles.

Wherever they occur in England and Wales, Small-leaved limes share features that still endorse Bentham and Hooker's claim that 'limes are something of a puzzle'. Many of these will be enlarged upon later, but here to start with is a quick tour of this remarkable tree.

- Along with ash and elm, most herbivores find lime leaves especially tasty. Cattle, deer, sheep and goats will all browse lime leaves in preference to grass. Within living memory, particularly in Scandinavia and Eastern Europe, lime foliage has been used to fatten farm animals and, as dried fodder, to sustain them through long winters.

- Paradoxically, the regrowth from lime trees that have been cut down – particularly the 'spring' from coppice stools – is relatively resistant to browse damage. (02) Rabbits and deer will only touch these tender shoots as a last resort, probably due to the early formation of a protective bast layer which gives the coppice shoots an undesirable 'stringy' quality if nibbled.[6] Almost all other deciduous trees and shrubs growing in English woodland are particularly vulnerable to browse damage, by a wide range of herbivores, when new shoots emerge from a cut coppice stool.[7] In many cases, high browsing pressure over successive seasons kills unprotected stools. Under similar circumstances, Small-leaved lime has a significantly higher rate of survival.

- This same bast layer has been exploited by people, at least since Mesolithic times, as a source of fibre. Whether woven into cloth, twisted into string and rope or plaited as broad strips to make baskets and mats, lime bast was the universal material for endless human applications until gradually displaced over several millennium by fibres such as hemp, flax, wool, raffia, sisal and cotton. The last known use for lime bast in the three principal lime zones identified above, including Shrawley Wood, was the manufacture of rope.[8]

Sir Harry. 1975. The history of the British flora. Cambridge University Press. Second edition. p164.

1 Pigott C D. 1991. Tilia cordata. *Journal of Ecology* 79. p1182. Pigott attributes the scarcity of natural hybrids to earlier flowering by *platyphylos* compared to *cordata*

2 Pigott C D. 1992. The Clones of Common Lime (Tilia x vulgaris Hayne) planted in England during the seventeenth and eighteenth centuries. *New Phytologist* 121. pp487-493.

3 Peter Moore. 1978. Bronze Age Honey. *Nature* 276, 443; Dickson, Camilla & Dickson, James. 2000. Plants and People in Ancient Scotland. Tempus. pp207/8

4 See distribution map for North West England in: Pigott C D. 1992. Are the distributions of species determined by failure to set seed? in Marshall, C & Grace, J. *Fruit and seed production. Aspects of development, environmental physiology and ecology*. Society for Experimental Biology Seminar Series 47. Cambridge University Press.

5 Castle Eden Dene National Nature Reserve; 'Spring Gill' in Backstone Bank and Baal Hill Site of Special Scientific Interest first notified 6/11/1987; Durkin, John (BSBI Recorder for County Durham) 'Flora of Hawthorn Dene' privately published online – accessed 2/06/2021 'There are a small number of Small-leaved Limes in the lower Dene, assessed by a national expert, Professor C D Pigott as native here, though some appear to be planted regularly and in straight lines.'

6 Hanson, Clarence Oldham. 1911. Forestry for woodmen**.** Oxford University Press. 1911 pp78/9 'Lime (all) as coppice are not rabbit grazed due to stringy bark'; Elwes, Augustine Henry. 1913. The Trees of Great Britain and Ireland. Privately printed. Edinburgh. vol VII; p1659 'But though rabbits will eat almost anything before they touch lime….'; Pigott C D. 1991. Tillia cordata. *Journal of Ecology* 79. p1186; Reed, J L. 1954. Forests of France. Faber & Faber. p118

7 One exception is Elder (*Sambucus nigra*); stands of elder provided an excellent indicator of where to go ferreting in the days before myxomatosis.

8 For the Lincolnshire limewoods: Ray, John. 1695. Historia Planterium volume 2. p1695 '*Hæc est illa species quam in Essexiæ Angliæ sylvis & sepibus frequentum diximus, nec minus in Lincolnia ubi á rusticus (ut nos monuit D. Martinus Lister Bast dicitur, quoniam ex ejus corticibus funes texunt; cui usui & olim adhibebantur. Invenitur & alibi in Anglia multis in locis.';* For Essex/Suffolk: Rackham, Oliver. 2003. Ancient Woodland – its history, vegetation and uses in England. Castlepoint Press p250 provides an early 17thC account of bast harvest in Chalkney Wood, Essex – rope manufacture is not recorded but might be inferred from the good prices obtained. *Note the East Anglian term for 'lime' is 'pry' and the bast peeling usually called 'teeling' in Shrawley Wood is 'tarling'.*



02. Recent coppice at Bardney, Lincolnshirere with regrowing birch and hazel grazed almost to extinction but lime left unmolested.

- The great majority of ancient lime trees in England and Wales are derived from coppice stools, albeit they may have been last cut many decades and sometimes centuries previously. Most deciduous trees slowly lose their ability to regenerate if there's a long period between episodes of coppicing, whereas a felled 200-year-old lime can readily start again with new growth from ground level. Any age limit on this ability has yet to be determined.

- Most trees cut down to ground level need light to produce new coppice growth. Lime is no exception, but it can get by with less than many others. Lime trees can be found that have been both 'stored' – a single stem from a coppice stool is allowed to mature into a tree – and yet coppice stems might still grow from the stool, despite the shade cast by more mature progeniture.

- Unlike many other, wind pollinated, trees, Limes rely on insect pollination. The crowns of older trees can be an effusion of creamy-white blossom during early summer. Younger trees, and coppice poles under about 30 years, are often devoid of any blossom whatever. A typical coppice rotation for small-leaved lime in medieval time and before was probably 10-20 years and coppice lime woods, such as Shrawley, might be almost invisible to archaeological pollen records. Conversely, it's possible that lime woods with a few of the older 'stored' trees mentioned above can produce equally deceptive results.

- Lime flowers are rich in nectar; bees feeding on lime blossom produce honey of high repute. Ombersley, across the river from Shrawley and rich in lime trees, was noted for honey in Domesday Book. A wide range of insects are attracted to lime blossom and it has been observed recently that some of these can migrate over continental distances. This may explain the considerable genetic diversity of trees in Shrawley Wood, despite growing in relative isolation towards the western extremity of European colonisation by *Tilia cordata*.

- In terms of coppice wood production per hectare, Small-leaved lime compares favourably with other native woodland hardwoods. Hazel, the *par excellent* coppice wood, is more productive in early years but this advantage is lost with successive growth seasons. Lime coppice is around 60% more productive of wood than lime trees grown as single stemmed timber trees.[1]

- Unlike many other trees, deciduous and coniferous, lime woods and their leaf-fall promote soil structure congenial to a wide range of other plants.[2] It has been theorised that this characteristic led to the widespread destruction of limewoods by Neolithic farmers who favoured lime woodland as the prospective site for growing crops.[3] On a much smaller scale, it may also have encouraged the post-WWII Forestry Commission to acquire limewoods with a view to their complete destruction and displacement by Douglas Fir – a fate that Shrawley Wood only avoided in part.

- Lime seed has only a limited ability to disperse over any distance. Despite having a 'wing', experiment suggests that strong wind will only take the seed a short distance from the parent tree.[4] Unlike oak or beech or hawthorn, there are no known agencies by which lime might easily disperse over longer distances. Other than humans, perhaps.

- Lime trees in England and Wales appear to be singularly inept at reproduction from seed, quite apart from apparently limited dispersal mechanisms. This has been attributed to a need for specific ambient temperatures at the time of flower formation before viable seed can set.[5] There's little doubt this has played a significant role, but recent years have seen a few prolific crops of lime seedlings in Shrawley Wood and elsewhere. With only rare exceptions, these simply disappear a few weeks

1 Pigott C D. 1991. Tillia cordata. Journal of Ecology 79. p1169.
2 *ibid.* p.1157 citing: Wood & Nimmo. 1960. Forestry Commission experimental plot at Holt Down nr Petersfield, Hants; *ibid.* p1153. 'In King's Wood, [Northamptonshire] correlation between patches of *Tilia cordata* and fine-textured soils.'
3 Crane, Nicholas. 2011. The Making of the British Landscape: the Ice Age to the Present. Weidenfeld & Nicolson. p145.
4 There have been reports in scientific papers of 100 and 200 metre dispersal distances, but these appear to be informed guesses. A more systematic, but limited study, arrived at a maximum of 23 yards!: Hadfield, Miles. 1962. Limes. *Quarterly Journal of Forestry* LVI no 1. p42.
5 Pigott C D & Huntley J P. 1981. Factors controlling the distribution of *Tilia cordata* at the northern limit of its geographical range: III Nature and causes of seed sterility. *New Phytologist* 87(4). 817-39

after germination. The cause is not yet known, at least to students of Shrawley Wood.



03. Long overstood Lime stool in Astley.

- Despite lamentably poor reproduction from seed, individual lime trees can enjoy a biblical lifespan. In the British Isles, only yew competes with lime for longevity. The oldest British lime of all is probably at Westonbirt Arboretum in Gloucestershire where a huge *Tilia cordata* coppice stool is thought to have been a sapling at the dawn of the Christian era. The limes stools in Shrawley Wood appear from their size to be still relatively youthful – a few centuries at most – but they have been actively managed for at least half a millennium; there's no present knowledge of how they might have been replaced or divided in times past.

- Many different trees have been venerated and sometimes deified by a wide variety of European cultures over many centuries but Small-leaved lime was a particular favourite. Whether because of its' longevity or ancient utility, *Tilia cordata* acquired a mystical status that still has resonance, whether it is the '*Unter den Linden*' still to be found in many Germanic towns or Lithuanian foundation myths.[1] In England, there's some correlation between existing limewoods and ancient ownership by monastic and religious bodies, [2], [3] but coincidence or innate conservatism may be the best explanation for this.

- At the risk of tempting providence, here's one last feature. Many common European trees have been subject to exceptional attacks by pathogens and parasites during the past half-century with some dire consequences. The best-known examples in the British Isles being 'Dutch' Elm Disease and now Ash Dieback. At the time of writing, the many living things that find *Tilia cordata* an hospitable host show their appreciation by exercising constraint. If these trends continue, Small-leaved lime could become one of the last trees left standing.

Wildwood, Lime Decline and all that

Woodland history used to be quite straightforward. According to ideas still lingering towards the end of the 20th century, nature blessed old England with coast-to-coast oak woodland; only odd patches of moorland and marsh interrupted an endless canopy. Historians invoked this 'dense, impenetrable forest' as the explanation for invading armies taking circular routes or outlaws lurking beyond the reach of justice.

Large swathes of this 'wildwood' remained through Roman time until Anglo-Saxon invaders, bent on farming, began hacking it down.[4] They were followed by rapine charcoal burners who fed the rest into the hungry furnaces of a nascent iron industry.[5] Most naturalists were more circumspect, but standard texts of the 1960's and 70s still had an almost continuous oak forest dominating what is called the Atlantic period and tree cover remained largely intact into medieval times.[6]

Oak dominated this tableau and lime trees didn't feature at all, except in Worcestershire. A remarkable Bewdley naturalist, George Jordan, was intrigued by the ancient lime trees he found scattered in woods and hedgerows around Wyre Forest in the north west of the county. This is an entry from his diary of 1841:-

> *'The Tillias are truly aboriginal trees in this County., which is very evident at the present time from their stratal adjustment and distribution. They occupied in our primitive forests an area of about forty square miles on the banks of the Severn and adjacent parts of the county in Worcestershire, Shropshire and Staffordshire, beginning near Areley and ending at Holt, distributed in hedges, woods and ravines leading to the Severn and its rocky precipices. Astley and Shrawley woods, which cover an area of nearly three square miles, are for the greater part densely wooded with Tilias, Tilia parvifolia [*the old name for Tilia cordata*] in far the largest quantity……'*

This account by George Jordan, almost verbatim, was sent by a botanising Shropshire parson, WA Leighton, to the editor of a new nation-wide monthly journal of botanical gleanings 'The Phytologist'.[7] Publication inspired editor George Luxford to proclaim the truly native status of small-leaved lime.[8] Much later. George Jordan wrote directly for The Phytologist a longer account that began with a similar theme:

'*More than fifty years I have wandered in forest and field, over mountain and more, in highways and byways, in dingle and dell, among brakes and bogs in Wyre Forest and neighbourhood in search of the treasures of Flora.*
First in our interesting old hedges, which truthfully record the arboreal history of our primitive forests in mutilated stumps, which

1 Greimas, Algirdas Julien. 1992. Of Gods and men: studies in Lithuanian mythology. Bloomington: Indiana University Press.
2 Foster C W. 1924. The Lincolnshire Domesday and the Lindsey Survey (liv) Linwood in Lincolnshire displaced the original name 'Cotes' when this was acquired by Kirkstead Abbey in 12thC.
3 Gibbons, Joan. 1975. The Flora of Lincolnshire. Lincoln Naturalist Union. p35 provides a brass of unknown age in St Cornelius Church, Linwood, portraying *Tilia cordata*

4Darby, H. C 1948 The Domesday woodland of Lincolnshire. The Lincolnshire Historian. 1. p55 'The Anglo-Saxon settlement, it is true, had pierced the wilderness….'
5 For some sense of the great changes that have revolutionised ideas about English landscapes see the introduction to 1981 edition of Hoskins classic work, where the author contrasts contemporary ideas with those prevalent at the time of his first edition in 1955. Hoskins, W G. 1981. *The Making of the English Landscape.* Penguin, especially pp10-12
6 Darby, H.C. 1950. Domesday Woodland. The Economic History Review, New Series, 3:1. p.21; Tansley, Arthur George. 1949. *The British Islands and their Vegetation* Cambridge University Press. p. I 73. 2
7 Leighton W A. (writing from Shrewsbury December 22 1841). 1842. Notes on the Genus Tilia [with addendum written in Jordan's own words] The Phytologist: a popular botanical miscellany. 1:9 pp147-148
8 Luxford G (editor). 1842. *ibid.* 1:10 pp169-171.

have weathered the blasts of more than a thousand winters, I find all the species, and some more, that now exist in the present Wyre Forest.

In a very old hedge, which borders one of our roads which was first cut out of the wilderness, I find several specimens of Tilia parvifolia [cordata]: I must seek for you elsewhere before you make your claims as a native of our ancient forest. I wandered in woods, by hedgerows, and on the rocky heights of both banks of the River Severn, over an area of more than fifty square miles, in Worcestershire, Shropshire and Staffordshire, where I find them plentifully dispersed, particularly Astly[sic] and Shrawley Wood, an unreclaimed remnant of the Forest; here it covers a space of nearly two square miles, which was the nucleus of an extensive forest, where this species predominated, as the great number of very old pollards at this time testify; a great number have been destroyed within these last sixty years….'[1] (04)



04. Pollards along what used to be the NW boundary of Shrawley Wood. The woodland to the left is the result of recent regeneration and is growing in a field surrounded by a bank. The pollarded row is likely to have been ornamental and dates back no further than Vernon time.

Apart from his prescience, George Jorden defied the conventional image of a Victorian naturalist. He was a self-taught house servant and son of a farm labourer. Members of the county-wide Worcestershire Naturalist Club were ladies and gentlemen of education and gentility; Jorden was not elected as a member until 1855 although he was attending field meetings from the early days of the Club's inception in 1847.[2] Jorden was greatly respected as a naturalist and there was a particular friendship between him and the Club's President and principal founder, Edwin Lees. Like Jorden, Lees was intrigued by the remnants of Lime that he found in the woods and hedgerows of Worcestershire and he has a claim to have brought this to public attention at the same time as Jorden. After Jorden's first brief text sent in by Leighton, Lees wrote to the editor:-

'*About two years ago I sent to the Botanical Society of London a paper on the British species of the genus Tilia….. I also communicated to Mr Loudon, for his '*Arboretum Britannicum*', the fact of a large wood, of more than five hundred acres in extent, existing in Worcestershire, where, strange to say, the greater part of the underwood, regularly cut down at stated intervals, consisted of Tilia parvifolia: thus, I should say, removing any doubt, if any could exist, of the indigenousness of this tree, as far as England is concerned….*'

In his later writing, Lees occasionally had doubts about the full extent of this 'indigenousness'. Here he is writing in 1856 about a small woodland a few miles from Shrawley:-

The Little Storrage Wood contains a considerable quantity of the small-leaved lime-tree (Tilia parvifolia), which appears to be indigenous; and several dwarf trees by the side of the brook have their roots washed out of the bank into most singular intricate masses, that look as if they had struggled to maintain their position there for hundreds of years. That the Tilia has grown here for a long period is certain; and yet it may only be a question of time, after all.[3]

Later, in the same book, this caution is cast aside. Lees provides one of the earliest glimpses of Shrawley Wood through the eye of a naturalist and he now seems convinced of *our tree's* native status:-

A great part of the underwood of Shrawley is made up of the small-leaved Lime (Tilia parvifolia), which, as it is periodically felled, never flowers; and the leaves are mostly as large as those of T. Europcea. The old trees, however, on the verge of the wood are all T. parvifolia, and no record exists that the lime-tree was planted in this wood at any time; and I believe, indeed, that Wyre Forest anciently extended as low down the Severn as to include Shrawley Wood within its bounds. It seems reasonable, then, to conclude that the small-leaved lime is indigenous to Worcestershire. The diversified ground that this wood covers, and the numerous paths there are through its alleys green, crossing each other at right angles and curling about through deep sandy banks, or mounting up to airy steeps, renders this a most delightful and exciting place to wander in; and a stranger may easily get entangled in its leafy labyrinths.[4]

Other parts of the British Isles had to wait nearly a century for the idea that *Tilia cordata* had been part of the 'primeval wildwood'. The inspiration came from Sweden, in the person of Gunner Erdtman, who published an English paper in 1928[5] describing the basic techniques for a new science of palynology - the microscopic study of ancient pollen, usually preserved in permanently wet archaeological strata. Here 'wildwood' lime makes a first brief appearance:

''*The first half of post-boreal time in England is characterised by the fairly high frequency of lime*[6]'

This cutting-edge tool for exploring the landscapes of long ago was taken up by several British researchers and in 1940 Cambridge University's Harry Godwin was able to present a paper to the Linnean Society citing a variety of pollen studies from around the country.[7] These proved that *Tilia cordata* played a part in post-glacial English woodland. In numerical terms, lime was subordinate to oak, elm and hazel but it was undoubtedly there.[8] At this time there was no evidence for *Tilia platyphylus,* Large Leaved Lime, and admission to the English pantheon had to wait another couple of decades.[9]

1 Jorden, G. 1855. Some account of the Botany of Wyre Forest and surrounding parts of the Country. The Phytologist: a botanical journal. 1:1 [the journal was relaunched] pp281-6 (continued pp354-361) p281.
2 Munslow Jones, M. 1980. The Lookers-Out of Worcestershire. The Worcestershire Naturalist Club. p182

3 Lees, Edwin. 1856. *Pictures of nature in the silurian region around the Malvern Hills and Vale of Severn: including incidental excursions with the Malvern and Worcestershire Naturalists' Club and notices of the natural history... of many interesting localities in Worcestershire and Herefordshire*. Malvern: H. W. Lamb, p199 I'm grateful to Francesca for this reference. In the original text, Lees uses the term '*Tilia parvifolia*'; this has been replaced with *T. cordata* in accordance with modern usage.
4 *ibid.* pp224-229
5 Erdtman G. 1929. Some aspects of the post-glacial history of British forests. Journal of Ecology 17 112-126.
6 *ibid.* p122. See also chart p123
7 Godwin, H., 1940. Pollen analysis and the forest history of England and Wales. New Phytologist 39. pp370-400
8 The classic text, still in print during the 1970's is: Tansley, Arthur George. 1949. *The British Isles and their Vegetation*. Cambridge University Press. See especially p163 for lime reference.
9 *ibid.* Godwin H. 940. p389

In the 1960's *Tilia cordata* began to move from cameo role towards centre stage. There was a proliferation of ancient pollen investigations and these usually provided further evidence of lime in the 'wildwood' but, more importantly, researchers began to realise that pollen results had been distorted by environmental factors. This led to under-reporting of *Tilia cordata* in archaeological sequences.

For example, lime pollen has a stickiness that pollinating insects find attractive, and lime comes into flower in early summer, when the forest is in full leaf; this combination impedes pollen deposition. Oak is wind pollinated, flowers earlier and the pollen lacks this adhesive quality. More oak pollen hits the ground - with a potential to become part of the archaeological record. Another distortion results from the best samples being found in ground that has been waterlogged since arboreal times; any map of archaeological pollen records around the country shows the distinct prejudice in favour of wetlands. Limes have a wide range, but they avoid water-logged ground; oak is less cautious of the wet.

Danish researchers, first Johannes Iverson and then Hans Andreson pioneered strategies for dealing with these anomalies. The outcome, summarised by James Greig in 1982,[1] was a reappraisal of lime in the ancient landscape. After taking account of real forest conditions and adjusting the pollen counts accordingly, the status of lime in antiquity was transformed. *Tilia cordata*, it turned out, was not the elusive tree it's inclined to be now. Lime prevailed in large parts of the woodland canopy throughout much of England and Wales. This profusion lasted until the Neolithic farming revolution began to grip and Mesolithic hunter-gathers supposedly gave way to farmers anxious to grow crops.

Two north London sites, in particular, helped to consolidate a new doctrine that cast *Tilia cordata* as a mainstay of the ancient 'wildwood'. Investigations at Hampstead Heath and Epping Forest in the 1970's came to the same conclusion - that lime had been the most important tree about three and a half thousand years ago. The difference between them was that on Hampstead Heath lime had disappeared shortly afterwards, whereas so-called 'lime decline' didn't occur in Epping Forest until Anglo-Saxon times.[2] This was later reassessed as the early Roman period,[3] but the prevalence of lime for considerably longer than anywhere else still held. Epping Forest was the first archaeological pollen from contemporary woodland; it is still only one of a few. There are no Small-Leaved Lime to be found in today's Hampstead Heath or Epping Forest[4] or for many miles around; the nearest are a handful of survivors across the River Thames in south London.[5]

Pollen samples from sites much closer to Jordan's north west Worcestershire 'lime zone' – and Shrawley Wood – confirm the importance of lime in late Mesolithic times. Examples include Cookley, in the Stour Valley above Stourport[6]; Callow End, south of the Teme-Severn confluence; Ripple Brook, close to the western end of the M40 Severn bridge and Ashmoor Common nearby[7]; Hartlebury Common[8] and the City of Worcester itself[9]. They all demonstrate *Tilia cordata* as a significant tree in the Severn valley around 3500 years ago.

This significance didn't last. The various Severn Valley sites confirm a remarkably consistent phenomenon that has been dubbed 'Lime Decline'. After Mesolithic hunter-gathers gave way to Neolithic farmers, *Tilia cordata* was relegated from major player to virtual extinction across much of England and Wales. Lime Decline has come to indicate the watershed between 'primeval wildwood', where human impact was supposedly very slight, to a new kind of landscape dedicated largely to agriculture. Landscapes reconfigured, simplified and controlled by human beings. The launch of the Anthropocene.

If this paradigm shift had come a few years earlier, it's just possible Shrawley Wood might have been spared the turmoil and upheaval of the early 1960's. Preserved, perhaps, as a national treasure; a last rare remnant of ancient wildwood. Unfortunately, foresters in the 1960's had their own explanation for the lime in Shrawley Wood. Far from being relict wildwood, Shrawley Wood was a plantation. In 1907, Henry John Elwes was happy to confirm, in his monumental *Sylva Britannica,* that in all his travels around the British Isles he had never seen a seedling of *Tilia cordata*, despite their common occurrence elsewhere - for example in northern France. In preparation for Sylva Britannica he visited Shrawley Wood and recorded the opinion of the then owner, Sir Henry Vernon:

'*there is not, so far as he knows, any lime in the adjoining woods*'.

Elwes contradicts Sir Henry in his book by quoting from Edward Lees the incidence of *Tilia cordata* in George Jordan's 'lime zone' – and he adds his own considerable knowledge of lime woods in Worcestershire and Gloucestershire and those reported by historical writers. In particular, he describes lime trees growing in rocky and precipitous places, such as Castle Eden Dene in Durham, and the Lower Wye Valley where he didn't think they could have been established in any other way than by seed. But for all that, he has to agree with Sir Henry Vernon when he says of Shrawley Wood:-

'*.....that the stools are in rows as though they had been planted*'[10]

More than half a century later, Miles Hadfield paid a couple of visits to Shrawley Wood, just after the Forestry Commission had bought the largest part and radical change was afoot. Curiously, he reports a phenomenon rarely noticed in the chronicles of lime history – in 1939 George Vernon's woodsman, Cyril Powick, had restored the vista between the Wellingtonia on Spion Kop and the Wood House, widening the ride between them. One consequence was that:

'*for the next few years seedlings had arisen; there they were in hundreds, some of them only a few years old*'.[11]

Hadfield also records that in the summer of his second visit, there were 'many seedlings coming up in the turf under a *Tilia. cordata* at Kew'. In short, Hadfield didn't share Sir Harry Vernon's conviction that reproduction of *Tilia cordata* from seed was unknown, but he was convinced of Shrawley Wood's origin as a plantation:

1 Greig, James. 1982. Past and Present Lime Woods of Europe. In *Archaeological Aspects of Woodland Ecology.* Editors Bell, M & Limbrey, S. BAR International Series 146 pp23-55. See also p23 for a general appraisal of linden's previous neglect by woodland historians.

2 Baker, Colin A; Moxey, Paul A and Oxford, Patricia M**.** 1978**.** Woodland continuity and change in Epping Forest. Field Studies 4 pp 645-69.

3 Grant, M J & Dark, P. nd. Re-evaluating the concept of woodland continuity and change in Epping Forest: new dating evidence from Lodge Road. Unpublished: prepared for Dr Jeremy Dagley, Corporation of London, The Warren, Loughton IG10 4RW.

4 There are some planted trees around the Epping Forest Field Centre at High Beech; these are trees planted in celebration of the important part played by the late Paul Moxey and the Field Centre in this research.

5 Spring Park, Addington, Croydon. Thanks Hugh!

6 Greig, J R A. Unpublished pollen diagram for the valley of the River Stour at Cookley, Worcestershire, diagrammatically summarised in Greig, James. 1982 *ibid.* p.29

7 Brown, A. G. 1982. Human Impact on the Former Floodplain Woodlands of the Severn. In: Bell, Martin & Limbrey, Susan (eds) *Archaeological Aspects of Woodland Ecology*. Oxford: BAR International Series. pp93-104 Three sites: Callow End (SO 842505) 1.5km s. of Teme-Severn confluence; Ripple Brook (SO881387); Ashmoor Common (SO 852467)

8 Brown A G. 1984. The Flandrian vegetational history of Hartlebury Common, Worcestershire. Proceedings Birmingham Natural History Society 15: pp89-98.

9 Daffern, Nicholas. 2016. Two Palaeochannels, the Lime Decline, and the Identification of Worcester's First Stratified Neolithic Deposits: Worcester Area, Hylton Road, Worcester. In: *Transactions of the orcestershire Archaeological Society* 3rd ser. 25. p101

10 Elwes, Augustine Henry. 1913. *The Trees of Great Britain and Ireland*. Privately printed. 7:1659

11 Hadfield, Miles. 1963. Shrawley Wood. Quarterly Journal of Forestry 57 p38.

'*One must agree with Elwes and Sir Harry that it has been planted, for the most part spaced at roughly nine feet apart*.'[1]

This consensus was shared by a highly influential writer of the time, HL Edlin. In 1956 his '*Trees, Woods and Man*' was published in the prestigious Collins 'New Naturalist' series and while he doesn't specifically say Shrawley Wood was a plantation he makes this abundantly clear by default.[2] According to Edlin, the only 'native' limes in England and Wales were to be found as solitary specimens clinging to inaccessible crags in Cumbria, the Wye Valley and Yorkshire. By implication, the lime woods of Worcestershire, Lincolnshire and other parts of lowland England are planted. He denounced this 'lime coppice' as useless for modern purposes.[3]

Apart from his role as the doyen of British forestry writers in the post-war era, he also happened to be the man who wrote the Forestry Commission's publications; he was their press and public relations officer. Not until 1976, when Oliver Rackham published his first edition of 'Trees and Woodland in the British Landscape' was Edlin's authority seriously challenged.[4]

Some vindication of the Forestry Commission - and Edlin and Elwes before them - can be found in the 1952 designation of Shrawley Wood as a Site of Special Scientific Interest (SSSI) by the Nature Conservancy Council. The officer responsible was Dr Verona Conway[5] and the Shrawley oak and concomitant fungi were the main reasons she gave:

'*An extensive piece of oak woodland, valued particularly for its fungi…. The boundary was chosen to cover most of the area which was said to be visited for fungi and a good sample of the summit woodlands*'[6]

Although Conway's principal area of expertise was wetland ecology, she was no slouch when it came to archaeological pollen and the historical importance of lime.[7] She had studied under Harry Godwin at Cambridge, published a long joint paper with him and when a new book '*An Introduction to Pollen Analysis*' was published by Gunner Erdtman in 1945, she reviewed this for the Journal of Ecology.[8] All of which might suggest it wasn't just foresters who thought the lime in Shrawley Wood was artificially induced.

If naturalists of the 1950's were falling into line with the forester's 'plantation' paradigm they were having second thoughts in the 1960's. When the Forestry Commission acquired the larger part of Shrawley Wood in 1961, their intention was complete re-stocking – mainly with Douglas Fir (05) - but they were persuaded by the Nature Conservancy to maintain three areas of lime coppice, totalling 36 acres. By this time, the historic 17-20 year rotation for the Shrawley Wood lime coppice had been abandoned and much had last been cut up to 50 years previously. The Forestry Commission agreed to implement a 40 year rotation on this retained 36 acres and mention was made of 0.47 acres each year. This would be utilised for either pulp or 'turnery'.



05. Douglas fir in Shrawley Wood, 27th March 2018[9]

The responsible Nature Conservancy officer was Dr Tom Pritchard, later to become Director of the NCC in Wales and, given the circumstances, it seems he obtained the best possible compromise. At this time, Site of Special Scientific Interest status was a flaccid affair with few practical consequences. The purpose of dedication was to alert the statutory planning authorities that had been set up in the post-war era to issues that might be relevant to their plans – the Nature Conservancy Council had no power to intervene in the economic management of farm or forest.[10] The Forestry Commission couldn't be coerced, but their officers come across as reasonable people, amenable to persuasion. Perhaps civil service freemasonry played a part – both sides were departments of government. Despite their remit to manage the Commission's estate using what was described as 'economic' or 'scientific' forestry, there were some regrets. For example, in an annual report the Regional Officer justifies keeping Worcestershire's Kyre Park as a superb oak site – despite a general policy of switching to exotic conifers - admitting that '*a little of what you fancy does you good*'![11]

In Shrawley Wood, they not only conceded the 36 acres, there was talk of conserving the large area of limes on the steep scarp slope overlooking the River Severn. And they were enthusiastic supporters of a project whereby Worcester Teacher's College managed a small part of Shrawley Wood as a training ground where students specialising in rural studies could gain practical 'hands on' experience.[12] The Forestry Commission were certainly determined to

1 *ibid.* p37
2 Edlin, H L. 1966. *Tree Woods and Man.* Collins. pp79, 193
3 *ibid.* p193. See also Edlin H L. 1958. *The Living Forest* Thames & Hudson. pp89-91
4 The gulf between Edlin and Rackham was wide. In all of his considerable output, Rackham makes no reference to Edlin. Until he was invited to write the 100th New Naturalist to be published – O. Rackham. 2006. 'Woodlands'. In the commemorative introduction he refers to his 'great predecessor… a then old-fashioned forester who still remembered something of the distinction between woodland and plantation'
5 Langerheim, J H. 1996. Early history and Progress of Woman Ecologists. Annual Review of Ecology and Systematics' p14 confirms Conway began work for the NCC in1949
6 Peterken, G. 1967. Report (unpublished) to International Council of Scientific Unions: International Biological Program. Section CT: Conservation. (in copy sent to NCC Regional Office at Attingham Park, Shrewsbury 21/3/1967)
7 Conway, V M. 1945. Swiss Contribution to Quaternary History. New Phytologist 44:2. Pp234-9. Conway notes the absence of lime in some Swiss pollen samples.
8 Conway V M. 1945. Journal of Ecology 32:2. p214
9 Drone photo by Robert Somer
10 *ibid.* 1955. On the Nature Conservancy; other sites of special scientific interest. Proceedings of the Linnean Society of London 65:2.
11 The National Archives (TNA) F37/35 *Forestry Commission: forestry histories and working plans. Wyre Forest, parts I, II & III with map and appendices 1960-1965 (*in a summary at the beginning)
12 Simmons, Gordon E. c1970. Shrawley Wood~ Worcestershire: A Study in Colonisation After Clearing and Replanting. *Countryside;* Simmons, GE (Dept of Rural Studies, Worcester College of Education and formerly

replace much of Shrawley Wood's lime with Douglas Fir, but there was still scope for compromise. After mentioning in his report negotiations with the Worcestershire Naturalist Trust and Birmingham University over a possible nature reserve at Seckley Wood, the Regional Officer summed up the future policy as regards the Wyre Forest area:-

'*to manage the forest, as far as sporting and protection allow, as an "Open Forest" and to foster public interest in it.'..... [this] provision does not necessarily mean that the status quo will be preserved in all SSSI's but there will be full consultation with the Nature Conservancy in the management of these areas. This will apply especially to Shrawley Wood, where major changes of species will be unavoidable in the interests of economic management.*'

This 'economic management' comprised planting 10 acres of Douglas Fir in the Forest Year 1963, 20 acres in 1964 and 210 acres in 1966. At first it seems the lime stools may have been retained as a 'nurse' for the new planting and the use of herbicide was limited to the inevitable flush of brambles; this was later extended to what is ominously described as 'basal' spraying.[1]

The grim details of this effort to re-engineer an ancient woodland have already been recounted towards the end of 'Owning the Wood'. There's no doubt considerable destruction of lime stools took place and this was followed by the successful introduction of Douglas Fir on a large scale. The change was not so extensive as The Forestry Commission had originally planned, but the reasons for this have been obscured by a fire at their regional office that destroyed many relevant records. The only archive for the later 1960's is provided by the trees themselves - the parts of Shrawley Wood still dominated by Douglas Fir. These are perfectly sound trees, a credit to the foresters who planted and maintained them over nearly six decades. They are definitely there, but somehow hiding in plain sight. In among the twists and turns of the lime decline saga, there's a curious local episode that has air-brushed the Douglas Fir from Shrawley Wood and put the lime back where it was!

As far as is known, the late Oliver Rackham only visited Shrawley Wood once, in 1987, and there's local knowledge to affirm that he spent most and perhaps all of his time in the part that wasn't sold to the Forestry Commission.[2] Later on, he heard that one of the forestry workers involved in spraying the lime stools in Shrawley Wood had said:

'*I'm the man that tried to poison the lime in Shrawley Wood. We sprayed it with gallons and gallons of 2, 4, 5– T: we couldn't kill the b---- stuff.*'[3]

There's some truth in this, but there must have been an element of hyperbole because large areas of lime were, in fact, destroyed. Influenced, no doubt, by this colourful account and the lime stools that still flourished in the private part of Shrawley Wood, Rackham reported in 2006:

'Shrawley Wood fell into the hands of the Forestry Commission and was given the usual treatment. But Agent Orange here met its match. By 1985 Shrawley was back to being a magnificent limewood, and ***one had to look carefully for the miserable remnants of conifers.'***[4]



06. What became of those "miserable remnants"…[5]

Perhaps Rackham was inspired by Peter Marren, writing for the Nature Conservancy Council in 1996. There is much to excite incredulity in the quote that follows, but only the reference to conifers is highlighted. The author was painting a picture of English woods on a broad canvas and can hardly be expected to have visited every one he mentions, but colleagues at the Conservancy's Regional Office might have set him right!

'*Many woodland nature reserves in Worcestershire represent unsuccessful attempts at plantation forestry. Shrawley Wood (103ha; 254a), on the banks of the Severn near Stourport is, on paper, a conifer plantation, but in practise the planted trees were unable to compete with what is perhaps the most magnificent limewood in the land.* ***Today it is hard to find a single living conifer****. The wood has reverted to type: a rare example of lime and ash underwood beneath standard limes, an authentic whiff of prehistory*.'[6]

The notion that Shrawley Wood has somehow reverted to being its old self, bereft of the pine-for-profit that made a rude intrusion in the 1960's, has taken on a life of its own. This is Ian Gambles, Chief Executive Officer of the Forestry Commission, writing in his history of the Commission's work, a couple of years ago:

'*Shrawley Wood in Worcestershire, Bedford Purlieus in Northamptonshire, and the ancient and ornamental woods of the New Forest are all first-class examples of well-documented and wildlife-rich ancient woodlands that survived the utilitarian post-war decades to become some of the premier woodland sites in the country*.'[7]

There's no doubting Shrawley Wood's a wonderful place and the Forestry Commission can be proud to own it, but it didn't survive the '*utilitarian post-war decades'* unscathed. Many limes aren't there any longer and those that remain are managed in a different way than in the past. And there's the Douglas Fir to consider and the oaks that are now sadly missing.[8]

For all that, Shrawley Wood has done well compared to any single example of the Lincolnshire lime woods. Devastation there in the 1960's was remorseless and although there may be as many limes surviving in aggregate, these are spread over several individual woods.

An important factor in finally halting the destruction of lime stools was proof that the Lincolnshire limes weren't part of a plantation but

Ludlow CE Modern School). 1968. Trees and Forestry Illus. by author. Longmans (Rural Education series)

1 TNA F37/35 *ibid.* These records appear to have been heavily weeded.

2 Information from Harry Green.

3 Rackham O. Ancient Woodland its history, vegetation and uses in England. New Edition. Castlepoint Press 2003 The anonymous recollection was made in 1999.

4 Rackham O. 2006. Woodlands. Collins New Naturalist. Collins p479

5 Drone photo by Robert Somer

6 Marren, Peter. 1992. The Wild Woods. A regional guide to Britain's ancient woodland. Esso, David & Charles and the Nature Conservancy Council (copyright NCC & PM) p173

7 Gambles, Ian (ed). 2019. British Forests - The Forestry Commission 1919-2019. p129

8 See 'Hearts of Oak' pp.65-75

had deep historical roots. The Nature Conservancy's woodland ecologist George Peterken was crucial in this. He spent many of his own weekends searching for relict wood banks or cloistered in archival carousels in order to prove this. Much later, inspired by Peterken, the Limewood Working Group has tried to do something similar for Shrawley Wood.

There's no doubting now that Shrawley Wood goes back a long way as a lime wood but Messrs Elwes, Vernon, Hadfield and Edlin were not entirely wrong. While there's reason to suppose the trees in Shrawley Wood are descended from Mesolithic and earlier Neolithic predecessors nearby, the regimented spacing speaks of woodsmen and their dark arts, such as layering, striving to achieve maximum productivity. George Peterken explained the small stools – small considering the long centuries when coppicing prevailed – as being the result of regular division that rejuvenated productivity.[1]

Going back to the business of Lime Decline. In 2014 there was a summary of lime pollen sites throughout England and Wales that particularly analysed the probable causes of lime decline. Some episodes they attributed to natural causes, especially rising water tables, but the great majority were down to anthropogenic destruction.[2] As Nicholas Crane put it most succinctly 'farming killed the lime wood'[3]

More recently, landscape archaeologists have demonstrated that lime cut as coppice can have a low or non-existent profile in the pollen record.[4] This would be patently obvious to any woodsman familiar with limes, but it's good to have some scientific confirmation. *Tilia cordata* poles only produce dribs and drabs of pollen before they're a quarter century old - and abundance only comes in later decades, assuming unfettered access to sunshine.

If the history of Shrawley Wood depended on archaeological pollen records, it might well have been accessed as an oak wood with only faint traces of lime. The archival evidence is that lime in Shrawley Wood has been repeatedly coppiced since at least the end of the 14th century and probably long before. The poles didn't grow for longer than 20 years until the 20th century.

This might suggest variations on the simple theme of agriculture displacing lime woods. Perhaps significant areas of lime were coppiced for a while after the supposed 'lime decline' and they simply haven't been noticed. As will be seen shortly, lime provided all kinds of services in the Mesolithic and early Neolithic economies; woodland browse and leaf fodder were probably the most important, apart from a considerable demand for lime bast. Regular coppicing or pollarding is the easy way to provide this.

Could our ancestors have gone all the way and take up permaculture, at least until the hazards of early agriculture have been ironed out? The hoe can be mightier than the plough! Lime leaf litter composts well and provides good humic soil. Cattle feeding in coppices oblige with their dung. The ground at the start of each new coppice cycle is free of pernicious weeds. Altogether an ideal environment for checking out this new-fangled rye, sown between the stools for a season or two before the lime gets too high. Then wait for another year or two before feeding your cattle on the smogesbord of ground vegetation and lime leaves that will flourish for another few years before the canopy closes again. Fanciful? A similar system - *Haubergwirtschaft* - survived in Germany almost into the 20th century.[5]

As mentioned at the beginning of this chapter, it looks as if limes have a bright future. But the past might still have some surprises. Take for example this recent complication from the Białowieża Forest in Poland – long held up as Europe's closest approximation to 'authentic wildwood':-

'*All low pollen producers in our data (Corylus [hazel], Poaceae [grass] and Tilia [lime]) grow in relatively shaded situations and do not receive sufficient light for their pollen production to be as abundant as in cultural landscapes. In addition, dense, multi-layered forest may limit the dispersal of their pollen, while high producers (Pinus sylvestris Scot's pine] and Quercus robur [pedunculate oak]) are tall trees that reach the canopy where they receive sufficient light for abundant pollen production and where pollen gets freely dispersed.*'[6]

Is it possible lime was itself part of a 'cultural landscape', with 'lime decline' indicating a change of culture? Might the expansion of Lime in late Mesolithic time have had a helping hand? A case has been made for the anthropogenic dispersal (and ultimately disposal!) of elms.[7] Why not limes?

In amongst the many debates about wildwood and when it might have been and what it might have been like[8], some of us are consoled by a simple idea. Trees and people arrived more-or-less together in a landscape wiped clean by the last Ice Age. Human beings have always messed with the landscape around them and the whole idea of 'wildwood' might be a rather splendid academic conceit.[9]

1 *ibid.* Peterken G. 1967

2 Grant, M J; Waller, M P & Groves, J A. 2011. The Tilia Decline: vegetation change in lowland Britain during the mid to late Holocene. In *Quaternary Science Reviews*. 30: 394-408. Discussion pp405-7, in particular, confirms an association with arable agriculture.

3 Crane, Nicholas. 2011. The Making of the British Landscape: from the Ice Age to the Present. Weidenfeld & Nicolson p145

4 Waller, Martyn et al. 2012. Modern Pollen Studies from Coppiced Woodlands and Their Implications for the Detection of Woodland Management in Holocene Pollen Records. *Review of Palaeobotany and Palynology* 187: 11–28 (with thanks to Suzi Richer)

5 Radkau J. 2012. Wood – a History (trans from German '*Holz'*, 2007) p50; Sieferle, Rolf Peter. 2001. The subterranean forest, energy systems and the Industrial Revolution (trans from 'Der unterirdische Wald') Cambridge: The White Horse Press. p67

6 Baker, Ambroise G; Zimmy, Marcelina et al. 2016. Pollen productivity estimates from old-growth forest strongly differ from those obtained in cultural landscapes: Evidence from the Białowieża National Park, Poland. *The Holocene* 26(1) p89

7 Richens, R H. 1956. Elms. Penguin Books: New Biology. Richens interprets elm as primarily an agricultural crop, grown for leaf fodder. See especially pp18/19, 28. For modern vindication see Coleman, Max. 2009. Wych Elm. Royal Botanic Gardens, Edinburgh p22

8 Vera, F W M. c2000. *Grazing ecology and forest history* CABI Wallingford. Based on PhD thesis: Agriculture University, Wageningen, 1997. Vera suggested the 'wildwood' was in fact a shifting mosaic of woodland and prairie, maintained in a dynamic state by herbivores. The present consensus in academic circles seems to have taken part of Frans Vera's thesis on board, but with a limit on the extent of grassland – about 20%. See: Kirby, Keith J & Watkins, Charles. The Forest Landscape Before Farming. In: Kirby, Keith J & Watkins, Charles (eds) 2015 *Europe's changing woods and forests: from wildwood to managed landscape* CABI p40. Citing: Nielson, A B et al. 2012 Quantitative reconstructions of changes in regional openness in north-central Europe reveal new insights into old questions. In: *Quartenary Science Reviews*, 47: 131-149; Fyfe, R.M. et al. 2013. The Holocene vegetation cover of Britain and Ireland: overcoming problems of scale and discerning patterns of openness. In: *Quartenary Science Reviews* 73, 132-148

9 The term 'wildwood' was popularised by Oliver Rackham, starting with his 'Trees and Woods in the British Landscape', inferring a post glacial British woodland established without interference by humans. George Peterken used the term 'ancient woodland' in his 'Woodland Conservation and Management' to describe primeval woodland subject to modification by people. Whether or not these assumptions were literally true, they had a profound effect on modern woodland conservation; without them Douglas Fir might still dominate Shrawley Wood!

A Really Useful Tree

Flowers and Honey

Mature lime trees produce nectar in abundance and lime forests, especially in eastern Europe, are still home to many thousands of hives. According to Mrs Grieve in her 'Modern Herbal', the honey from lime flowers is the best flavoured and the most valuable in the world.[1] There were some hives in Shrawley Wood until recently, taking advantage of 'stored' trees and the longer coppice rotations that enabled Shrawley limes to produce flowers – possibly for the first time in many centuries. Historically, Shrawley limes were coppiced on rotations too short for flower production.

Across the river, in Ombersley, things may have been different. Tenants there paid 'honey silver' to the lord[2] - a commutation in lieu of a previous render of honey. Before the Dissolution, Ombersley manor was owned by Evesham Abbey and the monks expected twelve sextaries of honey each year from their detached property.[3] There's no certainty this was lime honey, but Ombersley contained several limewoods and there are still pollard lime to be found; there used to be many more.[4]

Lime honey was the cause of extraordinary archaeological confusion in central Scotland, where an exceptional lime pollen count was found in a Neolithic 'cist' grave, radio-carbon dated to 1250BC.[5] Speculation followed that, contrary to received wisdom, *Tilia cordata* once grew further north in the British Isles than previously supposed. [6] However, taking into account the presence of pollen from Meadowsweet, another plant much favoured by bees, researchers eventually came to the conclusion that a votive pot of honey or mead had been spilled.[7] No Scottish lime trees need have been involved, but there must have been long-distance trade in lime products. The researchers speculated the honey may have come from Sweden or Germany.

In many European countries, denied the comforts of Co-op Red Label, they make tea from lime flowers. According, once again, to Mrs Grieves[8], most French housewives kept stocks of dried lime-flowers for making 'tilleul'. Mrs Grieve was writing in the 1930's and enthusiasm for lime tea may have waned, but 'tilleul' tea bags can still be found on most supermarket shelves. Not only in France but in Germany, Poland, Hungary, Lithuania, Croatia and doubtless other European countries where this author doesn't know anybody to ask.

The flowers, dried or fresh – and sometimes compounded with lime bark and leaves - have been used medicinally over many centuries for treating restlessness, hysteria, headaches, high blood pressure and other afflictions. How successful such intervention might be is hard to discover, but there's perhaps some confirmation in the persistent use of medicinal lime over thousands of years. A recent European Medicines Agency report devoted twenty pages to an assessment of medicines derived from *Tilia* species, without any obvious scepticism.[9] In addition to medical use, there are reports of perfumes that use lime flowers, with results some folk find alluring.

For the volume of wood that can be grown in a given area, lime coppice is considerably more productive than beech, oak, or hornbeam and according to research by the Forestry Commission in the 1950's, it beats even hazel coppice by a whisker.[10] Nevertheless, the acreage devoted to lime in modern times has been low – a 1947 survey records there was a total of 1034 acres throughout England and Wales and only 97 acres of this was pure lime coppice.[11] At the time, Shrawley Wood still had a significant oak and birch component; presumably it was included in the larger acreage.

When much of Shrawley Wood was bought by the Forestry Commission in 1961, they regarded lime as a near-useless relict of the past. The intention was to kill most and replant with Douglas Fir. As will be seen later, things didn't go entirely to plan but the intention illustrates the nadir of *Tilia cordata's* reputation as a useful tree. It wasn't always like that. To redress the balance, we'll start with 'cultural services', move swiftly on to flowers and honey, follow on with wood, then bast – the stringy inner bark – and finish on foliage.

Cultural Services

A legendary tale from Ovid, the Roman poet, gives some idea of lime's status in the ancient world; he's explaining the curiously close proximity of a venerable oak and a lime somewhere on a desolate plain. The gods Zeus and Hermes, it seems, were in the habit of posing as beggars and knocking at doors in quest of food and shelter, in this once fertile part of the world. Every door was shut against them until, at long last, they found the hovel of a poor decrepit man and wife who welcomed them in with all the little food, wine and warmth they had. The two gods led the elderly barren lovers - Baucis and Philemon - to a hilltop where they lived out their last years in comfort. Then with vindictive wrath - forgiveness wasn't a strong point among Greek gods - they laid waste the landscape with floods. When the end finally came for the kindly couple, they were granted their last wish - to die together in loving embrace. In death they were transmuted into these two trees.

In Germanic culture[12], apart from the frolicking under trees already mentioned, limes had serious status in matters of jurisprudence: they helped to discover truth and courts were held '*unter den linden*' in less formal times. Lime trees were the favourite tree for lovers making vows or planning trysts. Association with Freya – goddess of fertility - bought veneration and her husband Wotan (Thor) – god of thunder – ensured protection from lightning when limes grew alongside houses and churches. Many German towns and villages incorporate the term 'lind'. In Slavic culture, the linden or lipa was regarded as holy and Poland abounds with villages called 'Swieta Lipka" (Holy Lime). Currencies and months of the year incorporate 'lipa' and lime tress are now the national emblem of the Czech Republic, Slovakia, Slovenia and Lusatia. In Baltic mythology Laima, goddess of fate, inhabited a lime tree, where interventions might be sought in matters of fertility, pregnancy, childbirth, marriage and death. Alas, the limes of Shrawley Wood are stubbornly silent on these weighty matters.

Lime Wood

As wood, seasoned lime is light and exceptionally stable. These qualities, along with a soft grain that's easily gouged, have made it the first choice for wood carvers; Grinling Gibbons, the man who

1 Grieve, (Mrs) M. 1931. *A Modern Herbal.* Jonathan Cape pp485/6. Mrs Grieve obviously hadn't heard of Manuka honey!
2 *Victoria History of the County of Worcester 3.2* : Ombersley p465 fn 86. VCH describes honeysilver as a 'rent' which implies a commutation of rents once paid with honey.
3 Sayers, J & Watkiss, L. 2003. *Thomas of Marlborough. History of the Abbey of Evesham* Oxford Medieval Texts Clarendon Press, Oxford. Heading 410 Refectory revenues include 'twelve sextaries of honey from Ombersley' See also pp550-1 & 526-7. The origin of what appears to be a customary render isn't known, but it may be relevant that Ombersley was granted to the Abbey of Evesham by Æthelweard, sub-king of the Hwicce, with the agreement of King Centred, in 706 AD. See: Sawyer, Peter Hayes. 1968. *Anglo-Saxon Charters: an annotated list and bibliography*. London: Royal Historical Society. Charter 54.
4 Worcestershire Archives and Archaeology Service (WAAS) 705:56 BA 3972/2 'Lops & Crops and Heads of all those oaks, Witton or Lime Trees now standing or growing within Lynall Common'
5 Dickson, Camilla & Dickson, James. 2000. *Plants and People in Ancient Scotland* Tempus. 79/80
6 Moore, Peter 1978. Bronze Age Honey in *Nature* 276 p443
7 Dickson, Camilla**.** *ibid.* p81
8 *ibid.* Mrs Grieve, pp485/6. The author also discusses various medicinal uses.
9 Chinou R I. 2012. Assessment Report on Tilia cordata Miller, Tilia platyphyllos…. European Medicines Agency. Accessed online 19/6/2021 at: https://www.ema.europa.eu › herbal-report › final...
10 Pigott C D. 1991. Tillia cordata. In: *Jnl of Ecology* 79: 1169
11 Forestry Commission Census Report no 1. Reported in: Hadfield, Miles. 1961**.** Limes. In: *Quarterly Journal of Forestry.* 55:308
12 Reeg, Tatiana. 2008. Germany: Linde in *Cultural aspects of the trees in selected European countries.* pp30/31

crafted exemplary woodwork for Windsor Castle and Wren's post-fire London churches was a noted exponent.[1] A word of caution, however, before buying a bole of *Tilia cordata* and embarking on a wood-carving career. Exact information as to the kind of lime Gibbons might have used is hard to come by, whereas it's certain his Germanic predecessors had a decided preference for Large Leaved Lime. Indeed, there's a distinct correlation between the incidence of church carving in southern Germany and the areas where 'summer lime' (*Tilia platyphylos*) is prevalent. [2] This 'summer lime' was the medium for a profusion of incredibly intricate, at times almost lace-like, iconography that flourished in southern Germany between 1475 to 1525.[3] More profanely, limes in general could be used for carving ship's figureheads and, as basswood in the eastern United States, for the 'cigar shop Indians' that still advertise some tobacconists. The inherent stability of seasoned lime also made it suitable as a 'canvas' for Slavonic icons and, in Roman times, the base for writing tablets.

A good flat surface and kindness to knives made lime the first choice for shoemakers and other cutters-out of leather. Similar benefits applied to the kitchen: my lime bread board (admittedly *Tilia vulgaris*) has provided a quarter century of hard use. Lime's also a clean wood without taint – good for all kinds of kitchen utensils. The Ancient Greeks made bottles from linden wood, sealed inside with resin, and one of the last recorded uses of lime from Shrawley Wood was for making 'chip baskets' – c12 lb one-trip containers for soft fruit and suchlike, woven with thin lathes of limewood.[4] These were used by the Evesham fruit district in the 1950s – until plastic prevailed.

Lime is among the lightest of the European hardwoods and was used for boxes of many kinds – anything that didn't need great load-bearing strength or resistance to decay. Cigar boxes come to mind. Bristol toy makers were still paying 30 shillings a ton for limewood in the early 19th century.[5] A particular speciality that exploited lightness and stability, in Yorkshire at least, was the framing for saddles [6] Reluctance to crack or warp made lime ideal for piano sounding boards and the 19th fashion for domestic pianos helped make suitable lime trees briefly valuable until 'basswood' from North American forests displaced domestic sources.[7]

Historically, the same qualities that helped make music were exploited to wage war. Lime made excellent shields, light and strong. They always feature in portrayals of the Viking longboats that once struck terror near and far; they were known to their owners as 'lindens' and the word became closely associated in the Nordic languages with the whole concept of warfare.[8] After gunpowder transformed the arts of collective slaughter, John Evelyn claimed that 'truncheons' of lime made the finest charcoal for gunpowder.[9] [10]. Given the Evelyn family's unique status in the early explosives business,[11] he should know.

In among these many useful features *Tilia cordata*, along with the other limes, has a downside shared by such as poplar, willow and alder: it doesn't burn very well. Before fossil fuel became ubiquitous, most coppice wood was destined to be burned, either as wood, charcoal or faggots, and lime is no match for the likes of beech, oak, birch, ash, hornbeam and several others. Not only is the heat output poor, ash residues are high.[12] [13] However, one of medieval England's largest devourers of wood – the brine pans at Droitwich – was only seven miles from Shrawley Wood and some of the journey, perhaps all at one time, could be made by water transport. A large part of the demand was for faggots[14] – tightly bundled sticks and twigs – rather than solid billet wood[15] and buyers of such 'offal wood' were less discriminating as to species.

Since long before Roman time, brine pumped from below ground at Droitwich was boiled to evaporate the water content and by the early 16th century John Leland estimated the industry devoured six thousand loads of wood a year to support 400 furnaces, albeit they only operated for part of the year. He didn't mention coal, although there's little doubt this played an important part.[16] Wood came from as far afield as Bromsgrove, Alcester and Worcester. However, communities with a traditional stake in Droitwich salt boiling spanned a much wider area – at least seven counties including Oxfordshire, Herefordshire and Buckinghamshire – far beyond the hinterland for overland transport of wood fuel.[17] One result was a lucrative local market in small poles and faggots.[18] Another was the haulage of Black Country coal nearly 20 miles overland; the cost of transport was considerably more than the pithead price[19] but the superior calorific value of coal per load made this worthwhile, set against the inflated price of wood. Short-rotation coppices within a few miles of Droitwich remained very profitable, but coal provided a price benchmark.

It would be remarkable if Shrawley Wood didn't play a part in supplying wood at some period during the Droitwich industry's long existence. Not least before Astley Wood and Shrawley Wood were

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1 Evelyn, John FRS. 1908. *Sylva....a reprint of the 4th edition.* Arthur Doubleday. p125, where Evelyn calls Gibbons 'our Lysypus'.
2 Baxandall, Michael. 1980. *The Limewood Sculptors of Renaissance Germany*. Yale University Press p28
3 *ibid.* Baxandall. Most of this 420 page work is devoted to the artistic craftsman who created these lime carvings - and photographs of their work.
4 Darby H C.1938. The Cambridge Region. Cambridge University Press. p155 provides the background to chip or lath baskets. Information on Shrawley's contribution at Evesham from Mr Cyril Powick via his nephew at Court Farm and Harry Green.
5 Rudge, Thomas. 1807. General View of the Agriculture of the County of Gloucester. Board of Agriculture. p247
6 Faull, ML & Moorhouse, SA (eds). 1981. West Yorkshire: an Archaeological Survey to AD 1500 3 vols 3/689 citing Yorks Archaeological Society MS 759/1340, ppp82-3 'The list [of 23 cases of independent craftsmen taking wood from Sowerby Wood in 1337 also records the uncommon use of the linden or lime tree (*lynde*) for making *sadeltres*, the wooden frames of saddles.'
7 Pigott, Donald. 2012. *Lime-trees and Basswoods A biological monograph of the genus Tilia*. p353.
8 Pigott, Donald ibid pp352/3. In the poem that described the battle of Maldon in Essex, where, in AD 991 an army was defeated by Danish seaborne raiders, there is the line 'Leofsunu gemaelde and his linde ahof' (Leofsun spoke and his lind [shield] was raised)
9 These authorities make clear the superiority of 'light' woods, without extolling lime: Nye, Nathaniel. 1647. *The art of gunnery. Wherein is described the true way to make all sorts of gunpowder, gun-match [etc]*; Smith, FM (Captain, Royal Artillery). 1870. *Handbook of the Manufacture & Proof of Gunpowder*. London: Her Majesty's Stationery Office.
10 J.E. Esq. 1664. Sylva or A discourse on Forest-trees. London: Royal Society. p102: Coal for the Powder Mills is made of Alder-wood (but Lime-tree were much better had we it in that plenty as we easily might)….
11 The Evelyn family fortune was made from gunpowder mills in Surrey that enjoyed a monopoly of supplying royal arsenals up until the Civil War. See Dictionary of National Biography.
12 These observations on calorific value and ash residue are derived from this author's personal experiment.
13 Schlich, Sir William. 1910. Schlich's Manual of Forestry. Third edition, revised. London: Bradbury, Agnew & Co. Volume 2, p349: [Tilia] 'of small heating power'
14 WAAS: DR 500. In a enquiry regarding the use of wood versus coal fuel in 1623, the bailiffs asserted that it was not timber wood but 'croppes, loppes of trees, underwood and small scrub poles' that was used for burning.
15 Dyer, Christopher. 2004. Salt making at Droitwich, Worcestershire in the 14thC. Transactions of the Worcestershire Archaeological Society 3rd series 19 p137 Claims made by the bailiffs above are contradicted in 14th century accounts of Westwod Priory where 'great wood' and 'logs' are specified as fuel.
16 Chandler, J. 1993. John Leland's Itinerary: Travels in Tudor England. Stroud: Sutton p515
17 Hooke, Della. 1981. The Droitwich Salt Industry: an examination of the West Midland Charter Evidence. In: *Anglo-Saxon Studies in Archaeology and History 2.* Edtors*:* Brown, David; Campbell, James & Hawkes, Sonia Chadwick. BAR British Ser. 92. p42
18 TNA Letters & Papers, Foreign and Domestic, Henry VIII Vol 6 1533. 1882. H.M.S.O. no 231 provides an example of two woods at Elmley Lovett (three miles from Droitwich) where two 'coppyes' (coppices) within the lordship called 'Bawckryge' and 'Jones Wood', the first comprising eight acres of 6 years growth, the other six acres of seven years growth, sold to the Bailiffs of Droitwich for £6 13s 4d. This works out at about £1 per acre for each year's growth.'
19 *ibid.* Dyer, C. p137 suggests a 250% difference between pithead and salt pan, based on 14th century archives from Westwood Priory, near Droitwich.

separated – at the time of Domesday Book they were both part of a Manor of Astley that owned:-

> '*at Droitwich 1 salt-house which pays 18 measures of salt and 64d.*'[1]

Towards the end of the 14th century Shrawley 'computus rolls' record 'bundles of rods' being sent to Salwarpe, a hamlet on the outskirts of Droitwich. These 'bundles' are almost certainly cut from Small Leaved Lime coppice, and they accord well with the size of wood used for boiling brine. However, despite some previous ambiguity,[2] it now seems reasonably certain these 'bundles' were destined for new stables, presumably used in wattle and daub walls.[3] [4] Salwarpe was the *de facto* Worcestershire home of the Beauchamp family; they were overlords of Shrawley at the time. Remarkably, records appear to show that they still had to pay.

Whether or not lime coppice was part of the mix, it seems inevitable that Shrawley wood of various kinds – for example thinnings and brash from birch poles and brash from oak – was sold as fuel for boiling brine. Quite apart from direct sales, Droitwich's voracious appetite must have influenced wood prices throughout its hinterland.

Fossil fuel and faggots were rivals in the business of brine boiling for at least three centuries and possibly far longer but, towards the end of the 17th century, Black Country coal emerged as the clear winner. There's an apparently random note in the Vernon archives, dated 1706, pondering an investment in the Droitwich salt industry after traditional arrangements had collapsed. By then coal was the only fuel under consideration.[5] [6]

Lime bast

According to a granddaughter's O level biology book, bast is the outer fibrous layer of the phloem – the long tubular vessels that transport products of photosynthesis – mainly sucrose – from leaves to where they're needed around the plant. Inside of the phloem is the xylem: tubular vessels, of different structure, that transport water and minerals from roots in the direction of upwards and outwards. Neither phloems nor xylems will be mentioned again!

In plants, bast fibres provide mechanical strength and protection and they lie against an outermost epidermis or skin. The bast fibre in particular plants have long been exploited by people to make string, rope and textiles - cannabis, flax and nettles are good examples. In trees, this bast layer is soon relegated to a protective function, as new shoots mature, but basts from several species have been similarly exploited. With *Tilia cordata*, bast is particularly well developed and usually comprises 10 to 14 separate fibrous layers, with the coarsest on the outside and smoothest and softest layers on the inside. According to one long-standing authority:

> *'Bast fibres have been produced from a variety of trees, eg lime, elm, birch, willow and even cedar,* ***but by far the most important of these in Europe is lime****.'*[7] *[author's emphasis]*

Since this was written in 1964, the enlargement of archaeological activity and scientific techniques have confirmed this many times. - aided and abetted by chance finds such as "Ötzi", the Trolean Iceman who died on an Alpine mountainside around 3500 BCE. The Iceman's sophisticated assemblage of clothing, footwear and artefacts all involved the use of bast.[8] As an archaeologist put it:- *Microscopic analysis of 295 tissue samples taken from the cords on a random basis show that the Iceman* ***used only bast from the lime tree (Tilia)*** *for this purpose.[author's emphasis] The bast was harvested by the simple technique of stripping the fresh bast layers from the wood without soaking or retting. This can be seen from the multi-layered bast strips and bast fibre bundles which were simply twisted together to make the cords.'*[9]

Antoinette Rast-Eicher takes us further back:-

'Tree bast was still in use during the Neolithic; it was the most important fibre until the beginning of the Bronze Age, and used for many different objects, including clothing. ***We can speak of a "bast culture"****. [*Authors' emphasis*] …….Bast could be used either as unretted strips or retted and spun. The coming of a new fibre [flax]did not much change the use of bast. Flax was processed like tree bast, unretted or retted. [*wool wasn't used until later*]*[10]

Anne Reichert, who has produced some wonderful examples of cords, netting, textiles, baskets and different weaving techniques that are freely accessible on the internet, confirms that, for most of this, lime bast was the material used:

'In the Neolithic, ***lime bast was the most frequently used bast*** *for all sorts of textile items'[*author's emphasis*]*

The widest range of lime bast cords, baskets and textiles found in the UK to date are from the Must farm excavations in Cambridgeshire; the results of these can be provisionally explored on the internet but, at the time of writing, formal publication is imminent.

Homo sapiens aren't the only species to appreciate the fibrous quality of *Tilia cordata*. An early advocate of the historical importance of lime bast, Geoffrey Dimbleby, also recalled how he :-

> '*Watched jackdaws tearing strips of bark several feet long from the dead branches of a lime tree. The strips were then carried away to a nearby house and stuffed down the chimney as nesting material.*'[11]

Throughout the Neolithic, lime was gradually displaced, particularly in textile use, by linen (made from flax) and wool (everyone knows where wool comes from) but lime bast continued in use for long afterwards, particularly for ropes and cords.

Lime bast ropes first came to archaeological attention more than a century ago in Swiss 'Pile Villages', where they were used to bind timbers together[12] Now more than a hundred similar 'village' sites

1 Thorn, Frank; Whitelaw; Elizabeth; Wood, Sarah; Thorn, Caroline; (General Editor Morris, John). 1982. *Domesday Book* Phillimore. 176b

2 Sproat, Rod 2006. The Castle at Oliver's Mound, and the Poher Family. Shrawley History Society Journal No 2 pp4-8. 'This was the crossing place [ie Oliver's Mound] where large numbers of faggots were sent from Shrawley Wood to fuel the brine pans to make salt, at Droitwich

3 WAAS 705:66 BA 4221/7. Compotus Roll of Robert Hulhampton, 13 Richard II - 14 Richard II (1389 – 1390)

4 Rackham. O. 2006. Woodlands. *Collins New Naturalist*. Colins. P298 has picture of such a wall using lime.

5 WAAS 705:7 BA 7335 2(iv)/38 'A true account of what profit the Town of Wych [Droitwich] makes out of a tun of salt.' 1706 1500 of Coal makes a tun 7s Salt is sold per ton Worcester £7 11 0. Queen's duty deducted £6 06 8d

6 Bayley C. H. 1882. The Rent Rolls of Lord Dudley & Ward in 1701 p9 provides the monthly sales for Knowle, the largest coal pit in the southern Black Country. There are remarkable differences in monthly sales, suggestive of the difficulties of winter transport – and the cyclic nature of the Droitwich industry.

7 Hodges, H W M. 1964. Artefacts. (Introduction to Early Materials and Artefacts): London: Baker. p127

8 Oeggl, Klaus. 2009. The Significance of the Tyrolean Iceman for the Archaeobotany of Central Europe. *Vegetation History & Archeaobotany* 18 pp1-11 p69-7

9 Pfeifer, K & Oeggl, K. 2000. Analysis of the bast used by the Iceman as binding material in Bortenschlager, Sigmar & Oeggl, Klaus (eds) *The Iceman and his Natural Environment (The Man in the Ice Volume 4: Palaeobotanical Results)* Springer: NewYork p76

10 Rast-Eicher, Antoinette. 2005. Bast before Wool: the first textiles. P Bichler et al (eds) *Hallstaff Textiles……* pp118/9 Oxford: Archeopress.

11 Dimbleby, Geoffrey. 1978. *Plants and Archaeology.* John Baker, London. p47

12 Rast-Eicher, A. 1992. Die Entwicklung der Webstühle vom Neolithikum bis zum Mittelalter. In: *Helvetia Archaeologica* 23: 56-70; Reinhard J. 1992. Etoffes cordees et metiers a pierres. In: *Helvetica Archaeologica* 23: 51; Evans, John. 1897 (Second revised ed.). *Ancient stone implements, weapons and ornaments of GB.* 2 vols. London: Longman, Green; Keller, Dr Ferdinand (trans. John Edward Lees) Second ed. 178. *The Lake dwellings of Switzerland and other parts of Europe* Longman Green and Co 2 vols.

have been found in 6 countries around the Alps. Boats have been another source of evidence *for Tilia cordata*'s utility.

An early example is the Laibach boat, found in an old lake bottom in what used to be Austria in 1890. Displaying a mix of Celtic and Egyptian styles and deposited somewhere around 500-100 BC, this was built of spruce with an elm bottom – and the entire hull was, quite literally, held together with lime bast cord. Thousands of holes, about 90mm apart were drilled to stitch planking together. The whole structure had then been heavily caulked with lime bast.[1]

Scandinavian boats used lime bast for their standing rigging and anchor cables almost into modern times. Lime does have a weakness - it doesn't wear very well when regularly run over a pully. Nevertheless, virtues such as low water absorption, good floatation and, most important of all, limited stretch, kept lime ropes in widespread use.[2] It may have helped that lime leaf fodder remained a farming staple in parts of Norway and Sweden through to the 19th century; regular cutting, usually of pollards, provided the ideal stems, 5-10 years old, for good quality bast. As late as the 1800's, the demand for lime bast ensured trade into cities such as Bergen from the countryside. Earlier, there are hints of a medieval export trade to the England.[3] In Finland, at one time, trade was such that lime bast became a species of currency and taxes could be paid with it![4]

In Norway, making lime bast rope carried on to the twentieth century, especially for making fishing nets. There was even a revival across a broader spectrum of use during the Second World War when German occupation and Allied blockade made many other fibres unobtainable. More recently, Scandinavian interest in the recreation of authentic Viking boats has prompted a renaissance in the skills necessary for making lime bast ropes. Of which more towards the end of this chapter.

Bast rope making in England seems to have faded earlier than in much of Europe; it's possible the Severn Valley was the last significant location. There are references to Cornish and Devon fisherman still using lime bast in the 18th century, but these are anecdotal.[5] Lime coppice from Leigh Woods in the Avon Gorge supplied bast for making ships' ropes in Bristol, but this didn't survive beyond the 1600's.[6] Elsewhere, there are medieval references to a customary stripping of lime bast in Staffordshire's Needwood Forest[7] and records of bast harvesting in an Essex limewood (part of Chalkney Wood) in the early17thC.[8] The considerable area of limewood in Lincolnshire was exploited for lime ropes at one time, but this is described by the naturalist John Ray, writing in the late 1600's, as being a practice of the past.[9] Roger Clooney has pointed out a preference for lime bast ties in the scaffolding trade, that seems to have survived well into the 17th century.

Bridport, on the Dorset coast, was the largest single location in the British Isles for making rope of all kinds and there are detailed 16th century records. Output supplied to King Edward III's navy appears to have been made from locally-grown hemp although there may be some ambivalence over what are described as 'bastard ropes'.[10] The last significant reference to the use for lime bast in England is possibly fishing nets and well ropes, recorded in early 19th century Gloucestershire:

> '*Birch, witch-elm, sycamore, lime, and others, are found in the coppices. The latter, provincially the "whitten or whitrod" (*Tilia cordata*) though not recommended as the most profitable, is remarkable for its uses. Of the inner bark are made ropes for cyder-presses, draw-wells and fishing boats. To the latter purposes, they are excellently adapted, as not expanding or contracting from moisture or drought. The bark is stripped off about Midsummer, dried like hay in the sun, and is called "bast": it is either manufactured on the spot, or removed to other places for the same purpose. Bast ropes are sold at a hundred yards length, in pairs, for 14s per pair*.'[11]

How long was a piece of rope? One commentator has suggested that, on the River Thames, the necessary cables for towing boats might be 220 yards long, weigh up to seven or eight hundredweight, cost around £10 per piece and last for only 3 voyages![12] This seems excessive. Long tow ropes were certainly needed to get round a bend, when the boat might be on the inside in slack water and the bow haulers far ahead along the opposite towpath side, struggling to gain purchase, but some direct evidence from the River Severn suggests more modest needs,[13]. Tow ropes stolen at Shrewsbury in 1798 from a Barge that worked to Pool Quay were 33 yards and 54 yards long.[14]

In the days of hauling boats manually, there were certain advantages to lime bast ropes. Once again, they have good flotation qualities, don't become too heavy with waterlogging and don't stretch very much. With a team of human 'bow haulers' this last feature would have been beneficial but the requirements for horse-towing are diametrically opposed.[15] Draft animals need ropes with sufficient stretch that they can built up their exertion exponentially – in the long era of horse drawn canal boats, towropes were made of abraded cotton that provided this quality even at the cost of poor resistance to abrasion and a need for regular renewal.[16] It would be convenient to

1 Willers, Louisa. 2000. Laibach Boat REP110. H*istory and Archaeology of the ship – student seminar reports*.
2 Myking, Tor et al. 2005. History, manufacture and properties of lime bast cordage in Northern Europe. *Forestry* 78: 65-71
3 *ibid.* p67
4 Vuorela, Irmeli. 1970. The indications of farming in pollen diagrams from southern Finland. In: *Acta Btanica Fennica* (Helsinki) 87: 14, citing: Kaukovalta, K V. 1931. In: *Hämeenläänin historia I-II. Hämeenlinna*.
5 Loudon J C. 1844. Arboretum et Fruticetum Britannicum; or, the Trees and shrubs of Britain [in 8 volumes] I p569 'Ropes are still made from the bark of the tree [Tilia cordata] in Cornwall, and in some parts of Devonshire; as appears by the Agricultural Reports of those counties.' However, I cannot find any reference in the following: Fraser, Robert A M. 1794. *General view (of the agriculture) of the county of Cornwall London*; Worgan, George B. 1811. *General view of the agriculture of the county of Cornwall*; Claridge, John. 1793. *General View of the Agriculture of the county of Dorset*; Vancouver, Charles. 1808. *General view of the agriculture of the county of Devon*.
6 Titchen, Tony. 2006-7. Leigh Woods. In: *Bristol Nat Soc Bulletin* no 456 Dec-Jan
7 Birrell, Jean. 1962. Forest Economy. In: *University of Birmingham Historical Jnl.* 7:132.
8 Rackham O. 2003. Ancient Woodland its history, vegetation and uses in England. New edition. Castlepoint Press. p250. Different terminology from Worcestershire: see 'tarling the bast of 2 akers of prye wood'
9 Ray, John**.** 1695. *Historia Planterium* volume 2*. The quotation is:- 'Hæc est illa species quam in Essexiæ Angliæ sylvis & sepibus frequentum diximus, nec minus in Lincolnia ubi á rusticus (ut nos monuit D. Martinus Lister) Bast dicitur, quoniam ex ejus corticibus funes texunt; cui usui & olim adhibebantur. Invenitur & alibi in Anglia multis in locis.'
10 Frequent references to 14thC 'bastard ropes' can be found in: Runyan, T J (ed). 1974. A 14thC cordage account for the king's ships. In: *The Mariner's Mirror* 60: 311-326. For a possible explanation that this is simply as a term for low-grade hemp rope see: Sims, Richard. 2009. *Rope, Net and Twine. The Bridport Textile Industry.* Dovecote Press; for a wide-ranging review of historic naval cordage see: Oppenheim, Michael. 1896. *Naval Accounts & Inventories of the Reign of HVII 1485-8 and 1495-7.* In: *Naval Record Society.* 8:: xxvii, 12, 13, 20, 184, 196, 206, 243-5, 262, 263, 274-6, 290, 297, 321
11 Rudge, Thomas**.** 1807. *General View of the Agriculture of the County of Gloucester*. Board of Agriculture. p247
12 Wilson, David Gordon. 1977. *The Making of the Middle Thames* Spur Books p45, 145
13 Trinder, Barrie. 2005. *Barges and Bargemen. A social history of the Upper Severn Navigation 1660-1900.* Phillimore. p30 gives some examples.
14 Eddowe's Salopian Jnl 18 July 1798 (from Trinder)
15 Thanks to Harry New, boating rope maker on the River Avon, for examining a length of bast twine and explaining the relevance of this non-stretch characteristic.
16 Thanks to Sue Day, horse boater extraordinary, for explaining this. Cotton also had good flotation qualities. The groove marks on bridge-hole rubbing

report that bast ropes gave way to more pliant material with the advent of horse towing on the River Severn at the end of the 18th century but there's no record of bast ropes still being used as late as this.

The importance of river navigations in the distant past has been the subject of mild controversy in the academic community,[1] but advocates of extensive river highways seem to be getting the upper hand. Without doubt, the Severn and its tributaries were important transport routes and Shrawley and Astley Wood rope makers were well placed to benefit from this.

Foliage

Springtime leaves gathered from lime coppice in Shrawley Wood make a pleasant salad. Many green things gathered young enough and tempered with a nice dressing will pass muster in the salad bowl but *Tilia cordata*, in particular, makes mockery of a hydroponic Iceberg. The short lifespan of lime seedlings in Shrawley Wood, the 'browse-line' to be found with parkland lime trees and the enthusiasm shown by cattle, offered a leafy lime branch in the meadows below Shrawley Wood, all confirm that lime leaves are widely appreciated.

Modern livestock farming in England has little or no place for leaf fodder, but this wasn't always so. A twenty-first century cow, grazing swards of Italian rye grass bereft of 'weed' or flower, has her dietary deficiencies adjusted by 'scientific' food supplements; that's if she's allowed out to graze anywhere at all.

Earlier bovine generations enjoyed more eclectic grassland diets but keeping beasts healthy through the winter, or when late summer pastures became brown and shrivelled, was never easy. Haymaking helped a good deal and good meadow land was always the most valuable kind of agricultural land in medieval time – as it was in Shrawley - but supply was limited, expensive and dependent on the weather. Before Iron Age scythe technology matured, it was difficult to harvest. Ever since people managed livestock – and in some places well into the 20th century - leaf fodder filled many voids. This could take the form either of live foliage, munched on the hoof in coppice, scrub and hedgerow or cut and dried on the branch for winter use in byre and barn.

An obvious source of leaf fodder was hedges. They did more than keep livestock in bounds or provide good partridge shooting. Traditional hedges fostered trees and while landowners usually claimed the timber, farm tenants expected to lop them for fodder. The tree most commonly lopped or shredded for fodder was elm, but a few lines of *Tilia cordata* can still be found within an easy cycle ride of Shrawley Wood. And Edwin Lees reports many more in hedgerows around Jordan's 'lime zone in the mid-19th century.[2] It's all hard to imagine now, after the ravages of elm disease, when most hedges are flailed within an inch of their lives and there's little prospect of brave new shoots maturing into trees of any kind, that this was once a routine part of many rural economies. Some concept can be gleaned from European experience – especially in parts of Scandinavia and upland zones where climate made 'grass hay' more problematic and there was greater reliance on 'leaf hay' – much of it derived from *Tilia cordata* - into the 19th century.[3]

And then there were coppices. An idea has come about that cattle and horses are inimical to coppice management. True enough, a herd of heifers can make an unholy mess of a small woodland but, at one time, the 'fodder' function of a coppice vied closely with 'fuel' as the main reasons for having them. Compromises had to be made.

Any coppice woodland with remnants of internal wood banks provides testimony. They still illustrate, invariably after long neglect, how newly cut coppice compartments were protected against browsing until, after a few years, the 'spring' was sufficiently robust to admit livestock. Shrawley Wood didn't have internal wood banks, but livestock browsed in the more mature coppice binds until the 1600's.

In the 18th century, there was a customary payment made to the Shrawley woodsmen for 'parting the bind' before any lime was coppiced and this possibly involved erecting a 'dead hedge', but it's likely that browsing in the wood had ended by this time. 'Dead hedges' were certainly used in woodlands without wood banks and even those that had this more robust long-term infrastructure still needed temporary paling along the bank tops. A complimentary strategy, used in Shrawley Wood in the 16th century, was 'shackling' – tethering livestock to prevent them straying into vulnerable coppice. In Shrawley Wood, and limewoods elsewhere, the reluctance of many herbivores to chew stringy bast fibres emerging from cut coppice stools may have reduced the need for physical protection.

Throughout the British Isles, it's not easy to find ancient woodland that wasn't, at some time in the past, subject to systematic browsing as part of the coppice cycle. Famous Forests – Dene, Rockingham, Wyre, Epping, Needwood or The New Forest were all subject to browsing in coppices – the only difference between them is when and under what circumstances this changed. Elsewhere, transhumance links between lowland pasture and upland woods such as those on the Kent and Sussex Weald exemplify the historic dependence of graziers upon woodland browse. Worcestershire provides several examples of these links between lowland pastures and upland 'wood pastures'.[4]

The lime woods of Lincolnshire's Witham Valley provide a useful analogue for Shrawley Wood. Collectively, they're England's largest modern refuge for *Tilia cordata* and although they don't have the wealth of more recent records afforded by Shrawley, lordship before the Dissolution was largely in monastic hands and they've left slightly better medieval accounts. All these Lincolnshire limewoods were coppiced and a majority were *boscus pastoris* (woodland pasture)[5]. Possibly the largest specific examples was Minting Wood.[1]

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strakes, characteristic of towpath bridges, were a product of these very soft ropes picking up mud and abrasive material – part of the reason for their short working life.

1 The debate commenced with a presentation of the greatest possible network: Edwards, James Frederick & Hindle, Brian Paul. 1991. The transportation system of medieval England & Wales. In: *Journal of Historical Geography*: 17: 123-134; Langdon, John Inland Transport in the medieval Period. In: J*ournal of Historical Geography*, 19: 1-11 attempts to qualify this, but there appears to be a general consensus on the River Severn which did not suffer the obstructions of mill sites. For a recent appraisal see: Blair, John (ed). 2012. *Waterways and canal building in medieval England*. OUP. For a specific view of the Roman period Jones, James Ellis *Maritime landscape of Roman Britain: water transport on the coasts and rivers of Britannia.* Oxford Archaeopress. 2012

2 Lees, Edwin. 1867. The Botany of Worcestershire. Worcestershire Naturalists' Club 1867 p15

3 For Finland see:- Vuorela, Irmeli.1970. The indications of farming in pollen diagrams from southern Finland. *Acta Botanica Fennica 87*. Helsinki. p14. Sweden: Slotte, Håken. 2001. Harvesting of leaf-hay shaped the Swedish landscape. *Landscape Ecology* 16(8) pp691-702; Ramussen, Peter. 1989. Leaf foddering in the earliest Neolithic agriculture. Evidence from Switzerland and Denmark. *Acta Archaeologica* 60 pp71-80 [Rasmussen has an intriguing illustration (Fig 6 p81) Harvesting of leaf-bearing Lime twigs by shredding. Scene from a fresco painting from c.AD 1475 in Elmelunde Church on the island of Mon, Denmark. Photo: The National Museum, Copenhagen.]

4 Hooke, Della. 2008. *Recent views on the Worcestershire Landscape* (The Berkeley Lecture WAS April 26 2006) in *Transactions of the Worcestershire Archaeological Society* Third Ser. 21 91-106. See, for example pp95, 96, 103.

5 Foster CW. 1924. The Lincolnshire Domesday and the Lindsey Survey. *Lincolnshire Record Society 19.* For a summary see H C Darby Domesday Woodland in Lincolnshire. *Lincolnshire Historian 1* pp55-59, espec 56-7. In both instances, 'silva pastilis' is taken to mean 'pannage' whereas a modern interpretation would be 'wood or coppice pasture'. Another category of woodland used in Domesday was 'silva minuta', quite reasonably translated as 'coppice wood' but it is up for discussion whether this was coppice never

There's sometimes an assumption that wood pasture means trees were pollarded – browse and wood lopped from trees beyond the reach of deer and cattle – but this was exceptional. For most of farming history, pollards were common in many hedgerows, on open grazing commons - and in meadows, where pollard willow was a common feature. In woodlands, pollarding was usually limited to boundary and marker trees; Shrawley has a handful of these.[2] Modern woodlands famous for large areas of pollarded trees, such as Burnham Beeches and Epping Forest, also carry the stigmata of having once been coppiced as part of a '*boscus pastoris*' regime.[3]

Much closer to home, on the opposite bank of the River Severn from Shrawley, the remnants of lime woods in Ombersley provide further comparison with our wood. The largest of these Ombersley woodlands, Lynholt, was worth nothing to the lord in 1299 'since it is the common pasture of the whole parish'[4]. Similar, it seems, to the Domesday Shrawley Wood/Astley woodland 'that pays nothing'[5]

Later on, the lord of Ombersley evidently sought to correct this unseemly communism by incorporating 'Lynholt' into a park for himself. Less draconian measures turned most of Shrawley Wood into a park for a while; the outcomes were different but taken together they offer insights into the role of *Tilia cordata* as feed for animals, including deer – and, incidentally, the erosion of rights in landscapes once held in common.

In 1376 the Abbot of Evesham obtained a license to enclose 300 acres of land and water, including the wood of Lineholt, 'and to make a park there'. A majority of Lincolnshire limewoods went through the same process of appropriation for parks. These enhanced the status of new owners and not infrequently provided a device for privatising communal assets. Such was the initial outcome for Lineholt, despite fierce local resistance.

The timing may be relevant – this was the period leading up to the Peasant's Revolt of 1381. Often supposed to be simply about poll taxes, this was an era of general discontent and agitation against feudalism throughout large parts of England. In 1393, the Ombersley tenants:-

> *'exhibited a Bill of Griefs and Injuries offered unto them by the Lords officers, complaining that the officers would not suffer them the fall their trees and fell their wood off the ground…… The Lord receiving their Bill denied every one of their requests, whereupon they rebelled, and rose against him with force, using lewd words, for which they being then bondsman were grievously punished by the purse'*.[6]

Four years later, there are examples of such punishment: Henry Hemming, 'bondsman', who gave 40s against a fine of £18 6 8d for:

> '*rebellion and other evil acts done to the lord*'.[7]

The 'bondsmen' of Ombersley never recovered their former dominion in Lineholt, but it seems their resistance wrung grudging concession from the Abbot of Evesham. In 1498, the tenants apparently had some of their coppices back, but they were instructed: -

> '*Coppices of Lynholt to be kept severall 7 yeares after the fall by the tenants of Linholt under a penalty*'[8]

This means the lime coppice had to be enclosed against browse for the first 7 years of every coppice cycle. Several decades later, a similar provision was proclaimed by Parliamentary statute but in 1498 this was a parochial measure likely to have usurped local custom. In the 15th century, typical enclosure times were rather less – possibly as little as 3 years; 7 years considerably reduced the browse value of a coppice because much of the leaf was out of reach.

Disputes in Ombersley raged long after the Dissolution and the Abbot's eventual replacement by a new dynasty of secular lords. They were fuelled by ancient grievance and a manorial jury split between tenants and rival freeholders. Thomas Habington, writing at some time in the early 17th century[9] said of Ombersley:-

> '*This paryshe of Ambresley [Ombersley]aboundethe in customary houlders, wheareuppon have longe controversyes arisen betweene the lords and tenantes enrychinge law(y)ers and imporver(ish)ing themselves, which nowe beeinge layde asleep or rather deade, I wish may neaver be awakened or revived; and God send a good ende to all the lyke in this shyre and throughout England*.'[10]

The commoners of Ombersley didn't finally lose all their rights to grazing until Parliamentary Enclosure in 1827.[11] Up to this date they retained six 'commons' in this large manor, including a part of Lineholt, but there's no suggestion of the collective arrangements that had once made Lineholt productive of browse, bast and coppice wood.

There are still many lime trees to seen in Ombersley, particularly above the river bank between Lincombe Lock and Hawford but most display the stigmata of have been pollarded in the past – this was the strategy typical of open commons where the writ of tightly controlled custom that enabled coppice pasture no longer ran.[12] There were more lime trees in the 19th century and one local observer recorded a puzzling phenomenon:–

> *'The pollards of the Tilias are still very numerous on the precipitous banks of the streams running into the Severn, and on the banks of the Severn at Lynal (Lineholt) Common, (now enclosed)…… they grow most luxuriantly and of a great size and age, many of them divided into several parts.'*[13]

That division into several parts looks remarkably like former coppice! Another noteworthy Ombersley lime tree is reported by Edwin Lees; although he doesn't say so himself, this also suggests coppicing in the past:-

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subject to browsing or simply 'silva pastilis' held in defence for a period after cutting.

1 TNA Calendar of Inquisitions Miscellaneous. (Chancery) Preserved in the Public Record Office Vol 7 1399-1422 1968. H.M.S.O. No 53 P38 1401 [Re Minting Wood] 'On the same day [of his forfeiture] he [Thomas, earl of Kent] held the manor of Thorley, worth 26 marks yearly; there are 1700 acres [sic] of wood whereof 20 acres, worth 30s an acre, can be felled yearly, but there is no profit of pasture or pannage there (because) the tenants of the manor have common of pasture there with their beasts throughout the year and always have had'

2 The forestry track between the New Inn entrance and the Stepping Stones has a short row of pollard lime about half-way along. The antiquity of these is open to doubt. Thanks to John Hemingway for pointing out this was the NW boundary of Shrawley Wood.

3 Epping Forest is possibly the best known example of a 'pollard' forest; present management by the Corporation of London is based on an assumption it was ever thus. For a contrary view see Boulger GS. 1892. Pollards and how to treat them, with special reference to the hornbeams in Epping Forest. *Essex Naturalist* 6 p94. Many of the ancient coppice stools reported by Boulger and Sir Fowell Buxton are still hidden in plain sight!

4 Hollings, Marjory (ed). 1934. The Red Book of Worcester. Worcestershire Historical Society. First Series 47. p190

5 Thorn, Frank et al. (General Editor Morris, John). 1982. Domesday Book. Pillimore. (176b)

6 WAAS 705:56 BA 3972/9 (viii) p41

7 *ibid.* p48

8 *ibid.* p230

9 Gilbert C Don. 2003. The Composition of Thomas Habington's 'Survey of Worcestershire'. *British Catholic History* 22:3 pp415-425 where this approximation is explained.

10 Habington, Thomas. 1899. Survey of Worcestershire (edited for Worcestershire Historical Society by John Amphlett of Clent) volume II p224

11 Yelling JA. 1968. Enclosure in East Worcestershire 1540-1870. *Transactions of the Institute of British Geography* 45 p166

12 Bast (and leaf fodder) from pollard *Tilia cordata* was common practise on Scandinavian farms.

13 Jeffrey, F R. 1914-22. Gleanings from the diary of a Bewdley naturalist. *Transactions Worcestershire Naturalist Club* vols 6-7 p305 (Diary entry April 1844)

A very old and remarkable pollard tree of Tilia parvifolia stands by the side of a little pool, at Hawford, on the ridge not far removed from the Severn. The base is more than 40 feet round, and six large boles rise from this in a semicircular manner. It is probably more than 300 years old. Its bark is partially overgrown with Lungwort (Sticta pulmonaria), quite a rarity in Worcestershire'[1]

The first faint hint of a park at Shrawley is the claim of 'free warren' made by William Poer in 1274-5.[2] This involved a grant from the Crown, usually paid for, that allowed the recipient to hunt game otherwise reserved for the monarch. Game such as deer. Firmer evidence is the grant in 1304 of one third of a park, held of the Earl of Warwick, by Aline Poer to Edmund and Margery Mortimer.[3] Quite how this division was made in practise isn't known, but this is unlikely to have been the division of a newly created park.

In 1389-90 the park gets another mention, this time in bailiff Robert Hullhampton's accounts. Much of his business was commuting feudal obligations to cash – for example, in lieu of 948 days of manual work, he takes money calculated at ½d a day. Commutation of ploughing obligations at 3d a day and sundry other items brings in a total of £3 3s 1d. But he also has to pay out ½d a day for:-

> *201 works hired to make a close around the Park and elsewhere where it was necessary this year 8s. 4½d.*[4]

Modern field names suggest that this 'Shrawley Park' lay between today's Shrawley Wood and Shopgrove, with the scarp slope above the River Severn's flood plain as the north-eastern boundary, but the Park also embraced most of Shrawley Wood. The earliest accounts of wood sales from Shrawley coppice binds makes it clear that one of them was 'without the pale' while another was inside.

Outwode, as the name might suggest, was outside and it corresponds to the coppice of the same name identified by Richard Pumphrey as being on the north west of Shrawley Wood. This is an approximation of the 2 Henry V (c1410) Manorial Roll entry:-

> '*…. Vendidos John Brewer una Valettu bos juxta pcum de Shrawley xxxij marc' called le Outewode & dimitteh ccxl poles*'.[5]

In plain English, this might be:-

> '*Sold to John Brewer one bounded coppice alongside the park of Shrawley for 32 marks and (he) took away 240 poles'.*

32 marks should equate with £21 6s 8d, but a separate scrawl in the Manorial Roll for that year seems to record wood sales of £30 2s 4d. or perhaps £32 0s 4d. Judging from 18th century terminology, the 240 'poles' may have been oak poles; if this is the case, it's the only mention of oak in the many records of coppice bind 'vends' over the next century and a half.

In 1415, there' mention of another a bind sale to John Brewer, for £22. No name is given, but it's located 'inside the park'.[6]

Another coppice bind 'inside the Park' was 'Blakewych'. This coppice was variously spelled over the centuries but it's likely to be the bind identified by Richard Pumphrey as being near the centre of Shrawley Wood. This is the Manorial Role entry for 11 Henry VI (c1433):-

> *Bosc in pco dni voc' Blake Wych poc Anno ad val £23*[7]

In other words, a wood in the Park called Blake Wych, this year sold for £23. There's a third sale of coppice wood during this early 15th century period that doesn't make specific reference to a park but makes the browse aspect explicit; the regnal year is 4 Henry IV ((1426). The buyers, or possibly just the front men in the purchase, are Thomas Severn and Thomas Brewer.

> '*1 Bayne past' croc. le Aleye*…. bosc vend xx xiij iiij'[8]

There's some obscurity in this entry[9] but, again judging from similar references in later decades and centuries, a purchaser is buying the standing wood in a coppice *pasture* 'bind' called The Aley for £20 13s 4d.

After the 'Blake Wych' entry in 1433, there are no further references to a park, excepting for legacies such as 'park field' and 'nether field' that survived as a field name into the era of modern maps. It's likely 'Shrawley Park' ceased to exist towards the middle of the 15th century – possibly coinciding with the manor of Shrawley becoming crown property.

There's no problem with the idea of coppices being part of what was, presumably, a deer park. This was common practise to the extent that, if there weren't enough coppices to incorporate into a park, they would be planted. The royal deer park at Clarendon in Wiltshire provides an example – the park included coppices enclosed from the Royal Forest of Penchet but this was augmented by plantation. This 'underwood' was cut on an eight-year rotation, with the new 'spring' being protected for a period after each cut, before animals were admitted to browse.[10]

For most of recorded history, and this means from the early 15th century, Shrawley Wood and Shopgrove were cut on a 20-year rotation, later reduced towards 17 years before an extension to 40 years in modern time. These are not regimes calculated to excite deer or cattle bent on browsing, excepting when the coppice regrowth is relatively young towards the beginning of each 20 or 17 year period. However, there are whispers from an earlier time, just beyond the reach of firm archival evidence, of a shorter coppice rotation.

The three lots of wood sent to the stables at Salwarpe in 1389/90 are described as bundles of '*virg'*. Dr Peter King interprets these as either 'sticks' or 'rods'; neither sound like the 'poles' that might be expected from a 20 year rotation. This might suggest a shorter coppice cycle in the late 1300s - in accordance with the Clarendon Park example.

Oliver Rackham thought the ten named coppice binds he found in 15th century Shrawley Wood implied a ten-year rotation. In fact, it's now known that most of the binds were cut over two or three years at this time - the outcome overall amounted to each lime stool being cut every 20 years. This still begs the question of why the wood was

1 Lees, Edwin. 1867 The Botany of Worcestershire p17
2 TNA JUST 1/1026, m. 35
3 Calendar Inquisitions Edward I vol 4 235 (Writ 25 July 32 Edw I Edmund de Moruo Mari) p159
4 WAAS 705:66 BA 4221/7. Compotus Roll of Robert Hulhampton, 13 Richard II - 14 Richard II (1389 – 1390)
5 Prattinton Collection WAAS 989.9:91 BA 10509/2 / (ii) [Microfilm]. Vol XXX Shrawley. 2 Henry V. [This refers to the Prattinton Papers of Worcestershire History, transcripts made by Peter Prattinton (1776-1840). Originals are held at the Society of Antiquaries, London. For background see E.A.B. Barnard 'The Prattinton Collections of Worcestershire History (Evesham 1931), with further details in SAL typescript 1932 & 1951. Also his 'Some further notes…..' in Transactions of the Worcestershire Archaeological Society, N.S. 8 (1931) 67-73. This author has relied largely upon the microfilm copy of SAL originals held by Worcestershire Archive & Archaeological Service at 'The Hive']
6 Prattinton ibid 2 Henry V
7 Prattinton. *ibid.* 11 Henry I
8 Prattinton. *ibid.*4 Henry IV
9 Prattinton writes Vayne; comparison with the original suggests 'Bayne'. He's also ambivalent as to *pasc'* or *past'* This is likely to be the latter as an abbreviation for *pasture*.
10 Richardson, Amanda. 2003. The Forest, Park and Palace of Clarendon, c1200-1650: Reconstructing an actual, conceptual and documented Wiltshire landscape. *Thesis submitted for the degree of Doctor of Philosophy School of Social Sciences. September 2003. Southampton University*. See especially pp 61, 81, 83 (citing Williamson, T. 2003. Shaping Medieval Landscapes p.165) and 92 (where there's an inference cut coppice was presented to the deer as browse wood)

divided into only ten parts. The practise of dividing the wood into a greater number of binds – with each being cut in its entirety each year - didn't come about until later, at some time before 1700. These new coppice compartment or 'binds' were given names derived from the larger entities – for example, 'Elbow bind' becomes 'Elbow bind' and 'Second Elbow bind', while the largest of the old bindes, once known as 'Wendleys' and cut over three years, becomes 'Great Winless's', 'Second Winless's' and 'Little Winless's'.

A ten-year cycle would match what we know from Scandinavian sources about the ideal regime for bast production.[1] And ten years would certainly have suited a lime coppice that played an important part in feeding cattle and deer.

If the lime was cut much younger until the early 15th century, what might have caused the change? Lime bast becoming less valuable? The rise of the local hop industry, creating a demand for older poles? Just possibly, a lessening of dependence on coppice browse? Perhaps the gradual demise of Shrawley Park acted as a catalyst to all or any of these. Whatever the economic drivers may have been, the circumstantial evidence points towards a change in the coppice cycle from 10 to 20 years somewhere around the year 1400.

For all that, it's apparent that the customary feeding of livestock in the coppice binds lingered on into the 1600's. The commoners of Shrawley didn't lose this facility, despite the period of emparkment.

There's a puzzling addition to a c1443 Shrawley manor court roll that says something like:

'*Court Rolls [con?]teyning Inclosure of the Woods*'[2]

When this addendum was made isn't certain, but it cannot have been a permanent prohibition because in 1571 there's an order of the manorial court:-

> *'.....that no one who inhabits the Manor should send oxen by law into the brush under Shrawley Wood unless they shackled them well....'*[3]

More emphatically, there's a lawsuit providing strong inferences that the wood is still subject to cattle browsing in the 17th century and always has been. It's curious business that involved a son taking his father to court.

The year is 1654 and William Child has a life interest in Shrawley Wood '*without impeachment for waste*'. Meaning he's not liable if he makes a mess of things and the wood or part of it is destroyed. During the recently concluded Civil War, William chose the losing side and one John Tilt of Worcester informed against him to the Parliamentary Committee bent on sequestration – fining landowners for supporting the King.

After some haggling a fine was eventually set at £1,840 18s 8d[4] and William Child borrowed £2000 from a London 'scrivener' or solicitor to cover this. To help repayment, routine exploitation of Shrawley Wood was accelerated; in particular, livestock are allowed to browse recently cut coppice binds. Not only citizens of Shrawley, who are likely to have enjoyed this for free, but outsiders who are paying 'agistment' money for the privilege.

William's son Thomas inherited part of the Child estate when he married, but Shrawley Wood isn't to be included until after his father's death. He can't stop his father's enhanced exploitation because of the 'waste' provision but his lawyers find another route. They invoke a 16th century Parliamentary statute laying down mandatory periods of inclosure for coppices cut on different rotations; in the case of Shrawley Wood this made it compulsory to enclose against grazing for six years after each cut.[5] By not complying with this edict, William was supposedly ruining a woodland resource upon which the entire locality depends.

William Child's solicitor, Thomas Colwall, is a defendant in the case along with Andrew Yarranton, who played a part in this alleged rape and pillage of Shrawley Wood. We don't have any outcome, apart from a promise by Thomas Colwall that nothing of the kind will happen again. Whether matters were as serious as Thomas Child alleged is hard to discern. It's possible his father was simply following a traditional, shorter, period of inclosure[6]; we don't know. What does emerge clearly is that the Shrawley Wood coppices, like many others, was part of the local farming economy. As it said in the Bill of Complaint:-

> *'....the said woods and underwoods being altogether barren and unprofitable for tillage pasture **or** any other sourte of husbandry and will be of very little or no value unless the spring thereof be preserved as they have beene for all tyme past whereof there is no memory of man to the contrary....'*[7]

Now all of Shrawley Wood, including coppice of all ages, has been cut over in a short times and nothing has been fenced. And then, to quote the plaintiff's submission:

> *'they [the defendants] or some of them have hitherto and yet willfully doe putt in diverse cattel and beastes viz cowes and sheepe and horses of there owne and doe likewise take in agistments of the cattel and beasts of other men and doe take money for the herbage of the said Woodes by which meanes if not prevented by the order of this Honourable Court the said coppice and woodes will in short tyme bee uttelry spoiled and destroyed'*

Agistment is browsing livestock in woodland. Normally, cattle would only have been put into a coppice compartment, or 'bind' as they were known in Shrawley Wood, after new growth or 'spring' had become sufficiently woody to recover from the more destructive attentions of hungry cattle. Of course, this was an acrimonious lawsuit and some exaggeration and special pleading can be taken for granted. On either side; perhaps both. At any rate, the lawsuit does establish that Shrawley Wood continued as 'coppice pasture' until the later 17th century. There's no evidence of pasturing livestock in the Shrawley binds thereafter.

Mention was made a few paragraphs back of 'hop poles' conceivably playing some part in the switch to longer coppice rotations in Shrawley Wood. Whether or not this was the case, hop poles certainly played an important part in Shrawley Wood's later history and so, before embarking on 'Workers in the Wood' this might be a good time to take a break and talk of beer.

Beer, Hops and Heresy

According to the Oxford Dictionary of Quotations a piece of doggerel, well-known to the denizens of public bars, was first recorded in 1643.

"*Turkey, heresy, hops and beer came to England all in one year"*

The beer and hops are sort of synonymous; in its original meaning, beer was hopped ale. The turkeys gobble for themselves and as for heresy – well, believe it if you like, but heresy seems to have been part of the English psyche since long before the Lollards. The year in

1 Myking, Tor; Hertzberg, Anja and Skroppa, Tore. 2005. History, manufacture and properties of lime bast cordage in Northern Europe. *Forestry* 78: 65-71. Ideally, bast should be taken from 5-10 year old growth.
2 Prattinton. *ibid.* 21 Henry VI
3 Prattinton. *ibid.* 13 Elizabeth I Thanks to Vanessa James & Chris Dring for providing this translation.
4 TNA Deputy Keeper's Room *Calendar of the Committee for Compounding, etc. Domestic. 1643-1660 2146.*
5 The Statute of Woods, 35. Henry VIII, c 17, 1544
6 An Act of 22. Edward IV, *c* 5-7, 1483, recited the enclosure of land in Royal Forests for a period of three years as accepted practice and extended the period to seven years. The statute applied only to Royal Forests, but gives some idea of the shorter inclosure periods that were once commonplace.
7 TNA C6/41/116 Childe v Childe 1654. According to this, the custom has always been to enclose individual binds, with the inference that cattle are not excluded from the entire wood.

question, supposedly, was 1524 and this conflicts with a small detail, glimpsed in the capricious lottery that comprise Shrawley Wood archives

According to Wikipedia and other learned works, the idea that beer came to England in 1524 isn't quite correct. Beer, that is, hopped ale, goes back several more decades in England, but all are adamant that imported hops were used. English hop growing didn't begin until 1524 and that was in Kent.[1] It's a well-known fact.[2]

But not, perhaps, in Shrawley. A Court Roll dated 4 Henry IV (c.1403), refers to a 'hop croft' – croft being a garden or similar. The context is the clearing of a ditch near this 'hop garden'.[3] There's no doubt that Shrawley and the land roundabout – in particular the Teme Valley – became major players in the English hop industry, second only to Kent. Witness the picturesque legacy of the former Hop Market in Worcester, near Foregate Station. Horticultural hops needed hop poles and there's ample evidence that Shrawley Wood played a significant part in supplying these. But would it be outrageous to go further and put Shrawley in the vanguard of English beer?

Well, maybe. We'll compromise and give this remarkably early reference to a hop garden a few more paragraphs.

When asked about medieval hops in Worcestershire, botanist John Day reached for his Worcestershire Wild Hops file and provided four Anglo-Saxon references contained in contemporary charters. Apparently, the Anglo-Saxon for 'hops' was 'hymel' and it's contained within the village name 'Himbleton', some 5 miles south-east of Droitwich. This could be construed as meaning 'hop farm' but John favours a back-formation from the nearby 'hymel broc' or hop brook. This in turn would suggest the reference is to wild hops.[4] Three[5] of the four charters relate to this area, but there's another reference for Lower Wolverton, in the north west of the county.

The Lower Wolverton charter of 984AD mentions a 'hymel more'[6] - 'hop marsh'. Once again, this might simply mean wild hops. However, there's a tantalising mention of another hop marsh in Nosey Wood, near Billericay in Essex. Still more wild hops, perhaps, excepting that a 1607 lease specifically authorises the lessee to plant hops in the marsh.[7] Could it be that hops were cultivated in England at an early time, but these were cultivars of wild hops; the real revolution didn't come until new and more commercially successful varieties were imported from Flanders in the 16thC.? We'll leave such speculation hanging and move on to greater certainty. For almost a century and half, Shrawley Wood made a considerable contribution to the local industry by providing the means for hops to grow reliably in the direction of up.

For a long time, hops were grown in much the same way as exceptionally athletic runner beans. They grew up poles, configured either as 'wigwams' or linear 'tents'.[8] In Kent and Sussex, the pole of choice was sweet chestnut and many thousands of coppice acres were planted to fulfil this need;[9] a 'bind' of sweet chestnut in Shrawley Wood and a larger 'bind' in what was Astley Wood presumably owe their origin to this preference. The Astley 'bind', last cut a couple of years ago for firewood, is the only part of the old Astley wood that still survives, apart from fringes along the Dick Brook and River Severn.

Judging from stool size, sweet chestnut came late to Shrawley and Astley - for centuries small leaved lime provided the staple crop of hop poles. A good match when lime bast was still profitable, but as the rope business fell off in the 18th century this synergy was lost and the advantages of sweet chestnut became more obvious. Lime poles are light and straight, but they have one significant flaw – they are particularly prone to rot below ground level. Sweet chestnut poles are heavier, but well managed chestnut coppice almost matches lime productivity, grows straight and provides greatly superior longevity both in winter storage and, most especially, in the ground. Chestnut almost matches oak as the first choice for any kind of post destined to live in the hostile world of aerobic topsoil.

For all that they were a compromise, lime poles were the largest single source of revenue for Shrawley underwood for more than a century. The hop industry must have played an important part in the conservation of *Tilia cordata* as the bast trade waned, not only our wood but lime woods around the Teme Valley. [10]

Longevity was the problem. Despite being lifted after each growing season and put into upright stacks on well-drained ground, the bottoms that had been in the ground would have been lucky to see a second season and only so much amputation could have been done before they became too short. Chestnut has rot-resistance comparable to oak, but even with these, the annual demand for new poles was considerable – the Kent and Sussex hop fields are said to have needed several million poles each season in replacements alone. From the middle of the 19thC, the use of coal-tar based preservatives extended the working life of hop poles but, towards the end of the century, there was a quantum change in the way field hops were kept upright.

Cheap galvanised wire was the game changer. The new strategy for hop-growing involved a much smaller number of larger poles that were left in place throughout the year. A matrix of wires, strung between these uprights was kept in place between seasons. Each year, vertical coir ropes pegged to the ground provided pole-replacements. More conservative hop farmers swore these flimsy supports were nothing like as good and would never catch on but, by the First World War, such luddite notions had been largely swept aside. Lime poles played no part in this new world.

Another 19th century change persisted into the 1950's. Railways made possible an annual influx of Black Country industrial workers and their families to pick the hops; the West Midland equivalent of the London 'busman's holiday'.[11] An annual fusion - or sometimes a clash - of cultures that had grown apart. Industrialisation began in the countryside but then focussed in what became urban areas; hop picking turned the clock back and returned industrial workers and their families to the countryside. Then mechanisation put an end to this annual influx and a generation later, towards the end of the twentieth century, imported hops almost finished the Worcestershire industry. Despite a recent renaissance, hop growing in the Teme

1 Lower, Mark Anthony. *History of Susse*x attributes the first introduction to Leonard Mascall of Plumpton, Sussex, in 1525.
2 Parker, Hubert H. 1934. The Hop Industry. S King & Son. Provides a solid, 'conventional' history of the English industry.
3 Prattinton Collection. WAAS 989.9:91 BA 10509/2 / (ii) [Microfilm]. Vol XXX Shrawley The exact quote in '*Fossat non mund apud le hops croft*'.
4 Mawer, A & Stenton, F M. The Place-Names of Worcstershire 1927 English Place-Name Society volume IV. Cambridge University Press p135/6. The authors here are sceptical as to the first element [of 'Himbleton'] being synonymous with 'hop'. '*The wild hop has been suggested but it is very doubtful whether it is a native plant. More probably it is used here as in some of the Old English vocabularies, of either bryony or bindweed, and the whole name would then refer to the frequency of the plant there*.'
5 Kemble. *Codex Diplomaticus Aevi Saxonici*, 6 vols.. 1839-48 no 680; Birch. *Cartularium Saxonicum*. 3 vols. 185-93. No 256; *ibid.* no 552.
6 Kemble. *Codex Diplomaticus Aevi Saxonici*, 6 vols.. 1839-48 no 645.
7 Essex Record Office D/DP E/25. Cited in Rackham, Oliver *Ancient Woodland, its history, vegetation and uses in England* 1980 p336
8 Ewing, George. 1738. Frugal Husbandry Expressed in Short Rules and Directions for the Growth and Improvement of Hops. Dublin. According to Ewing, (p11) ash made the best poles, but the evidence suggests the many 'ash beds' in and around Shrawley were not devoted to this purpose. An ideal pole was 18 inches in the ground and 12-14 feet high. Shrawley Wood poles seem to have been longer
9 Jarman, Rob. 2019. Sweet chestnut (Castanea sativa Mill.) in Britain: a multi-proxy approach to determine its origins and cultural significance. PhD thesis, University of Gloucestershire. Provides a comprehensive account of Sweet Chestnut and its association with the hop industry.
10 Filmer, Richard. 1982. Hops and hop picking. Shire: points out the large quantity of charcoal needed in preparing hops – another influence on local woodland.
11 Faulkner, Christine. 1989. Hops and Hop Pickers. Faulkner Publications. Quarry Bank, Brierley Hill provides evocative first-hand account.

valley is still a shadow of what used to be.[1] And horticultural crops that have brought new prosperity to some farms around Shrawley Wood are harvested by workers who have travelled not from Brum and the Black Country, but much farther away.

Working in a Limewood

On a fine May morning, when parts of Shrawley Wood are resplendent with bluebells, and birdsong resonates through the treetops, it's easy for a wanderer to feel 'one with nature, herb and stone'. All around is a magical world, seemingly bereft of human agency. The illusion is delightful but, of course, that's exactly what it is. Today's Shrawley Wood must be the culmination of a million, and many more, hours of human labour.

There's no reason to suppose the work in Shrawley Wood began in medieval time - progenitors possibly go back to the Romans and beyond - but activity we can put names to starts in the early 1400's. Many families are associated with Shrawley Wood over the next three centuries - the Stones, Martens, James's and Brewers are all recurring names - but the Severnes are the most persistent. They're a widespread Shrawley family, who feature as bondsmen, millers, fish weir leaseholders and regular members of manorial juries - but involvement with Shrawley Wood is outstanding.

According to one local historian, the Rev J Lewis Moilliet of Abberley, the Severne tribe originated in Shrawley after troglodyte monks made a home in woodland caves above the River Severn.[2] In his account, folk with babies surplus to requirements built small arks and launched them from the bridge at Bewdley, into the downstream current. The Shrawley monks were vigilant for infants drifting past and made it their business to rescue them and give succour and education until they reached adulthood. The surname 'Severne' for these abandoned bairns seemed only right. The Rev Moilliet may be confusing this with a remarkably similar legend related to another river crossing upstream at Redstone but, in either case, hints of biblical inspiration raise hackles of doubt. However they came to Shrawley, woodsmen with the name of 'Severne' were the among the first and almost the last recorded players in the business of coppicing *Tilia cordata* and, we can presume, making ropes from lime bast..

A Thomas Seven emerges from the Shrawley archives in 1403; it looks as if he was fined by the manorial jury.[3] In 1426, probably the same Thomas Severn is in partnership with Thomas Brewer to buy 'le Aleye', already mentioned towards the end of 'Foliage', as being inside Shrawley Park at the time. A couple of decades later, standing wood in 'The Aley', no longer in a park, is sold for £10 and we learn it contains 12 acres and is cut over two successive years.

Thomas Seven's partner in the first 'Aleye' enterprise is likely to be the same Thomas Brewer featured above who bought the coppice called 'Outewode' that lay just outside Shrawley Park. As one of the Shrawley Wood coppice binds it was cut again, in 11 Edward IV (c1472) and in 10 Henry VII (c1495); each time over two years.[4]

In 1479 Thomas Severne and Thomas Brewer bought 'wood and underwood' in Shrawley Wood for £20; the binde isn't named but it was again cut over two years. The reference to both wood and underwood might suggest not only is the lime coppice involved but also other trees we think were part of the Shrawley Wood economy at this time – birch grown on a 40 year rotation and oak grown on a 60 year rotation.

In 1481 Thomas Severne senior and John Janes junior paid £24 for a bind called 'Long Wanlees' The payment is for cutting the bind over 3 years; this possibly makes it another name for 'The Wendleys' binde, which was also large enough to be cut over a three-year period. In 1489, a John Severne was in partnership with John Janes, John Truell and Robert Martyn to buy an unspecified bind. Most of the remaining sales during the reigns of Henry VII and Henry VIII are to 'several persons' or they remain silent as to the buyer, but the penultimate entry for the Tudor era, in 1532, is yet another Thomas Severne 'vendor of wood' who paid £5 6s for a bind that isn't named.

Not all references to the Severne family involve buying Shrawley coppice binds. Dr Peter King records occasional transgressions of manorial custom, such as selling wood without reference to court or bailiff or not muzzling draft animals working in the wood. The penalty in both cases was 3s 4d.

After 1580, the archives are almost silent about any woodland workers, until 1708, when William Seaverne and Randle Seaverne are part of an eight man consortium working in Nutward binde. Of course, an absence of archives doesn't mean there weren't many people busy in between.

A revelatory document at The National Archives gives some context to the payments made for Shrawley Wood coppice binds during the 15th century.[5] Why and exactly when it was compiled is a puzzle. Oliver Rackham thought it may have been written in the 1530's, but the present National Archives catalogue entry is dated 1490. However, the document itself contains references to 1495! [6]

The content is a retrospective account of selected coppice wood sales, starting in 1422 and ending with 1495. Selection is erratic as to year; the determining factor seems to be a need to include an example of each bind. The intention, it seems, is to provide evidence for claims made by Shrawley villagers as to their customary rights - and the income that a lord might expect.

The document tells us Shrawley Wood was divided into ten named coppice binds:-The Brechyng, Tagleyheld, The Aley, The Fryth, The Outwood, The Roche, Blackwych, Roughscenz with Shopgrove, The Wendleys and The Elbow. Six of these contain 16 acres each and they are cut over two successive seasons. The Outwoode has 15 acres and The Aleye only twelve, but both are cut over the same two year period. The exceptions are Tagleyheld which contains only 7 acres and takes just a single year - and 'Wendleys' which is 27 acres and takes three years. These have all been tabulated by Dr Peter King in his 'Medieval Shrawley'.

Nimble readers will have tallied a total of 167 acres and possibly thought Shrawley Wood must have grown a good deal since the 15th century - but they used 'forest acres' in those days when measuring woodland. An acre of any kind contained 160 perches, as it did until 1987,[7] but whereas a statute perch was 16½ feet square, forest acres comprised 'forest perches' and these were often 25 feet square and might, according to various local traditions, be anything between 20 and 28 feet.[8] Mensuration used to be more interesting.

1 Anon.1988 (revised and updated 2007). A Pocketful of Hops. Hop growing in the Bromyard Area. Bromyard & District Local History Society provides the most recent account

2 Moilliet, Rev J Lewis. 1905. Abberley Manor, Worcestershire. London: Elliot Stock 1905 pp75/6

3 Prattinton 22 Richard II.

4 TNA 315/83/8 'Rating of the wood of Shrawley, Warwickshire'. This was previously catalogued under TNA 315/83 folio 36 and is cited as such in:- *Rackham O. 2006. Woodlands. Collins New Naturalist. Chapter 19 note 12*. The change is confirmed in a TNA 'reply to query' 161791836P58. However, 'the wood of Shrawley' is still catalogued as being in Warwickshire! There is a 'Shrewley' in Warwickshire but the wood in question is, without doubt, **our** Worcestershire Shrawley Wood. Thanks to Roger Clooney and Dr Peter King for transcribing the larger part of this document.

5 Ibid

6 Rackham O. 2006. See 125 above. p479.

7 Weights and Measures Act 1987 abolished the perch as a statutory measurement.

8 Grierson, Philip. 1987. Weights and Measures. Williams, Anne et al (eds) *A General Introduction to Domesday Book*. London: Alecto Historical Editions pp80-81

The area of coppice cut each season varies from 6 to 10 acres and the binds are always cut in rotation – there's no attempt to cut portions of different binds concurrently. Each bind has a valuation, averaging £0.92 per acre and this is given under a heading:-

> '*The wood at Shrawley rated by the tenants of the same by custom*.'

For several binds, the amount paid to the lord for a particular year is less than the customary valuation. Some other binds attract a higher payment, but the average remains much the same. The reason for these oscillations and the calculations that lay behind them, remain a mystery.

What might be going on? Did Thomas Severne and Thomas Brewer buy the standing wood in The Aleye and then pay Shrawley villagers to do the work of felling, peeling the bast and making ropes? A role comparable to a modern contractor perhaps, excepting that their pool of labour was fixed by tradition.

Are they acting on behalf of the local community? As Shrawley Wood moved towards the 16th century, three or four people might be the buyers of a bind and very often they are not given names but are lumped together anonymously. Does the whole village expect to work in the wood and make part of their living the annual coppice cut and all the benefits that ensued, including the making and sale of bast ropes. Benefits their ancestors had enjoyed 'time out of mind'?

Did the villagers expect the oak bark, oak poles and birch as well as the lime coppice? Throughout more than a century, when the lord of Shrawley was either king or consort, there's no record of separate oak sales being paid to the lord.

Perhaps Thomas Severne and Thomas Brewer had a hybrid role. Spokesman for the community, but with public service tempered by self interest. Entrepreneurs who received a greater reward than the rest in recognition of their investment and responsibilities.

There were certainly rewards to be had – even allowing for inflation, a large margin of money exists between the £6 – £11 the lord might expect from coppice campaigns in the 1400s and the £200 and more expected by the Child family, who owned the wood in the 17th century. Messrs Severne and Brewer and their ilk may have taken an extra cut but it's likely the whole woodland community made more money than they did in later years.

Apart from the cash, there was a useful bonus - the lime was cut in full leaf, providing browse wood for livestock – whether fed to them fresh and green or stacked and dried for winter use. And it's probably safe to assume that nobody involved with Shrawley Wood paid many fuel bills. Altogether, a good deal!

In 1527 responsibility for the management of Shrawley passed to the Surveyor of Crown Woods South of the Trent, but the record of annual sale, with some gaps, continued up until 1532, when a Thomas Severne (not, of course, the one we started with!) is described as 'vendor of wood'. He paid £5 6s, presumably for that year's bind; no name is recorded. Then there's a ten year gap before a final sale of 'Rough land and Shortegreve' (Shopgrove) for £7 16s.

Apart from the 15th century sales, already mentioned as providing evidence of the tenants' customary interest, Dr King has tabulated all the other binde sales for which record exists between 1480 and 1542. There are 34 in total, of which 20 record the amount paid. Most of these payments are for consecutive years, suggesting, perhaps, that sub-division of the old ten binds has taken place. If this is the case, the division may have taken place around 1484; Long Wanlees was cut, almost certainly over 3 years, in 1481 and this is the last clear record of a bind being cut over more than a single year.

The average payment, allowing for the triennial Long Wanlees, is a little under £8, suggesting that the balance of benefit is still in favour of the tenants, although there's the suggestion of inflation towards the end – there are three payments of £14 quite late in the sequence. But there's also the record of a £2 payment in 1511. As mentioned previously, no rhyme or reason that might explain the different amounts paid has, as yet, been discovered. Could it be that the lord is taking a percentage cut of a net income determined overall by the market prices prevailing in that particular year?

There's a step change in the management of Shrawley Wood after William Sheldon bought the reversion of Shrawley manor from the Crown. He sells the manor itself to William Gower but keeps Shrawley Wood and the church advowson for himself. From here on, until 1580, there's a remarkable record of William Gower – or his nominee – presiding over manorial courts and dealing with business that includes Shrawley Wood – a wood he has no interest in. Take, for example, a manorial court held in the twelfth year of Queen Elizabeth I's reign (1570). Gower presides but an agenda item includes details of Shrawley Wood management: -

Ordered that Thomas Cooke, Richard Marten and Hugh Salwey do oversee every mannes part in Shrawley Wood for the felling and cutting out of theyre wood and teasing of the Whitards and that every man having a parte shall use it in such ordre as they or any of them shall appoint.[1]

Dr King reports similar orders in a Shrawley manorial court presided over by William Gower in 1574, this time with Robert Severne, Walter Severne and John Marten as supervisors. Much the same happens the following year. Intriguingly, when Robert Blount from neighbouring Astley dies in 1573, he refers to

'*my interest or term of years in a wood called Shrawley Wood and the profit thereof*'[2]

The Blount family had landed interests in Shrawley throughout the Elizabethan era[3] and Robert Blount was on the 1570 jury mentioned above. Dr King has suggested that Robert Blount, either by himself, or as part of a consortium, had a 21-year lease from William Sheldon. This makes good sense, although our interpretation of Blount's favours the consortium.

Whatever the division of spoils, it's unlikely that Robert Blount or any of his family were tempted into Shrawley Wood to engage in coppice cutting or rope twisting. While it's easy to imagine Thomas Severn lending a hand in the woods, Blount was an investor. Would it be speculative to imagine that less money was available for those actually doing the work during Sheldon's time?

Remarkably, the manorial court continues to record the rules for the division of Shrawley Wood binds up until ownership by the Child family. And there's little doubt of where most of the money goes after that.

Apart from the bizarre legal tussle already described in 'Foliage,' there's not much in the archival record that casts much light on woodland work. There's a hiatus until Shrawley – wood and all – is about to be bought by Counsellor Vernon and he sets his cousin Richard Vernon to working out what it might be worth.

Richard, writing in 1700, provides the earliest detailed account of work going on in Shrawley Wood. His main preoccupation is the capital value of oak poles that are mixed with the lime in each coppice bind,[4] but he also calculates the future income to be made

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1 Prattinton *ibid.* 12 Elizabeth I (1570)
2 TNA WARD 7/14/114 Blunt, Robert: Worcester 15 Eliz 1
3 Thomas Blount's death is recorded in Prattinton (*ibid.*) 5 Elizabeth 1 (1562) and Walter Blount succeeds; Robert Blount is present 12 Elizabeth I (1570) and a Robert Blount's death is recorded 31 Elizabeth I (c1589). All are described as 'arminger'. Thomas Blount 'gentleman is on the jury. In 32 Elizabeth 1 (c1590) the death of Walter Blount 'arminger de Hillynyton' [Hillhampton?] is recorded.
4 See 'Hearts of Oak'.

from the lime. Incidentally, he also provides an eye-witness account of Shrawley Wood, describing the difficulties of counting oak poles hidden in dense swathes of luxuriant lime growth. And how easy it is to get lost.

As mentioned later in 'Hearts of Oak', much of Richard's information came from talking to the woodmen' and especially their foreman, who spent time with him in a local pub. The following – in italics - is part of Richard's subsequent report to Cousin 'Counsellor' Thomas Vernon in London. Explanatory text has been added beneath each section. Liberties have been taken with the original punctuation; spellings are those used in Richard's original notes [1]: -

The woodman's account of the yearly profit
of the underwood and bast in Shrawley Wood
The wood is fell by six men each his equal part.
One of those parts, in ffaggotts, whittard,
and shides of hardwood may be *12000*
By which the six parts have yearly *72000*
All which are equally sold at 4s 8d the[?] hundred.
And so in the whole *£182-00-00*

The year's 'fall' of underwood is divided into 6 parts, each of which is taken on by an individual. This doesn't mean that only six men are involved in the work; it's likely that each of these six shared some of the work with family and friends.

The faggots are possibly a mix – the side growth 'brashed' from birch, lime and oak. Whittards are lime poles. Shides of hardwood are, presumably, billets derived from both birch and the thinnings from oak coppice. The sale of all these – faggots, lime poles and billets – at the same price per hundred is difficult to explain; this must be a very rough generalisation.

Out of which there is paid, for
falling [peeling?] and carrying to Severne *£52-00-00*
leaveing the sume of [calculations] *£130-00-00*

The cost of this work, presumably wages, is £52. Falling speaks for itself. Both the lime poles and oak thinnings were 'peeled'; the oak bark was sold primarily for tanning leather and the lime pole bast made into ropes.

Carrying to 'Severne' means some or all of this woodland produce was exported on the river; the wharfage point for loading onto boats isn't known but before locks were built in the mid-19th century the river may have been more flexible as regards loading and unloading

Of the Great Bast Ropes at 2000 to the load,
bringing £7 the load, there may be *7 load*
Of the Small Ropes, at the same price *9 load*
Both sorts coming to *£112-00-00*

Two kinds of rope were made. Exact specifications are unknown, but there's circumstantial evidence the 'Great Ropes' were sold for towing boats.

Halfe of which is all wayes reckond to cost in pieling, making and carrying to Severn, so that the real profit is but £56-00-00

Labour costs account for half the income derived from selling rope

That of the ffaggotts [etc] before mentioned *£130-00-00*
there may be made of barke *£ 3-00-00*
Of Poles. *£16-00-00*
Of rods and twigs *£3-00-00*
And of wood *£3-00-00*

The 'faggots before mentioned' presumably still includes lime poles and shides of hardwood. The 'poles' are probably oak coppice thinnings.

Making the whole Proffit *£211-00-00*
Out of which there being paid to a bayly
to looke after it *£12*
there remains but *£199-00-00*

The 'bayly' will be a 'bailiff' to supervise matters in the owner's interest.

Richard Vernon lumped together faggots, hardwood billets and lime poles and gave them all the same notional price. This makes any overall assessment of woodland management difficult – inferences will have to be made retrospectively from what is known about Shrawley Wood a few decades later – but he provides more specific detail about the income to be made from lime-bast ropes. Perhaps this is because in earlier correspondence with cousin Thomas Vernon he had said:-

'you were misinformed about ye bast ropes, for they are a rising commodity at this time, and have advanced this 3 or 4 years past.' [2]

Further information about this 'rising commodity' requires a digression to the River Avon.

The Warwickshire Avon was among the first British rivers to use multiple pound locks to make navigation more practical. In medieval times and long before, people used the river for moving goods in small boats – perhaps almost as far as Coventry – but this was a haphazard affair dependent on water levels and improvised staunches. Gradually navigation became subordinate to watermills with their conflicting demands upon the river. During the reign of Charles I, however, an Evesham merchant, William Sandys, bought out some riparian rights – millers in particular- and set about a serious project to install pound locks and flashes to regulate the river in favour of navigation, from Tewkesbury upstream to just beyond Stratford upon Avon. He was partially successful[3], but his work fell into abeyance during the Civil War and new investment was needed. A leading instigator was Andrew Yarranton, an Astley man whose name keeps cropping up in the 17th century annals of Shrawley Wood.

A Parliamentary Act gave Andrew Yarranton and three associates a two-third stake in a refurbished Avon navigation above Evesham[4]; in later life Andrew gave his part to elder son Robert[5] This in turn passed on to an Astley woman, Mary Vicaris.[6]. His second son, also an Andrew, received a different kind of bequest – a monopoly of trading bast ropes on the Avon upstream of Evesham lock. These ropes came from Shrawley Wood and Astley Wood.

Andrew Yarranton junior had managed the making and selling of 'bast ropes' in Shrawley Wood and Astley Wood since at least 1687[7]

1 WAAS 705:7 BA 7335 109(iv) 51

2 WAAS 705:7 BA 7335 109(iv) 58 Richard Vernon letter to Thomas Vernon 11 March 1699

3 Davies, Jamie. c1996. Shakespeare's Avon: the history of a navigation. Oxford : Oakwood.; Nash, T R 1781. History of Worcestershire p446; May, George. 1834. History of Evesham.

4 Shakespeare Birthplace Trust, Stratford-upon-Avon DR444/6/2/31/1. 8 May 1665 Articles of agreement between Andrew Yarranton of Astley, Worcestershire on the first part, Richard Tinton of the City of London on the second part, Richard Bartlett of Stratford upon Avon on the third part and Nicholas Baker of Worcester, mercer on the fourth part. Regarding 2/3 of the navigation between Stratford upon Avon and Evesham.

5 *ibid.* DR444/6/2/29/5 25 March 1669. Articles of Agreement between Andrew Yarranton of Astley on the first part and Robert Yarranton of Astley, one of the sons of Andrew on the second part. Agreement regarding 2/8ths of 2/3 of a share in the Navigation of the Avon between Stratford and Evesham.

6 *ibid.* DR444/6/2/29/6 30 April 1681. Assignment of Share. Articles of agreement Robert Yarranton of Astley, one of the sons of Andrew on the first part and Mary Vicaris of Astley, spinster on the second part. Agreement regarding 2/8ths of 2/3 of a share in the Navigation of the Avon between Stratford and Evesham.

7 DR444/6/2/31/4 15 June 1693 Agreement Cliffe and Yarranton. Reciting that Andrew Yarranton has carriage and tonnage rights of Basten Ropes on the River Avon and that he has managed the said rope trade for the past 6 years to the great advantage of Allan Cliffe and the other freeholders of Astley Wood.

and there's a strong family connection with the business going back into the previous century. His father's brother Walter had inherited a thirty-third part of Astley Wood at a time when this was lime coppice producing bast ropes.[1] Uncle Walter's share came from his father, also named Walter Yarranton and before him from grandfather William Yarranton. This takes us well back into the 16th century.[2]

Andrew Yarranton senior had begun working life apprenticed to a linen draper in Worcester, but he soon tired of this and spent some years 'in the country' before the Civil War bought him opportunities as a successful Parliamentary soldier. Given his connections with both Shrawley wood and Astley wood, the legacy to his son and his direct family interest in lime woods and lime bast, it's likely he was involved in the bast rope business himself during his 1630s sojourn in the countryside.

There's no archival evidence for the way they made rope in Shrawley and Astley Wood, except that the bast was harvested after the sap had started running; this would have made separation of the bast layers much easier. And the ropes were made in the wood – the bast wasn't exported for manufacture elsewhere. At one stage of this book's compilation it was assumed the bast was 'retted' – macerated in water for a period of weeks before it could be used, in much the same way as flax on the way to becoming linen. This led to a hunt for retting ponds in Shrawley Wood. A hunt called off when it emerged that soaking made the fibres softer and more pliable - but led to a significant reduction in tensile strength. Retting was fine for fishing nets, small ropes and the kind of Neolithic fabrics that archaeologists have been finding in recent years - but unlikely to suit the towing ropes we think were a Shrawley Wood staple.

The Limewood Working Group also made diligent search for rope walks: long flat avenues in the wood where ropes might have been spun in the way that hemp ropes were made until recently. But then came the revelation that a Danish rope-maker, faced with the challenge of making authentic lime bast ropes for a Viking ship recreation project, had worked out how it was done. No rope walks were needed. The only essentials were nimble fingers, something to wind freshly twisted cords onto and a few years of well-honed skill and dexterity.

Limewood Working Group stalwarts had already made some experiments. This involved twisting bands of lime bast, as they were drawn fresh from the pole, into simple cords – all done under the stern tutorial gaze of two American experimental archaeologists. Hugh Milner and Roger Clooney made some handy lengths of bast string in this way. The problem is joining lengths together to form the 'Great Ropes' we know were part of the Shrawley repertoire. The answer is to use shorter lengths of bast fibre and to incorporate these sequentially into a continuous cord. The clue to this comes from a late medieval print of a Danish 'rebvindere'[3] sat twisting lime bast rope in a small 'booth' shelter. On a short horizontal overhead pole he has a bunch of lime bast fibres which he draws down into his lap as needed. This material is twisted to make a cord which is then wound onto the simple reel at his side.



07. Twisting rope from bast

The print (07) is reproduced in a wonderful summary of historical rope production, using lime bast, made by the late Ole Magnus, craftsman rope maker extraordinary, in preparation for producing all the ropes needed to fit out and rig Skuldelev II, an authentic reproduction of a Viking boat.[4] Alongside, is a photo of the author himself making bast rope on a Copenhagen key side using just his fingers and a modern version of the same reel. Later, this wound cord will be hand-laid into a two or three ply rope, usually achieved by turning the same cord back upon itself.

The end product might be an 8mm three-ply rope that is 33m long and all made from the same continuous cord. That is to say, the cord from which the final rope is laid must have been at least 99m long. No tools were involved, apart from the reel. As Ole Magnus puts it:-

> *'The greatest part of a traditional ropemaker's work was walking backwards down the ropewalk with hemp fibre wound round my belly, twisting one of the many yarns that would become rope. One could say that it was a backwards job to come to an understanding of the fact that the only equipment needed for preparing linden bast and turning it into rope are the hands.'*[5]

Bast ropes covering a vast range of sizes, ranging from 7 -120mm in diameter have been found by Scandinavian archaeologists[6] and there's no doubt that lime bast predominated. Again, in Ole Magus's own words:

> *'Bast from the bark of the linden tree…. seems to have been the most commonly used material for rope in the Viking period.'*[7]

He makes the point that twisting is made easier if the bast is wetted first. Perhaps this wetting wasn't necessary in Shrawley Wood if the bast fibre was taken fresh from the tree. Or perhaps our Shrawley and Astley craftsmen rinsed the bast first, to remove the slimy feel of freshly peeled layers. Maybe it was then dried on trestles set in the newly cleared coppice binds and then wetted again before use. This would enable some separation between the work of peeling the poles and actually making rope.

Mention of 'great ropes' by Richard Vernon and transport up the

1 WAAS 705:550 4600/33 [with thanks to Francesca] 'This Indenture….10 July 1659….between Walter Yarranton of Larvard….. and Thomas Crane of Astley….yeoman…Witnesseth that the said Walter Yarranton for and in consideration of the sum of fourscore and one pounds and five shillings…..paid by the said Thomas Crane….unto the said Walter Yarranton and William Yarranton father of the said Walter…..hath granted by these presents….all that his the said Walters parte of and in certain woods called Astley Wood and penny Parke in Astley aforesaid…..being one part of the said woods the same being divided into three and thirty parts….(I'm grateful to Francesca Llewellyn for this reference)

2 TNA, WARD 7/30/59. grandfather William died in 1593, though the inquisition post mortem on his death was not held until 1607. (I'm grateful to Dr Peter King for this information.)

3 Literally a 'rope twister'

4 Magnus, Ole. 2003. Reconstruction of rope for the copy of Skuldelev 2: Rope in the Viking Period. Blue, Lucy; Hocker, Frederick M & Englert, Anton Connected by the Sea: Proceedings of the Tenth International Symposium on Boat and Ship Archaeology, Denmark p34 Fig 5.14. This figure has been re-drawn for present purposes by Helen Edwards.

5 *ibid.* p28

6 *ibid.* p31

7 *ibid.* p28

River Avon suggests tow ropes for boats. The location of Astley Wood and Shrawley Wood alongside Europe's second busiest navigation – not to mention an earlier industry in Ombersley on the opposite river bank – provides circumstantial evidence of river-related rope making. And yet the agent or wholesaler of ropes from both Shrawley and Astley was a John Wilson 'ropier of Camden in the County of Gloucester'[1]; a place some distance from either the sea or a navigable river. As yet there's no irrefutable evidence. When a well-documented ropeyard began spinning ropes at Bewdley in the mid-18th century, they had ropes and harnesses for towing Trows and other boats on their inventory. But nothing made from lime bast.[2]

Rope making in Shrawley Wood carried on until at least the mid-18th century, but the archives suggest a trade that's dying. There are references to bast ropes being sold out of Shrawley Wood in 1745 and 1746 but activity is muted and seems incidental to other woodland work. 1708 is the penultimate year for which there's a detailed account of the annual bind cut, with bast stripping and rope making an integral part. Richard Vernon was managing Shrawley Wood at the time and he seems determined to wring every scrap of advantage for himself and the owner. Andrew Yarranton Junior is still organising the sale of bast ropes. What follows is the first part of a long contract agreed by the villagers carrying out the work clearing Nutward bind and producing, among much else, bast ropes.

Eight named individuals contract with the Vernons[3] to cut and partially process Nutward, that year's bind.[4] They were: Edward Smith, John Atherage, William Seaverne, John Spragg, William Jones, Robert Marshall and Randle Searverne. It's likely each of these principals will bring family, neighbours and friends into the wood to help. All marked their agreement with a cross. In addition there are the signatures of three witnesses: John Turner, Henry Chellingworth and Mary Ssebb. Spellings, grammar and punctuation have been amended from the original.

> *Article of agreement made the second day of February anno domini 1708 by and between Richard Cook, Edward Smith, John Atherage, William Severne, John Spragg, William Jones snr., Robert Marshall and Randle Severne of the Parish of Shrawley in the County of Worcester, Woodcutters, of the one part and Richard Vernon of the Webhouse in the parish of Hanbury in the county aforesaid Agent for Thomas Vernon of Hanbury Hall Esq on the other part as follows:-*
>
> *First that in consideration of the rates and times of payment herein after mentiond to be paid by the said Richard Vernon. They the said Richard Cook [and the others] do hereby agree with the said Richard Vernon: To fall, mark, binde, faggot and work up all the underwood and what crops and lops of trees that shall be appointed to them to work up by the said Richard Vernon or other Agent of the said Thomas Vernon for the Nutward bind in Shrawley Wood and in order thereto shall divide the said binde amongst them to each a suitable part according to his time and ability to work up the same on or before the fifth day of this instant February……*

Most of this document is covered by Richard Pumphrey in his part of the monograph and - assuming coppice management in Shrawley and Astley Wood was inherently conservative - the 1708 contract provides further guidance to the historical management of both these woodlands. In particular, it suggests that oak and lime have 'always' been harvested in the spring and early summer,[5] and that birch was always part of the mix. As already surmised, searching for retting ponds can be scaled down. Separating out the softer grades of bast by soaking for a few weeks may have been needed for Neolithic bedspreads and 20th century Norwegian fishing nets. But probably not for basic bast ropes.

Following on from the 1708 contract between Shrawley woodlanders and the Vernon estate, there's a sequel in 1709/10.[6] This time it's Tadglyhill binde,[7] the woodlanders are Richard Cooke, Edward Smith and Robert Marshall and the witnesses John Turner, William Eckles and John Brooke. This is the text of the new agreement: -

> *Agreement with Shrawley Woodmen in 1709/10*
> *Memorandum on the 17th of Feb: 1709. Richard Cook Edward Smith and Robert Marshall all of the Parish of Shrawley in the County of Worcester, Woodcutters, agreed with Richard Vernon of the Webhouse in the parish of Hanbury in the County of Worcester aforesaid that they the said Richard Cooke Edward Smith & Robert Marshall will fall and work up the wood of the Tadglyhill binde in Shrawley Wood this present year in such manner within such time and at such rates to be paid in the same manner as they the said Richard Cook, Edward Smith, Robert Marshall, and others agreed to fall the Lesser Nutward binde the last year, And they the said Richard Cook Edward Smith and Robert Marshall have Re... in earnest of the bargain five shillings and thereon for the true performance of the said falling and working up of the said wood in all respects according to the Agreement that they with others made for falling and working the wood of the said Nutward Binde the last year, they and each of them do for themselves their Executors and administrators Bind themselves to the said Richard Vernon his Executors and Administrators in the equal sum of ten pounds apiece. In witness whereof they the said Richard Cooke Edward Smith and Robert Marshall have hereunto set their hand and seales the day and year above written.*
> *Sealed and delivered*

There are obvious differences from 1708. The number of woodsmen putting a name to the agreement has halved. So has the sum demanded from each of them as security. Members of the Severn family are conspicuous by their absence. Comparison with further contracts isn't possible because there aren't any. At least, none have been found.

What's it all about? The present authors see a watershed in the affairs of Shrawley Wood. The culmination of long decline in the fortunes of Shrawley villagers. From the communal ownership implied by Domesday's 'woodland that pays nothing'. To the favourable rates paid on behalf of the community during late medieval and Tudor time. The less favourable arrangements made between 1545 and 1580. Then the Child era when the lion's share of benefit was taken by the Child family. Now Richard Vernon is squeezing more money than a declining market for bast can bear, and people are pulling out; perhaps the Severnes are making their own arrangements with the various owners of Astley Wood.

There are other views. Dr Peter King's more objective scholarship, covering a similar period to '*Limewoods*'. Then Richard Pumphrey follows both of us with the next couple of centuries. No more grudging stray archives in enigmatic, abbreviated Latin but a rich cornucopia of record, heralding a new and vibrant perspective on woodland work and village life.

Richard is altogether more sanguine about both of these contracts. He points out that Tadgleyhill bind was small. He sees nothing exceptional to get excited about. And, as said elsewhere, he's usually right!

1 Shakespeare Birthplace Trust, Stratford-upon-Avon DR444/6/2/3/5
2 Crowther, EM. n.d.. *Lowe's Rope and Twine Manufactory – a local industry*. Bewdley Historical Research Group.
3 WAAS 705:7 BA 7335 18/11 This and the following reference are thanks to Francesca.
4 Two Nutward binds were identified by Richard Vernon in his 1700 Survey. In one of these – Little Nutward – he counted 561 12s oak poles; the other Great Nutward, where he counted by far the greatest number of oak poles in any single bind – 1414 at 10s apiece.
5 This early summer cutting of lime coppice for bast (and a corresponding absence of any need for retting) is also documented from Harlackendens, where the date 'by the 6th June' is specified. 'Essex Record Office Temp Access. 897 [see Rackham Ancient Woodland 1980 p250]
6 WAAS 705:7 BA 7335 18/12
7 This must be the Tadgley Hill bind where Richard Vernon counted 161 10s [oak] poles in 1700.

Hearts of Oak

Heart of Oak are our ships,
Jolly Tars are our men,
We always are ready: Steady, boys, Steady!
We'll fight and we'll conquer again and again.

Oak trees and nationalism have often marched together through English history. There's a special connection at the royalist end of the spectrum, of course, what with the future Charles II skulking in oak trees after the Battle of Worcester[1] and oak leaves and gall wasp nurseries adopted as badges of loyalty to the Crown.[2] Then there was a supposed shortage of ship's timber and a deluge of tracts about sowing acorns as a patriotic duty, with much talk of sturdy English oak as the bulwark of old English liberty. The rivetted iron hull rather cramped this rhetoric. But amid much bombast, myth and legend there remains one incontrovertible fact that we'll discover towards the end of this chapter. Shrawley Wood oak plays a pivotal role at the heart of the British Constitution.

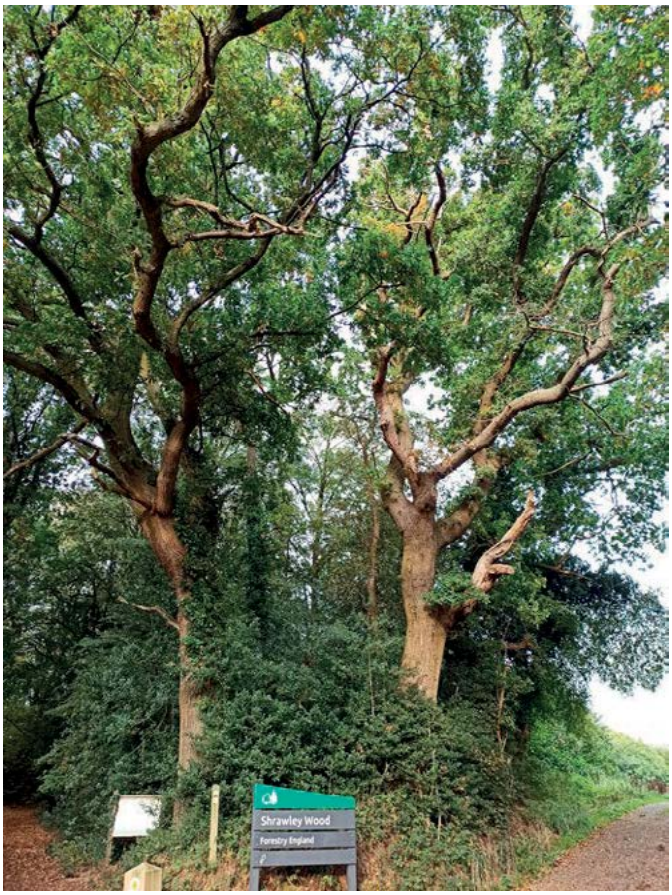
At a conference of the Botanical Society of the British Isles held in 1970, focusing on oak trees, Dr EW Jones pointed that other European countries, such as France, made similar claims of unique virtue for their own oaks. And he wasn't surprised that oak was held in such high esteem:-

> *'They have a combination of properties - size, longevity, strength, durability and fissibility of the wood, a high yield of fruit and tannin and an ability to coppice freely – which made them of exceptional utility amongst European trees; indeed there can be few plants other than those which yield staple foods which were so intimately related to the economy and the history of the people.'*

He went on to point out an anomaly of oak in northern Europe and especially the British Isles. We have only two native varieties compared to over 400 worldwide. Most of these can be found in montane areas and Dr Jones suggests that oak evolved primarily as a tropical plant; to this he attributes the exceptionally high number of insects associated with oak. In migrating into temperate zones, oak has dragged with it some of the biodiversity that characterizes tropical forest.[3]

Lime, conversely, evolved in temperate zones with its own, albeit smaller, range of insects, fungi and lichens. Until recently, Shrawley Wood combined the heritage of both.

If you approach Shrawley Wood from the main 'New Inn' entrance, there are a couple of economically indifferent oak trees behind the gate, suggesting this ancient association still stands but, like antique cannon outside a barrack guard room, they're just for show. Apart from these sentinels, the publicly owned part of Shrawley Wood has been stripped of anything resembling oak timber. Exploration will find a few stunted and bristly veterans, runts that nobody could bother to cut down. And a few slightly better specimens on difficult slopes. Hard to imagine that for centuries Shrawley Wood was renowned for oak trees and they commanded premium prices, while the now much-lauded lime coppice became ever more difficult to shift at almost any price.



01. Sentinel Oaks at the New Inn entrance to Shrawley Wood.

Richard Vernon's Survey

The first distinct record of Shrawley oak isn't until 1699. Thomas Vernon was weighing up the offer he might make for Shrawley Wood. He's in London, gathering money in the law courts and a cousin, Richard Vernon, is delegated to take soundings. Richard's assessment of the lime underwood has already been mentioned, but he's especially interested in the oak. Here's part of what he said; the Mr Cliffe he mentions still owns Shrawley Wood at the time.

> *1699 Dec 11 Richard Vernon to Thomas Vernon (at Bell Yard nr Temple Bar)*[4]
> *Honoured Sir*
> *There being a snow on the ground when I received your letter I did not go to Shrawley till Wednesday last when my cousin Vernon of Sandwell met me and looked over Mr Cliffe's estate the same day….I think it a desirable purchase being (in my opinion) let very cheap to several tenants who have only five years of their leases unexpired……..I have put on the same paper a note of the number of the great poles in every fall of the wood, which Mr Cliffe had taken by the woodmen four years ago. In viewing of which poles I spent my day on Thursday and believe that although there may be 1000 poles worth £1000, there are three or four thousand not worth above so many crowns; they must be too dear at ten shillings apiece altogether, but for ought I know may be worth nine. They are pretty tall trees but being so hid with the underwood it is so difficult to count them that I believe forty men who are strangers in the wood cannot do it. The underwood being in some of the eldest falls as high as a house and when it was counted six men that spend all their lives in the woods and know exactly the bounds of every particular fall as they go by it, were a fortnight in doing it. I endeavoured to count those that are in the*

1 The skulking was apparently done in the Boscobel Oak in Shropshire.
2 For the benefit of folk bought up on republican notions, this is a reference to Oak Apple Day (May 29) – a celebration of the King's restoration. Loyalist members of the Lime Working Group have long dreamed His Majesty rode through Shrawley Wood on his way north; it now seems certain he passed by on the opposite river bank.
3 Morris, MG & Perring, FH *The British Oak: its history and natural history* 62-79. BSBI Conference Report 14. Classey, Faringdon. Introduction by EW Jones.
4 Worcestershire Archives and Archaeology Service (WAAS).705:7 BA 7335 109 (iv) 46.

last year's fall (being named the first Elbow bind) and find it fewer by about forty than is mentioned in Mr Cliffs note. The workmen say these were fallen (of the worse of them) when the underwood was felled, and about such a number was felled in each of the three other falls that were felled since they numbered the poles……
I took my leave on Friday morning and returned to the wood and took the chief of the woodmen to an alehouse, he having knowledge in all things that belong to it, ……..He told me the poles were full as many as they were counted for; they were then more than they are. But I conceive there cannot be a very big sum of money made of them immediately but by the degrees of one fall at a time making it eighteen years before the last can be sold unless it be by destroying of the wood which I think cannot be proper it being in my opinion there is less ground than it is valued to be and (according to the Rate they set the ground at which lies by it) will not answer the Rent it now makes. But I believe the wood rent would be improved by falling most of the poles when their turns came and leaving only some of the finest of them; in that it causes great damage by their growth……
I hear Shrawley Wood and the advowson cost Alderman Cliffe £12500 but now Mr Cliffe asks fourteen thousand and when my cousin Vernon told him he were a happy man if he had £1200 for it he made little answer. At which rate in my mind it would not be a miss-purchase to a gentleman that has store of money.
I humbly beg your pardon for giving my thoughts thereon and for the length of this tedious list which I hope you will be pleased to excuse me in
Your humble servant
Richard Vernon

This is the count of the 'great poles' numbered by Mr Cliffe's woodmen four years previous to Richard Vernon's visit:[1] The names in the left-hand column are the 'bindes' into which Shrawley Wood was divided at the time. The [values] are totals added by the author:

	poles	shillings apiece	[values]
Great Nutward	1414	10	£ 707.00
First frith	776	10	£ 388.00
Second frith	600	10	£ 300.00
Alley Binde	600	10	£ 300.00
Kings Hill binde	500	10	£ 250.00
Second Kings Hill binde	232	10	£ 116.00
Elbow binde	232	10	£ 116.00
Second Elbow bind	442	10	£ 221.00
Great Rochpole	454	10	£ 227.00
Little Rochpole	451	10	£ 225.50
Tadgley hill	161	10	£ 80.50
First Border	110	10	£ 55.00
Second Border	138	10	£ 69.00
first Blackwich	446	18	£ 401.40
Second Blackwich	340	15	£ 255.00
Rowlane	563	15	£ 422.25
Great Winlesses	532	12	£ 319.20
Second Winlesses	783	12	£ 469.80
Little Winlesses	363	12	£ 217.80
Little Nutward	561	12	£ 336.60
			£ 5,477.05
In all: poles above 36 yeares growth	9945		
out of which deduct 160 being fell in the four last falls	160		
There Remaining	9785		

Table 01. Richard Vernon's report on poles in Shrawley Wood. Richard Vernon letter to Thomas Vernon 11 March 1699[2]

I received yours not till Saturday last, upon which day I waited upon Mr Cliff and when I told him how indifferent you were about ye purchase……
As to what you mention about ye falling ye young timber, I have inquired into and find there has bin about 20 or 30 fell in a year, but only such as will be unthrifty, and would never have come to timber trees, and it has been a constant practise to leave 3 or 4 of ye best thriving poles of those…….[3]

Richard Vernon letter to Thomas Vernon Esq, Bell Yard nr Temple Bar, London 13 March 1699

Honoured Sir
I have made haste to acquaint you that having again counted, with help, the poles of the last fall in Shrawley Wood, I find them fewer by about a hundred than I said before. This was partly for want of one with me to observe the right place that I had looked over, but chiefly, because there was more wood fallen the last year than really there ought to have been. When I charged the woodman that had formerly given me an account with this, he owned that it is so. His master Mr Cliff had ordered the woodmen to count the four last falls since I spoke with him, and he says that the three last falls want somewhat more than three hundred poles of the amount Mr Cliffe gave me, but the fourth fall is now done and my account is but six hundred and ten and he says that fall was for the same winter before they took the account. He is confident the rest of the wood has as many in it as Mr Cliffe's note mentions. I am still of the opinion that the trees are, one with another, worth nine shillings apiece and the lands are a good bargain as they are set, but cannot tell whether the Poles will be so many in count, My heart aches for fear you should think it a dear purchase; some being of opinion that it is though others think it is not. I pray with all my heart that the bargain may be not made, till you have seen it, and humbly beg your pardon that I could not give you a better account in myself.
Your most humble servant
Richard Vernon[4]

There's no doubt the 'great poles' that preoccupy Richard Vernon are oak and little doubt, judging from nomenclature, rotation and density, that he's describing multi-stemmed oak grown from coppice stools, in among the lime underwood. There may have been oak poles that had grown directly from acorns, but these would be a minority.

Oak trees don't produce acorn crops every year and coppice poles have a relatively short life – they may never get round to the business of reproduction before they're cut and a fresh cycle of 'spring' growth from the old stool begins yet again. In most years, any acorns that hit the floor will simply be smothered by the dense shade of lime coppice. To stand any chance, acorns need to germinate when the lime is cut - and light levels are reset to green and go. This might be the very year local wood mice enjoy a population boom. Amid this grim Darwinian struggle, there may have been some respite for acorns with almost-ready-for-cutting black poles as a parent. According to DT Streeter,[5] a problem with regeneration in 'coppice with standards' woodland is that oak standards don't become sufficiently mature to create large light well before they're cut – a stool of black poles might create a larger gap when they're harvested or 'stored' to just one stem. Any which way, ambitious acorns starting life in a lime coppice need a lot of luck.

Oak from a coppice stool cut at the same time as the lime offers far fewer challenges. There's the considerable benefit of a large pre-existing root system, an almost complete absence of hazard from marauding mice, pigs and pigeons or the need to be buried by a passing hoof or obliging jay. Spring growth from an oak coppice stool doesn't quite match the meteoric rise of new lime shoots but

1 WAAS 705:7 BA 7335 109 (iv) 51
2 The New Year started 25th March until 1752, so this would be 1700 by modern convention.
3 WAAS 705:7 BA 7335 109(iv) 58
4 WAAS 705:7 BA 7335 109 (iv) 55
5 Streeter, DT. 1974. *Ecological aspects of oak woodland conservation*. In: The British Oak, 341-354. See specifically pp 295,305

given sufficient momentum and maybe some judicious help from a woodsman's billhook when the lime becomes dense, oak from the stool can manage. Given some protection from browsing animals, oak regeneration from the stool is altogether more reliable, so long as the oak and lime harvests are synchronised.



02. Overstood Black Poles, not from Shrawley Wood but in the woodland above Redmarley.

White Poles, Black Poles and Stores

The usual system for growing oak throughout large parts of the West Midlands and especially the Severn Valley is explained by Mr Thomas Fulljames, surveyor to the Dean and Chapter of Westminster Abbey in London. They had owned Tiddesley Wood near Pershore since 1065, when they took over from Pershore Abbey, proprietors since 689AD. Neither were the kind of owners who rushed to embrace change and it's possible he's describing a system of woodland management that hasn't changed a great deal during this time. Fulljames is writing to the Westminster Dean and Chapter in 1824, reiterating an account he first gave them in 1804.

> *'Tiddesley Wood nr Pershore, in lease to Sir John Sebright, is divided into falls and the whole part is cut as coppice wood, which is chiefly of oak in the following manner –viz: At every 14 years it is cut (some parts may be cut at 16 years growth) at which time there are from 150 to 200 oak poles at 14 years growth (if the stock upon each one will allow of as many) marked and left to stand which are denominated as Tellers; at the following 14 years (or 16 years as the case may be) when the coppice is cut again there are about one half of the Tellers, which are then 28 or 32 years growth and called* ***White Poles*** *[author's emphasis] cut with the rest of the Coppice Stuff; at the following 14 or 16 years as the case may be when the coppice is cut again the remainder, which are then 42 or 48 years growth and called* ***Black Poles****, are cut – care being taken at each time of these cuttings to keep up a succession of poles of each description……*[1]

There are obvious differences between Tiddesley Wood and Shrawley Wood. In Shrawley, the underwood is Small Leaved Lime and at the time of Richard Vernon's survey this was cut every 18 years. For comparative purposes, it's necessary to make adjustments to the oak rotation and stocking rates – but the regime for oak poles would have been much the same.

In Shrawley Wood, an oak stool, clear cut with the lime, produced new 'spring' growth that developed over the next 18 years. When lime in the same coupe was cut again, the oak stools were thinned and remaining poles grown on for another 18 years as 'white' poles. At a third lime cut, when the oak poles were 36 years old, these 'white' poles were thinned once more and the remainder grown on for another 18 years, now designated as 'black' poles. Judging from examples still extant in Ravenshill Wood and elsewhere, a good stool might carry four or five 'black poles' to maturity. These could be harvested at the fourth lime cut – that is, at 54 years of age.

The terms 'white' and 'black' apparently refers to the darkening of oak bark over time. In vernacular use the word for these younger poles was shortened from 'white poles' to something like 'whiturns'[2] and this has caused much confusion with variations on the term 'whittan', generally used in Worcestershire and Gloucestershire to describe *Tilia cordata* grown as coppice.[3] Much time and fervour has been expended by the Lime Working Group in discussing this subject!

The inference from Richard Vernon's survey – that Shrawley oak was primarily grown 'from the stool' at this time – corresponds to what's known about woodlands along the Severn Valley in general. Shrawley Wood's very own Captain Andrew Yarranton makes this clear in his polemic '*England's Improvement by Sea and Land*', where he calculates there are 10,000 acres of oak coppice from Holt northwards to Wyre Forest – and he includes Shrawley and Astley by name – but not a hundred tons of naval timber between the lot of them.[4] Earlier, in 1606 a prospective buyer of Ribbesford manor, which including Ribbesford Wood (north of Astley and part of Wyre Forest), is warned: '….. *the estate, standing a great part of it yn coppice wood, doth not strengthen a lord with any multitude of able tenants*'[5] The prevalence of 'black poles' as the furthest extent of oak maturity in the 17th century Wyre Forest is implied in a complaint of alleged theft.[6] A rare eye-witness description of the

1 Wilson, Marshall. 1990. Early Maps and Plans of Tiddesley Wood. Transactions Worcestershire Archaeological Society 3rd ser. Vol 12 pp252-257

2 *ibid.* See also Smart, Ron & Wellings, Richard Worcestershire Woodin': Hazel woods in a nutshell. Conversations with Geoff Osborne. Small Woods Association. Telford. 2009 Pages 29 – 33 'The little tree saplings if you notice, they have silvery bark. Well the old woodman's term was 'Whituns.' As the oaks grow older the bark grows darker and if they were good big 'uns we'd call 'em 'black barks.'

3 See for example Rudge, Thomas. 1807. *General View of the Agriculture of the County of Gloucester*. Board of Agriculture. p247 lime: provincially "whitten or "whitrod"; Watson, Kenrick. 1840. Statistical and General History of Worcestershire published under the superintendence of the statistical committee of the Worcestershire Natural History Society [under 'industry']; WAAS 705:7 BA 7335 18 (i) '….all the whitterns distinguishing the choice whitterns in parcels by themselves from the other as soone as the Baste is peild….'.

4 Yarranton, Andrew. 1698. *England's Improvement by Sea and Land (The Second Part).* London, Tho. Parkhurst. 70/1.

5 Warner, Rebecca. 1818. *Epistolary curiosities: series the first: consisting of unpublished letters of the 17thC, illustrative of the Herbert family. p16.* The advice is from Sir Edward Blount, in a note appended to a letter from Sir Ralph Clare to Sir Henry Herbert. Sir Henry didn't take this advice and moved into 'Ribsford House', from where he later became custodian of His Majesty's woods in Wyre (see *ibid.* pp34-6.)

6 HMC Thirteenth Report, Appendix, Part IV *Manuscripts of Rye and Hereford Corporations.*
271 f. 132b. 1623, Aug 30. Lord Middlesex to the Lord President. 'The inhabitants of Bewdley are committing great waste in the Bewdley Woods, and especially in the wood called the Lord's Park, where Thomas Smith, his wife and daughter, have been carrying away black poles, and being opposed by one Wm Fidoe, they set upon him and beat him very sore and said they would never cease cutting wood there whilst there was any standing; and many of the magistrates of that town, that should right the king against such

large expanse of oak coppice that still existed in the mid-18th century Black Country talks of 'starvelling shrubs', devoid of timber trees[1]. Worcestershire's early 19th century agricultural chronicler says: '*Wire Forest*….[woodland] *is well furnished with oak, from which are thinned immense quantities of poles, which, after stripping off the bark, are sold under the name of Black Poles*.'[2] In the early 20th century, naturalist RC Gaut says there is very little Wyre oak that has regenerated from acorns – most comes from coppice stools[3] and this is confirmed by the later reminiscences of a retired Wyre forester.[4] In 1987, an academic conference on the history of Wyre Forest heard about the customary transition from oak coppice to 'white' and 'black' poles and then, in some cases, 'stored' trees.[5] And an information leaflet put out by English Nature accepts it as axiomatic that oak trees in the region were stored.[6] Further afield, in the Lincolnshire limewoods, the oak grown in among the lime stools was coppiced - here oak was often cut along with the lime, on the same rotation.[7]

Why this ubiquity of black poles grown from the stool? The charcoal iron industry was a large part of the reason. Not that decent black poles would have been converted to charcoal; as Captain Yarranton said, they were worth more for beams and barrel staithes and much else.[8] But there were lots of thinnings *en route* to black poles and then there was the lops and tops - and only a proportion of black poles turned out straight and true. All this could be 'charked'. And if the price was right, coppices might be cleared at the 'white pole' stage and all of them converted to charcoal. The Wyre Forest formula offered flexibility and England's longest navigable river provided cheap access to a wide range of diverse markets, most of them associated with an innovative iron industry that was growing toward global stature.[9]

Oak grown on the relatively short 'black pole' rotation gave reasonable yields of bark for the tanning industry, provided a compromise with the tradition use of coppice woodland for cattle browsing and made it more difficult for a new class of capitalist landowners to muscle in to the ancient prerogatives of traditional forest users. And the Tudor Statute of Woods might have encouraged black poles as a way of staying within the law. Just about.[10]

Apart from Richard Vernon's 1699 Report, there's a second survey in the Vernon archive attributed to a 'Mr Yarranton'. Almost certainly this is Captain Andrew Yarranton's eponymous son. Once again, the lime element has been relegated to a previous chapter. Andrew Yarranton Junior was involved in organising the lime bast business for Mr Cliffe and during the first decade of Vernon tenure; he also advised the Astley Wood shareholders and was probably one himself. There's no certainty as to date, but the early years of the 18th century might be a fair guess.

Notes out of Mr Yarringtons Survey or Estimate of Shrawley [Wood][11]

Notes out of Mr Yarringtons Survey of Shrawley & Demesnes

18 Binds in the Wood	*Each bind 34 Statute acres.*		
In each bind			
40 trees at 20s per tree		*£720*	*£40*
300 trees at 10s per tree		*£2700*	*£150*
150 at 7s per		*£945*	*£52.2*
40 at 5s per tree		*£1080*	*£6*
In total	*Total*	*£5445*	

[In each bind:
730 trees to value of £302.550;
in total 13,140 trees to value of £5,444]

Table 02. Andrew Yarranton's survey.

Andrew Yarranton's valuation might be a more realistic assessment of the black poles than the one provided for Richard Vernon by the woodmen, but he's clearly generalising about their distribution. However, he seems to confirm that Richard Vernon's suggestion - thinning the oak canopy - is underway. And many remaining oak poles are being 'stored' as future timber.

Both surveys capture snapshots of Shrawley Wood oak at an historic watershed. Since being owned by Catherine Parr, Shrawley Wood has shed the last vestiges of ancient constraint: complex tenures, common grazing rights, customary practises and collective management that still encumbered Ribbesford Wood, Wyre Forest, Astley Wood and many more. The old Statute of Woods was a dead letter now - and it would be two and a half centuries before the State, in Forestry Commission guise, could determine what a wood owner might do and when. Like Mr Cliffe before him, Thomas Vernon acquired a large freehold woodland with nothing to stop him doing what he liked. And, in common with many more rising gentry of the time, he wanted the social prestige and long dynastic investment of growing oak timber - not plebeian poles.

How Long Has This Been Going on?

Richard Vernon's survey was in 1699 and the count of oak poles made by Mr Cliff's woodsmen takes us back to 1695. There are no previous references to oak in Shrawley Wood - at least, nothing definitive has come to hand.[12] Was Shrawley oak a 17th century innovation or did this combination of oak and lime go back much further? At the time of writing, official accolades that celebrate Shrawley Wood as a rare and precious national treasure only mention lime. But is this only half the story?

A confluence with oak is an almost universal feature of modern limewoods throughout England. As Rackham summed it up: '*Limewoods normally contain a full complement of oak trees*'[13]. He had especially in mind the 'pry' (lime) woods[14] of eastern Essex and Suffolk, where oak standards were a feature in recent times, but

apparent wrong, do trade money in things wrought out of such black poles and wood.'

1 Ilingworth, Rev RI (ed). 1896.*The life and poetical works of James Woodhouse 1735-1820*. London: Leadenhall Press

2 Pitt, W. 1813. *General View of the Agriculture of the County of Worcestershire.* p189

3 Gaut RC. 1926-8. Wyre Forest: General, Soil and Botanical Features. *Transactions Worcestershire Naturalists' Club*. 175-6.

4 George, Edwin. c1987. *The Forest is my life - the story of one man's love affair with the Wyre Forest*

5 Packham, John R & Harding, David L (eds). 1995. *Ecology, Management & History of the Wyre Forest* Proceedings of a symposium run by the Forestry Ecology Group, British Ecology Society, on 28-29 March 1994, at the Priorslee Site, University of Wolverhampton. pp14-18.

6 Anon. 1994. *Wyre Forest National Nature Reserve*. English Nature. [after describing the process of storing'] 'This possibly explains why much of the oak in Wyre is of such poor silvicultural quality. Most of the trees in Wyre today are from coppice stool regrowth, and not from seed, and so have been felled and regrown on the same root or stool numerous times in the last 300 years.'

7 Lincolnshire Record Office. Tyrwhitt-Drake VI/1/1755-1780. There are many sales of timber oak during this period, but a consistent annual theme is the sale of 'gadwood' – coppice sold in small area lots ['gads'] at auction. The right to the bark from any oak component of this underwood is retained by the wood owner and is clearly identified as oak bark by sale to various local tanners.

8 Yarranton, Andrew *England's Improvement by Sea and Land*….. London: sold by Tho. Parkhurst 2 pt.1677-81

9 See the 'Sabrina' chapter p.82 for further discussion of this.

10 Statutes of the Realm, 34-35 Hen VIII, c 3 This required a minimum of 12 'standels' [standard trees] to the acre that should not be felled until they're 'tenne ynches square within thre fote of the ground.' EW Jones (1959) calculates that an average 50 year old oak tree might be 7-10 inches in diameter at a height of 4' 3 inches. {Biological Flora of the British Isles: Quercus L. Journal of Ecology, 47, 169-222. p187}

11 WAAS 705:7 BA 7335/109 (iv) 44

12 Atkin, Malcolm. 1995. *The Civil War in Worcestershire*. Alan Sutton. Stroud. p90 refers to Royalist attempts from Worcester to obtain 100 loads of timber - presumably oak - from Shrawley Wood; these were apparently frustrated.

13 Rackham, Oliver. 1980. *Ancient Woodland – its history, vegetation and uses in England.* Edward Arnold. p242.

14 'Pry', variously spelt, was the local vernacular for lime – almost invariably lime underwood.

whether grown as standard trees or coppice the association of lime and oak is remarkably consistent. According to the Forestry Commission national tree census 1947-1949 there were only 10 acres of 'pure' lime coppice in all of England's privately owned woodlands[1] and a trawl of the remaining 750 acres confirms that oak was a consistent accomplice[2].

In the vicinity of Shrawley Wood the close relationship between lime coppice and oak remains strong. This is evident, for example, in woodlands such as Ockeridge and Monk Wood, where lime survives on the boundaries but historical evidence points towards wider dispersal. Ancient lime stools can be found in Areley and Ribbesford woods, both of which provide ample evidence of former *Quercus petraea* coppice. Most especially, it can be seen in parts of Ravenshill Wood, where overstood stools of lime and oak are still growing together in the same juxtaposition as Richard Vernon's survey implies.

The remnants of Astley Wood, once conjoined with Shrawley Wood and probably managed in much the same way in the distant past, shows no sign of former oak coppice to complement the remaining fragments of lime - but a single archival reference is more obliging. Well into the 19th century, two of the original 33 parts of Astley Wood were leased by the John Sherriff's Charity to provide apprenticeship premiums of £4 or £5 for impoverished young people around Bewdley[3]. The Charity Commissioner's entry for this land reads:

> *The property consists of about 11a. in Astley Wood,…., let by indenture, £28pa…..the lessee covenanting to manage the said wood in a good and workmanlike manner, and at the end of the term to leave 50 store oaks, 20 oaks of the girth of 3 inches and 10 birch trees of the same girth, on every acre of the said wood. Lease now vested in Thomas Henry Cooke, esq., of Bentley, the son of the lessee, who also is the owner of the remainder of the wood. The rent of £28 regularly paid by Mr Cooke to the three overseers……..* [4]

No date is given for the origin of Sherriffe's charity, but John Sherriff died in 1702[5] and it's likely the terms and conditions are based on custom and practise around this time. In due course, almost all the original 33 shares into which Astley Wood was divided were bought or otherwise acquired by the largest single landowner in Astley, the Cookes family, but at the beginning of the 18th century the wood was still managed on some kind of collective basis. John Sherriff's stipulations are likely to preserve a template for the historical management of Astley Wood. There is no precise date for the division of Astley Wood into 33 separate shares, but it had certainly occurred by the late 16th century and there's no reason to think this divided ownership heralded radical departure from management that reached further back in time.

Some pollen evidence suggests Shrawley oak goes back almost to Norman times, at least. Suzi Richer's pollen samples, taken on the southern edge of Shrawley Wood, can't be conclusive – they indicate what was growing both in the wood and the Poher family's adjacent medieval park and oak was always a favoured denizen of parkland - but Richer's interpretation of her evidence is persuasive. She emphasises not just the raw results but the consistent relationship between lime and oak. Yes, the parkland probably contained both oak and lime, but the relationship between the two would have been relatively static: the dynamic relationship implied by Richer is more suggestive of a woodland management regime not far removed from the kind described by Richard Vernon.[6]

More archive evidence favours oak in Shrawley Wood, at least in late medieval time. Between 1410 and 1530 there are ten records, with slight variation, of 'takk porc.'.[7] This refers to payments made by Shrawley tenants for the benefit of putting their pigs into Shrawley Wood.[8] Pigs can find a meal in many kinds of landscape and especially woodlands, but the usual reason for money changing hands is pigs being fattened on acorns. Pannage, as it's often described in Domesday Book and elsewhere. Acorns, of course, mean oaks and one of these 'takk porc.' references (13 Henry IV) says this is a customary practice – with the implication that the 15th century oak in Shrawley Wood was no recent innovation.

Oaks of any age tend to alternate good 'mast' years, when acorns proliferate, with a year or two of dearth and famine – from a porcine perspective. And oaks – like limes - are in no rush to reach sexual maturity – they're unlikely to produce many acorns until they're well on the way to being 'black' poles; full acorn production doesn't come until around 70 years of age and even then it's proportionate to size of the crown. Compared to other Midland woods, the sums of money paid for 'pannage' is paltry, consistent with a triple rotation to 'black pole' stage for Shrawley oak and little, if any, 'storing' to greater maturity.[9]

If coppice oak grown to 'black poles' has medieval or much older origins, it begs a question. Why is there no record of the manorial lord taking a profit from Shrawley oak? At the very least, there should be some trace in The National Archives for the period when Shrawley was in royal hands. Could it be the local syndicate that apparently paid a customary price to secure successive bindes were acquiring oak as well as the lime?

There are two more pieces of information that suggest this was the case. Mr Thomas Fulljames, solicitor to the Westminster Dean & Chapter who described the sequence of white and black poles in Tiddesley Wood, given above,[10] went on to talk about the legal consequences of this for his clients:

> *'It is to be observed that all these oak poles grow from the stool and not from the acorn, and are therefore not deemed timber; for if they were deemed Timber Sir John Sebright or the Lessee would have no right to cut them, but they would belong to the D & C of Westminster'*

This legal opinion is confirmed by his successor, London solicitors Smith and Watkins in 1872.[11] The villagers of Shrawley and Astley may have played a similar game. And the villagers of Astley, in particular, provide further clues that oak didn't always have the

1 Chard JSR (compiler). 1952. *Forestry Commission Census Report No 1. Census of Woodlands 1947-1949: Woodlands of five acres and over*. London: HMSO. p102 for lime in private coppice woods.
2 The National Archives (TNA) F22 includes all the 1947-1949 Survey results filed by county.
3 WAAS 705:550BA 4600/499 (ii) has some late Victorian account of this charity, including the Overseers determination to benefit only the poorest or less able children, but by this time the woodland had been cleared and the land leased as pasture,
4 TNA ZLIB 17/180. Reports of the Commissioners (Lord Brougham's Commission). Worcester. 1895. *Charities in England & Wales 1818-1837.* p398/9.
5 Many thanks to Francesca for tracking down this date!
6 Richter, Suzi. 2017. The Site that slipped through the 'Lime Decline' Net A Holocene History of Tilia at Shrawley Wood, Worcestershire, UK. In: *Quaternary Newsletter* Vol. 141 February. pp46/7.
7 WAAS. 989.9:91 BA 10509/2 / (ii) Prattinton Collection. 5HIV- 2s [p5]; 7HIV - 18d.[p6]; 12 HIV – 13p[p13]; 13 HIV- 11d[p7]; 10 HV – 18d[p7]; 3HVI – 16d[p7]; 17 HVI – 10d[p8]; 19 HVI – 16d[p9]; 22 HVI – 9d[p9]; 49 HVI 8d[p11]. The dates are in regnal years; numbers in square parenthesis are microfilm page numbers; payments are shillings and pence.
8 Mosley, Sir Oswald. 1832. *History of Castle, Priory and Town of Tutbury* p359 gives an account of 'tak silver' in Needwood Forest, meaning payment for pannage.
9 According to mainly German sources, pigs played an important part in the regeneration of oak woods from acorns. The thin pannage payments for Shrawley Wood might be suggestive of some oaks having grown from acorns at this time – or they might militate against this proposition! For a summary see Joachim Radkau (translated by Patrick Carniller). 2012. Wood: A History. Polity Press. pp66-8.
10 Wilson, Marshall (Dr). 1990. *Early Maps and Plans of Tiddesley Wood in Trans. Worcs*. Arch. Soc 3rd ser. . Transactions. Worcestershire Archaeological Society 3rd ser. Vol 12 1990 pp252-257.
11 *ibid.*

special status it enjoyed in recent centuries, particular if it grew from the stool. When the original 'Astley Wood' of Domesday was divided between a manorial Shrawley Wood and a smaller Astley Wood that became the property of manorial tenants, they also acquired complete and unfettered ownership of the oak.

Stores and Maidens

There's a gap in the paperwork for Shrawley Wood in the first half of the 18th century but resumption comes in 1760. This is a contract for the £1660 sale of 604 oak trees; a tad more than £2 15s per tree. Clearly, these are not black poles but economically mature timber trees that might be 125-150 years old. The majority would once have been 'black poles that first sprung from an older stool somewhere between 1610 and 1635. Some may have started life as acorns around the same time, having struck lucky; perhaps buried by the boot of a woodsman coppicing the lime underwood – but from what we think we know, most were 'stores'.

> *Thomas Vernon Esq to Messrs Moore & Drew. Counterpart Sale of Timber 1760 April 9*
> *This Indenture made 9/4/1760 between Thomas Vernon and John Moore of Reanald Dean (Gloucester) and John Drew of Ledbury, (Herefordshire) Timber Merchants. Sale price £1660 for 604 oak trees in Shrawley Wood, already numbered and marked. Access for timber merchants and their agents until 25 June 1762….'there to fall cut down stock and grub up the trees hereby sold and afterwards to hew saw square cord and coal the Timber and Cordwood arising from the said trees and to make sawpits for sawing the said timber and there to take turves earth and materials necessary for charcoaling the cordwood and with horses waggons carts and other carriages to have take and carry away the timber and bark arising from the said trees thro' and over the lands of the said Thomas Vernon in Shrawley aforesaid by the most convenient ways to the River Severn' (and to store any bark or timber until 29 Sept 1763) All timber, bark etc to be removed from Wood by 24 June 1762. Cordwood and charcoal to be removed by 29 Sept 1763. Minimum damage: sawpits to be filled in; all horses to be muzzled. Payment [in instalments]; 'Timber Boards, Cleft, Bark and Cordwood' can be seized in Wood or on Riverbank' if not paid on schedule*[1].

The saw pits and timber boards speak for themselves. With a busy river navigation at hand, sawn oak planks could go easily to bankside boat yards for building and repairs or they might go a bit further, on the flood tide up to Bristol, where they built larger ships for world-wide trade. There were other uses for sawn oak boards – genteel furniture and housing for example, but Baltic timber had long been a builder's favourite and tropical mahogany was about to become fashionable. In 1760, most structures that used oak did not utilise sawn oak timber – English carpenters were remarkably conservative in this matter. Black poles and adzes were still the general rule.

The 'cleft' covered a multitude of uses, all dependent on what Dr Jones called oak's 'fissibility'. He might have said oak splits easily. In the days before sawn boards, radial splitting was a means of obtaining boards for boat building but in the mid-18th century 'cleft' was destined for barrel staves, shingles, miner's baskets and laths. These last were a surprisingly common use for good quality oak timber. Making them involves endless (and tedious!) splitting of 'green' oak into thin strips that were the foundation for wall and ceiling plaster; slightly larger lathes were used to underpin roofing slates. The more expensive, meant to last almost forever, were called 'heart lath' as opposed to cheaper 'sap lath' from the soft and sappy outer trunk.

'Cordwood' covered everything else, apart from faggots and bark. This was oak brash (branch wood) cut to 4ft lengths and stacked onsite to season for a summer, in preparation for conversion to charcoal or, having lost weight, export as firewood.[2] Almost certainly, charcoal was paramount at the time. Presumably, this cordwood had already been stripped of bark and this may have meant 'thatching' the stacks to avoid waterlogging.[3]
By 1760, coal had largely displaced wood for domestic heating anywhere near a coalfield or navigable waterway, although faggots still had their uses for baking and some summertime cooking. Droitwich salt, that had once consumed a vast hinterland of coppice wood, was made entirely with coal.[4] Brewers had switched to coke and coal and industries such as glass and pottery had gravitated towards coalfields. There were complaints about smoke pollution, but nobody dreamt that this precipitous plunder of ancient sunshine would become the engine of climatic Armageddon.

Despite a wholesale movement towards fossil fuel, the iron industry was going through a curiously contorted phase. Coal was displacing oak charcoal for making cast iron and had made serious inroads into most aspects of the industry, but there was a paradox. Lower production costs promoted exponential growth in output, but there remained a significant manufacturing bottleneck that still required charcoal. This meant good prices for the parts of Shrawley oak trees that were not sawn into planks or cut for 'cleft' - including the ancient oak stools that were being grubbed up as part of the contract. This gordian knot was soon to be cut, but some niche iron industry products, from wire to mule nails, continued to use some charcoal almost into the 20th century and Shrawley oak long remained a provider.[5]

Oak bark for tanning leather and preserving ropes and canvas commanded good prices; there were strong markets in Bewdley, Worcester and beyond but there were potential penalties. To be of any value, bark had to be stripped when the sap was running,[6] whereas some buyers of high-grade oak had a preference for winter felling. For example, Royal Navy dockyards paid compensation of 7½% for boards sawn from oak felled during the dormant season.[7] And labour costs for oak bark were high – up to half the sale price and sometimes more.[8] Of course, we speak of high labour costs from a capitalist perspective. Readers of Thomas Hardy's 'Woodlanders' will remember the important part played by bark peeling in local forest economies. Shrawley Wood provided annual employment into the 1930's. Traditionally. the woodsmen who felled oak poles or full-grown timber trees would strip such bark as they could from the ground, as the tree was still standing; after felling, stripping would radiate out into the finest twigs of the crown, usually at the dextrous hand of village woman. Anecdotally, barking played an important part in funding new bonnets, children's shoes and trousseaus.

In addition to the 1760 counterpoint lease copied above, Francesca has found advertisements in London and Shropshire newspapers that brought Moore and Drew to this work. Annoyingly, the 604 oaks for sale are described not simply as oak trees, but 'maiden oaks'.[9] A maiden oak, in woodland parlance, is one grown from an acorn, in

1 WAAS 705:7 BA 7335/109 (iv) 4

2 As a unit of mensuration, the most common was 4 ft logs stacked to a height of 4 ft and a stack length of 8ft. (H. L. Edlin. 1958. England's Forests: A survey of the woodlands old and new in the English and Welsh counties. London: Faber and Faber. p278.
3 Smith, FM (Captain., RA) *Handbook of the Manufacture & Proof of Gunpowder*. 1870. p26-37: Charcoal, for everything students of cordwood thatching may wish to know – and more.
4 The Vernon archive at WAAS 705:7 BA 7335/2(iv)/38 contains a 4-page pamphlet outlining the economics of Droitwich salt production; only coal is specified.
5 See chapter Shrawley Wood 1764-1850' pp.194-5
6 Clarkson, LA, 1974. *The English Bark Trade, 1660-1839*. Agricultural History Review 22 p.145
7 ibid, p149
8 *ibid.* p150
9 *Public Ledger or The Daily Register of Commerce and Intelligence* (London, England), Monday, March 17, 1760; Issue 56 [reiterating] Worcester Journal March 13. Thanks to Francesca Llewellyn for this reference.

contrast to a tree that has been singled or 'stored' from a coppice stool. And if these really were 'maidens' in the generally understood sense of the term, most of the history put forward in this 'Hearts of Oak' chapter (pp. 65-75) would become redundant.

The next large disposal of Shrawley oak is in 1778, when 250 trees are put up for sale and once again 'maiden oaks' are specified.[1] Half a century later there's a flurry of annual auctions, starting in 1828 with a bevy of maidens:

> *TO BE SOLD BY AUCTION*
> *By Mr Court*
> *At the Vernon Arms Inn, Shrawley at three o'clock precisely on Monday the 5th of May in one Lot:*
> *50* ***MAIDEN*** *[author's emphasis] OAK TREES with their Bark and Lop, now growing in* ***Shrawley Wood****. The above Trees are of large lengthy dimension, and it is presumed their quality is too well known to need further comment here. They are numbered from 1 to 50 with White Paint; and the Woodman, Thos Cook of Shrawley, will show them on application. Shrawley Wood is situated on the Banks of the Severn, four miles below Stourport.*
> *N.B. It is intended to have an Annual Sale of Timber in this Wood*,[2]

Another forty maidens followed in 1829,[3] but in 1830 there were no maidens to be had and 30 trees are auctioned as 'Capital Oak'.[4] More maidens followed in 1831, 50 of them,[5] but there's a dearth in 1832 when once again the specification is 'Capital Oak.[6]. Either there was no auction in 1833 or it wasn't advertised. Then in 1834 the advertisement is simply for '35 oak trees'.

There's no mention of maidens thereafter. In the early 19th century there was extensive planting of oak in Shrawley Wood (see below under 'What Kind of Oak?' p. 72) and when these were harvested in the 20th century they might unambiguously have been called 'maidens', but nobody seems to have been bothered. What's going on?

The Oxford English Dictionary offers some slight ambiguity in the matter of arboricultural maidenhood. The compilers are emphatic that maidens cannot be mutilated – they expressly rule out coppices and pollards but they cite a learned 18th century book on tithe law suggesting the term might apply to any growth from the stool that exceeds the typical coppice cycle of 20 years.[7] The Shrawley oaks advertised for sale fulfilled this criteria many times over. Combine this with the erratic switching of nomenclature and the prerogatives, assumed by advertisers throughout the ages to shine a favourable light on the goods on offer, and the author is quietly confident that no great reappraisal is needed. But he had better draw attention to the matter before somebody else does.

As we'll see in the next section, 'What Kind of Oak', the seeds of change were sown early in the 19th century. Literally. A large-scale planting programme ensured a substantial supply of authentic and irrefutable maidens to be harvested many decades later – the last of them in the winter of 1966/7. Despite this huge influx, not all the many hundreds of mature oaks cut down in the twentieth century were grown from seed. No less an authority than 'The Times' pronounced that oaks cut in Shrawley Wood at the end of World War II had their origin in the 17th century;[8] in all likelihood they originated as stores. The same applies to some of the trees felled in 1966/7: George Peterken was able to ring-count some stumps and one, at least, was 250 years old.[9]

In the meantime, some semblance of former times continued well into Victorian time. Woodsman John Cook was paid for falling 'stubwood' in 1800 and in 1846 a Mr Edmund Clarke, while putting in a £6 an acre bid for 20 acres of lime underwood notes that: '*the Oak stores, double growing Ash and all the Birch Poles are Masked in the Fall for this Season in Shrawley Wood, so that there can be no mistake which is to be fell….*'[10]

There's a euphoric account of Shrawley oak in 1803; it was made at the behest of the 10th Marquis of Exeter who, after a lascivious love saga that modern tabloid editors can only dream about, had retained control of the Vernon estate during his lifetime, despite an acrimonious divorce.[11] His first wife, the former Emma Vernon, and her heirs, stood to inherit the estate eventually, but she had no control and derived no income while the Marquis lived. He had already sold off the entire contents of Hanbury Hall, neglected to maintain or repair the many farms that comprised the Vernon lands and finally he began to fell oak timber throughout the estate. This was the one form of exploitation specifically forbidden by the Parliamentary Act that set out the terms of his divorce and in 1803 Emma and her third husband, John Phillips, launched a Chancery suit to prevent further asset stripping. One response by the Marquis of Exeter was to commission a survey by Richard Harvey of Dunstal, Lichfield[12]. The Marquis's stewardship is presented as exemplary.

> *Shrawley Wood contains 317 acres – this is one of the finest woods in the county of Worcester or perhaps any adjoining county – The greatest care and attention has been had for its improvement – it contains a great deal of large and valuable oak timber of a proper growth for falling with a regular succession of fine oak trees and saplings down to the smallest size – There is also a regular quantity of fine underwood a proper proportion of which is cut down every year – There might be a valuable sale of oak timber taken from this and Shotgrove Wood leaving an ample supply for all the repairs upon the whole of the Worcestershire Estate and from the contiguity of this wood to the River Severn timber wanted for repairs upon the other parts of the estate would be conveyed to Droitwich and Worcester at an easy expense and might be had by the different tenants from thence by land carriage – The timber and underwood upon this detached part of the Hanbury Hall estate is of more value than is generally found upon estates of double the value of the whole estate… With respect to the oak fallen in the year 1803 not one tree that could possibly improve or be ornamental was marked and the appearance of the estate has been much improved by its being taken down. On examining the trees fallen the preceding Winter by far the greatest part appear to be decaying and not more than two trees were in positions considered to be ornamental and those two were surrounded by many beautiful young trees leaving the spot on which they grew just as handsome as before and those trees were at their full growth. Malice only could induce any person to find fault – Taking into consideration the whole of this valuable and extensive estate with respect to the present state of the buildings on which in the last twenty years a sum of not less than ten thousand pounds has been expended, considering also the timber in the park, demesne and farms at and near Hanbury on the east side of the Severn with those extremely valuable and well managed woods in the Manor of Shrawley no man could hesitate to say that this is one of the best conditioned estates in the County of Worcester and perhaps there are very few better in the Kingdom and does the*

1 Shrewsbury Chronicle, 28 February 1778.
2 Berrow's Worcester Journal, April 24 1828
3 Worcester Herald 7 February 1829
4 *ibid.* 3 April 1830. I'm grateful to Dr Peter King for referring me to the Worcester Herald.
5 Berrow's Worcester Journal April 14 1831
6 *ibid.* 3 May 1832
7 *Oxford English Dictionary* (Second Edition, 2001) Volume 9 citing Burn, Richard. *Ecclesiastical Law* London 1763 [concerning tithes] 'Maiden trees of beech proceeding from stools of above 20 years growth'.
8 See 'Heart of the Nation' below
9 See 'The Final Clearance' below
10 WAAS 705:7 BA 7335/108/ii/84
11 See 'Owning Shrawley Wood' for a tastefully expurgated account of this episode.
12 Harris, Andrew p122

highest credit to the present possessor whose interest in this estate is very precarious.[1]

Sensitive readers might detect some slight hint of hyperbole. Nonetheless, it's probable Harvey's assessment was based on more than the prospect of a fat fee. Some felling had taken place, and this contravened the Parliamentary Act, but if the transgression had been large, it would have been difficult to dispose of the spoil without publicity. The Wood Books are largely silent on the sale of oak timber from Shrawley Wood and most of what is now known about them has been gleaned from auction notices in Worcestershire newspapers; it's difficult to see how large amounts of timber might have been profitably disposed of in any other way. I'm inclined to give our Marquis the benefit of the doubt and suppose that Emma and her husband nipped large-scale felling in the bud with their impending legal challenge.

We don't know the outcome of the Chancery Court ruling because it was never given. The 10th Marquis of Exeter died on 1 May 1804 in London, and this bought litigation to an end. Emma Phillips née Vernon and her husband John moved into Hanbury Hall and within days there were stirrings in Shrawley Wood that led to radical changes in the oak population.

What kind of Oak?

When the author was an apprentice it was taught – at least in the arboricultural evening classes of Bethnal Green – that one of our two long-resident oaks is a foreign imposter. *Quercus robur* – pedunculate oak - wasn't indigenous to the British Isles but had arrived by human agency long ago; the only true native is sessile oak - *Quercus petraea*.[2] This idea was always controversial, and it has been well trounced by Oliver Rackham[3] among others,[4] but it did raise some intriguing questions.

For example, there's a clear bias in favour of sessile oak down the western side of the British Isles and this is particularly noticeable in the great woods that fuelled the first phases of the Industrial Revolution They all have in common oak grown primarily for charcoal. Oak woodlands around Loch Lomond,[5] the Lake District[6] and Severn Gorge woodlands,[7] Wyre Forest[8] and the Forest of Dean[9] are – or were – almost exclusively *petraea*. The Forest of Dean provides good evidence of a coppicing tradition going back to Roman time and it's reasonable to suppose Wyre Forest's Roman precursor played a part in Worcester's earliest iron industry.[10] Conversely, the eastern side of England – the part most open to continental influence – is largely the domain of pedunculate oak. There are exceptions – notably a cluster of sessile oak near the Thames Estuary in South East Essex, a 'ring' of woodland north of the Thames around London and four woodlands in Norfolk – two of them curiously located on Norwich's doorstep.[11] South of the Thames, Kent's great Blean Wood in Kent is notable. There's no obvious correlation between *petraea* and the Essex/Suffolk limewoods, although there is some slight correspondence in Norfolk.[12]

Rackham provides a credible explanation for these apparent anomalies. He says both oaks are native but particular characteristics engender adaption to different kinds of woodland. Pedunculate oak, with a larger acorn and an especially enlarged food-storing tap root that helps recovery from browse damage as a seedling, is best adapted to wood pasture. Sessile oak is 'more gregarious' and favours environments where grazing pressure is lower. Hence a preference for long-term coppice woodland. Sessile predominance in, say, Wyre Forest, can be explained, in large part at least, simply by a long tradition of coppicing.

Wyre Forest and the other 'early industrial' coppices mentioned above, were themselves subject to livestock browsing at one time but disciplined coppicing regimes provided constraints. In 17th century Wyre Forest, coppices were enclosed for 7 years after cutting before cattle were let in.[13] Previous to this, the enclosure period was probably shorter, perhaps as little as 3 years,[14] but this still wasn't the relentless grazing that Rackham had in mind for wood pasture. Historically, Shrawley was part of the *weogorena leage* that included Wyre Forest.

What are the oaks in Shrawley Wood? As ever, John Day provides a succinct and conclusive account of all things botanical:

> [In Shrawley Wood*] '…… both robur and petraea plus hybrids occur. Q. robur is the most frequent taxon over most of the wood. Q. petraea is most prevalent in the far east (seems to reach its maximum expression on the higher ground adjoining the eastern scarp - soils are different here & more acid, partly v. ancient river terrace); don't know of any study on specific distribution in the wood but it would be interesting to see. I expect the prevalence of petraea in the east reflects a natural distribution but whether or not the dominance of robur is natural is less clear cut….'*[15]

John Day's assessment is based on recent observation; it's confirmed by a visit made by George Peterken to Shrawley Wood in 1967, when there were considerably more oak trees to identify. They were lying on the ground at the time, awaiting extraction. The larger part of the Forestry Commission's new domain had been cleared of timber by Mrs Horton two years previously, but oak trees and any other timber growing in the areas set aside for lime coppice was left standing. The Forestry Commission felled these trees in the Winter 1966/7, regardless of the inevitable damage to long overstood lime

1 *ibid.* p123

2 A leading exponent of this idea was Professor ML Anderson eg Anderson ML 1950. The Selection of Tree Species. University of Edinburgh; Anderson, ML. 1954. The Ecological Status of Wistman's Wood, Devonshire. *Transactions. Botanical Society of Edinburgh*. 36 195-206; Anderson ML Distribution of the sessile oak in the New Forest, Hampshire. *Forestry* 24 79-113

3 Rackham O . 2003. Ancient Woodland… Castlepoint Press eg p300 'There is no need for ingenious schemes to explain away these occurrences: [eg relict populations and hybrids in obscure valley sites in Scottish Islands; Wistman's Wood on Dartmoor] *robur* extends further north than *petraea* in Scandinavia, Finland and Russia and it should withstand our extreme climate too. The two oaks have roughly the same geographic range, in Britain as in most of Europe, and there is no reason to doubt that both ended their present limits in prehistoric times.'

4 Hadfield M. 1974. The British Oak and its Legends. *The British Oak* 123-9 points out that most extant medieval carvings of oak are clearly *robur*.

5 Tittensor RM.1970. History of Loch Lomond oakwoods. *1. Ecological History. 2. Period of intensive management: 1700-1920*. Scottish Forestry 24(2) 100-118; Tittensor, Ruth M & Steele RC. 1971. *Plant Communities of the Loch Lomond Oakwoods*. Journal of Ecology 59(2) 561-582

6 Fell, Alfred. 1908 *The early iron industry of Furness and District. An historical and descriptive account from earliest times to the end of the 18thC, with an account of Furness Ironmasters in Scotland 1726-1800*. Hume Kitchen.

7 Wiggins WE. 1986 *Ancient woodland in the Telford area*. Telford Nature Conservation Project.

8 British Association for the Advancement of Science. 1950. *Birmingham and its Regional Setting. A Scientific Survey.* p.83. The contrast is made between Wyre Forest and the *Quercus robur* of Sutton Park. (now in Birmingham)

9 Riddelsdel, HJ, Hedley, GW & Price WR. 1948. *Flora of Gloucestershire*. Cotteswold Naturalists' Field Club, Cheltenham

10 See 'Tales of Two Rivers' p.82

11 Rackham, O. 2003. *Ancient Woodland…* Castlepoint Press. Map p287.

12 *ibid.* Comparison of Maps pp 238 and 287

13 Lea, Rev E E, Rector of Eastham. 1923 *Notes on the History of Wyre Forest.* Transactions Worcestershire Naturalists Club p76

14 The Statute of Woods, 35. Henry VIII, c 17, 1544 provided for a qualified seven year enclosure in all coppice woodland; it's precursor, the *Act of 22. Edward IV, c 5-7, 1483*, recited the enclosure of coppice in Royal Forests for a period of three years as accepted practice and extended the period to seven years, although this initially applied only to Royal Forests.

15 This is an edited version of John Day's account provided to the Lime Working Group; he goes on to describe the prevalence of Q. *robur* in Worcestershire east of Shrawley Wood.

coppice and apparently oblivious of any understanding as to oak's historical role. Peterken was able to ring count some of the stumps and he found examples of oaks almost two and a half centuries old. He also noted that oak along the scarp was *Q. petraea* whereas the large number of oak trees prostrated in the south-west were *Q. robur*.

In the 20th century, it's evident that *Q. robur* was the predominant oak in Shrawley Wood and Q. *petraea* was marginalised. A literal application of Rackham's formula would suggest that only a small part of Shrawley Wood had sustained coppiced oak for any length of time, while most had been as some form of wood pasture. However, there's strong circumstantial evidence to suggest that *petraea* is the true native of Shrawley Wood and *robur* is the interloper.
A feint whiff of this change comes with the first recorded fall of Shrawley Wood oak timber, in 1760. It's a big fall - 604 trees. They appear to be taken from many parts of the wood; there's no suggestion that felling is synchronised with cutting of lime underwood in any particular bind. The full text is given in 'Stores and Maidens' above; for present purposes a brief extract will suffice:

> [The contractors shall] *'fall cut down stock and grub up the trees hereby sold*'.

There's clearly no intention of more whiturnes, black poles or stores from these particular stools and stumps! Most would have failed anyway. The ubiquitous felling would have presented problems - many of the stools would be engulfed from the start in dense lime undergrowth. More importantly, the grubbed-up stools and stumps were too old. When a stool of 50-year-old 'black' poles is cleared, new growth will 'spring' with alacrity, all other things being equal. Fell a 120-year-old oak, no matter it grew on a stool that has produced successive crops of black poles over several centuries, and regrowth will be less vigorous. If we assume that much of the 1760 timber crop had once been identified by Richard Vernon as a 15s tree, then many would be more like 150 years old – at which age effective new growth from the stool is exceptional. Even in ideal light conditions.

The archives are silent about restocking after oak timber was felled in the 18th century. Could it be the woodsmen are relying upon natural regeneration from acorns?

There has been a long debate, over more than a century, about a decline in the ability of oak in woodland to grow from acorns. Blame has been cast on various scapegoats, including Victorian gamekeepers,[1] pigeons, grey squirrels and jays.[2] The decline is a woodland phenomenon; oak retains the ability to colonise suitable open ground as efficiently as ever.[3] American Oak Mildew, an accidental introduction to the British Isles in the late 19th century,[4] is the most likely candidate so far – it doesn't kill oak seedlings but makes photosynthesis less efficient and compounds the effect of shading. This handicap is real, but the overall impact on oak woods may have been exaggerated because Victorians – and many modern Elizabethans[5] – believed that dense oak forest covered old England coast to coast for thousands of years and it was a puzzle that regeneration was so poor. More recent received wisdom casts lime in the role of dense primeval woodland and continuous high-canopy oak woodland an innovation of the 18th century.

What has all this to do with Q. *robur* as an interloper in Shrawley Wood? It suggests *robur* is not an obvious candidate for regeneration from acorns after the large-scale felling of 1760. Research by Dr EW Jones suggests that Q *petraea* is more likely to succeed in shaded conditions, regardless of American Oak Mildew.[6]

If the trees cut down in 1760 were *petraea*, how did the switch to *robur* come about? The Marquis of Exeter's death in 1803 prompted the change and Emma Vernon's husband, John Phillips, made it happen.

John Phillips didn't waste any time. Days after the Marquis's death, he probably had the gates into Shrawley Wood broken open as the prelude to taking over.[7] And later in the year there are entries in the Wood Book never seen before, starting with:-

To Plantin Oke in the Wood T Jones	*12 Days*	*£0.18.0*
Phillip Jones	*14 Days*	*£1.1.0*
Thos. Jones Jnr.	*14 Days*	*£1.1.0*[8]

Thanks to Richard's fine-tooth combing through the extant Shrawley Wood books,[9] it's possible to track oak planting in Shrawley Wood over the next 13 years. After making some guesses where the Wood Book lumps oak planting with other tasks, this extended oak planting episode amounts to about 185 days of paid labour before it stopped, as abruptly as it started.

Where the 1804 tranche of oak came from isn't specified; perhaps they were bought in – as they had been in 1779 when the grounds around Hanbury Hall were replanted.[10] However, there's no record of payment to a commercial nursery where Shrawley Wood is concerned. Later on, there's a suggestion of oak being nursery grown inhouse. In 1811, John Layland was paid for two days planting acorns. This may have been sowing acorns directly into a recently cut lime coupe but it's the only incidence of sowing acorns; every other reference is to planting and transplanting. Perhaps John Layland was starting a tree nursery.

Again, in 1811 John is paid for two days 'planting young oke' in the Ash beds. The two ash beds in Shrawley, like several others in the parish, grew ash poles bought by wood-workers, coopers, etc.and they were grown intensively; oaks would seem to be out of place here unless they were seedlings being grown on for another couple of years before a final transplant.

Three further references in 1816 have John Preece, Edward Powick and Samuel Powick paid a total of 34½ days for '*replanting oak &c*' - perhaps trees that had been grown on elsewhere, possibly in the ash bed. The year before, in 1815, Thomas and William Jones were paid 15 days for '*planting and stakeing oke*' implying more mature plants that had been grown on elsewhere. All the other references are simply for planting 'oke &c'

Readers thinking that planting baby oaks must be a breeze should be assured that even two-year-old oak is a challenge. A long tap-root develops in the first year and this inevitably gets damaged; anybody who has tried digging up a dandelion will have the right idea.[11] The common nursery practise is – or was - to 'root prune' with a sharp spade in successive years before moving; this promotes a more fibrous and less vulnerable root system.[12] The oaks that were large

1 Watt, AS. 1919. *On the causes of failure of natural regeneration in British oakwoods*. Journal of Ecology 11 1-48. Watt argued that gamekeeper persecution of predators led to a proliferation of acorn-eating mice & voles.
2 The Conservators of Epping Forest long held an annual 'jay shoot' in the belief these were instrumental in supposedly poor oak regeneration. Jays are now generally regarded as very effective vectors of acorns!
3 A splendid example is Dalton's Clay Pit, Dudley – formerly in Worcestershire. This was abandoned in the 1950's and within a decade oak from the adjacent Saltwells Wood had muscled in. They're still there.
4 Jones, EW. 1959. *Biological Flora of the British Isles: Quercus* L. Journal of Ecology 32, 235-52
5 For example: Dudley Stamp, L. 1962. The Land of Britain. Its Use and Misuse. Longmans, Green (Third edition) pp 44, 167
6 Jones, EW. 1959. I. *Journal of Ecology*, 47 169-222
7 WAAS. 705:7 BA 7335/108(ii) 8
8 WAAS.705:7 BA 7335/108(ii) 8.
9 See 'Shrawley Wood 1764-1850' in this volume - Table 32. Richard's work acknowledges the importance of the work on the Wood Books by Francesca Llewellyn.
10 Harris, Andrew. *ibid.* p99
11 Jones EW. 1959. Biological Flora of the British Isles. Quercus L. Journal of Ecology. 47, 169-222. pp 201/2 for a more scientific appraisal of oak tap roots. He reckons 20-40 cm in the first year.
12 Learning the hard way by author when young. London County Council Avery Hill Tree Nursery c1963-5.

enough to need staking would have required successive treatments before they were moved.

The final planting programme was presumably synchronised with cutting of the lime underwood in each bind. Woodsmen would have the advantage of planting into clean ground with all the more pernicious weed and bramble having been suppressed by a dark cloak of *Tilia cordata*. Getting the young oak off to a head start before that dark cloak enveloped once again couldn't be taken for granted and this is presumably why they had been previously 'grown on' in the ash bed.

There's little doubt the oaks planted in Shrawley Wood at this time, whether acorns or five-year-olds, were pedunculate oak, *Q. robur*. During the late 18th and 19th centuries sessile oak, *Q. petraea*, acquired the status of a woodland pariah, particularly among exponents of estate forestry.[1] From 1790 onwards discrimination grew into a frenzy of silvicultural apartheid[2] – new planting was exclusively Q. *robur* and there were significant attempts to displace Q. *petraea* throughout entire woodlands.[3] Shrawley Wood can be seen as an example. On a much larger scale, strenuous efforts were made to expunge Q. *petraea* from its' largest traditional stronghold, The Forest of Dean, and replant with Q. *robur*.[4]

John Phillips seems to have been thoroughly up to date with the fads and fashions of contemporary forestry – and began replanting Shrawley Wood as soon as he was able. It's reasonable to speculate that the small areas of *Q. petraea* identified by John Day and George Peterken were the relicts of a much older and far more extensive community. This would, of course, sit well with the notion that coppiced oak and lime in Shrawley Wood have a long history together.

Heart of the Nation

The swansong for Shrawley oak began on the night of the 10th May 1941, when high explosives and a deluge of incendiary bombs marked the last night of the London Blitz and the partial destruction of the House of Commons debating chamber. Rebuilding after the war was a priority and the hunt was on for the very best oak to provide our elected members with the dignity and comfort we would all wish for them. After fifty years of declining interest in broadleaf forestry and the forestal plunder of two World Wars, a challenge had been set, but enough top-quality oak was found in Shrawley Wood to meet a significant part of the need.

Success was celebrated in The Manchester Guardian[5] and an article in The Times described in detail the kiln drying and quarter sawing of this heritage oak. Alas, they were silent on the subjects of selection, felling and extraction.[6] The oaks that were felled have never been replaced. Decades later, when another prestigious national building project cried out for oak, it was imported from America.[7]

The Times[8]

Oak for the House of Commons: Artificial Seasoning

To provide sufficient seasoned English oak of a quality to conform with Sir Giles Gilbert Scott's plans for a new interior of the House of Commons was a problem which at one time caused some concern. Trees that can yield the high-grade logs of great size needed for this work are found only in a few parts of the country, and the oaks are now being selected from estates in Shropshire, Herefordshire, Worcestershire and Staffordshire. Today a party of journalists were able to trace the course of the timber from the standing tree to the wood delivered to the woodworkers. ***Much of the timber going into the new House of Commons has come from the Shrawley estate in Worcestershire****, [author's emphasis] where an oak from a belt of trees valued at £1 each in a census taken in 1733*[9] *was felled and transported to the sawmills.*

It has been the custom to insist that English oak for interior decorative work should be dried naturally - "a year to an inch of thickness". Timber experts, however, maintained that air-dried oak was unsuitable for an air-conditioned building such as the new House of Commons. After the matter had been investigated by the Ministry of Works and the Forest Products Research Laboratory, approval was given for Messrs Ashworth & Co, of Manchester, to undertake all the work from selecting the trees to supplying the processed timber to the woodworkers.

Finest Figuring

On arrival at Messrs. Ashworth's sawmills at Newport, Salop, the logs are first cross cut to the required lengths, only the bole of the tree up to the first branches being suitable. The next process is to quarter the logs longitudinally, a method not usually employed commercially but necessary if the finest figuring is to be brought out. The logs are then sawn into boards and planks, the cut being made so far as possible along a radius from the centre of the tree by a band saw travelling at 9,000 ft a minute. The boards and planks are trimmed to remove the sapwood, which is easily damaged by insects. They are then moved to the sorting sheds and inspected piece by piece for allotment to sections of the work before being removed to the piling ground. In covered marshalling yards the timber is stacked with exact uniformity of spacing on bogies ready for transfer to the conditioning chambers. In these chambers the temperature, air circulation and humidity are controlled to ensure the most suitable rate of drying, and the seasoning process is reduced from a matter of years to weeks. Those who have long admired the beauty of English oak are encouraged by its use in such an undertaking in the new House of Commons, though difficulties of supply would soon arise if Britain's depleted woodlands had to supply large quantities of such timber.

Counting the Trees

The wood books for Shrawley don't cover all the time from Richard Vernon's Survey in 1700 until the last known felling of standard oak trees in 1948. Most insights into sales of oak timber trees come from newspaper advertisements – and these are unlikely to be

1 P. Miller, editor of the Gardener's Dictionary led the charge against sessile oak. {The Gardiner's Dictionary, 8th edition, London 1768}

2 T. Nichols castigated the planting of *Q. petraea* in the New Forest and poured scorn on the taxon generally. {Nichols, T. 1791. Observations on the propagation and management of Oak Trees in General. Southampton.}

3 Gardiner AS. 1974. A history of the taxonomy and distribution of the native oak species. In Morris, MG & Perring FH (eds) The British Oak : Its History and Natural History pp13-26

4 Riddelsdel;, HJ, Hedley, GW & Price WR. 1948. Flora of Gloucestershire. Cotteswold Naturalists' Field Club, Cheltenham.

5 Manchester Guardian February 4 1948

6 In 1945 the Forestry Commission granted a Felling License for 726 oak {Shrawley Wood Sept 1945 Tree and Log Measurement Book, courtesy of Mrs Jeavons-Fellows}. These trees, or a proportion of them, were, presumably, destined for the House of Commons'

7 i.e. The British Library.

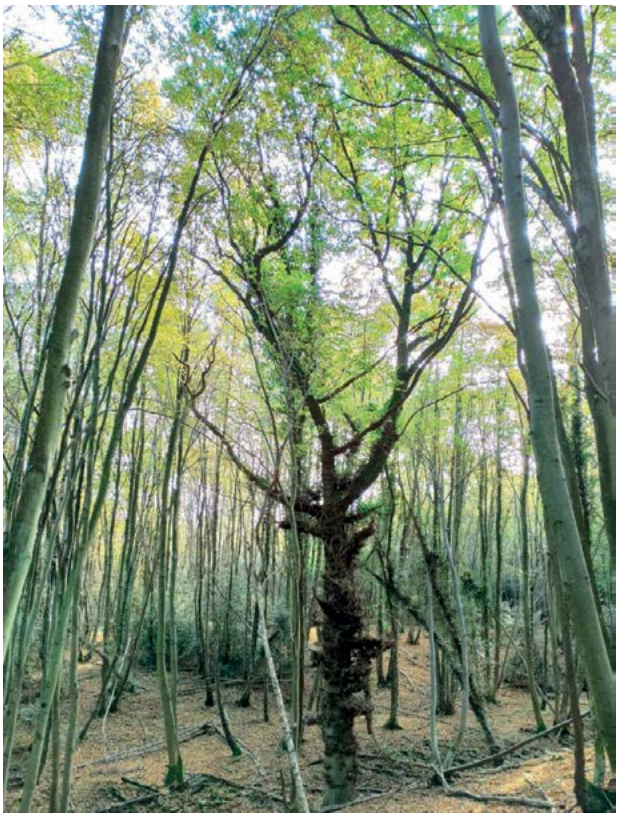
8 The Times. 1948. Friday April 2 p2

9 There's no specific mention of a 1733 valuation in the Vernon archive. The closest known is an undated survey made by Andrew Yarranton junior, thought hitherto to have been made in the first decade of the 18th century. This undated status may have led to conflation with a comprehensive map of the Vernon Estate published in that year - WAAS 705:7 BA 7335/154/1 A Book of Maps Containing all the Estates Belonging to Bowater Vernon Esq. In Worcestershire, Warwickshire and Shropshire ... Drawn by John Dougharty of Worcester Surveyor Survey'd and map'd by John Dougharty Jur : Worcester in 1731. 1732. Map 16 'A Map of an Estate in Shraley belonging to Bowater Vernon Esq Mappt and Measur'd by Jos Dougharty of Worcestr Surveyor; Map the First.

Map 17 A Map of Shraley Wood with the Land and Cottages joyning to it. Mappt and Measur'd by Jos Dougharty of Worcestr Surveyor; Map the Second.

comprehensive. It isn't possible to give any overall figure for oak production; what we know about it is listed in the Appendix: Oak Loss and Replanting (pp. 246-8).
In addition, there's a valuation of Shrawley Wood and the timber growing therein. This was made in 1912, anticipating a government Land Tax. No matter how approximate the timber valuation, it's an interesting contrast with the lime coppice and the land it's growing on.[1]

Shrawley Wood comprises 392 acres
Market value of the land, divested of any structures and things growing on it, £1375
Timber valued at £12,540



03. Runt oak left behind as worthless after the clearance.

The Final Clearance
At the risk of trespassing in Hugh Milner's domain, there are a couple more things to say about Shrawley oak, particularly in light of a wonderful report that has recently come to hand; it was made by George Peterken after a visit to Shrawley Wood on March 7 1967. He sent a copy of this from the London headquarters of the Nature Conservancy to their Midland Regional Officer at Attingham Park in Shropshire. At the time of his visit, the Forestry Commission had completed their purchase of the larger part and had begun a programme of planting Douglas Fir. They had not yet, apparently, poisoned the recently cut lime stools. The previous owner of Shrawley Wood, by then known as Mrs Horton, retained 110 acres and her agreement with the Forestry Commission gave her license to clear any timber from the part she had sold them, up until 1965.

Peterken includes in comments made by RC Steele of the Nature Conservancy's Woodland Department in 1965. At this time, felling and extraction on Mrs Horton's behalf was still going on and it's clear that most of the Forestry Commission's new property was being stripped of timber – only the three areas designated as Sites of Special Scientific Interest were spared.

The public part of todays' Shrawley Wood could have been endowed with significant stands of oak and birch, with the former ranging up to 300 years old. Could have been. Alas, when Peterken was visiting in 1967 the largest of the three retained lime blocks was being cleared of timber by the Forestry Commission – a fair sprinkling of birch, but most of it oak, ancient and modern. Although the lime coppice suffered some damage in the process, it wasn't cut - and hence there was no significant oak or birch regeneration. Peterken did a ring count on some stump samples and ranged to 250 years. Something similar must have happened in the other retained areas of lime.

What makes this systematic destruction of Shrawley oak particularly bizarre is Peterken's revelation of why the Nature Conservancy designated parts of Shrawley Wood as a Site of Special Scientific Interest in the first place. This was instigated in 1952 on the recommendation of a Nature Conservancy field officer, VM Conway. She doesn't ignore the small leaved lime but the primary reason for designation is clear. "*This was an extensive area of oak woodland valued particularly for its fungi". "The boundary was chosen to cover most of the area visited for fungi and a good sample of the summit woodlands*".

A Mysterious Postscript
One dark night in the spring of 2018, two friends of the Lime Working Group were out with torches looking for slugs in Shrawley Wood. As you do. They thought these might be implicated in the very brief lives of almost all *Tilia cordata* seedlings that have germinated in recent years. None of the supposedly villainous slugs were found, but there were plenty of lime seedlings. And after a while, something else – in among the limes were drifts of high plastic tubes that cast an ethereal green glow in torchlight as we moved about. Surely, they hadn't been there earlier, in daylight? The more melodramatic among us let imagination run riot.

Where did they come from? Assuming faraway planets are out of the question, it's likely these metre-high green tubular tree shelters were put in by contractors working for the Forestry Commission. Why? That's more difficult to say. At first, we thought they might be the precursor of a wonderful project to put more oak back into Shrawley Wood, but they all turned out to be hornbeams. Perhaps they were meant to be oaks but became hornbeams due to some, well, shall we say, administrative error? We may never know and must be consoled with the thought that they were well meant.

Hornbeams were never known in Shrawley Wood or anywhere nearby. There are very faint hints of hornbeam and lime association elsewhere in England,[2] but such woods are better known in Continental Europe. Chantilly Forest in France even has a legend to explain how a mixture of lime and hornbeam came about.[3] Shrawley's association with hornbeam is not yet legendary, but it was certainly brief. One June morning in 2020 the author paid a visit to see how they were getting on. And there they were. Gone. All one hundred and fifteen, planted in four drifts spread over a couple of acres. Gone, with not a trace left behind.

Excepting, perhaps, for a salutary reminder. That Shrawley Wood was never just about lime. And if there is any prospect of restoring Shrawley Wood to some semblance of former glory, oak should be back on the agenda. This might include some sessile oak - *Quercus petraea*.

1 TNA. *Board of Inland Revenue: Valuation Office Records: The Finance (1909-1910)* Act: Field Books: Worcester IR 58/93540 - Hillhampton Assessment Nos. 201-291. No 249

2 A small part of the lime woodland described in Newton, Alan. 1971. Flora of Cheshire. Chester: Cheshire Community Council. p87 has a hornbeam component (author's observation). This is undoubtedly planted. A more significant example is Chalkney Wood, Essex, although the larger part of this coppiced hornbeam is established separately from the lime stools.
3 Reed, JL. 1954. Forests of France. Faber & Faber 1954 p118 Supposedly, hornbeam planted in among oak was eaten by rabbits, forcing the introduction of lime, which was not. The lime ran rampant, displacing large areas of hornbeam. How so unlike our own dear *Tilia cordata*!

People in the Wood

Apart from a larger work force, there must have been a fair number of people passing through Shrawley Wood in former time, when the Shrawley river crossing was important enough to have a castle and there were two routes through the wood to get there. It's all hard to imagine now, although deep gullies worn in the cliffs on both sides of the river provide some help.

Who was passing through? Welsh cattle drovers, perhaps, driving herds on the long journey to London? Droitwich salt traders taking their wares westward? Merchants, monks, soldiers, tinkers and tally men? We don't know and can only assume that when the castle fell into decay, most of those who had once used the crossing migrated upstream to Redstone or downstream to Holt.



01. The steps cut into the sandstone behind the Weir Inn, November 2016.[1]

Boats still passed across the weir at Shrawley and their numbers increased as the river became the lifeline for industries along the Severn Valley and the emergent Black Country. The riverbank must have been busy with bow-haulers pulling trows upstream. Coming back again was more erratic. When the current was right, scores of trows would move together, making the journey from Shropshire to Gloucester in a single bout that meant sweeping through Shrawley Weir by day or night.[2] At other times, water shortages could hold up deep-laden boats for weeks and even months; navigation became problematic and there would have been a demand for manual labour, helping boats over the weir during parts of the year. Another strategy for coping with river shoals was 'lightening'- taking off part of a boat's cargo and transferring it to another or man-handling it around the obstacle; once again, casual labour was needed.

No doubt bow-haulers, trowmen and local helpers would have drunk at the Wyre Inn on the edge of Shrawley Wood. There were a few cottages there as well; according to one account this was once the main location for Shrawley village itself[3], although the site seems cramped and there's no obvious evidence remaining. Most of the Severn shoals had a pub alongside and it seems reasonable to suppose they all go back a long way, but references for The Wyre are few and speculation has to augment evidence. Two first-hand accounts are known, both come from the 19thC. Edwin Lees, the Victorian botanist, paints a nice sketch of wood and pub together:

Shrawley Wood is well known to Worcestershire botanists, and lives in my memory as the scene of many a pleasant excursion. I remember the curiosity that first incited me to visit the spot, as being the habitat of the elegant Lily of the Valley, when I journeyed here with a companion as enthusiastic as myself. Close by the river there was then a little low-roofed rustic inn, plain and simple, in accordance with the spot; a tall and large hawthorn stood in front of it, and behind the garden a flight of rude steps, carved in the sandstone, led into the wood. All was rural and sequestered, and below the public-house was a ford of the Severn, where the water broke over the stones with a resonance charming to the ear.[4]

There's a more austere description from the Vernon estate agent, Mr Bourne, advertising in the London Morning Post in 1845. This is just before a new pound lock downstream at Holt and dredging of the shoals upstream is making Shrawley's role in river navigation redundant:-

> *AN OLD-ESTABLISHED PUBLIC-HOUSE*
> *With Ferry for Foot passengers over the River Severn*
> *TO BE LET*
> *And entered upon at Michaelmas next*
> *AN OLD-ESTABLISHED PUBLIC-HOUSE, called SHRAWLEY WEAR, with two excellent GARDENS and PASTURE LAND about 1A 1R 0P adjoining the River Severn, with a FERRY for FOOT PASSENGERS over the said River. A good Tenant will meet with every encouragement and at a moderate rent.*
> *For Particulars apply to Mr Bourne Shrawley Court*[5]

In the 1920's came another account, from Shrawley's prize-winning historian, Mrs Masterman. Pub and weir have long since gone by the time she writes and it isn't entirely certain whether she's relying on personal memory or the recollection of village elders but she conjures a romantic image of timeless tradition. There was a bowling green here and Ombersley men from across the river were frequent visitors; if river levels were right they avoided the foot-ferry toll and waded back across the weir. A highlight of the Shrawley social calendar was the village wake held at the Wyre on the fifth of November. Mrs Masterman notes that the Worcestershire musician Julius Harrison collected music from two local dances here – '*Upper Severn*' and '*Lower Severn*' – and wove the melodies into his orchestral 'Severn Suite', which includes a Shrawley piece. Thanks to the miracles of Google, this can now be heard with a few manipulations of a mouse; think of music in the style of Vaughan Williams evoking balmy summer evenings in deep English countryside. Pub closure, according to Mrs Masterman, was a

1 Photo by Richard Pumphrey
2 Trinder, Barrie. 2005. *Barges and Bargemen. A social history of the Upper Severn Navigation 1660-1900* Phillimore p.29
3 Gwilliam, H W. 1982. *Severn Ferries and Fords in Worcestershire*. pp 4 – 6
4 Lees, Edwin. 1856. *Pictures of nature in the Silurian region around the Malvern Hills and Vale of Severn : including incidental excursions with the Malvern and Worcestershire Naturalists' Club and notices of the natural history... of many interesting localities in Worcestershire and Herefordshire*. Malvern : H. W. Lamb pp224-9
5 *The Morning Post* (London, England), Saturday, November 22, 1845; pg. 5; Issue 22456

consequence of "immoral activity" meaning, perhaps, it was too far removed from the Worcestershire Constabulary's supervision of closing times.

Bill Gwilliam says the wall of the old garden and the cave used as the pub cellar still survived around the time he was writing in the early 1980's.[1] There's no obvious trace now, although walkers can still use Edwin Lees' '*flight of rude steps, carved in the sandstone,* [that] *led into the wood*'.

If you discount the 14th century episode of civil engineering that possibly took place in Shrawley Wood, the oldest account we have of people mob-handed dates back to the English Civil War. According to Parliamentary newspaper reports, Shrawley Wood served as a sanctuary for their sympathisers at a time when Worcestershire was supposed to be a Royalist redoubt. Fifty men from one village alone were camped in Shrawley Wood, along with countless others – all ready and able to rise against the king if only they had timely support.[2] Wishful thinking, perhaps? Maybe the men in Shrawley Wood were simply avoiding conscription into anybody's army.[3] All that's reasonably certain is the dense lime binds of Shrawley Wood provided a good place to hide. According to Mrs Masterman, old musket balls were found in the wood, suggesting perhaps that some soldiers in the wood did more than simply hide. The name 'Oliver's Mound' might indicate, perhaps, a Parliamentary gun emplacement. Apart from the name, there's no good evidence, but control of an established river crossing – and passage along the river itself – would have engaged military minds on both sides when Worcester and its hinterland were embroiled in the final, decisive struggles of civil war.

Apart from woodsmen, no account of people visiting Shrawley Wood in the 18th century has come to hand. To fill this void, some slight cheating will allow the admission of Thomas Cooke, gamekeeper, first to the Earl of Exeter and then to John Phillips, when Emma regained possession of the Vernon estate. Confusingly, there were two Thomas Cook(e)s who both started work for the Vernons around 1776-8: our gamekeeper in Shrawley and the Vernon's steward, based in Hanbury (see 1764-1850, p 185). A Thomas Cook(e) paid the highway rates[4] and modus for Shrawley Wood, collected sales money[5] and organised the annual feast given for the benefit of estate tenants.[6] It is not always clear when this was the gamekeeper and when it was the steward. Our gamekeeper enjoys the distinction of a worn epitaph in Shrawley church-yard (see chapter 1764-1850, p 191):-

> *'He sleeps, no more at early morn*
> *To wake the woods with mellow horn,*
> *No more with willing dog and gun*
> *To rise before the sluggard sun.*
> *No more before the social can*
> *Tomorrow's sport with joy to plan.*
> *Death took his aim,*
> *Discharged his piece*
> *And bade his sporting season cease.'*[7]

Thomas Cooke died in 1814, but his son Thomas continued to live at the gamekeepers house until 1829. The Cooke's were a large extended family and their spraint marks can be found all over the Wyre Forest district through many centuries and several were called Thomas; the Thomas who woke the woods with mellow horn was succeeded by an eponymous son. The epitaph gives a strong hint that Shrawley Wood was used for organised shoots, with partridge and woodcock as the quarry at this time (see 1700-1763 appendix, p 170). In the second half of the 19th century pheasants were more fashionable.

Later in the 19th century sporting references come thick and fast as fox-hunting became a focus of social life among the Worcestershire gentry. When it came to drawing a fox, Shrawley Wood rarely disappointed. Here's an exception in 1896:-

The Worcestershire [Hounds]
Monday, at Areley Wood, Stourport. There was an average field. It was a cold day and a poor scent. Areley Wood and the Burnt Wood were drawn blank. Found at Ribbesford Wood, and he was soon away over the main side to Areley Wood, out the top side, but was unfortunately headed and came back again into the wood, then up the Dingle to Ribbesford, but scent failed and he had to be given up. Next tried the Bank, the Osiers, Astley Wood and ***Shrawley Wood*** *without finding. It is a long time since the large wood of Shrawley was blank. Then home, after a moderate day's hunting*.[8]

Shrawley Wood seems to have attracted foxes still more cunning and fleet of foot than the average:-

Worcestershire Hounds
January 16th ..... found a brace of foxes in ***Shrawley Wood****; one crossed the Severn; after running the other a long time in cover, he beat us. Finding again in Monk Wood we ran through Ockeridge Wood and Mowley Dingle by Holt Mill through Shot-grove, and into* ***Shrawley Wood****, a fast thirty minutes' burst, when as the cover had been so foiled in the morning, we had to give him up*.[9]

1 Gwilliam, H W. 1982. *Severn Ferries and Fords in Worcestershire*. pp 4 - 6

2 The quotations are: Walbancke, Matthew (publisher). 1645 April 24. *A diary, or, An exact journal faithfully communicating the most remarkable proceedings in both houses of Parliament.* British Library Thomason Tract E.281 (3): 24 April – 1 May (p3). 'We have had a Messenger from that part of our County that lyeth beyond Severne, to acquaint us that if speedy helpe appeare not, they must all forsake their houses, and if helpe would yet come, they would rise every man. There are 50 of one Parish that have betaken themselves to a Wood and standeth upon their Guard. If Speedy helpe come, a brave Countrie. If not a ruined one. Labour hard for a poore Country, and lose no time.' ALSO *Mercurius Veridicus*, *or, True Infomations, of Speciall and Remarkable Passages, from both Houses of Parliament; And severall Counties of the Kingdom* 1645 April 19 Saturday. British Library Thomason Tract E.279 (1) p16. 'By other Letters out of Worcester, it was thus advertised; That a great distraction continues in that County, and many Countrymen have forsook their own dwellings, and betook themselves into a Wood called Shraleyes Wood, which is near to the River of Severn, to hide themselves from the Kings forces'

3 For a presumption the men holed up in Shrawley Wood were deserters see: Atkin, Malcolm. 1995. *The Civil War in Worcestershire* Alan Sutton, Stroud, Gloucestershire p83; for an opinion that royalist support in Worcester has been inflated by historiography see Styles, Philip. 1978. *Studies in Seventeenth Century West Midlands History* The Roundwood Press for the Philip Styles Memorial Fund p257

4 Worcestershire Archives and Archaeology Service (WAAS) 705:7 BA 7335 Parcel 47/iii/8 1816 Jan 7 Received of John Phillips Esq by the payment of Thomas Cooke £10 16s for one years composition for the Highways of Shrawley for the present year. James Squire

5 WAAS 705:7 BA 7335 Parcel 47/iii/20 1781 Feb 2 Acc. With Henry Cecil Esq.
By cash – paid for falling Poles and sundry other matters in Shrawley Wood, as appears in forgoing Acc. £13 12s
By cash - paid the Poor and Services in the parish of Shrawley £17 16
By cash - paid sundry bills £24.6.11
By cash - paid to the Steward, Thomas Cook, in Nov & Jan last - £60
By cash paid to ditto to balance this account £3 17 4¾
This account examined, stated and allowed by me Thomas Cook, Steward [total £119 12 3¾]

6 WAAS 705:7 BA 7335 Parcel 47/iv/17 1780 May 10 David Rawlins for Court Dinner £ 8s paid by Thomas Cook. A Sirlion of beef weighing 16lb; leg of veal, 16 lb gammon of bacon, 2 couple of fowl, pudding, bread and butter.

7 Hodgkinson, W. P. 1948. The Kingdom is a Garden. E.U.P. p174. This tombstone is shown in chapter 1764-1850 p.191 fig. (21)

8 *Berrow's Worcester Journal*, Saturday, April 04, 1896; pg. 5; Issue 10563.

9 *Berrow's Worcester Journal*, Saturday, January 19, 1889; pg. [1]; Issue 10188

In fact, if the available records are typical, foxes using Shrawley Wood invariably had the last laugh. For Worcestershire foxes generally, however, the odds were slightly in favour of folk in scarlet jackets and their baying hounds:-

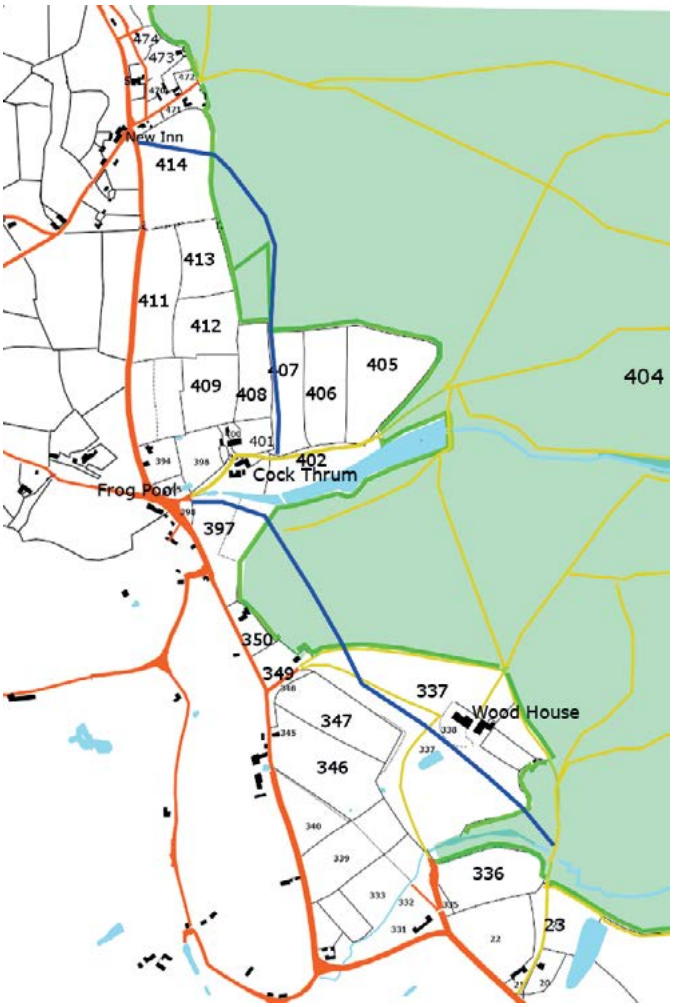
Worcestershire Hounds
These hounds had their last meet of the season on Friday at the Hundred House…… After drawing Abberley Hill and several other coverts in the neighbourhood blank, a fox was found in ***Shrawley Wood****; ran to Astley Osier Bed, turned back through Shrawley Wood, went away across Shrawley Court Farm, through Shot Grove, on by East Grove, and up by Hillhampton to Witley Park, where he was lost after an hour's run. The hounds have been out 96 times, having killed 24½ brace of foxes and ran 12 brace to ground. Great thanks are due to Mr Morrell and to his first whip, Tom Dawson, for the amount of sport they have shown this season, and that they may have health and strength to continue for many years to hunt the county is the sincere wish of every follower of the Worcestershire Hounds.*[1]

The larger part of Worcestershire's landscape was controlled by a small number of families in the 19th century either directly, as in the case of Shrawley Wood, or indirectly through tenanted farms and manorial lordship; in practise the Worcestershire Hounds could hunt almost everywhere in woods and open countryside. But open access didn't necessarily extend to more humble visitors. Despite rights of way through Shrawley Wood, there was a deliberate effort to restrict these to a minimum, as illustrated by the 1826 closure of two footpaths that touched upon the wood:

NOTICE is hereby given, that on the thirteenth day of February instant, an Order was signed by Sir Christopher Sidney Smith, Baronet, and Henry Bromley, Esquire, two of his Majesty's Justices of the Peace in and for the County of Worcester, for stopping up part of a certain useless and unnecessary Public Footway, in the Parish of Shrawley, in the said County of Worcester, commencing at a Style leading out of a certain Public Highway, in the said Parish of Shrawley, at or near to a Pool called Frog Pool, and lending towards the Parish Church of Shrawley aforesaid, extending through and over a piece of Meadow Land belonging to and in the occupation of Mr. Robert Wormington, from thence into and through part of a Wood, called ***Shrawley Wood****, belonging to Thomas Tayler Vernon, Esquire, and so on through and over two pieces of Meadow Land belonging to Elizabeth Vernon, Widow, and another part of the* ***said Wood****; being of the length of eight hundred and seventy-five yards, or thereabouts, and of the breadth of three feet or thereabouts.*(02)

And also for the stopping up of a certain other useless and unnecessary Public Footway, in the said Parish of Shrawley, commencing at a Style opposite to the New Inn Public House, in the said Parish, through and over a piece or Arable Land, belonging to and in the occupation of Mr. John Beach, and from thence through the said Wood, called ***Shrawley Wood****, and other Lands of the said Thomas Tayler Vernon, Esquire, to a Farm and Farm-House, called Cock Thrum Farm; of the length six hundred and twenty-eight yards, or thereabouts, and of the breadth of three feet, or thereabouts. And which said Order and Plans of the said Roads respectively, now lie at the Office of Mr. Vernon, Solicitor, Bromsgrove, for the inspection of all Persons interested.*

And Notice is hereby further given, that the said Order will be lodged with the Clerk of the Peace for the said County, at the General Quarter Sessions of the Peace, to be holden for the said County, on Tuesday, the fourth day of April next. And also that the said Order will, at the said Quarter Sessions, be confirmed and enrolled, unless upon an Appeal against the name to be then made, it be otherwise determined.[2]



02. Map derived from the Tithe map of 1839 showing the deduced course of the public footways (blue) closed in 1826. Tithe 404 is Shrawley Wood.

Towards the middle of the 19th century, it seems that casual access to Shrawley Wood was being tightened, possibly for the first time, leaving only the remaining rights of way. There's an undated note in George Vernon's hand that looks like the draft for a notice board or such similar.

'All persons found trespassing in Shrawley Wood or taking Dead wood out of the same ……. will be prosecuted as the law allows by order of the Lord of the Manor'[3]

Perhaps George Vernon had read Kenrick Watson's 'Statistical and General History of Worcestershire' published at around the same time by the Worcestershire Natural History Society. Talking of Shrawley Wood, Watson said:-

'*Most of the children are employed in picking sticks for firing in the wood, an occupation which perhaps is not very favourable to the formation of correct moral habits*.'[4]

Watson's '*Statistical and General History*' was the first and last foray by the county naturalists into the realms of strict Utilitarianism, but ideas favouring discipline and the moral hazards of indulging the labouring class lived on. Later, in the early 20th century and probably under the patronage of the Allan family who then occupied the Wood House, Shrawley Wood was opened for two weeks each summer for collection of *'Winter fue*l' by parishioners.

1 *Berrow's Worcester Journal*, Saturday, April 21, 1877; pg. 5; Issue 9575.
2 *Berrow's Worcester Journal* (Worcester, England), Thursday, March 09, 1826; pg. [1]; Issue 6427

3 WAAS 705:7 BA 7335 109/iii/23
4 Watson, Kenrick *Statistical and general history of Worcestershire*. Worcestershire Natural History Society n.d. p25

Axes, saws and wheelbarrows were banned.[1] It's a far cry from what we think we know about Shrawley Wood in the 16th century.

While Shrawley Wood became less accessible in one sense, the second half of the nineteenth century brought a golden age for organised visits by institutions of accredited respectability. Most arrived by boat from Worcester and all obtained formal permission. The first on record are the Worcestershire Naturalist Club. They're also far and away the most prolific, with reports of numerous visitations stretching well into the 20thC.:-

WORCESTERSHIRE NATURALISTS' CLUB.
The first meeting of the Worcestershire Naturalist' Field Club took place on Monday, in Shrawley Wood, by the kind permission of ***H. F.*** *Vernon,* ***Esq,*** *MP. The club left Worcester in the large pleasure barge towed by two powerful horses, and much enjoyed the scenery on the banks of the Severn. At Hampstall they were met by the Rev. Foley Vernon, who conducted them to the Wood, and kindly took them to every place of interest. Here the lily of the valley luxuriates in all its native wildness, but the club was too late to gather any flowers, and only two specimens were found. The ferns were grand, and several rare specimens were seen. The club regretted the wanton destruction of one very beautiful kind, the Polypodiam Dryspteris, which a short time ago grew plentiful in one part of the wood, but having been seen by some greedy excursionists, they had rooted the whole up, and carried it away root and branch. Only two specimens were seen which was carefully guarded by the Naturalists. Among the plants found were - Blecknum boreale (immense specimens), Aspidium dilatata and spinulosa, Polistichum aculeatum aud angulare, Veronica montana, Lysimoachia nemorum, Saponaria offinalis, Nupher lutea, Jasione montana, Aquilega vulgaris, Festuca calamaria, Cardamine impatiens, Pyrola minor, Sedum telephium. The club were so delighted with the ramble that* ***it w****as nearly five o'clock before they returned to Hampstall Inn, where an excellent dinner, provided by Mrs. Williams, awaited them, after which the Rev. E. Horton proposed the health of the "Queen and Royal Family," which was duly honoured, and the Rev. W. A. Hill, who was vice, in an excellent speech, proposed a vote of thanks to H. F. Vernon, Esq., MP., for his kindness, not only in giving permission, but also for having a person in readiness to accompany the party and in having boats cleared and put ready for any one who wished to go on the lake……"*[2]

Accompanying this report is a letter from Edward Lees regretting that he couldn't attend because he's in London – campaigning on behalf of River Severn conservation. Many Victorian naturalists were mainly concerned with enlarging their collections of dead plants and creatures, but not the stalwarts of the Worcestershire Naturalist Club**.**

Another repeat visitor was Worcester All Saints' Church, located close to the City's riverbank. Here's an account of their 1877 Summer Picnic in Shrawley Wood, specifically for members of the choir. The original article made much of local shopkeepers who provided champagne, sherry and lemonade; genteel ladies who presented prizes for the Adult Choristers Race and a subsequent evening meeting to polish off any remaining vitals – these have been edited.

'……..This year, the locale selected was ***Shrawley Wood****, the scene of many pleasant gatherings during the summer months. Permission having been kindly accorded to visit this spot by the proprietor, Mr H. F. Vernon of Hanbury Hall, arrangements for the excursion were made for Tuesday last. Accordingly at half-past nine on Tuesday morning the members of the choir, with their friends and a number of parishioners, in all about 120, embarked on board the steamer Perseverance, which had been chartered to convey them to their destination…… ……The weather, although rain had fallen in the morning and the sun obstinately refused to appear, was very favourable, and gave promise (which was unfortunately broken) of a fine day. On leaving the Quay, Moore's quadrille band, which had been engaged gave "The days' when we went gipsying" with capital effect, and soon the boat was travelling at a very respectable rate. The landscape spreading out on each side the stream was greatly admired. Some part singing by the choir and songs by Mr H Ranford also added to the enjoyment of the voyage. Arriving at the foot of the wood, which is charmingly situated upon an eminence overlooking the valley of the Severn, the party disembarked, preparatory to which Mr Haywood cautioned the excursionists to keep together in the wood or they might lose themselves in its intricacies, and return too late for dinner. As a warning he related that when, some years ago, a body of naturalists were exploring Shrawley Wood, four of them got separated from the others, and had not returned when dinner time arrived. But when that meal had been despatched these four naturalists arrived looking so pale and frightened that they excited universal commiseration, and strange to say, Mr. Haywood added, they had not since regained their natural colour……*
…….. Dinner over, the wood was explored, and great was the pleasure derived from the ramble, although the company of Mr. Haywood, which is much sought after and with good reason on these occasions, had to be dispensed with owing to his indisposition. Nevertheless, the natural beauties of the spot were admired, the dripping well and the hermit's cave were inspected, walks through shady and intricate paths were taken, wild flowers in profusion were culled; the large lake, lying so still and bearing numberless water lilies upon its surface, and the bulrush at its edge, contrasting with the grandeur of the majestic trees on the opposite bank, was visited, and the exclamations of many indicated how happily the time passed amid

these sylvan scenes
Where, the long drooping boughs between
Shadows dark and sunlight sheen
Alternate come and go[3]

But after admiring to their hearts' content, the majority of the party left the wood and adjourned to the meadow, in which the racing took place, and while some were occupied in cricket others indulged in dancing to the strains of the band. The remainder were still roaming in the wood, but all were compelled soon to seek the shelter of the boat, owing to a heavy shower…….. [on the return journey] *The vocal powers of the choristers were called into requisition, and songs were rendered by Messrs White, H Ranford, Hagon, Bray and Master Chetwyn, and the band also enlivened the journey. The bridge* [at Worcester, close to All Saint's Church] *was reached at about half-past nine, and after singing the National Anthem a general stampede was rendered necessary owing to the rain……..'*[4]

Other paragons of respectability who met with Vernon approval included:- St Clement's Church, Worcester; Worcestershire Law Students Society; Messrs Munt and Cosford's Assistants; St Clement's Parish Workers; Pump Street Wesleyan Choir; Wesleyan Mutual Improvement Class and Chapel Choir**;** Worcester Ladies College; Friends of Mr and Mrs Skyrme of the Bird-in-Hand Inn and Grand Stand: The Worcester Guardians; Dudley and Midland Geological Society; Worcester Debating Society; Worcester Musical Society; Young Women's Bible Class of the Sansome Walk

1 Walker, Robert Oswald. 1982. *The parish of Shrawley: to celebrate the ninth centenary of St Mary's church*. pp 17/18.
2 *Berrow's Worcester Journal*, Saturday, June 03, 1865; pg. 8; Issue 8492

3 Longfellow, Wadsworth Henry. 1831. *Voices of the Night.* John Owen, Cambridge (Mass.). Prelude: p.ix. The full verse is: 'Pleasant it was, when woods were green / And winds were soft and low, / To lie amid some sylvan scene, / Where, the long drooping boughs between**,** / Shadows dark and sunlight sheen. / Alternate come and go; / Or where the denser grove receives. / No sunlight from above, / But the dark foliage interweaves. / In one unbroken roof.'
4 *Berrow's Worcester Journal* (Worcester, England), Saturday, August 18, 1877; pg. 5; Issue 9592.

Schools; Juvenile Foresters (Friendly Society); St Nicholas' Church; Worcester Baptist Young Women's Guild & Bible Classes; Messrs Courtney and Co.[1] Other than the naturalists, visits of this kind appear to end around the time of the Boer War. Whether this signals a decline in Vernon and Allen family hospitality, new-fangled charabancs taking people further afield or simply more riveting material for local journalists to write about isn't clear.

When the Worcester Ladies College were cavorting in the woods, perhaps the most important visitors to Shrawley Wood were the Vernons themselves. The last George Vernon's parents lived at Hanbury and the Wood House was leased to the Allan family, but he had fond childhood memories of living through long school holidays in the Summer House that had been built in the heart of Shrawley Wood. This is probably where he became acquainted with his future wife, Doris Allan. Presumably his younger brother Hubert shared this woodland idyll; either of them or both might subsequently have named the Shrawley Wood hilltop where the Wellingtonia grow as 'Scion Kop' after their Boer War experience. Sir George Vernon, as the elder brother became, provides powerful testimony to his affection for Shrawley Wood in his choice of final resting place – just alongside the woodland summerhouse of his youth. It's impossible to quantify, but such family sentiment must have played a crucial role in their keeping the wood through difficult times and maintaining a relatively conservative management regime.

Leading on into the 20th century, the middle reaches of the River Severn attracted ever more visitors from Birmingham and the Black Country. Well within living memory folk from Dudley and Brierley Hill spent summer weekends a couple of miles downstream at Holt, experiencing the joys of paddling, candy floss and Banks's Mild *al fresco*. At Stourport, upstream, there's still an exceeding rare example of a permanent inland fairground that might have been specially built to excite the wrath of people writing elegies to the local landscape.[2] All along this part of the river, exiles from the Conurbation built holiday homes and parked caravans wherever landowners had the need to sell their acres in the days before fierce planning laws. Somehow or other, Shrawley Wood has managed to elude all this.

In fact, Shrawley Wood and the landscape around became something of an icon for authentic English countryside; the model of pastoral repose. Between two World Wars, prime minister Stanley Baldwin found refuge from the recriminations of office at his family home close to Shrawley Wood [3]. His best known speeches drew heavily on the timeless rhythms of an idyllic countryside, landscapes he claimed had shaped national character and still sustained true Britons throughout the empire.[4]

Poets and journalists have added their own accounts of folklore, tradition and romantic inspiration.[5] Here's a sample from Wilfrid Hodkinson's 'The Eloquent Silence', first published in 1946. The garden of his Tudor cottage ran onto Shrawley Wood.

And when May slides into June, and the apple blossom falls in drifts among the buttercups at the trees' foot; when the first flush of happiness has left the earth's face and been replaced with a hush of sweet content, all becomes quiet. The bird is on the nest, the flower has come to perfection, and the leaf is out. Then is a time of peace - a pause, as it were, in the pulse of the seasons.

The nuptial flights are over. Gone is the triumph and the novelty; gone the initial bursts of sweet madness. Only a great quiet is heard.

It is then, when the garden is heavy with the hot sunshine of noon, that I sit at ease in the "murmurous shade" to listen to the soft crooning of the turtle-doves or the far-off flute of the cuckoo.[6]

Later on, he waxes lyrical about Shrawley Wood itself, called here 'Ridding Wood'.

Ridding Woods are small enough to seem intimate, and yet not quite so small as to be insignificant. Imagine a few score acres of quietness, threaded by an aimless brook and bordered by the swift Severn, composed mainly of tall avenues of lime and having in it lakes of bluebells and drifts of anemones, and there you have Ridding Woods. Of course, I may be prejudiced; it may be that these woods have grown into my soul, so that I write with a bias in their favour. Nevertheless, I have never known a man enter my woods without coming away with a lighter step.

All woods have a mysterious air, but mine has a solemnity more inspiring, than the precincts of the most noble cathedral. Its pavements are renewed by the seasons, and its green shafts cannot help but increase in height and dignity also. For that is the magic of a wood; from season to season it presents the eye with ever-increasing magnificence; and yet over it all there broods a never-changing aloofness. I never tread the green aisles of Ridding Woods but I sense the nearness of eternity. The wild loneliness of a winter pine wood, when the leaves lie damp and sodden underfoot and where the wind whines in the branches, never fails to bring me into proper perspective with the infinite.

Yet a wood will tell no secrets except to the solitary traveller. Go there in company and you will come away empty; but go alone and you will bring back more peace than your heart can carry.

What a pity it is that civilisation forces men to live in avenues of bricks and mortar, and so close upon one another's heels that they are never free from the hot breath of their neighbours! As long as men remain afraid of solitude and contemplation, these things will be. And I shall walk in my woods alone, and without any danger of colliding with co-philosophers.

If you come to Ridding Woods in April, when the paths are embroidered with the gold of celandines, it would seem to you that snow had fallen; and in the distance you would see drifts of white among the trees and along the brookside. These are wild anemones - those frail children of the wind, whose coming is so shy and unassuming. Only a week before, their tentative green fingers were pushing up the dead leaves, but now they will have advanced over hill and valley, leaving a white radiance between the trees. Each windflower - the country name is best - is a miracle of daintiness with its green-veined petals centred upon a star of green leaves.[7]

Kidderminster journalist Isaac Wedley was enchanted by the countryside around Shrawley; this is the beginning of a visit to Shrawley Wood: –

On a recent morning I set out to explore these woods and revive memories of days long gone by, days when springtime and youth tinged everything with the halo which surrounds the days of life's morning when "merry goes the time when the heart is young." 'Leaving my faithful push-bike under a hedge in a back lane, I

1 Accessed via Internet 2014-15 from Berrow's Journal. All these records, together with almost all of the Newspaper citations used in this Chapter, are the product of diligent research by Francesca.

2 Kissack, Keith. 1982. *The River Severn* Terence Dalton, Lavenham. 'Below the bridge, [at Stourport] the canal basin and wharehouses have been effectively overwhelmed by a hideous, seemingly permanent, Fun Fare.' Conversely, this author's children thought it quite wonderful.

3 Accounts of Baldwin invariably project the archetypal English country squire; for a recent re-appraisal of him as the man who girded British loins for war see: Dobson, Jeremy. 2009. *Why do people hate me so? The strange interlude between the two Great Wars in the Britain of Stanley Baldwin.* Matador, Leicester pp268-297

4 Baldwin, Stanley. 1924. *What England means to me' speech to Royal Society of St George, Hotel Cecil, London May 6 1924. In* Baldwin, Stanley 1937. On England & other Addresses. London: Books for Libraries Press.

5 Apart from Wedley and Hodgkinson below, these include Hodgkinson, WP. 1948. *The Kingdom is a Garden.*

6 Hodgkinson, WP. 1946. *The Eloquent Silence* pp54-5

7 *ibid.* pp65-6

entered the wood at a point near to the New Inn beyond Glazenbridge. The spell of Shrawley came upon me at the first step, the spell of the miracle of waking nature, the spell of solitude. On either hand stood oaks, limes, chestnuts, firs and holly trees in abundance, at my feet primroses, anenomes, mosses and all the budding promise of spring in profusion……., but greater than all was the silence, the utter absence of anything of the busy world. I wondered on for some time, down first one grassy path, then another, with nothing to remind me of ought but Nature's busy silence. I seemed to be alone in Paradise.'[1]

In today's Shrawley Wood most noise comes from wind in the trees and occasional bird song. Sometimes there's the muffled pounding of an early morning jogger, chatter from dog-walkers and the hushed tones of migrant bird-watchers. Exceptionally, there can be harsh notes from a chain-saw or flail mower - but peaceful harmony with nature is the default setting. Several rights of way run through the wood and the Forestry Commission, owners of the largest part, are dedicated to public access but relative isolation and a lack of car parking helps to keep visitor numbers low.

There's one notable exception when, for a small fee, visitors can use the nearby 'New Inn' car park and the Forestry Commission girdles woodland paths with cautionary petitions extolling health and safety. Then a small army descends on Shrawley Wood; they come to marvel at magical carpets of smoking blue beneath fresh unfurling lime buds, at bluebell time. According to some, the display is still good but not as good as it used to be.

And that, more or less, brings 'Some history of Shrawley Wood' up to the present. Unless you count recent activity as history. Visitors during this time might occasionally have heard Robert's drone swooping over the tree tops, taking hundreds of aerial photos to compliment the thousands of measurements, plots and transects already made on the ground by Richard and a stalwart band of surveyors. They're building on a tradition that stretches back over almost two centuries, through such eminent figures as George Jordan, Edwin Lees and Carleton Rea, but there's now a change of emphasis.

For many centuries, Shrawley Wood has been managed for economic reasons but, by some miracle of grace, there's been accommodation for people looking for beauty, communion with nature, scientific enquiry and somewhere to hide. We seem to have lost the unconscious knack of combining utility with these finer things and need to work out new strategies for achieving holistic outcomes in the future. Scientific curiosity apart, that's what's going on. Finding out more so that future plans for Shrawley Wood might keep it as good as it has been. Naïve and hopeless optimism? Only time will tell.

1 Wedley, Isaac Leonard. 1928. *Twixt Severn and Teme: the Story of a delightful Country.* Kidderminster: Shuttle Press. p65 [Not copyrighted(?); no copy at British Library. Can be found in local libraries and at The Hive Local Studies Collection 942.44.]

Tales of Two Rivers

'There is a field near my home, more than a mile long, running through woods down to the river which I never visit without feeling I have stepped back to the days of Chaucer, and it would not surprise me to meet his pilgrims ambling along on their palfreys over the greensward.'

So said Stanley Baldwin, three times British Prime Minister between the World Wars, in a speech to the Worcester Conservative and Unionist Party. His home was at Astley Hall, less than a mile from Shrawley Wood and he's describing the path leading along the Dick Brook valley from Glasshampton Bridge to the River Severn. This is the thin rind of pasture that still divides Shrawley Wood from the remnants of Astley Wood.

Without doubt, the lower Dick Brook is a very pleasant walk but there's a gentle irony in Baldwin's celebration of timeless rural Idyll. Half the river was once canalized with locks and within little more than the mile described by Baldwin this modest watercourse once powered iron smelting furnaces, forges and mills. Archaeologists have been tempted to see the Dick Brook as a microcosm of the Industrial Revolution that began in the Severn Valley and came eventually to change the world.

The name of Andrew Yarranton has long been associated with the Dick Brook. He was a local man who became an eloquent advocate of the new industrial economy that was developing throughout the 17th century. And this association has tended, perhaps, to encourage conjecture about Dick Brook history that goes beyond the available evidence. What follows is an attempt to bring speculation up to date. Starting with the river the Dick Brook runs into.

And, yes, this is the same Andrew Yarranton who conspired to wreck the Shrawley Wood coppices in Child v Child. The other Andrew Yarranton, who organized the making and marketing of bast ropes in Shrawley and Astley Woods, was his son.

Sabrina, or, The River Severn

The long, straight ride that runs south east through Shrawley Wood finishes in a steep gully leading down to the Severn riverbank. This tranquil strip of meadow is wedged between ancient woodland and arcadian silver stream: it's easy to conjure images of timeless tranquillity. In fact, there was a pub – The Wyre - here until the middle of the nineteenth century and a cluster of houses; some have claimed that most of Shrawley village was here at one time.[1] Not far above, there's a hill known as Olivers Mound where local archaeologists have found evidence of a long-gone medieval castle that once commanded an ancient river crossing by The Wyre.

There's not much river traffic now. A summer's day might bring a few narrow boats down from the present head of navigation at Stourport. They probably came from the Black Country along the Staffordshire & Worcester canal and might be heading to the recently re-opened Droitwich Canal or further downstream to Diglis Basin at Worcester, portal for the Birmingham & Worcester Canal. A few more river miles to Tewkesbury and there's the prospect of a delightful trip up the Warwickshire Avon towards Shakespeare Country. Some brave souls head down the Severn tideway to Gloucester and perhaps the Sharpness Canal and the Severn Estuary, then find their way through the Avon Gorge to Bristol.

Within living memory things were different. War time exigencies preserved and enhanced the Severn's historical role as an artery of industry; up until the 1960's the river was busy with tankers moving petroleum products from Avonmouth refineries towards the West Midland industrial heartlands.[2] Now commercial traffic is dead. Huge navigation locks upstream at Lincomb and downstream at Holt give a hint of the way things were for a while, but they can't convey the still greater antiquity of river navigation. Long before they were built in the 1840s, the Severn was the second busiest river navigation in Europe[3] with a record of industrial use stretching back to Roman time.

Shrawley Wood's very own pub, The Wyre, disappeared not long after the locks were built. Some history of the River Severn will put this into perspective and help to explain why there are so many lime trees in Shrawley Wood.

Before the nineteenth century the River Severn was an open river. There were virtually no tolls to pay and, for much of the year, the Severn was navigable all the way from Welshpool in Montgomeryshire down to the Bristol Channel. Unlike most other English rivers, there were no sclerotic water mills and no millers eager to charge for a 'flash' of water to take boats across their private weirs. A Parliamentary Act of 1430 describes every part as:-

> *'common to all the king's liege-people to carry all manner of merchandise to and fro as well in trowes and boats as in floats or drags'.*[4]

Shrewsbury and Worcester tried to insist on payment for going under their bridges, supposedly as insurance against damage, and Worcester was accused of coercing boats onto their quay, forcing the sale of cargo at discounted prices.[5] But all this was small beer compared to the merchantile antics of cities on the Rhine, Meuse or Elbe. According to economic historian WHB Court[6], the Severn valley's relative freedom was a crucial factor in the world's first industrial revolution.

There were numerous weirs on the River Severn and many, if not most, served as fisheries. These probably originated as natural cataracts, modified to a greater or lesser extent. Improvements for the benefit of fishermen may have helped to back up the natural stream when water was scarce and hence been of help to boaters, despite contention over the centuries.[7] All had provision for boats to pass. In some cases there was a bypass 'gutter' and in others a gap. There are examples of fishermen compromising free navigation over the centuries, but nothing compared to the extortion endemic on many other rivers; for the most part fishermen took their profit in the form of fish.

There was a fish-weir across the river, just downstream of The Wyre pub, most of which appears to have been owned from the opposite

1 Gwilliam, H W *Severn Ferries and Fords in Worcestershire*. 1982. Pages 4 - 6

2 Underdown, P T The Navigation of the River Severn, 1750-1950 in WAS 9 1984 95-100. Annual post-war tonnage to Worcester was 500,000 tons; northwards to Stourport past Shrawley Wood 100,000 tons.

3 Nef, J U Rise of the British Coal Industry 1932, I, 97

4 Burton, John Richard (ed) Bibliography of Worcestershire. Part 1. Bibliography of Worcestershire Acts of Parliament. Worcestershire Historical Society 1898 pp3-4 citing Stat. 9 Hen. VI, cap 5

5 VCH Worcestershire 4 p304 citing VCH Worcs. Ii, 251 and Star Chamber Proceedings H VIII, iv, folio 182. Bewdley men complained in a c1504 Star Chamber proceeding, that they were compelled to *'cum out of the Kynge's hye streym with their merchandize and to pay the seyd summes of money and also to make sale of their merchaundize contrary to their myndes' because the citizens of Worcester set upon them with stones and arrows if they showed signs of passing the quay'*

6 Court W H B *The Rise of the Midland Industries 1600-1838* OUP 1938 p9

7 *Calendar of the Patent Rolls preserved in the Public Record Office: Edward I 1281-92.* 1893. For HMSO by Eyre & Spottiswoode p257. Henry de Ribbesford, justice of the King's Bench, was appointed in 1286 to make enquiry '*touching those who had narrowed and heightened the weirs on the Severn between Gloucester and Shrewsbury so that vessels could not pass through as they were wont, and to pull down the said weirs where necessary.*'

bank by the manor of Ombersley; it's probably the same weir specified in Domesday Book. The first known description isn't until 1512, when it's said to straddle three islands, with a 'weir house', presumably over the weir itself, and a 'fishers home', on the Ombersley bankside.[1] An earlier court record, in 1402, refers to a 'fishers home', together with twenty eight 'yardlands', let on a 28-year lease.[2] In 1422 the tenant of all these properties – fish-weir, weir house, a dwelling house and agricultural land, now identified as 'ffyshores', is Walter Werdman, who paid 6/8d a year for them all[3]. In 1468, Walter and his son John give up the fish-weir in favour of John Parker, on the same terms, excepting that the new tenant was charged with providing the prior of Evesham Abbey and his servants the first catch of salmon and lamprey each season - an obligation that may have been customary but hitherto left unsaid.[4]

John Parker may have been unlucky and suffered exceptional flood damage on successive years. Or perhaps he wasn't cut out to be a fish-weir keeper. Either way, in 1472 he defaulted on payment and in 1478 the fish-weir was let to Robert Grene who agreed to repair it with wood provided by the lord; the first term rent was reduced and the entry fine waived because the fish-weir was "ruinous".[5]

A small part of this same 'Ombersley' fish weir appears to have been owned on the west bank by Shrawley. At least, that's the inference of 'a fishery called Le Were……12d in the manorial court rolls in 1489-90.[6] There's an earlier reference to this in 1440-1, although this might imply that Shrawley had some minority stake in the weir predominantly owned by Ombersley.[7]

How did boats get across the weir? There's a late medieval record that Holt Fleet, downstream of Shrawley, was '*to be made by the whole lordship*'[8]. Holt Fleet was at the southern end of Ombersley lordship where another fish-weir may have been shared with the manor of Holt on the opposite bank. 'Fleet' hints at a bypass channel or 'gutter' and these were, apparently, typical of fish-weirs on the River Severn above Bewdley.[9] However, there's no evidence for this arrangement at Shrawley and a gap seems more likely.

When the River Severn was in full winter flood, navigation was impractical – and sometimes suicidal – but for long periods during summer there was insufficient water to float a laden boat. Better conditions for moving downstream are illustrated by an episode in 1786 when somewhere between 60 and 80 boats were held up at Severn Gorge, near modern Telford, waiting for water. When Welsh rainfall provided the necessary depth and impetus they all tumbled downstream, making the passage to Gloucester in 24 hours.[10] At this speed it's unlikely they stopped at The Wyre for a pint.

In some drought years there are records of up to 200 boats, ranging from 20 to 80 tons burden, marooned in Shropshire waiting for water.[11] Before Holt lock was built, water depth outside The Wyre pub could go down to 24 inches at times like these [12] and even when things were a little better boat cargoes might still be rendered down to 3 or 4 tons to make progress.[13] Nevertheless, the River Severn provided some of the lowest transport costs in the kingdom in an era before canals; figures of a penny per ton-mile downstream and one-and-a-half pence upstream were probably typical.[14]

According to shipping agent George Perry there were 376 substantial boats on the river between Shrewsbury and Gloucester in the mid-18th century, ranging from coal-carrying wherries to trows with a gross laden weight that ranged from 40-80 tons.[15] Trows had evolved over long centuries to accommodate the many quirks and vicissitudes of River Severn navigation. All were flat bottomed to minimise draft and allow beaching on mud and gravel banks either at low tide or when water was low; all had massive rudders to make the best of any slight steerage offered when running downstream with a fast current or being towed laboriously upstream; all carried sail on high masts to use such wind as maybe, while being easy to lower down flat when going under the bridges at Worcester and Shrewsbury. They were beamy, around 16-20 feet, enabling them to carry sail without keel or leeboards when running empty. Smaller trows tended towards the middle, non-tidal reaches of the Severn between Worcester and Shrewsbury while larger trows could handle more confidently the vagaries of estuarine navigation and might even run further afield along coasts. Whatever the size, all river craft were constrained in their cargo capacity by depth of water but a good trow was reckoned to make the best of whatever there was – the benchmark was one ton of cargo for every inch of water they draw.[16]

When the going was good, navigation downstream on the River Severn was fast and relatively easy. Consider this diary entry by a Captain Wm Owen, travelling from Llanidloes in North Wales to London. He set out on March 26 1750; on the 29th he boarded a wherry at Shrewsbury and then

> "*breakfasted at Atcham, dined at Bridgnorth, drunk tea at Bewdley and at 9 at night arrived at Worcester……. The next day I spent in the City of Worcester and hired a good horse …… to carry me to Oxford……..*"[17]

Coming back upstream was another matter. With luck, sail might help but there was no substitute for hauling. Up until the late 18th century this grunt work was done exclusively by human bow-haulers pulling from either riverbank; on the River Severn they usually

1 Guyatt, David A Study of the Field Names and Landscape of Ombersley ND p82 citing HWCM 22882 Medieval fishery, River Severn near Lythe Farm. Parishes: Ombersley and Shrawley. NGR SO 813 660
2 ibid p82
3 ibid p82 citing HWCM 22882 'Medieval fishery, River Severn near Lythe Farm, Parishes: Ombersley and Shrawley NGR SO 813 660'
4 Scardellato, Gabriele Pietro *Ombersley* British Columbia PhD Thesis 1983 p191 [there is some discrepancy between pagination of copy at Worcestershire Archives and Archaeology Service and original; latter used here, as checked against archivist's note on backs of pages and version now available online]
5 *ibid.* p191
6 WAAS 989.9:91 BA 10509/2/ii [Microfilm] Prattinton Collection 8 Henry IV.
7 Guyatt, David Gazetter of Fishery Sites from The Fisheries of the Worcestershire Severn (with notes on the fords and ferries. Worcestershire Archaeology Service Report. 1996. {Local Studies Collection. 936.244}
8 WAAS 705:56 BA 3972 8 (iv) Book entitled "Extract of all (the) points of the customs of Ombersley from 3 Richard I (1191/2) to 19 James I" p67 'Holt Fleet to be made by the whole lordship….'
9 Pannett D J Fish weirs of the River Severn with particular reference to Shropshire in Aston, Michael *Medieval Fish, Fisheries and Fishponds in England* BAR British Series 182 484p 1988 pp371-389
10 Trinder, Barrie *Barges and Bargemen. A social history of the Upper Severn Navigation 1660-1900* Phillimore 2005 p29
11 Richardson L *The River Severn between Upper Arley & Gloucester* 1964 pp13/14
12 Staffordshire Record Office D3186/8/5/2 *Longitudinal section of River Severn from near lower Parting below Gloucester to Gladder Brook above Stourport in cos Gloucester and Worcestershire.* c.1837
13 Gwilliam, H W Severn Ferries and Fords in Worcestershire, 1982 pp 4-6 Edward Bradley, 20 years a trowman, talks of Cloth House Ford, close to the Lincombe lock that made it redundant. 'We could only load 3 to 4 tons at low water. The average draught was only 21 inches [the worst on this part of the river]. At the Admiralty Inquiry of 1847 in the Severn navigation, Edward Bradley, (lock keeper at Diglis and 20 years a trowman), gave evidence that the Cloth-house Ford was the worst obstruction in that part of the river: 'We could only load 3 to 4 tons at low water. The average draught was only 21 inches.'
14 Johnson, B L C *New Light on the Iron Industry of the Forest of Dean* in Transactions of the Bristol and Gloucestershire Archaeological Society 1953 p135 [in fn 1] Johnson compares transport costs on Wye (3d per ton mile) with the River Severn's 1d per ton mile. I've added 50% for upstream costs in accordance with
15 Green, Colin *Severn Traders*. Black Dwarf Publications.1999 Appendix 3 pp168/9 citing The Gentleman
16 Davies, A Stanley. *The river trade and craft of Montgomeryshire and its borders* In The Montgomeryshire Collections 44 (1935) 51/2
17 The Montgomeryshire Collections XVI p239

operated in teams of six to eight. Boats coming upstream tended to be more lightly laden than those coming down and it wasn't so bad as some other Severn Valley tributaries. The River Wye upstream to Hereford, for example, often engaged a dozen men and more, and still they struggled.[1] Whatever the river, it was notoriously hard and thirsty work and bow haulers expected regular refreshment – hence the close association between pubs and weirs. The Wyre pub's principal trade is unlikely to have been folk using the foot ferry. Bow haulers drew attention from moralising clergymen, who denounced the work as bestial and degrading.

> *'How are they bathed in sweat and rain. Fastened to their line as horses to their traces, wherein do they differ from the laborious brutes? Not in an erect posture of the body, for in the intenseness of their toil, they bend forward, their head is foremost, and their hand upon the ground. If there is any difference it consists in this; horses are indulged with a collar to save their breasts; and these; as if theirs were not worth saving draw without one, the beasts tug in patient silence and mutual harmony; but the men with loud contention and horrible imprecations."*[2]

The laborious brutes themselves apparently saw things differently. When their independence and prosperity was threatened in the 1780's by a Parliamentary Act to promote horse towing they petitioned against this and successfully denied horse operators the monopoly they had hoped for. However, after a new horse-towing path was built, landowners were quick to challenge the common law right claimed by bow haulers to use either bank of the river as they thought fit - and to remove any trees that hindered their ropes.

Successful prosecution by landowners forced bow haulers to use the new horse tow paths[3] and, while they enjoyed this concession without charge, the new towpath was on the Ombersley side of the river, ignoring The Wyre pub.[4] Despite horse-towing, bow-haulers remained a feature of the River Severn well into the 19th century and when Parliamentary Reform finally became a reality in 1832 many of them imagined that earlier legislation enabling horses had been revoked; troops had to be called out to suppress the subsequent mayhem, cacophony and riot.[5]

Half a century later, after endless discussion and dispute, four new Parliamentary locks between Worcester and Stourport raised water levels, tamed and flattened a famously boisterous current during most of the year, put tolls on a legal footing for the first time in the river's history and imposed canal-bank discipline on a once anarchic and sometimes flower-strewn riverside. (See Appendix Remote Clients pp. 242-5) Worcestershire's eminent Victorian botanist Edward Lees remembered the transformation:

> *No sandy shallows now appear, and no pebbly fords, beautiful to contemplate or wade through in summer; and the tresses of the Water-Crowfoot (*Ranunculus fluitans*), once so characteristic, and silvering the stream with their glittering flowers in June, have shrunk from view since the deepening of the waters.*[6]

Wooden parts of the old weirs were dismantled, and explosives cleared obstinate rock and stonework. There's now no trace of Shrawley weir. The Wyre pub lingered on just long enough for Edwin Lees and his naturalist friends to slake their thirst on early visits to Shrawley Wood, but there was no reason for boats to stop here. The foot ferry across to Ombersley faded into history and the pub soon followed. There's no obvious trace of The Wyre today. Other weir pubs, such as the Hampstall at Astley Burf, the Lenchford downstream and a couple more at Holt have lasted longer. My favourite is The Camp, just below Bevere lock and three miles or so north of Worcester. A haunt of holiday makers from Dudley and a splendid place for a pint of Bathams and winding the clock back a couple of centuries.

Apart from The Wyre, Shrawley Wood used to have another intimate link with the old river. Bow-hauling on a wide and sometimes serpentine waterway required long ropes – possibly as long as 220 yards according to one source.[7] And long ropes – they were called 'great ropes' - were a Shrawley Wood speciality going back to the 15th century and possibly long before. They were made in the wood using bast fibre, derived from coppiced lime poles. Back in the day, this was a cottage industry involving people who lived around Shrawley Wood, Astley Wood to the north and some Ombersley woods on the far side of the river. All were part of a wider north Worcestershire 'lime zone' that stretched further inland but it's in these riverside woods that significant areas of lime survived for longest and where there's specific mention of bast ropes. Further and better particulars of this can be found in 'Limewoods'.

Other early navigations have the benefit of bankside lime coppices. The River Weaver in Cheshire, for example, has a long association with the salt trade stretching back into pre-history - and relicts of handy bankside lime coppice still survive.[8] The River Don is similarly endowed and two parts of the River Trent.[9] The Roman Car Dyke, long thought of as a navigation, has adjacent once-coppiced limewoods and so did another Roman canal, the Foss Dyke. One of the busiest medieval rivers of all, linking Lincoln to the sea at Boston, has a long tradition of coppice lime nearby and old memories of rope making. All and any of these examples may be no more than coincidence but, given the otherwise spasmodic distribution of small-leaved lime in England, this slender association is worth considering.

Documentary evidence for making 'great ropes' in Shrawley Wood ends around 1710. The earliest record is the 15th century but there's no suggestion then of novelty or innovation. Rope making in Shrawley Wood might be much older, perhaps as old as commercial navigation on the river.

Back in the 1990's there was learned dispute in the Journal of Historical Geography as to the use of British rivers for commercial

1 Berkeley, Mrs 1932 *The Ferries of Worcestershire* in Trans. Worcs Arch Soc for 1931 pp74-88. 'Camp Inn vitalled bow haulers with two penneth of bread and cheese, and an once and a half of tobacco and cheap beer or cider at 5 pints per shilling'.

2 Fletcher, John (1729-1785) The Works of the Reverend John Fletcher: Late Vicar of Madeley Volume 3 (Publishers: Waugh B & Mason T for the Methodist Episcopal Church) 269 New York 1835 vol 3 p269

3 Trinder, Barrie *Barges and Bargemen. A social history of the Upper Severn Navigation 1660-1900* Phillimore 2005 p20 citing Shrewsbury Chronicle 27 Sept 1811; 18 Oct 1811 'In September 1811 a waterman confessed that he had cut down a tree on the land of the Revd Henry Burton of Atcham, on the opposite side of the Severn from the towpath 'where the barge line formerly went.' Watermen were advised to use only the towpath and not the land on the opposite sides of the river where they had previously enjoyed customary towing rights.

4 Shrewsbury Chronicle 27 Sept 1811; 18 Oct 1811 cited in Trinder, Barrie *Barges and Bargemen. A social history of the Upper Severn Navigation 1660-1900* Phillimore 2005

5 Trinder, Barrie *Barges and Bargemen. A social history of the Upper Severn Navigation 1660-1900* Phillimore 2005. p68

6 Lees, Edwin (1800-1887) *Pictures of nature in the silurian region around the Malvern Hills and Vale of Severn : including incidental excursions with the Malvern and Worcestershire Naturalists' Club and notices of the natural history... of many interesting localities in Worcestershire and Herefordshire*. Malvern : H. W. Lamb, 1856 p218. See Lees's footnote 1, where he explains he refers to notebooks written as a younger man.

7 Wilson, David Gordon *The Making of the Middle Thames* Spur Books 1977 145 'The heavy towline [on the Thames] was at least 220 yards in length and weighed 6 to 7 hundredweight. As it cost about £10 and only lasted for about 3 voyages it was an expensive item.'

8 Newton, Alan *Flora of Cheshire*. Chester: Cheshire Community Council 1971 p87 'Tilia cordata Mill. Small leaved lime Rare. Apparently indigenous in old woodland in the Lower Weaver valley.' See also map p229. [Author observed large and long overstood coppice stools on steep riverside bank]

9 Birrell, Jean *Forest economy - Honor of Tutbury* in University of Birmingham Historical Jnl viii no 2 p132; Bass Wood on the outskirts of Gainsborough on the tidal Trent.

navigation in medieval times. James Edwards and Paul Hindle had ransacked every medieval document they could find, gathering any references to boats on rivers and concluding that an extensive network of navigable rivers played an important role in the medieval economy. The River Severn was part of this and their map depicted boats going upstream to Shrewsbury and a little beyond.[1]

These claims were soon dampened by an Oxford academic, John Langdon. He reckoned their rattle bag of references, covering a couple of centuries, fell far short of proving a widespread and stable transport system. They had cast their net too wide. Langdon's strategy was focussed exclusively on the 14th century and one paramount source – the demands made on the countryside to supply food and drink for the great provincial gatherings of a peripatetic parliament. County sheriffs were responsible for moving these victuals to where they were needed and, according to their purveyance records, they only made great use of the River Severn upstream to Tewkesbury, with just a thin trickle of supplies going further up the river to Worcester.

Langdon conceded that the river north of Worcester was in something of a record-free zone for purveyance accounts, but he was still inclined to dismiss any great importance for the River Severn. No doubt it served local needs, but it discharged into the sea on the wrong side of the British Isles to play any wider role in the nation's transport.[2] In any case, as he concluded in a later paper, it serviced a watershed that was economically backward compared to the east of England.

Despite Langdon's scholarly denunciation of long-distance medieval navigation on the River Severn, there's significant evidence to the contrary. This was summarised by Welsh historian Stanley Davies in 1934.[3] He starts with 9th century incursions into the Severn Valley near Welshpool by the Viking army and, while he admits there's no direct evidence they came by boat, it would be remarkable if they did not. He then offers solid evidence for royal mines in the Stiperstones near Shrewsbury supplying lead for buildings in Gloucester and elsewhere in the south of England that must have used river transport - and church bells from foundries in Gloucester for which the river was the only realistic means of transport. Any of these examples might conceivably be dismissed as exceptional rather than regular trade but for the 13thC he finds endless examples of materials such as iron, Spanish leather and tin regularly paying toll at Montford Bridge in Shrewsbury. Most telling of all are the charges made against boats carrying wood and timber moving downstream through Shrewsbury for damage supposedly caused to the bridge structure.

Equally compelling is the evidence for rivalry between Bewdley and Worcester merchants. For example, in 1308, Worcester captured a Bewdley boat laden with 'brushwood' and 'other goods' bound for Bristol.[4] The regular transport of low-value 'brushwood' over long distances, presumably faggots for domestic or industrial heating, illustrates the efficacy of River Severn transport.

There's no doubting either that the River Severn played a burgeoning transport role in later centuries. Far from being in an 'economically backward' area, the River Severn became the spinal cord linking key elements of the world's first industrial revolution. The story of Abraham Darby at Ironbridge on the River Severn is well known, but it's often forgotten that he was the product of an earlier iron industry that grew up on the south Staffordshire and north Worcestershire coalfields – an area later summarised as The Black Country.

In the 17th and early 18th century, the Foley Partnership, arguably the world's first industrial conglomerate, used acumen, judicious capital, new technology and the River Severn to make the most of expensive coppice wood at a time when primary smelting from ore was only practical using charcoal, while much of the subsequent processing could be eked out by coal and coke. They smelted Forest of Dean ore to pig iron with charcoal, then moved it up the Severn to Bewdley and cross country to Pensnett Chase and the Stour Valley where coal and water power could be applied for the complex business of conversion to rod iron before being farmed out to thousands of agriculturally self-sufficient Pensnett Chase cottage nail workers. Nails and other finished wrought iron products then made a return journey back down the Severn for export. Thanks to capitalist alchemy and low transport costs on the River Severn, they still beat Flemish rivals on price and quality in world markets. River navigation was the crucial link and, for a while, lime bast and human muscle were the supplements to wind and current that moved the boats.

This 17thC explosion of industrial activity provides a template for some understanding of Roman use of the River Severn. For centuries, it has long been known that extensive drifts of slag found near the riverside at Worcester are a legacy of charcoal iron smelting in the Roman era. A pragmatic City council put this slag to good use as road metalling and for bolstering bridge piers. The 17th century entrepreneur and close friend of Shrawley Wood, Andrew Yarranton, went one step further. Using the latest 'blast furnace' technology he smelted Roman slag a second time to extract much of the iron that had eluded an earlier bloomery process. He did this at a site just outside Shrawley Wood, after transporting the 'Roman cinders' up the River Severn from Worcester.

In recent years, archaeologists have confirmed more large deposits of this Roman bloomery slag on both sides of the river at Worcester. There was evidently an important iron industry in and near the Roman town and yet there aren't any obvious local sources of iron ore. There were nearby woodlands, both north and south of Worcester but there was also a large Roman salt industry at nearby Droitwich and this must have made prodigious demands on North Worcestershire woodlands. It is unlikely that local sources of wood and charcoal were especially cheap.

Recent analysis of the Worcester slag suggests that some of the raw material used was high-grade ore brought up from the Forest of Dean. Archaeologists have speculated that this was mixed with lower grades of iron ore, possibly brought down from what became the Forest of Wyre.[5] And the charcoal that can make up to seventy per cent of the overall cost of smelting iron ore to pig iron. That's the beauty of ironworks by the bank of a long navigable river: it can come from almost anywhere along a 130 mile corridor. And once upon a time – this probably means in the earlier medieval period and before – many of the River Severn tributaries that became cluttered and obstructed with water mills would have been navigable for part of the year. Such rivers as the Salwarpe[6], Teme[7], Stour and

1 Edwards, James Frederick & Hindle, Brian Paul *The transportation system of medieval England & Wales* in Journal of Historical Geography Volume 17 no 2 April 1991 123-134. See p130 for map and p129 for assertion of many shipments downstream from Shrewsbury, wool in particular.
2 Langdon, John *Inland Transport in the medieval Period* in Journal of Historical Geography Volume 19, Issue 1, January 1993, pp7/8
3 Davies, A Stanley *The river trade of Montgomeryshire and its borders* In The Montgomeryshire Collections 43 33-46 (1934)
4 *Calendar of Patent Rolls, Edward II: Volume 1, 1307-1313*, 1894, For HMSO by Eyre & Spottiswoode, p87
5 Allen J R L *Chemical compositional patterns in Romano-British bloomery slags from the wetlands of the Severn estuary* in Historical Metallurgy 22:2 1988 p84 citing T H Whitehead and R W Pocock, *Dudley and Bridgnorth, Memoirs of the Geological Survey of Great Britain*, 1974 especially figs. 8, 10; G H Mitchell, R W Pocock and J H Taylor, *Geology of the Country around Droitwich, Abberley and Kidderminster*, *ibid.* 1961
6 Green, Colin *Severn Traders*. Black Dwarf Publications. 1999 p32 'Crown granted right of toll to Bailiffs of Droitwich'
7 Ann Cole. Hythes, Small Ports, and other landing places in later Medieval England in Blair, John (ed) *Waterways and canal building in medieval England* OUP 2007. Cole speculates on the significance for navigation of the place name 'eton' found on the upper reaches of rivers Wyre, Teme & Severn and others – see p79 Fig 18 and p81.

Warwickshire Avon[1] all betray hints of boating in the days before water power trumped transport as the prime utilitarian feature of most English rivers. In short, the hinterland for exploiting resources such as wood and charcoal may have been still more extensive during the period of Roman industrialisation.

Further down the River Severn, beyond modern Gloucester, were more riverside Roman iron smelting bloomeries and a journey up the River Wye gave access to the largest Roman iron smelting area of all – the Forest of Dean. Here, the Roman slag possibly ran to millions of tons – modern estimates are difficult because re-working of Roman bloomery slag using later blast furnace technology was big business over several centuries. This is where Andrew Yarranton learned the value of 'Roman cinders'[2]. Part of the reason the Foley partnership focussed their 17th century smelting on Dean was this cornucopia from the past.

Some credible authors have taken the importance of river navigation back far beyond the Roman era, suggesting our Neolithic ancestors used coastal transport, rivers and the watersheds between rivers to move serious loads, such as the Stonehenge bluestones from their home in Pembrokeshire.[3] And they suggest navigable rivers played a key role in shaping the way tribal territory and kingdoms evolved.[4] The bluestones-by-water idea was rejected recently by a learned archaeologist who rather thought moving two-ton loads 200 miles overland without roads would be less challenging than floating a boat.[5] Doubtless the debate will run on, but from a Shrawley Wood perspective perhaps the outcome isn't all that important. If they weren't towing boats on the Severn before the Romans showed them how, they would certainly have been fishing. And a favourite material for fishing tackle in ancient time was lime bast.

Shrawley Wood and Crockery

An early morning walker through the back streets of Worcester, between the Cathedral and Diglis Basin, maybe fifteen years ago, might have encountered one or two large container lorries delivering plain white crockery to what many people still thought of as a fully-fledged manufactory. They would be witnessing the last dying gasps of Royal Worcester, whereby imported porcelain was painted and glazed at Worcester in an effort to sustain a world-famous English brand.[6] The business finally went bankrupt in 2008.[7] Nowadays, it's still possible to buy a Royal Worcester dinner set in John Lewis but brand ownership resides in Stoke on Trent[8] and the china itself is made entirely in – well, China. After more than two centuries of production, a former industrial complex in the heart of Worcester is being transformed into houses and flats. Curiously enough, until steam power came along, the Dick Brook that divides Shrawley Wood from Astley Wood played a crucial role in this crockery business.

In the 18th century, expanding global trade bought ship loads of attractive and durable Chinese porcelain to Europe, where a growing middle class had money, taste and inclination to buy new consumer products. Success encouraged imitation and Dresden porcelain began to rival the oriental original. In England, first in London and then Bristol, attempts were made to produce high-grade porcelain by exploiting a geological formation from the Cornish coast known as Soaprock. Eventually, this business moved to Worcester, where it prospered.[9]

The successful formula for what became Royal Worcester involved mixing Devon Ball Clay from Barnstaple, finely ground Cornish Soaprock and special sand from the Isle of Wight into a paste that could then be moulded, fired, decorated and glazed.[10] For the first forty years of making porcelain in Worcester, the mixing was done at what many have supposed to be Yarranton's forge site on the Dick Brook.

Exploitation of Dick Brook water power goes back to medieval times, but the first firm record occurs in 1665, when the site comprised three separate water wheels, all used for grinding corn into flour. This doesn't of itself rule out any use by Andrew Yarranton and his partners during their tenure at Astley Furnace during the period 1652-1660 but given what we now know about his forge at Shelsley, it's highly improbable.

Flour making involves a reasonably straight forward gearing from waterwheel to millstone but with a more complex camshaft mechanism, rotary power can be converted into the reciprocating movement necessary for tasks such as fulling, paper making or operating a forge's trip hammer. Three waterwheels offered considerable flexibility that could enable different processes to be integrated onto the same site. For example, the 'scythe mill' mentioned below needed reciprocating power for a tilt hammer and rotary power for finishing and sharpening. There was also the possibility of different industries sharing the site, as apparently happened in for a while.

In 1728 there's a reminder the normally placid Dick Brook, like its' Nutnell tributary, can erupt into raging turmoil and a hint of changing industrial priority. This from The Daily Post:

> *"On Saturday Night last two Corn-Mills, a Paper-Mill and a House were swept down Astley Brook [another name for the Dick Brook] into the River"* This was caused *"by means of a sudden Inundation, occasioned by a most violent Thunder-storm and Bursting of the Clouds, from which the Water descended as if it had been poured out of Hogsheads about Astley"*

By 1729, repair and refurbishment apparently entailed a change to Fulling Mills; this involved the degreasing and felting of woven cloth by pummelling in troughs of water containing fuller's earth, urine and various soapy plant extracts. Six years later, the emphasis has changed to paper making, a part of which involved pummelling old linen rags to separate and macerate the fibres; possibly the machinery involved wasn't so different from fulling. This is the advertisement in the 1735 Weekly Worcester Journal:

> *"To be Lett for Twenty-one Years or a longer Term A Very good Paper-Mill containing one Engine and Ten Hammers, with a welling-House and some Meadow Ground, situate on a Brook never wanting Water Sufficient for the Mill, being in the Parish of Astley, within a Quarter of a Mile of the River Severn ……. Enquiries of Nehemiah Jeavens Grocer in Bewdley."* [11]

1 Hunt, Carolyn. *Pershore Bridge* in Transactions of the Worcestershire Archaeological Society Third series. 14 1994 185-192 especially diagram 189/90.

2 Brown Peter J *The Military Career of Andrew Yarranton* in Transactions of the Worcestershire Archaeological Society Third series 13 1992 pp193-202. p193

3 Sherratt, A. 1996. *Why Wessex? The Avon Route and River Transport in later British Prehistory* in Oxford Journal of Archaeology 15, 211-234.

4 Sherratt, A. 1996. Linking Wessex with the three rivers Avon in British Archaeology 6, 6

5 Parker Pearson, M et al *Craig Rhos-y-felin: a Welsh bluestone megalith quarry for Stonehenge in Antiquity* 348 Dec 2015 pp1331-1352.

6 The walker in one instance was the author, while boat dry docked at Diglis. Information from lorry driver.

7 *Daily Telegraph* 6 November 2008

8 The 'Royal Worcester' brand is now owned by Portmeirion Group. They didn't buy the manufacturing facility in Worcester, although they did repatriate some manufacture of Spode porcelain to Stoke on Trent from the Far East when they bought the rights to this brand at the same time. Wikipedia accessed 2018 July 15.

9 Sandon, Henry. 1969. *Worcester Porcelain 1751-1793.* Herbert Jenkins; 1974 (Barrie & Jenkins). The author was Curator of the Dyson Perrins Museum and the Worcester Royal Porcelain Company Ltd.

10 Sandon, H. 1974. The Worcester Royal Porcelain Company. In: *Worcester and its Region. Field Studies in the former County of Worcestershire*. The Worcester Branch of the Geographical Association. p.21

11 *The Weekly Worcester Journal* 23-30 January 1735

Twenty five years later our Dick Brook site is a scythe mill[1] and a slightly later Indenture dated 25 March 1761 gives some details:-

> *"to all those mills heretofore used as Walkmills or Fulling mills and now converted into a Scyth Mill under one roof situate lying and being upon Glasshampton Brook [the earlier name for Dick Brook] in the parish of Astley……"*

It seems likely the "Scyth Mill" was less than a roaring success because by 1763 the mill was being used by the Worcester Porcelain Factory.[2] In 1772, the entire business was sold at auction, for complex reasons that can be relegated to the footnotes; it didn't in practise affect the relationship between mill and factory[3] that endured for another 30 years. However, a deed related to the sale provides a handy recapitulation of the sites' previous uses:-

> *"Conveyance of the China Manufactory House …. In Worcester With Mills at Astley et. Messrs Wall, Salwey & others and Mr John Wall Junior Dated 2nd January 1772" refers to "All those mills heretofore used as Walk Mills or Fulling Mills late as a Sythe Mill and now as a China Mill situate lying and being upon Glasshampton Brook in the parish of Astley in the tenure of the said Porcelane Company …. And also of that messuage or tenement known by the name of Woodend situate in the said parish of Astley"*

Two further snippets shed light onto what went on at Astley. First, the then proprietor, John Flight, made a 1789 diary entry that his visit to Astley was made necessary by a problem with the "mixture" of the porcelain. Secondly, and more comprehensively, in 1796, a chemist called Charles Hatchett wrote in his diary about visiting the Worcester factory:-

> *"When the steatite* [another name for soaprock] *is reduced to powder in a mill at Worcester, it is sent to some place about 10 miles distant to be mixed and washed: it is then bought back to W[orcester] and in a liquid state is passed through fine wire sieves, is dried and tempered with water for use."*

No mention has been found in contemporary records, but 20th century excavation suggests the site was also used by the Porcelain Company as a Pug Mill – for grinding manufactured porcelain that had fired or glazed badly into a powder that could be incorporated back into paste and also for grinding flint, a common ingredient of high-quality pottery.

The "steatite" mentioned by Charles Hatchett was much travelled. Having been cut from a cliff face in Cornwall it was, presumably, bought by sea-going boat to Gloucester, transferred into trows for onward movement to Worcester, ground to fine powder at a Worcester mill and then bought further upstream for mixing with equally itinerant clay and sand before a return visit to Worcester. Thereafter, porcelain for export would go back to Gloucester and maybe Bristol. The largest single market for Worcester porcelain was London and this possibly meant a journey through the Sapperton Tunnel to Lechlade and then down the Thames.

There's no obvious reason for choosing Worcester as a place to make porcelain. All the major ingredients were bought from far away, including coal for firing. Later on, as the industry matured, the increasing skill of artisan potters and especially painters would have given Worcester an advantage but there was no previous tradition of such skills and this can't have been a consideration at the start. Once again, as with iron making in different eras, the navigable River Severn, free both of mills and tolls, must have played an important part. Tributaries such as the Dick Brook, strong enough to power water wheels, would have helped. Another factor might be called dynamic provincial capitalism. All fifteen original investors, bar one, came from Worcestershire; they included a glover, woollen draper, maltster, goldsmith, doctor, surgeon, clergyman and an apothecary who between them subscribed the start-up capital of £4,500.[4] The single exception, resident in London, was Mr Cave - editor of The Gentleman's Magazine who brought with his investment the priceless gift of publicity.

The Dick Brook mill site ceased its' forty-odd year association with porcelain in 1806, when the heirs of Thomas Flight – who had purchased the business in 1783 – sold or leased their freehold Mill and the farm called Woodend to Richard Shinton and Richard Cooke Lowe.[5] Now, at last, the Dick Brook mill took on the role of "forging and manufacturing of iron". But it didn't last very long. The partnership was dissolved in 1811[6] and the Mill and Farm were advertised for sale once again.[7] When the Reverend Denham James Joseph Cookes bought the estate in 1812, it seems the Richard Shinton and Richard Cook Lowe were still operating the mill under a re-constituted partnership[8] but all commercial activity had ceased by 1813.[9]

Roman Cinders and Pig Iron

***'Nature has thought fit to produce this wasting ore more plentifully in woodlands than in any other ground, and to enrich our forests to their own destruction.'* John Evelyn**[10]

Within living memory it was a well-known fact that iron smelting was fatal to the woodlands of Old England. School history books recycled dogma they found in academic texts: from Tudor times onwards, woodland was driven to crisis point by charcoal burners feeding the voracious furnaces of an all-devouring iron industry.[11]

1 *Berrow's Worcester Journal* 13 November 1760; advert for "Freehold Farm called Wood End, in the parish of Astley, consisting of about 40 acres, 20 whereof are Arable, and 20 pasture and Hop Land, now let at the Yearly Rent of 34L; and also a Scythe Mill and two Acres of Land, let on a Lease for a Term of 14 Years…."

2 Sandon, Henry. 1969. *Worcester Porcelain 1751-1793.* Herbert Jenkins; 1974 (Barrie & Jenkins). Sandon records on p.10 'On Jan 1st, 1763, a deed of lease was taken out on a grinding mill situated upon Glasshampton Brook in the parish of Astley.

3 *ibid.* The lease was for nine years, intended to expire at the same time as the lease of Warmstry House. [Warmstry House, north of Worcester Cathedral, was the site of the original factory]. At the end of this period, the original company, with 14 persons holding a part share, would be dissolved and a new company constituted.

4 Sandon, H. 1974. The Worcester Royal Porcelain Company. In: *Worcester and its Region. Field Studies in the former County of Worcestershire*. The Worcester Branch of the Geographical Association pp19-23, especially pp20-1.

5 WAAS ref 705:550 BA4600/31

6 Berrow's Worcester Journal 18 July 1811 *"Notice is hereby given, that the Partnership lately subsisting between Richard Shinton, Richard Cooke Lowe and William Salkfield, in the business of Iron Masters, carried on by them at Astley …… was on the 29th day of May last, Dissolved by mutual consent ….."*

7 *ibid.* "*A Capital Water Mill and Farm To be sold by private contract, for an unexpired term of 17 years from the 2nd of February 1811 …. Now used as a Forge for manufacturing of Iron, together with two dwelling houses, Outbuildings, and about 34 acres of ….. Land, in Astley."*

8 WAAS ref 705:550 BA4600/31 *"All those Mills……. formerly in the occupation of Francis Hill but now of Richard Shinton and Richard Cook Lowe…."*

9 WAAS ref 705:550 BA 4600/30

10 Evelyn, John. 1664. Sylva volume 2, p150. This is the oft-quoted maxim from Evelyn, although in his original work he precedes this with contrary examples, such *as '... and I have heard my own father (whose estate was none of the least wooded in England) affirm, that a forge, and some other mills, to which he furnished much fuel, were a means of maintaining and improving his woods; I suppose, by increasing the industry of planting, and care; as what he left standing of his own planting, enclosing and cherishing, lately in the possession of my most honoured brother George Evelin of Wotton in the same county (and now in mine) did (before the late hurricane) sufficiently evince….'*

11 Drayton, Michael (1563-1631). *Polyolbion (in Poems: by Michael Drayton, Esquire. Newly Corrected by the Author. 1613*) is often quoted by the numerous authors who have retailed this notion in different forms over the centuries. The most common quote (p265) is: '*What should the Builder*

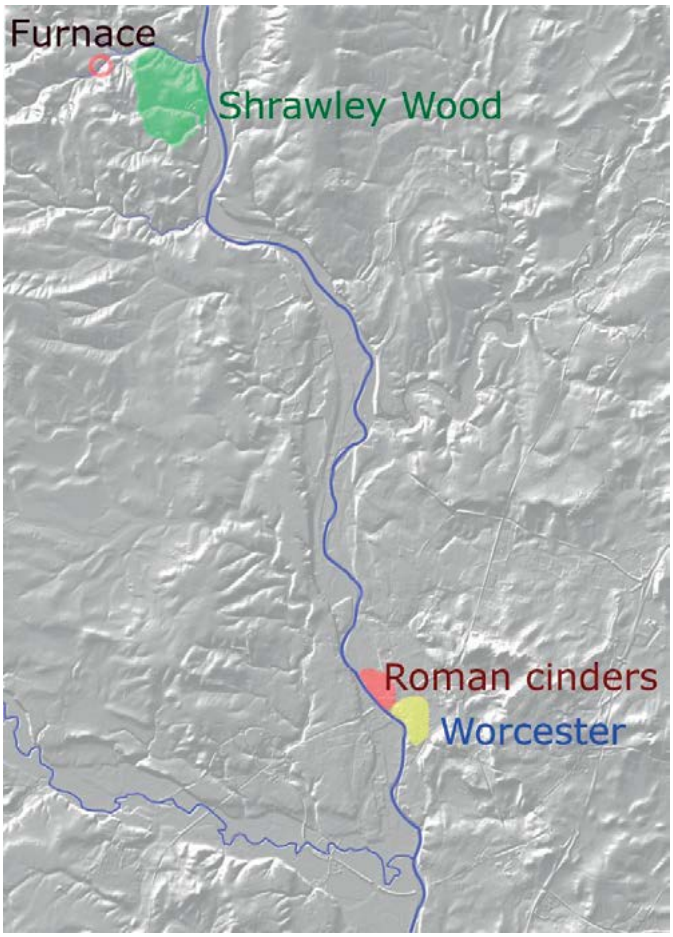
Then Mr Abraham Darby up at Coalbrookdale, further up the Severn Valley from Shrawley, finally mastered the dark arts of making iron with coke. Smelting iron was finally freed from the shackles of fast-dwindling woodland resources. Coal - energy fossilised from ancient sunshine - was plundered to enable exponential growth and the Industrial Revolution could begin in earnest. Such woodland as remained enjoyed last-minute reprieve.

An early modern critic of this beguiling tale was a Sussex librarian, Mr Ernest Straker. He made a lifetime study of the Wealden iron industry and concluded the evidence pointed in an opposite direction.[1] Part of his thesis was that early iron smelting depended on wood and this was a positive agent in woodland conservation.

The basis of his claim was the antiquity of the Wealden iron industry, demonstrated by the 'cinders' that still marked out the site of ancient 'bloomeries' where iron ore had been converted to iron.[2] These cinders were a waste product of the bloomery process, similar to the slag produced by later blast furnaces.[3] Most of these cinders he dated to Roman times, but there was also some activity during the late Iron Age and throughout the medieval period. From Tudor times up until the late 18thC, the Wealden charcoal iron industry was well documented.

In the Weald, 'Roman cinders' made good roads and many thousands of tons were used for metalling. Further afield, in the Forest of Dean, there were vast quantities of this Roman cinder and when blast furnace technology began to displace the much older and less efficient 'bloomery' process, probably by the late 15th C, Roman cinder was found still to contain appreciable amounts of iron – up to 20%. Iron that could now be recovered as sow or pig iron by incorporating Roman cinder into blast furnace loads. Mixed with freshly dug ore, there was sufficient 'waste' from Roman bloomeries to sustain the Forest of Dean iron industry for the next couple of centuries and arguably longer. In Northamptonshire's Forest of Rockingham smaller but still significant quantities of 'Roman cinder' indicate that an ancient iron industry was once sustained by woodland managed as a renewable resource.[4] Mr Evelyn was wrong: some of England's most densely wooded areas had a very long history of making iron.

Large quantities of this Roman cinder, lying just outside the northern walls of Worcester at a place called Little Pitchcroft, came to the attention of a certain Parliamentary Army Captain, Andrew Yarranton. Pitchcroft is where Worcester's cattle market used to be,[5] not far from today's "Hive" building. Together with Major Foulke Eastop, Lieutenant Clement Millward and other partners unknown, Captain Yarranton set about exploiting this gift from the past, shipping Roman cinder up the River Severn, past Shrawley Wood and into the Dick Brook. Just beyond the north-west corner of Shrawley Wood, on a small tributary that's now called Nutnell Brook, they built a blast furnace to convert Roman cinder, mixed with some fresh ore brought up from the Forest of Dean[6], into pig iron. We'll call this the Astley Furnace, apparently the name used when it was in blast.[7] Recent historians have tended to call it Sharpley Pool Furnace but, as we'll see, this can cause confusion because Sharpley Pool in its present form wasn't built until the early 18th century as part of a landscaping project.



01. 2020 LiDAR-derived hill shading map showing the positions of the Roman cinders outside the 1650 city walls of Worcester (now the site of Pitchcroft) and Astley Furnace just northwest of Shrawley Wood: they are 12km apart as the crow flies. Scars of modern roads and railways can be seen criss-crossing the landform..

The Astley Furnace partners launched their first smelting 'campaign' in 1652. The following year, they entered into a formal contract with Worcester Corporation, who claimed ownership of the Pitchcroft cinders; Captain Yarranton wasn't a man to let small details stand in the way of industrial progress and it seems he hadn't enquired too closely as to who might own them until well after he started digging.[8] The more-or-less amicable agreement that followed specified an 8 year license to take away cinders, restrained the partners from digging up the Causeway from The Butts to St Clement's Gate and imposed responsibility for finally making good and 'sowing' the disturbed ground - derelict land reclamation didn't start in the 20th century. [9]

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serve, supplies the Forger's turn; / When under publike good base private gain takes holde, / And we, poore woful Woods, to ruin lastly solde.'

1 Straker, Ernest. 1931. *Wealden Iron*. G Bell & Sons. See especially the Chapter Fourteen 'Fuel' pp109-140.

2 Straker uses the term 'cinder' to distinguish the waste product of the bloomery process from the 'slag' produced by later blast furnaces. In recent times archaeologists, such as those who excavated Worcester sites, have used 'slag' to cover both processes.

3 Modern archaeologists have tended to use the term 'slag' for the waste from both bloomeries and blast furnaces. Straker uses this distinctive nomenclature which will be followed here; 'cinders' was also the term used in the 17th century when bloomery 'waste' was being re-smelted to extract remaining iron.

4 Foard, Glenn and Partida, Tracey 2005 *A legacy of kings: the story of Rockingham Forest*. Rockingham Forest Trust, Oundle, Peterborough. pp16/17; Morton, John. 1712. *The natural history of Northamptonshire.* pp49/50

5 Richardson, L. 1957. Iron Smelting by the Romans in Worcester (pt 2) In: *Transactions of the Worcestershire Naturalist Club* 11.2 p.60

7 Brown PJ. 1982. The early industrial complex at Astley, Worcestershire. In: *Post-Medieval Archaeology* 16, p5 citing Stafford Record Office D(W)1788/9/3

8 Styles, Philip. 1978. *Studies in Seventeenth Century West Midlands History*. Kineton: The Roundwood Press for the Philip Styles Memorial Fund p246 citing: Bond, Shelagh. 1974. *The Chamber Order Book of Worcester, 1602-1650*. Worcestershire Historical Society, p433; Chamber Order Books, vol. 3, fols. 9, 10.

9 Richardson, L. 1954-5. Iron Smelting by the Romans in Worcester. In: *Transactions of the Worcestershire Naturalist Club* 11.1 p80, quoting Chamber Order Book for 30 Sept. 1653

How did Roman cinders come to Little Pitchcroft? Worcester isn't noted for ironstone mines and this wasn't the most densely wooded part of the Severn Valley, but there's little doubt the cinders were a 'waste' product of Roman iron smelting in the close vicinity. Many tons of this cinder have been found by 20th century archaeologists, spread around the city as roadstone and foundations.[1] Most notably, Roman cinder was used to fill the piers of Worcester's medieval bridge and during demolition in the 17th century many picks were bent in the breaking up of this very solid amalgamation.[2] But despite evident dispersal, Pitchcroft must have been the smelting site or, at least, one of them. An adjacent river bank was known as Cinder Point in the 18th century and a Worcester physician writing c1796 described the bankside erosion of this dumped cinder and claimed that when the River Severn was low, he could still make out brickwork from the old Roman bloomery furnace.[3] Andrew Yarranton himself saw the remains of a Roman bloomery hereabouts and said a pot of Roman coins was found nearby.[4] Modern archaeologists have located the remains of more bloomeries and far more cinders; they now regard Worcester as an important Romano-British industrial site.[5]

Why make iron at Worcester when the raw materials lay elsewhere? One old account talks of the need for security against marauding Britons and hence proximity to a defended town,[6] but 20th century archaeology has suggested reasons that would be familiar to iron industry moguls down through the ages. Put simply, it was the efficiency of water transport. Further downstream, on the banks of tidal waters in Gloucestershire, a complex of Roman smelting sites has been found that utilised iron ore brought from the Forest of Dean and charcoal from wherever was most convenient for river transport.[7] Worcester was detached from this industrial centre but a credible case has been made that the location was well placed to pad out high-grade Forest of Dean ore with lower grades brought down from the Wyre Forest.[8] Charcoal could come from anywhere along the Severn Valley including, of course, Shrawley Wood. To date, there's no evidence that charcoal from small-leaved lime was used in the bloomery process, but bloomeries were less demanding than blast furnaces such as Yarranton's and it's not impossible. Be that as it may, there's no doubt Roman bloomeries in the Severn Valley needed boats and Romano-British boats needed towing lines. The twisting of 'great ropes' in the limewoods around Shrawley might have a long history.

At the time Astley Furnace was being set up, Captain Yarranton lived at Rock, but he came from an old Astley family that had long been involved in the bast rope business. His grandfather William Yarranton had been active in Shrawley Wood and held one of the 33 shares in Astley Wood; Andrew Yarranton inherited this.[9] And Captain Andrew Yarranton's son – another Andrew – became the person who organised the rope making business in both woods after his father's death.[10] Captain Yarranton himself made no direct mention of bast ropes but, around the time he started smelting iron, he was named in the Chancery lawsuit Childe v Childe as being nefariously involved in the supposed clearance of Shrawley Wood.[11]

Captain Yarranton had an exceptionally interesting life, but he began conventionally enough as apprentice to a linen draper in Worcester, but he didn't last long in the rag trade. Then he had some years at home in Astley, which might have included rope twisting episodes in Astley Wood and possibly Shrawley too. Civil war came next and Andrew's rapid promotion to a Captain in the Parliamentary Army. As a troop commander he spent time in the Forest of Dean, an area of large-scale coppice management, charcoal iron smelting and the exploitation of Roman cinders. In his military capacity, he took a great interest in the way Dean miners used old workings and tunnels to wage guerrilla warfare and it's likely he learned much else besides. [12] Then came his big break. In the uneasy peace that followed the execution of Charles I in 1649, Captain Yarranton discovered and helped to disrupt a plot by local royalists to overthrow parliamentary rule; he was celebrated at the bar of the House and awarded £500 in cash[13] and later given a lucrative post as joint Commissioner for Sequestration in Worcestershire.[14] In the meantime, a much larger royalist uprising came about that was suppressed when Parliamentary forces finally won the Battle of Worcester. According to one account, Captain Yarranton may have discovered the Roman cinders at Pitchcroft when his soldiers were mustering for a siege of the City.[15]

In relatively peaceful times, Yarranton joined in with fellow officers to buy and sell Crown woodlands in Wyre Forest, using the debentures Parliament had authorised for their back-pay, and he

1 Carver, M (ed). 1980. Medieval Worcester – An Archaeological Framework. In: *Transactions of the Worcestershire Archaeological Society* 3rd series vol 7 See especially 8/3, [Broad Street]; 8/5, [ditto]; 8/6, [ditto]; 33/12, [High Street]; 65/7, [Sidbury] and perhaps 68/1, Tybridge Street

2 Green, Valentine. 1796. *The history and antiquities of the City and suburbs of Worcester* London 2 vols p10 (vol I) Valentine Green reprints a letter from Dr Johnson, "an eminent physician in Worcester". He refers to the Roman cinder as "dross" and says "much of this dross was found in the foundation of the piers, and filled the old piers in the slovenly mode of ancient masonry." For an account of demolition see Victoria County History. Worcestershire IV p382, citing Nash, Thomas Treadway. 1782. *Worcestershire. Vol.II.* Appendix p. cxvi]

3 Dr Johnson's letter in Valentine Green (above)

4 Richardson, L. 1955. Iron Smelting by the Romans in Worcester. In: *Transactions of the Worcestershire Naturalist Club* 11.1 p.80 quoting Yarranton, A. 1681. *England's Improvement by Sea and Land*, Part II, p162

5 Allen J R L. 1988. *Chemical compositional patterns in Romano-British bloomery slags from the wetlands of the Severn estuary*. In *Historical Metallurgy* 22:2 1988 p84 '*The large volumes of primitive iron-making bloomery slag excavated from the city leave little doubt that Roman Worcester, upstream on the Severn {fig 1}, was a major iron-making centre,* citing in fn9: Parker, P. 1970 for 1968-9. *The Origins of Worcester.* In: Transactions of the Worcestershire Archaeological Society; Carver, MOH. Medieval Worcester, an archaeological framework, *ibid.*, 7, 1-156 1980

6 Green, Valentine. *The history and antiquitites of the City and suburbs of Worcester* London 1796 2 vols p10 (vol I)

7 Allen J R L & Fulford M G. 1987. Romano-British Settlement and Industry on the Wetlands of the Severn Estuary. In: *The Antiquaries Journal* 67 1987 237-289

8 See Allen J R L 1988 above. p84. Allen's speculation relies upon slag analysis in: Morton, G & Wingrove, J Technical Aspects of the Roman Bloomery Process. In: *Transactions of the Worcestershire Archaeological Society* 3rd ser vol 2 1968-9 pp92-96 Table III and accounts of iron ore in Wyre Forest: T H Whitehead and R W Pocock. 1974. *Dudley and Bridgnorth, Memoirs of the Geological Survey of Great Britain*. especially figs. 8, 10; G H Mitchell, R W Pocock and J H Taylor. 1961. *Geology of the Country around Droitwich, Abberley and Kidderminster, ibid.*

9 TNA, WARD 7/30/59. His grandfather William died 1593, though the inquisition post mortem on his death was not held until 1607. Dr Peter King found this reference and first recognised its significance for the baston rope trade.

10 Shakespeare Birthplace Trust DR444/6/2/3/15. Mason Family; Agreement Yarranton[sic] to Wilson. This refers to Yarranton's management of the trade in respect of both Shrawley and Astley Wood during 1707. DR444/6/2/29/5 Mason Family. Agreement Cliffe and Yarranton 15 June 1695 According to this, Yarranton has managed the Astley Wood trade in Baston Ropes for seven years previous ie since 1688.

11 TNA C6/41/116. Child v Child. Plaintiffs: Thomas Child. Defendants: Wm Child and others [one of whom is named in the document as Andrew Yarranton.

12 Brown Peter J. 1992. The Military Career of Andrew Yarranton. In: *Transactions of the Worcestershire Archaeological Society.* Third series 13 p.193. Citing A Yarranton.1681. *England's Improvement by Sea and Land* Part II p.112, Brown shows Yarranton had considerable knowledge of the tunnels through old underground workings in the Forest of Dean, including their military exploitation by local partisans in guerrilla tactics. Being Andrew Yarranton he later put this knowledge to use in his published plans for the defence of Tangier, which featured linked tunnels.

13 ibid p194; *Calendar of State Papers Domestic Charles I 1648-9. 1893* HMSO. p206 July 21 Proceedings at the Committee of both Houses at Derby House

14 *Calendar of the proceedings of the Committee for Compounding etc, 1643-60*, 1889. HMSO Vol 1 p.481

15 Brown Peter J. 1992. The Military Career of Andrew Yarranton. In: *Transactions of the Worcestershire Archaeological Society.* Third series 13 p196

began wheeling and dealing in various other coppice woods that supplied charcoal for the fast-growing West Midland iron industry.[1] Given this track record and his involvement with Shrawley Wood, it would be remarkable if some loads of charcoal from Shrawley didn't find a way into the Astley Furnace, but there were practical constraints. As already discussed, lime charcoal isn't the ideal ingredient for a blast furnace because the lumps are fragile and prone to powdering. Shrawley oak would have been a candidate, but many of the oak poles valued in Shrawley Wood were too good for charcoal making; as Yarranton himself said:-

> '*So let all rational men consider, whether an Iron Master will cut up Timber to the value of fifty shillings, to make one Coard of Wood, when he pays for his Wood in most of these places* [contemporary iron making districts] *but seven shillings a Coard*?.... [2]

If he utilised Shrawley oak at all, it would only have been the lops and tops, first rotation thinnings and the occasional pole that didn't live up to expectations. But Shrawley birch trees might have tempted him; despite an apparent preference by English iron masters for oak and beech, birch was perfectly acceptable; birch charcoal was a mainstay of Swedish iron smelting.

Thanks to the whimsical gods of archive preservation, it happens that we know where much and maybe most of the fuel for the Astley Furnace came from. A pamphlet extolling the benefits of Stour and Salwarpe Navigation Act of 1661 says in part:-

> ' ..... *they may sell their Woods very dear to the Iron-Works, occasioned by the late finding out of a very great quantity of Cinders about Worcester; the truth whereof is evident by Mr Walker's furnishing Astley Furnace, within six miles of Worcester, with five hundred Loads of Charcoal yearly, for six years together, out of Hamonds Wood in Shropshire, to melt those Cinders; and now Mr Parsons furnisheth the like quantity yearly out of Wem-Brockhouse*.' [3]

There's still a Hall of Hammonds Coppice in Wyre Forest[4] today; it's at least four miles from the River Severn by the nearest overland route and more like seven miles if charcoal was taken along the Dowles Brook valley. Wem-Brockhouse can't be found on modern maps, but Wem in northern Shropshire has a nearby wooded district featuring the name 'Brockhurst' and this must be a contender. [5] Wem is several overland miles from the River Severn and then a long journey downstream. Both sources suggest the reach and sophistication of the 17th century West Midlands iron industry when it came to getting sustainable supplies of their most expensive single ingredient. This wasn't a wild west featuring charcoal-burning cowboys but a well-organised commercial environment in which long-term contracts and a considerable use of water transport were the keys to well-regulated markets and sustainable supplies.

Yarranton's interest in the Astley Furnace didn't last very long – no longer than the 8-year license the partners had negotiated with Worcester Corporation. By 1661, Thomas Foley, scion of the old Black Country nail-making family mentioned above, had possession[6] and there's no documentary evidence of further long-term use. Geologists have identified the furnace lining as being a specialised sandstone brought in from the Gornal district of the Black Country[7]; surface vitrification suggests several years of use, but there's no evidence of re-lining.[8]

In modern times, Yarranton's Astley Furnace has acquired some status as an example of innovation,[9] but this was an era of rapidly evolving technology and the site's potential must have been cramped by Nutnell Brook's meagre flow of water. Well, mostly meagre. Very occasionally, the Nutnell Brook becomes swollen with storm water, turning from a trickle into a torrent that exerts remarkable destructive power; this may have played a part in abandoning the site. Then again, depleted reserves of Pitchroft cinder, higher bids from rival iron smelting interests or rationalisation by an increasingly dominant Foley-led conglomerate might have been the principal cause.

According to a modern archaeological report, the ruins of Astley furnace lay at the tail of what was Sharpley Pool dam, that is to say, just below it. Topographically, this is true, but research by Francesca Llewellyn makes qualification necessary. Sharpley Pool didn't exist, as such, in Yarranton's day. A pond of some kind was needed to provide capacitance and a head of water for the wheel driving his bellows and there must have been a dam, however modest. This may have been a legacy of the Glasshampton mill valued in Domesday Book at a paltry 4 shillings a year. Whether or not the site stretched back to medieval times as a water mill of some kind, it was eclipsed in the early 18th century by a new dam that created Sharpley Pool. This incorporated the older dam as a foundation and part, at least, of Yarranton's abandoned furnace. The Sharpley Pool dam was built for gentrification rather than industry, part of a landscape scheme to enhance the newly-rebuilt Glasshampton House.

This larger dam burst during the last night of May 1924, causing considerable damage downstream but revealing the remains of Yarranton's Astley furnace for the first time in more than two centuries. A local historian, Miss Marjorie Wight, reported the find in a Birmingham paper and later in 'Country Life.[10] She then joined with Thomas Cantrill in 1929 to publish a scholarly article that's still the foundation for modern studies, but they acknowledge local writer Isaac Wedley as the first person to associate Astley Furnace with Andrew Yarranton. This he did in a series of three articles published in the "Kidderminster Shuttle" during 1926.[11] According to a more recent investigator, he may have been building on local oral tradition concerning Andrew Yarranton.[12]

Roman bloomeries weren't very efficient and could only extract a proportion of the iron, even from high-grade ore, but they had one advantage over blast furnaces. The molten iron mass from a bloomery could be hammered directly into something resembling wrought iron, whereas the pig iron from a blast furnace needed further processing before it became generally useful. Blast furnace iron required a forge, where pig iron was re-heated and endlessly

1 Berry, J & Lee, S G. 1938. *A Cromwellian Major General* Oxford p.96 citing PRO [now TNA] C54/3628

2 Yarranton, Andrew *England's Improvement by Sea and Land*….. London: sold by Tho. Parkhurst 2 pt.1677-81 p.60

3 Staffordshire Record Office D(W)1788/59/3. Reasons wherefore the making of the Rivers of Stower and Salwerp Navigable……. (1661?)

4 Grid reference SO 720780 gives an approximate epicentre of Hall of Hamond Coppice.

5 To the east of Wem is a still wooded district where 'Brockhouse' is a local place-name

6 Herefordshire Record Office. E12/VI/KE/24, f.1. This concerns a stock-take at Thomas Foley's Wolverley Forge on the River Stour, where there's a casual reference to wood taken from the furnace at Astley. I'm grateful to Dr Peter King for this information.

7 Hallett M M & Morton G R. 1968. *Yarranton's Furnace at Sharpley Pool, Worcestershire.* In: Journal of the Iron and Steel Institute 206 p691.

8 I'm grateful to Terry Chandler, of North Worcestershire Archaeological Group, for confirmation on this point.

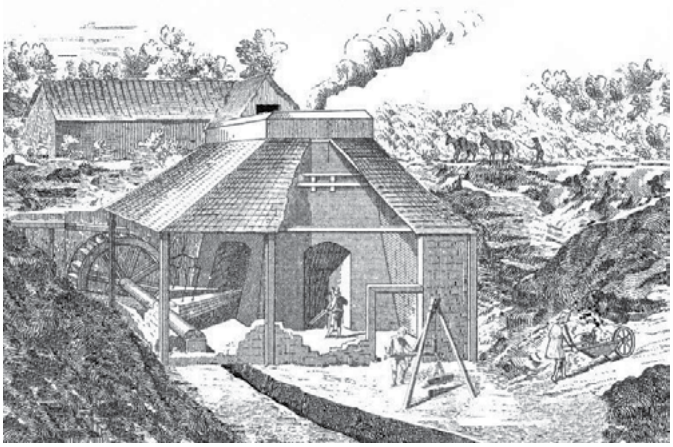
9 Schubert H R. 1957. *History of the British Iron and Steel Industry from c450BC to AD 1775.* p205, note 41

10 Cantrill Thomas Crosbee & Wight, Miss Marjory. 1992. Yarranton's works at Astley. In: *Transactions of the Worcestershire Archaeological Society*. p 92 fn4. 'The first published notice of the furnace appeared anonymously, with a photograph, in the B'ham Weekly Post 16 Jan 1926. A similar notice (signed by M. Wight) will be found in Country Life 6 Feb 1926. Both announcements were by the same hand'

11 As Cantrill & Wright above. p97. 'In three articles entitled 'After Two Centuries' in Kidderminster Shuttle 14 & 21 May; 4 June 1927'.

12 Brown P J. 1982. The early industrial complex at Astley, Worcestershire. In: *Post-Medieval Archaeology* 16,
p.5 ''Mr W H Gwilliam of Worcester has informed me that even before the dam burst in 1924 there was a local tradition that Yarranton's iron furnace had been on the Dick Brook'

hammered to remove excess carbon and other impurities. For many purposes a two-stage forge process was needed, finery and then a chafery, where wrought iron was drawn out into bars - but we're straying here into too much detail. Sufficient to say that Furnaces and Forges both needed an efficient power source, usually waterwheels, and there were some practical advantages, all other things being equal, in having them close together.[1]



02. This Graphic representation of the Astley Furnace in action is the brainchild of Richard Pumphrey, with expert advice from Dr Peter King, based on the excavations reported by Cantrill & Wight, Peter Brown and W S Smith.
The Keeper is weighing the cast iron pigs ready for packhorse dispatch. The Founder is plugging the tapping hole with clay following the last tapping. One of the men who normally load the charcoal and ore/cinder mix is removing slag to the slag heap. Out of sight are the other Loader, preparing the next baskets full of charcoal and cinders ready to add to the top of the furnace. Also the Stocktaker who is in the cinder store ready to meet the drover who can be seen in the background, with his pack animals on the track from the packhorse bridge - bringing another consignment of Roman cinders on the final stage of their journey from Worcester. He will have to wait for the stock-taker to check in his loads before leaving. A wooden launder on stilts carries water from the dam to the wheel and the mill tailrace is in the deep channel cut into the sandstone in the foreground.
The cinders store is seen to the left behind the furnace where Cantrill and Wight found the remains of its contents. See *LiDAR assisted reconstruction of industrial activity in the Dick Brook Valley*

Isaac Wedley explored the recently exposed Astley Furnace and then followed the Nutnell Brook a short distance to its confluence with the Dick Brook, before exploring these conjoined streams further downstream.[2] Just past Glazenbridge he noticed a shallow depression running parallel to the stream bank, on the opposite side from Shrawley Wood, which he identified as a mill leat. This led to "Forge Cottage", near the site of much broken stonework and the muddled remains of an ancient mill site. Wedley had heard stories that bobbins were made here once upon a time and, half remembering what he knew about Yarranton and the linen business, he conjectured this might, originally, have been his factory site.

Wedley speculated that Yarranton had converted his linen factory into the forge needed to make Astley Furnace pig iron fit for market. Then, to complete an early example of thoroughly integrated industry, Wedley found the stonework of what he took to be two lock chambers leading down to the River Severn. Yarranton was well known as a navigation pioneer and it all fitted together nicely. Dick Brook and the thin ribbon of greenery separating Shrawley Wood and Astley Wood had hosted some of the first fumbling trials of new technologies that were to transform the world.

Some researchers, including Miss Wight, have been sceptical about Wedley's integration of Furnace and Forge and various alternatives have been suggested, [3] but the idea of an early industrial complex pioneered by Captain Yarranton has taken on a life of its own, both in the specialised world of industrial archaeology[4] and among many local people - a quick and entirely unscientific straw poll of modern dog-walkers in Shrawley Wood suggests unanimity that the Forge Cottage site had something to do with him.

A local landowner, the late Spencer Comley, played an enthusiastic role in championing Captain Yarranton both with his own archaeological investigation[5] and a willingness to encourage others. Excavation in the 1970's provided hard evidence of a forge here, but it was the discovery of a cache of tin-plated buckles that seemed at the time to confirm a Yarranton connection.[6] Among his many talents, Captain Yarranton is widely recognised as a founding father of the British tin plate industry. Forensic research by Dr Peter King has since located another West Midlands site for Yarranton's experiments but this was published in a specialised journal and ideas about the Dick Brook's pioneering role in haberdashery have lingered on.[7] However, it's now certain the use of this Dick Brook mill site as a forge came a long time after Andrew Yarranton, the buckles are from the 18th century[8] and his metallurgical work was confined to Astley Furnace. Whether he had anything to do with the locks we'll come back to shortly.

Thanks once again to Dr Peter King, there's now firm evidence that Captain Yarranton and his partners leased a forge at Shelsley Walsh.[9] on the River Teme, 8 miles west of Astley Furnace if pig iron had wings. A bit further using packhorses. It's tempting to consider water transport – back to Worcester and then up the River Teme, but there's good evidence that pig iron from the Forest of Dean, sent to the same Shelsey Forge, went up the Severn to

1 Johnson B L C. 1951. The Charcoal Iron Trade in the Early Eighteenth Century. In: *Geographical Journal* 117 p.174 Johnson makes the point that there is an overall weight loss of some 30% in the double refining process of "finery" and "chafery". Such an appreciable wastage would appear from classical economic theory to encourage the location of forges close to their sources of pig iron. However, he goes on to say that water transport can negate these precepts.
2 This descriptive account is taken from the first of Wedley's articles, that is Kidderminster Shuttle 14 May 1927.

3 Downes, R L The Stour partnership, 1726-36. A note on landed capital in the iron industry. In: *English Historical Review* new series vol 3, no 1 1950-1 pp90-6 citing information from Mr A Perrett via Palfrey Papers [WAAS] that the Yarranton family had possession of iron-works at Lower Mitton on the Stour c1634.
4 Brook, F. 1977. *The Industrial Archaeology of the British Isles: The West Midlands*. p.43; Gladwin, D D. 1977. *An Illustrated History of British Waterways*. Bourne End p.16
5 Comley, S 1973. Andrew Yarranton's Furnace at Astley, Stourport-on-Severn. WAAS HER file. Unpublished document.
6 Evening News headline for January 12 1973, when archaeological excavations were in progress: 'Excavating old forge in village wood'. This confirms Yarranton's involvement and goes on to associate the site where he perfected tin plating.
7 Smith, W S. c.1974. Industrial Archaeology in the Dick Brook Valley. In: Adlam B H (ed) *Worcester and its Region. Field Studies in the former County of Worcestershire: Spring Conference of the Geographical Association 1974*. Worcester College of Education c1974 p121 begs the question of Yarranton tin-plating at Dick Brook; Brown P J. 1982. The early industrial complex at Astley, Worcestershire. In: *Post-Medieval Archaeology* 16, p.6. refutes any possibility of Yarranton involvement, quoting examination of tin-plated buckles by Miss J M Swann, Keeper of the Shoe Collection at Northampton Museum, who dated them to the late 18th century.
8 King, Peter W. 1988. Wolverley Lower Mill and the beginnings of the tinplate industry. Historical Metallurgy 22. p104-113; following on from Brown, Peter J. 1988. Andrew Yarranton and the British tinplate industry in *ibid.* 22. P42-48
9 Herefordshire Record Office. E12/IV/30, 26 Jun 1681. The context is a dispute between Philip Foley and his eldest brother Thomas who owned Shelsley Forge; a recitation of some history is involved. Apparently, the rent for the forge had been £50 a year but Sir George Blount, who previously held it on lease, was able to take advantage of Yarranton and partner's need of a forge by sub-letting it out to them for £100. Subsequently, the Foley brother's father, also Thomas, had bought Captain Yarranton and his partners out of Astley Furnace.

Redstone and completed the journey overland.[1] This makes it almost certain that Captain Yarranton used pack animals as well.

The River Teme may well have been navigable, but by the 17th century, water gradients that had once powered parochial corn mills were being harnessed for the iron industry and the cost of coaxing mill owners to dissipate precious pounds of water for the passage of boats would have risen accordingly.[2]

Miss Wight and Mr Cantrill were able to demonstrate that the Astley site was used as a forge, long after Andrew Yarranton's demise, not only through archaeological examination and archive research but by using the memory of local families to reach far back to the early years of the 19th century. They interviewed Mr Arthur Spragg in 1929, who remembered reminiscences of his grandfather, James Spragg, who had worked at the forge as a boy:-

> *'and on dark nights used to light his way home through Shrawley Wood by means of a torch which he made by fagging-out a piece of rope under the forge hammer and dipping the end in tar.*'

They reckoned this would have been about 1803.

In Yarranton's day, the mill that later became Astley Forge was a flour mill. Strictly speaking, it was three flour mills because there was sufficient water to turn three grindstones – a facility that was utilised to the full with successive changes of use. Later on, this same point in the local landscape was harnessed to pulp rags for making paper, as a fulling mill to degrease and 'felt' woollen cloth, to grind flint for incorporation into porcelain, kneading soaprock and clay for the same purpose, to power forge hammers.

When crossing the Dick Brook nowadays in an average summer, using the stepping stones, it's hard to imagine such a slight flow as a potential power-house, but this was just one small part of the network of Severn tributaries that drove many hundreds of industrial mills. Collectively they made up the world's most productive industrial landscape. For a while. Then somebody went and changed everything by inventing the steam engine.

Captain Yarranton's Canal?

The doyen of British waterway writers and founding father of the canal preservation movement, LTC Rolt, visited Dick Brook in the spring or early summer of 1947. This is what he wrote afterwards. His reference to friends living at the Wood House almost certainly means Ruth Vernon and her new husband Frederick Horton. Despite his enthusiasm for canals, Rolt had an abiding interest in early motor cars and had trained as an engineer – it seems likely he first encountered Horton either professionally or among motor-racing enthusiasts.[3]

> '*At Diglis, Worcester, we swung right-handed on to the river and headed upstream in the direction of Stourport. At that time some friends of ours were living at Shrawley Wood House which lies close beside the west bank of the Severn just below Stourport. They joined us at Worcester, the idea being that, after luncheon on board, they would travel with us as far as Shrawley where we would moor up for the night so that they could entertain us to dinner. This had seemed an excellent idea, but it proved singularly difficult to carry out as anyone familiar with the high and thickly overgrown banks of the Severn will appreciate. The tremendous wash created by the many tanker barges that were then using the river added to the hazards of such an uncongenial mooring. Nevertheless we contrived to moor eventually beside the mouth of the Dick brook, and in this way I discovered the mysterious ruins of the mason's lock chambers built by Andrew Yarranton when he made the brook navigable in 1652. The course of the brook is so narrow and tortuous, the lock (or half lock?) chambers so large and massive, that the whole set-up was a profound puzzle to me then as it still puzzles industrial archaeologists today.*'[4]

Rolt identifies a conundrum – why two such impressive lock chambers when the small, tightly meandering river between them looks as if it could only accommodate small craft, at best? And he follows in the footsteps of a well-known fact – that Andrew Yarranton was the engineer responsible. We'll start with Captain Yarranton.

No hard evidence for Andrew Yarranton's involvement has ever been found. There's no contemporary account of his canalising the lower Dick Brook, least of all from Andrew Yarranton himself. He wasn't a man to hide lights under bushels and yet there's not the slightest reference to this substantial undertaking in his written work. Nevertheless, several folk have taken Andrew Yarranton's involvement for granted. Not the least of them Tom Rolt.

The circumstantial evidence for Andrew Yarranton's involvement is tempting. As he said himself, at the time when his Astley Furnace was in blast, he was also surveying the nation's rivers with a view to improving their trading potential; one of his grandest projects was to link the Thames, Severn and Trent into a unitary system of inland navigation.[5] Closer to home, he played a substantial part in schemes to make the Stour navigable, campaigned for a Salwarpe navigation and consolidated part of the work already begun on the Warwickshire Avon. Apart from the Avon, most of these schemes came to nothing at the time and one that almost made it – linking Pensnett Chase and a nascent 'Black Country' to the River Severn by canalising the River Stour[6] – was finally frustrated by lack of capital and vested interests. These were all much larger projects than the Dick Brook, but some have argued Dick Brook was a proving ground for these more ambitious plans.

There's no doubt Yarranton needed to move large amounts of cinder, ore, charcoal and limestone up to his Astley Furnace, not to mention the sandstone from Gornall in Staffordshire used to line it. He refers to "many thousand tons" of Roman cinders from Pitchcroft at Worcester. All this must have arrived by boat at or fairly near the

1 Schafer, R G. A Selection from the Records of Philip Foley's Stour Valley Iron Works 1668-74. Part I. Worcestershire Historical Society new series 9 1978. (p99) Under the heading 'trowmen', there's record of payment at 3s/2s 9d [per ton] for transport of 119 tons 'to Readstone from Newent'; (p100) Under the heading 'Shelsley forge accompt of partnership with Lady Blount' there's a sub-heading 'to the general accompt for sow iron from Newent 119 tons [presumably the same material]. (p101) Under heading dated 1669 'Mr Richard Avenant of Shelsley his accompt of the forge' there's an item 'sent to Redstone for Tintorne'. This presumably is wrought iron heading overland from Shelsley to Redstone for river transport downstream to Tinterne on the River Wyre.

2 This is the authors conclusion from reading: Jones, Pat. 2006. Navigation on the River Teme. In: *Journal of Railway and Canal Historical Society* 35(4), who broadly confirms the Teme was navigable; King, Peter. 2006. The River Teme and Other Midland Navigations. In: *ibid.* 35(5) July 2006, 348-55, who largely refutes this, and subsequent correspondence in *ibid.* 35(6) p442 and *ibid.* 35(7) p551. For a credible assertion the Teme must have been navigable in pre-industrial times, at least in ideal conditions, see Green, Colin. 1999. *Severn Traders* Black Dwarf Publications; especially the assertion Caen stone for the mill at Ashford Carbonel was brought by water in the 14th century. For support of casual use in an unimproved state see: Gaut, R C. 1939. History of Worcestershire Agriculture and Rural Evolution p114 and Edward Paget-Tomlinson. 2006. *The Illustrated History of Canal and River Navigations*, 3rd edition p186

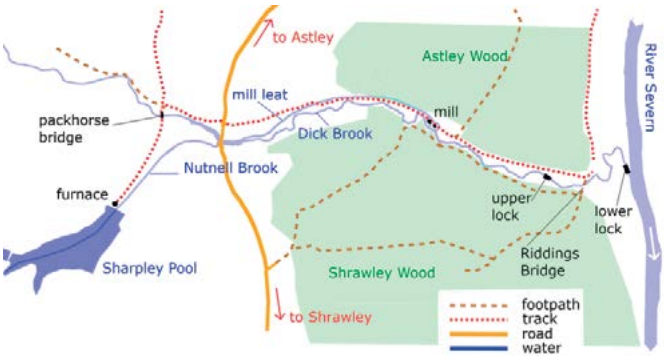
3 Rolt, L T C. Landscape with Machines. Longmans. 1971.

4 Rolt, L T C. 2009. *Canal Crusade* [extracted from] Landscape with Canals. Allen Lane 1977 in The Clouded Mirror. Penguin 'English Journey' series p72

5 Yarranton, A. 1681. *England's Improvement by Sea and Land, Part II*, p16 '……..in the year 1652, I entered upon Iron-works, and pli'd them several years, and in them times I made it my business to survey the three great Rivers of England, and some small ones……

6 *ibid.* 1698 edition. p65-6

mouth of the Dick Brook. Why wouldn't he get laden boats as close to his furnace as possible?



03. Sites of furnace and mill.

Was Dick Brook and Shrawley Wood a theatrical first night for industrial revolution: an integrated package of furnace, forges and canal that beat Iron Bridge by half a century? Alas, we've already had to dismiss Andrew Yarranton's supposed forge as a flour mill and now the evidence has stacked up against his involvement in building locks. Tom Rolt notwithstanding, he probably died at least half a century before they were built.

In 1969 Messrs Lewis, Slatcher and Jarvis found some evidence that associated the Dick Brook locks with the Royal Worcester Porcelain company, although they were unable at the time to draw definite conclusions.[1] They noticed stone blocks used for the lock walls were levelled with fragments of roofing tile and, most significantly, saggars. These are the clay 'coffins' used to protect porcelain when it's kiln fired. They only knew for certain that flint had been ground at Astley Mill for use at Worcester; there was no awareness of the much closer relationship between the Worcester porcelain kilns and Astley Mill. This knowledge came later. Even so, they still asked a Mr Mountford of Hanley Museum to examine samples of this saggar debris and he cautiously suggested a date range that, with hindsight, fits what we now know of Royal Worcester's Astley Mill tenure.

Curiously, Lewis & Co were investigating the Dick Brook locks as examples of flash locks – half locks in Tom Rolt's account. Rolt didn't look too closely at the masonry remains and he wasn't certain what kind of locks these might have been, but Lewis and his colleagues clearly made a far more forensic examination. How they concluded these were flash locks isn't clear – they came to Dick Brook in the expectation of finding flash locks and seem determined not to be disappointed – but this present author can see of no reason to think they are anything other than pound locks.[2] They have the remains of masonry chamber walls, wall rebates with a sill beneath for pointed lower gates and another sill upstream for some kind of upper gate or portcullis. Flash locks are nothing like this, whereas the great majority of all pound locks on British canals follow a similar formula!

Lewis and his colleagues were proposing, in effect, an impossibly long pound, bracketed by two massively over-engineered flash locks, that incorporated all the meanders of the lower Dick Brook. It would have taken an age to fill! Inadvertently they laid the foundations for yet another Dick Brook myth because when another scholarly, Department of the Environment-funded account of Dick Brook archaeology was published by Peter Brown in 1982 he simply acknowledged their work as definitive![3]

It's just about possible, as Lewis suggested, the saggars were not used in the original construction but were part of some later refurbishment. They aren't absolute proof of construction after Yarranton's time. And so there follows yet more reasons for thinking his involvement is highly improbable. They're in no particular order.

We now know Yarranton had a short-term contract, just 8 years, for the exploitation of Roman cinders from Worcester. This amounted to thousands of tons in total, but given the limited capacity of the Astley Furnace, Nutnell Brook's modest power provision and the time taken to complete a blast cycle, pack horses could have coped with bringing the necessary materials from Severn bankside. Even if they could not, the next step in terms of capital investment would have been a 'footrail' – a simple horse-drawn tramway. Yarranton's Stour Navigation relied on a network of such tramways to bring Pensnett Chase coal down to his canal wharfs. No matter how profitable the exploitation of Roman cinders may have been, capital investment that needed long-term amortisation made no sense.

The output from Astley Furnace – pig iron – headed south-west, overland to Shelsley Forge. There was no return cargo, compromising the economics of canalisation still further.
Astley Furnace needed more than just Roman cinder from Worcester; Yarranton mixed this with Forest of Dean iron ore and some limestone. The bulkiest and most expensive raw material of all, charcoal, came down the River Severn from the north, first from Wyre Forest and later from much further away in Shropshire. The cheapest river transport over any distance used Severn trows; they couldn't have used the canalised Dick Brook – with a sixteen foot beam and often more, they were too wide for locks and meanders alike. Re-loading into boats that could make the half-mile canal journey would hardly have been worth the trouble and effort.

There have been suggestions the Astley Mill leat extended the navigation further towards Astley Furnace but this would have meant re-loading again at the Mill wharf – and lifting cargo up to the leat level. If, as has also been suggested, the level above the Mill dam might have extended all the way up to the Furnace this would have meant re-loading at the dam. And given the Astley Furnace was a tall structure loaded from the top, yet more double handing and lifting would be involved. Much simpler to load onto pack-horses from a trow berthed on the mud bank of the River Severn and take it one and a half miles direct to the store by the top of the Furnace, ready for the next campaign. Cantrill and Wight found stocks of Roman cinder and charcoal ready for use in exactly this position; they also identified the remains of a bridge linking higher ground above the Nutnell Valley with the furnace top, enabling these materials to be barrowed across for direct loading.[4]

Two later researchers, Messrs Palmer and Berrill, writing in 1958, found the remains of a bridge across the Dick Brook that would, they thought, have eased the gradient for either pack animals or carts heading towards this same place[5].

Packhorse transport was expensive over long distances but Astley Furnace was just 1½ miles away from the Severn riverbank. Far less than the distance travelled by packhorses from Astley Furnace to Shelsey Forge, the endless shuttle between the emergent Black

1 Lewis, M J T, Slatcher, W N and Jarvis, P N. 1969. *Flashlocks on English Waterways, A Survey*. Industrial Archaeology Vol 6 pp222 - 4 & 233
2 Cantrill and Wight are agnostic as to locks. A later author, W S Smith, is certain the Lower Lock is a pound lock and thinks the Upper Lock might be (Smith, W S. 1974. Industrial Archaeology in the Dick Brook Valley in Adlam B H (ed) *Worcester and its Region. Field Studies in the former County of Worcestershire* 118-126 Spring Conference of the Geographical Association 1974. Worcester College of Education c1974 p121.
3 Brown P J. 1982. The early industrial complex at Astley, Worcestershire. In: *Post-Medieval Archaeology* 16. p.17
4 Cantrill & Wight. *ibid.* pp100-101
5 Palmer, J M & Berrill, M I. 1958. *Andrew Yarranton and the Navigation Works at Astley* in Journal of the Railway and Canal History Society 4(3) p43. In the subsequent edition of this Journal (pp77/8) I. Cohen, writing after consultation with Miss Marjorie Wight, suggested that this route would have been an unnecessary detour when the Glasshampton Bridge provided a shorter route. Palmer and Merrill responded that their suggestion minimised uphill gradient and would therefore have been more practical.

Country and its nearest riverport at Bewdley or the heroic journeys made from Pensnett Chace coal pits to Droitwich brine works. Exact calculations are problematic,[1] but a conservative estimate might allow a string of ten pack-horses to move a ton over 15 miles each day; allowing for return journeys without burden this could amount to 10 tons. Sufficient to keep a small blast furnace supplied. Of course horses need feeding and so would the people needed to lead and help load them but it's hard to see a half mile canal, with its loading and unloading and re-loading being any cheaper to run.

The Royal Worcester company, by way of contrast, had every reason to consider canalisation. They occupied Astley Mill for more than half a century and they made regular return journeys with heavy cargo from a fixed riverside wharf in Worcester direct to Astley Mill. The only lifting involved would be from their Astley Mill wharf up to the mill itself. Re-loading the boat with processed mixture could be done with some gravitational help. Apart from pound locks, this routine would justify investment in special boats for the purpose and it's possible to envisage a 50 foot boat with 10 foot beam, pointed at both ends to allow the tiller to be moved to deal with the lack of turning space at Astley Mill wharf.



04. The remains of Astley Mill Wharf, 24 April 2021. With the presumptive upper lock closed, the water level would have been around a metre higher at this point.[2]

The suggestion has been made that Yarranton used strings of tub boats to move materials up to his furnace; they would have overcome the lower Dick Brook's tight meanders.[3] Tub boats worked well on early canals, especially where lifts or hoists or inclined planes were involved; they could have worked on the Dick Brook. They were still used, with the benefit of diesel tugs and hydraulic steering mechanisms, on modern canal and river navigations until very recently. But bow-hauling a string of tubs up the Severn from Worcester? That might not have worked so well. And, once again, would a transfer from trow to tub at the mouth of the Dick Brook for the sake of getting half a mile closer have been worth the effort?

Could a custom-built, double ended boat of the kind conjectured above, 50 feet long and 10 feet in the beam, have made the journey from Worcester, gone through the Lower Pound Lock and negotiated the Dick Brook meanders before a passage through the Upper Pound Lock and tying up at the Astley Mill Wharf? It's the meanders upstream of the lower lock that would be the main problem. It would be a close-run thing.

Until recently, this author imagined the meanders would have been less pronounced in the days before Holt lock was built. The Severn flowed at a lower level for most of the year then and it might be reasonable to suppose the Dick Brook meanders were less pronounced; the Brook would have needed to cut down more and meander less because of the steeper gradient. This notion has been blown out of the water by Richard Pumphrey's comparison with early maps and precise calculation of levels using Lidar-derived data. See LiDAR assisted reconstruction of Industrial Activity in the Dick Brook Valley. The river meanders have been remarkably consistent since the 18th century.

But all is not lost. With a modicum of maintenance – principally the cutting back of mud-silted banks and the clearance of vegetation - it's likely a boat carrying, let's say 20- 30 tons, could make the passage from Severn to Astley Mill and back. With the help of a couple of pound locks.

Writing some years after his first visit to Dick Brook, Tom Rolt ended a short article on the Dick Brook locks with 'he [Yarranton] has bequeathed to posterity an intriguing problem'.[4] Given new information, it's more likely that posterity has the Royal Worcester Porcelain to thank for any outstanding intrigue. And if dedicated boats could, indeed, have negotiated the Dick Brook meanders, there still remain one or two problems to ponder.

For readers with a taste for perpetual mystery and intrigue, there's a number – 1715 - neatly incised on one of the stone blocks still in place on the northern wall of the Upper Lock. Past advocates of 'Captain Yarranton's Canal' have suggested this might record the year that some major refurbishment was made – presumably in favour of the flour mills then in use. But if this author is right, there was nothing to refurbish. Could the locks have been built in 1715, presumably to transport corn and flour? Possibly – but the ingredients for pottery seem to me more likely. In which case, re-cycled stone might be the explanation – that, and a stone mason who saw no good reason to lay this particular block the other way around.

Where was the towpath for the canalised Dick Brook? There's a fine path along the bottom of Shrawley Wood but it doesn't extend around the meanders to the River Severn and there are at least three Small Leaved Lime stools of evident antiquity growing in the river bank adjacent to the Wood. To say the least, they would have played havoc with a towing line. Does this mean that boats were punted the half mile through the *lock*s and meanders, up to Astley Mill Wharf?

And assuming Andrew Yarranton didn't have the benefit of a canal, he must have used pack-horses or carts to take his raw materials up to Astley Furnace from the River Severn bankside and there's no obvious trackway or bridle path down to the mouth of the Dick Brook. Did he land his cargoes just above The Wyre pub and bring them by pack-horse over the lower Dick Brook footbridge, up along the excellent trackway going past Astley Mill and then back across the Dick Brook beyond Glasshampton Bridge using the now derelict bridge identified by Messrs Palmer and Berrill and thence to the top of his Furnace? Or did he use carts, as they suggest, which meant landing further upstream towards Astley because carts couldn't have crossed the lower bridge. Perhaps he used both. He would have needed some storage on the Severn river bank because river cargos tended to be large but erratic, according to the seasons.

Bricks[5]

Anyone looking for the remains of riverside Shrawley, with its pub and cottages, will need the eye of faith. All that can be found now are a couple of trees that might, perhaps, have been part of a garden. Just south of 'Wyreford' – apparently one 19th name for this hamlet[6] – there's a long stretch of scrub-covered wetland. This is a legacy of

1 I have relied on: Bagwell, P S. 1974.The Transport Revolution from 1770-1985. Barnes & Noble p13 where he specifies a pack-horse on a bridle path carrying 2-3 cwt. A wider variation range is given for mules, ponies etc in less than ideal conditions; see, for example, Clayton, Anthony. 2017. The Mule in Military Service. The Book Guild 2017 p3 &107

2 Photo by Richard Pumphrey

3 Rolt, L T C. 1950. *Inland Waterways of England*. Allen & Unwin. p.33

4 Rolt, L T C. 1985. *Navigable Waterways* (revised edition, with an introduction by Bryan Marsh). Penguin. p.35

5 Many thanks to Richard Pumphrey for making corrections to this in light of his further research into the local brick industry

6 Richardson, L *The River Severn between Upper Arley and Gloucester*. 1964. pp 31

digging clay for the nearby Shrawley Brick works which, if the available archives are conclusive, operated from 1842-1861.
Mrs Masterman mentions the brickworks and talks of a rich red brick sent upstream to build Black Country houses. She might be right, but the only archive evidence suggests most of them went in the opposite direction, downstream to Worcester. Walking through early Victorian suburbs in Worcester, it would be nice to think of Shrawley clay still resplendent as the rubbed-brick frontages of many a bay-windowed terraced houses. Be that as it may, the modern amphibian population around Oliver's Mound is doubtless grateful for the provision of an ideal spawning ground.
The tenant of these brick grounds was John Hughes, with premises 'near the cattle market' in Worcester. He describes himself as a 'Builder and Brick-maker', with a trade in 'Fires Burrs, Bricks & Squares, Kiln Tiles & Border tiles for gardens.' The kiln tiles might have been used in the business of drying hops. Earlier (1832-1842) for his brick works 200 metres further south in Long Meadow he had paid the Vernon Estate a rent of £12 10s and a royalty of 2% on the value of manufactured items. In most years, he also did a reasonable trade in bricks and drainage tiles with the Vernon Estate, so it's likely they were able to buy these at a favourable price. Mr Hughes's contract required him to make good the clay pits with topsoil (he never did) and to leave a 15-foot margin undug along the riverbank. Although bricks were sometimes still fired with wood or faggots in the 19thC, there's no suggestion of any wood being sold to the brickworks out of Shrawley Wood. It's probable Mr Hughes fired his bricks with coal: in the second year of operation he supplied Hanbury Hall with substantial amounts of coal, possibly 'dropped off' by his boats bringing supplies from the Black Country. Whether they carried any bricks on return journeys isn't recorded.
Students of early 19th century parochial brick making will find further fascination in the Vernon archives,[1] but a sample year will be sufficient to give some idea of the trade, which reached a peak of production in 1834:-

1834 Account of all the Bricks and tiles etc [made] Mr John Hughes Brickyard at Long Meadow in the parish of Shrawley for the year 1834. Common bricks: 1,440,938; Plain Tiles 47,223; Paving Tiles 14,807; Ridge Tiles 513; Draining Tiles 71,370[2]
Similar entries for other years have been analysed and plotted graphically by Richard Pumphrey (chapter 1764-1850, p.183).

John Hughes's account with the Vernon estate ends in 1842, because by then he had bought the land to start his brickworks at Rowle Meadow; In 1854 he not only advertises his wares for sale but also the equipment for making them:-

> *JOHN HUGHES*
> *Begs to inform the Nobility, Gentry and the Public that he has still on hand FOR SALE, BUILDING and stock bricks 1½ , 2, 3, 4 and 5 inch PIPES, DRAINING TILES and culverts, a variety of other Red Goods, all of excellent quality, at BRICK WORKS, SHRAWLEY and PREMISES, BUTTS. Also a quantity of BARN FLOOR PAVING and MARBLE, all at most reasonable Prices. Capital PIPE TILE MACHINE, and PATENT BRICK PRESS, both nearly new, and upon improved principles; set of very good MALT KILN and PAN TILE MAKING TOOLS*[3]

His brickworks remained active several years after this, so he may have been selling his manual equipment as part on modernisation, replacing it with recently patented mechanical methods.

Along the riverbank from Dick Brook to Astley Burf, below Astley Wood, there's another, more extensive area of wetland was dug for clay in the same way as the riverbank in Shrawley; much of this has been planted with trees, possibly in the 1970's. Astley Hampstall Brickworks supplied materials from 1818 to 1852.[4] Even then, production at the Shrawley works carried on until 1861 as demonstrated by this melancholy report in Berrow's Worcester Journal of 1857:-.

> *A BOAT SUNK IN THE SEVERN.*
> *About one o'clock on Monday, as a boat called the 'Victory' laden with about 28 tons of bricks, belonging to the Messrs Rowland, slate and brick merchants, of St Clement's in this city, was coming down the Severn from the Shrawley Brickworks, the crew, when near the cutting at Holt lock, saw the steam tug 'Enterprise' having in tow two light barges, approach at a rapid pace, and they instantly shouted to the captain to ease the steam and run the tug nearer the bank, where there was a clear space of 96ft. The captain of the tug, Thos. Williams, however, with perfect indifference, replied that "he would see them d-- first." The tug passed, but caused so great a swell in the river that the Victory at once filled and sunk in about ten feet of water, the four men on board saving their lives with great difficulty by swimming to the shore. There was neither current nor squally weather at the time, and the mishap is attributed entirely to the swell caused by the steamer. Mr Rowland, with a staff of men and apparatus, have been making great endeavours to raise the sunken boat, but have only succeeded as yet in raising one end of her. Application has been made to the Severn Steam Tug Company for redress and Mr Williams, the secretary, promises the fullest investigation into the circumstances of the accident.*[5]

Encounters with the steam tug 'Enterprise', could be fatal, as happened in 1875:-

> *MELANCHOLY ACCIDENT. - On Wednesday evening a melancholy accident occurred in the river Severn, by which a respected member of the Stourport Literary Institute Boat Club, named A. H. Baldwin, residing at Astley, lost his life. In company with four others, he had gone out in a boat for a row to Holt Fleet, as practice for the ensuing regatta at Stourport. The river was very high, and when near Shrawley Wood they passed the steam-tug Enterprise, which runs between Stourport and Bristol. She is a powerful paddle steamer, and had two vessels in tow; there was a great current, and they* caused the water to become very *rough. Waves filled the boat and caused her to sink, leaving the crew struggling in the water. Only one of the drowning crew could swim, and he with difficulty managed to reach the banks. The other four struggled in the water for some time, when assistance came. Bayliss clang to the capsized boat, and whilst hanging on his son passed him. He made a snatch at his lad, caught hold of him under the arm, and both were rescued. Mr. Baldwin could not swim, and seizing hold of Mr. Beech's clothes, he held up until the clothes gave way, and he was at once carried down with the rapid current. His body had not been found up to Thursday night.*[6]

Mr Baldwin's body was later found near Shrawley Wood; Berrow's Worcester Journal attributed the accident 'entirely to the want of a knowledge of swimming'![7]

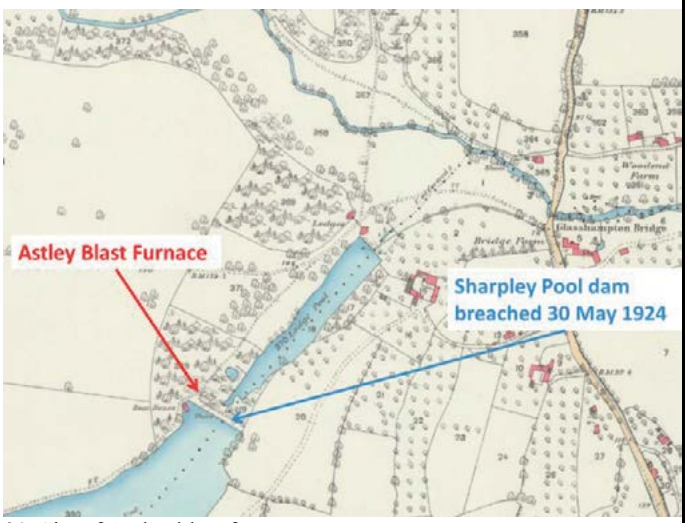
1 WAAS 705:7 BA 7335 133 (iii) 1-47. This file contains c.100 bills, receipts and miscellaneous notes.
2 WAAS 705:7 BA 7335 133 (iii) 40
3 *Berrow's Worcester Journal* (Worcester, England), Saturday, December 09, 1854; pg. [1]; Issue 7933. (21485 words). *19th Century British Library Newspapers: Part II*
4 WAAS 705:7 BA 7335/108 (i) 43 (1818) and WAAS 705:7 BA 7335/133 (vii) 64 (1852)
5 *Berrow's Worcester Journal* (Worcester, England), Saturday, March 21, 1857; pg. 8; Issue 8054. (3399 words). *19th Century British Library Newspapers: Part II.*
6 *Berrow's Worcester Journal* (Worcester, England), Saturday, June 21, 1879; pg. 3; Issue 9688.
7 *Berrow's Worcester Journal*, Saturday, June 28, 1879; pg. 3; Issue 9689.

LiDAR assisted Reconstruction of Industrial Activity in the Dick Brook Valley

Richard Pumphrey

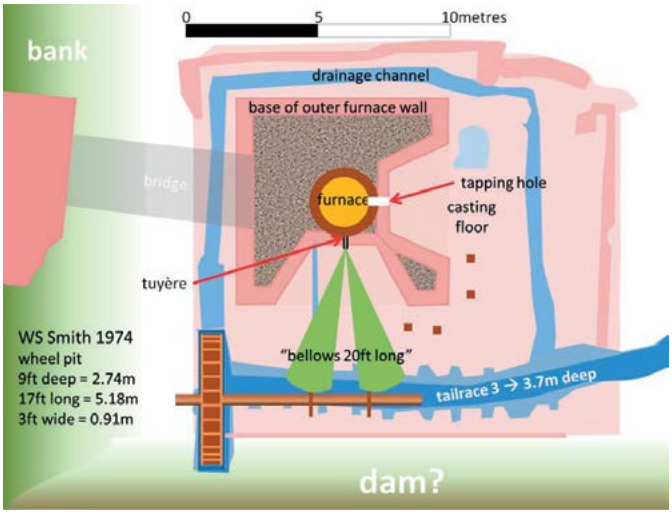
Astley Blast Furnace

The discovery of this furnace and its attribution to Yarranton is described in chapter Tales of Two Rivers (p. 82-95).



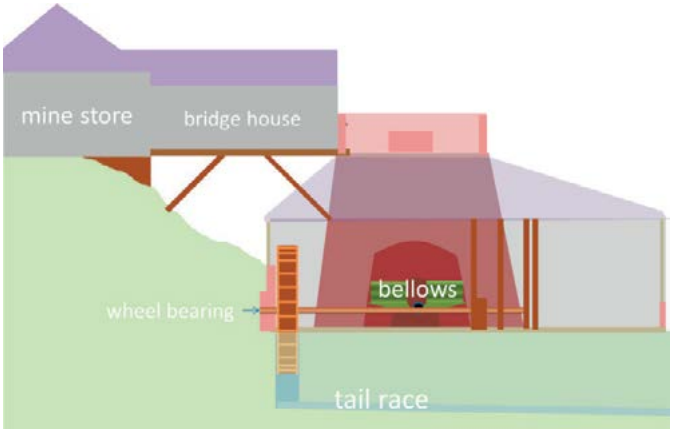
01. Site of Astley blast furnace

Archaeological investigations reported by Cantrill and Wight in 1929[1], Peter Brown in 1982[2] and WS Smith in 1974[3] describe the details of the remains allowing us to compile the plan in (02) and make tentative reconstructions of the elevations in (03) and (05). The stonework of the bridge abutment is still visible just below the public footpath designated as Worcestershire AD-640 (04). Like the other structural walls revealed during the excavations, it is built from ashlar – large regular rectangular blocks of sandstone masonry (04).



02. Plan of the foundations of the furnace revealed by successive excavations. Yarranton mentioned bellows twenty foot long driven by a great wheel, compatible with the distance from the wheel axle to the tuyère.

Blast furnaces had evolved over centuries before this one was built, but it was the first known example in the UK with a round furnace cross-section.[4] There are many other examples of blast furnaces with a similar ground plan to (02) and surviving examples and contemporary drawings suggest that the plan and elevation at Astley will have been something like (03) and (06).



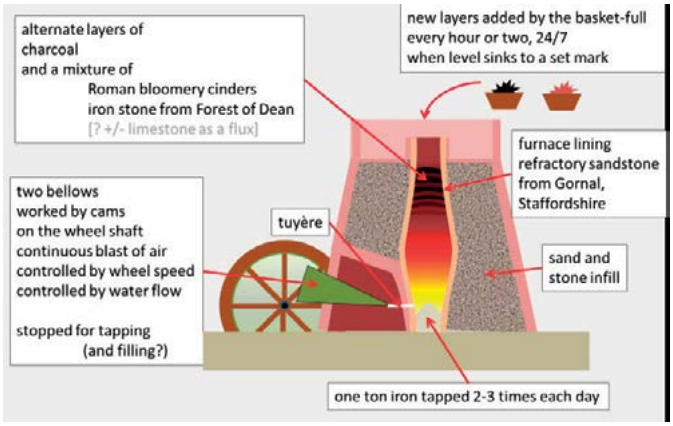
03. Tentative reconstructed elevation of the Furnace viewed from the southeast.



04. Photograph of the bridge abutment taken in April 2021.

How the furnace worked

It took several days to get the furnace fired up before iron production could start, and once started it had to run 24/7 for a "campaign" lasting several months; during this campaign it was fed every hour or two with alternate layers of charcoal and "mine" (05), the ore and Roman cinders described in (Tales of Two Rivers). Although limestone was added as a flux in some furnaces, an analysis of the slag at Astley by Hallett and Morton[5] suggested that the ore from the Forest of Dean had enough limestone to make further addition of flux unnecessary. Molten iron and slag were tapped two or three times each day by breaking the seal in the hearth. Once done, the seal was replaced with damp clay.



05. Diagram of the blast furnace to demonstrate its operation.

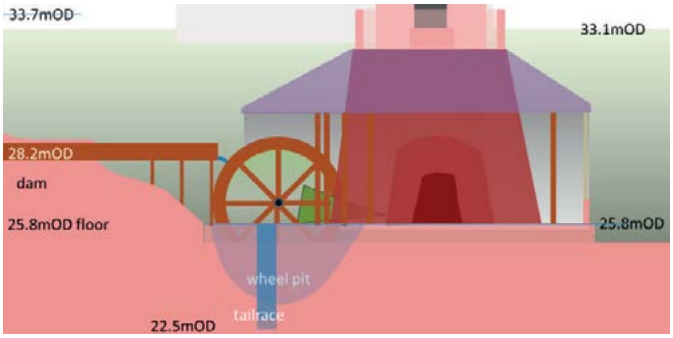
Power

Writing about recent improvements in iron extraction, Yarranton said "*but now by the force of a great Wheel that drives a pair of Bellows twenty foot long, all that Iron is extracted out of the Cinders which could not be forced from it by the Roman Foot-blast*."[6] The air was forced into the furnace through an orifice termed a tuyère. We know from the size of the wheel pit that the diameter of the wheel at Astley was around 17ft (5.2 metres), smaller than some other known blast furnace wheels. We do not know if it was overshot (water supplied at the top of the wheel turning it in the direction of the water flow), or breast-shot, when the wheel turned the opposite direction (06). Overshot would require a higher head of water than breast-shot, estimated at 29.2mOD (metres above Ordnance Datum). This head of water could have been supplied by a dam immediately above the furnace, in which case the surface of the pool at its lowest would need to have been at least 29.3mOD which is substantially lower than the surface of the later Sharpley Pool which was 33.7 mOD. But because of the vital importance of a continuous supply of water to the wheel during the furnace campaign, and because of the intermittent supply to the mill pool from Nutnell Brook, when full the mill pool would have needed a surface level of say a meter above the minimum head to give working reserve (07).

Alternatively, the wheel could have been supplied *via* a leat from Lower Nutnell Pool (08); with a fall comparable to that of Astley Mill leat, this leat would have an ample head to supply an overshot wheel. The option has been neglected by historians of this site.

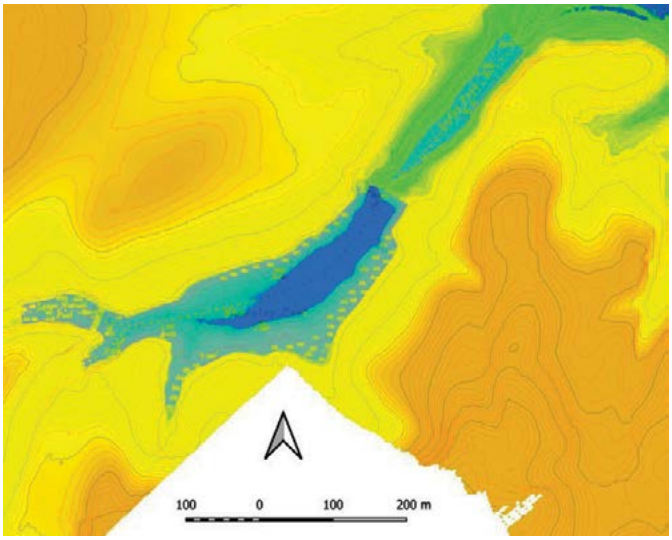


06a. Tentative southwest elevation of the furnace with overshot supply to the wheel at 29.2mOD. 33.7mOD marks the LiDAR level of the surface of Sharpley Pool as mapped in the OS survey of 1883, 33.1mOD is the LiDAR level of the track, now a footpath, above the bridge abutment.

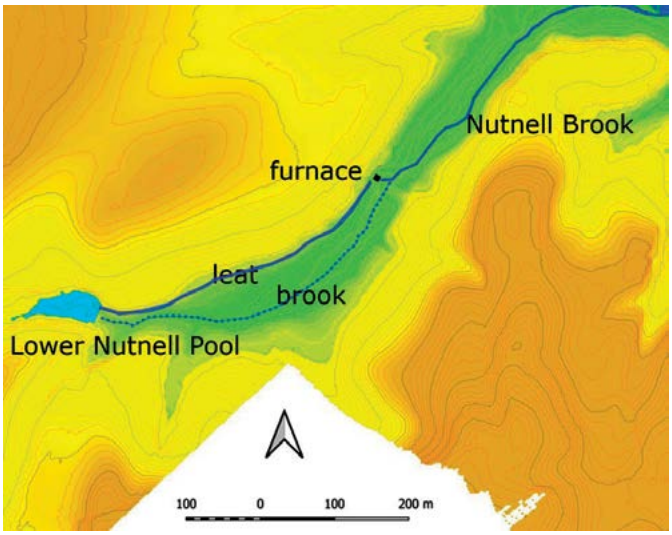


6b. Breast-shot supply to the wheel; minimum mill pool surface around 28.2mOD – working surface probably a metre higher.

An overshot wheel would have turned clockwise as seen from the southwest. Cams on the wheel axle would have connected with upper leaf of one of the bellows, forcing it down while the upper leaf of the other bellows was pulled up by a yoke connected to the one being pushed down. With further rotation of the wheel, the other cam performed the same process on the other bellows, thus providing an almost continuous blast of air to the tuyère. A breast-shot wheel would have turned counter-clockwise, with the cams connecting to the lower leaf of each bellows in turn, again providing an almost continuous blast of air.



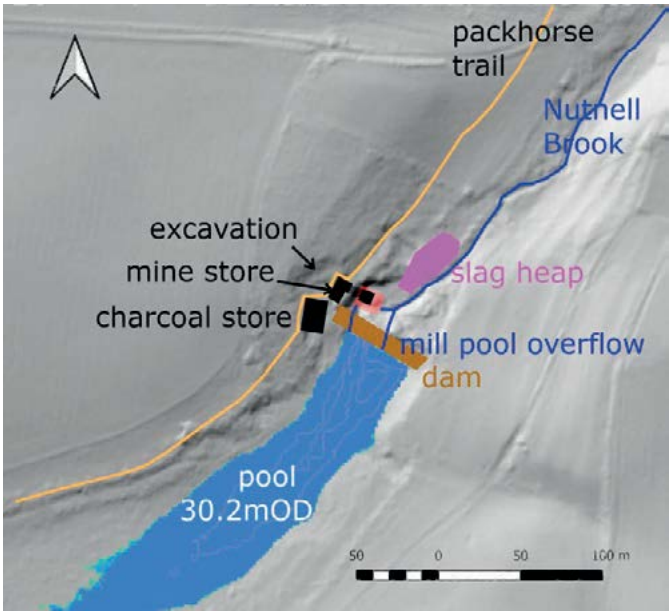
07. Size of a possible 1652 millpool with surface at 30.2mOD (dark blue) with 1901 Sharpley and Lodge Pools pale blue. Take-off from the pool would have been controlled by a sluice and there would have been an overflow system to protect the dam.



08. Course of the possible leat: with a similar fall to that of Astley Mill leat, this could have powered an overshot wheel.

Supplies

As with the need for a continuous supply of water, so there was a vital need for a continuous supply of charcoal and "mine". The weak link in the supply chain was the local transport system, which we suspect depended on pack animals rather than wheeled vehicles. The sources of charcoal and mine are detailed in the chapter Tales of Two Rivers (p. 82-95). Charcoal didn't travel well; losses accumulated with every mile because small fragments were not suitable fuel. A "load" of charcoal was twelve of one hundredweight sacks, roughly the amount produced by one burn. A cart might carry three or four "loads", a pack animal just two sacks. Because of vagaries in the supply chain, large stocks of charcoal and mine were held near the furnace. From other sites where the buildings have survived and the historical documentation has been preserved, a typical charcoal store at this time was around 600 cubic metres – say 3m high and 10m x 20m floor area. The store was sited upwind of the furnace at sufficient distance to protect against fire caused by sparks flying up from the furnace. Newly arrived charcoal sacks were quarantined for several days before adding to the store to ensure none had glowing embers concealed within. In their report on their excavation, Cantrill and Wight described remains of slag (Roman cinders) and charcoal sited southwest of the furnace (10).



10. Hill shading map (LiDAR 2020 DTM) of the furnace site, indicating possible positions of mine and charcoal stores. The hollowed-out area in the hillside above the furnace may have been created later when Sharpley Pool dam was made, or may have been the site of staff accommodation for the furnace, supposing that they had levelled the ground there in the process of making the mill pool dam.

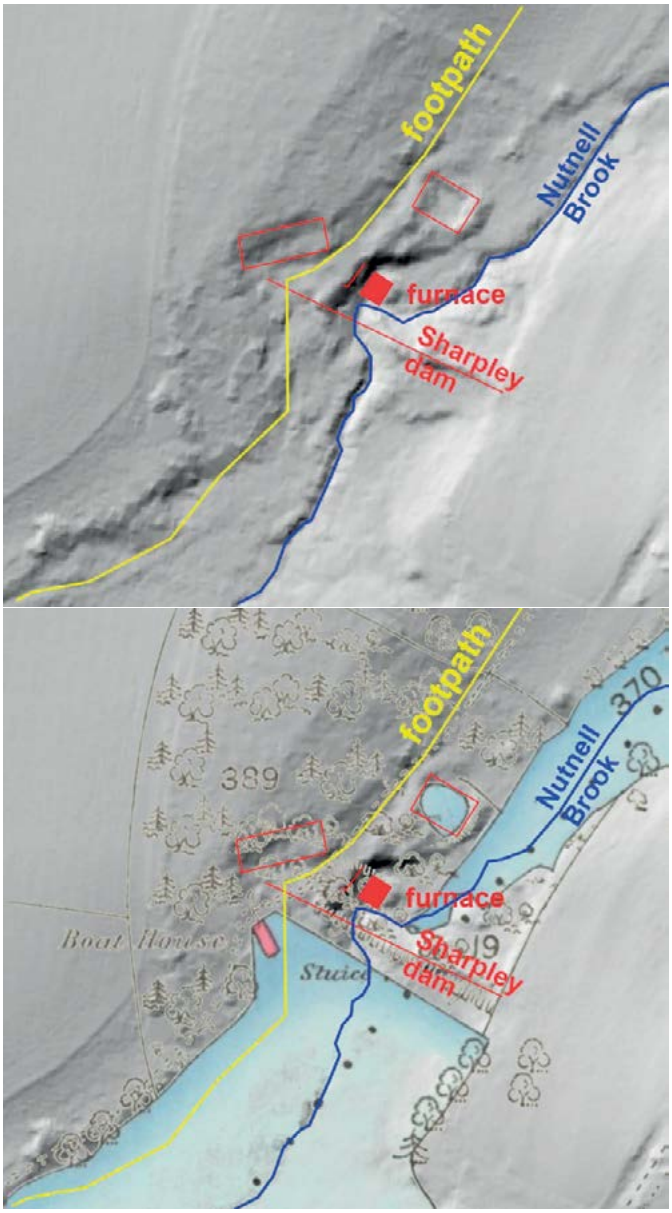
Staffing

Local staffing of a furnace such as this would have comprised a Founder (head of works, designer of the buildings), a Keeper (his second in command), one or more probably two Loaders to keep the feed to the furnace going all day and night, and a Stock-taker who kept a tally of supplies as they arrived and monitored local stock levels. These staff usually lived close to the furnace, at least during the campaign. Stocks would have been garnered throughout the year, being built up when the furnace was inactive. Offsite, supplies were negotiated and paid for by the Clark, or in the case of a small operation such as this seems to have been, by the Ironmaster himself. A majority of historians suppose that Yarranton was the Ironmaster for this furnace.

Productivity

At a minimum we know 500 loads of charcoal were delivered to this furnace (chapter Tales of Two Rivers p. 90). By comparison with other similar furnaces, we might expect Astley furnace to produce around 400 tons iron each year with a 150-day campaign. (2-3 tons each day). At two loads of charcoal to one ton of pig iron this amounts to 800 loads of charcoal, so we might suspect there were another 300 loads each year that we have no record of.

The Founder will have tapped the molten pig iron two or three times a day. Unless this was cast into end-use castings such as cannon or shot, the tapping would yield sows (long bars tapered to each end and weighing many hundredweight) or pigs (shorter bars weighing up to one hundredweight). It seems unlikely that Astley Furnace made sows because we think the pig iron transport was by packhorse, and a load for one animal would have been two pigs, each weighing 90-100 kilograms. Hallett and Morton[5] reported finding one partially filled pig, two feet long. At this length a pig 4 inches by 5 inches wide (60cm x 10cm x 12cm) would have weighed one hundredweight.



10a. 2020 1m LiDAR DTM showing rectangular features that have not been accounted for in previous reports on the archaeology of the site. The one northeast of the furnace was filled with water during the lifetime of Lodge Pool. Was this a building?

Lifetime of Astley Furnace

Building a blast furnace was a substantial investment. The furnace lining was a special refractory sandstone from Gornal, Staffordshire. The rest of the stone was Helsby Sandstone, the local bedrock. We have no information about whether this was sourced remotely and carted to the furnace or obtained locally. There is what may have been a quarry just 300 metres upstream of the furnace which could have been the source. Unfortunately for us, it seems that most of the furnace and associated buildings were cannibalised during the construction of Sharpley Pool dam.

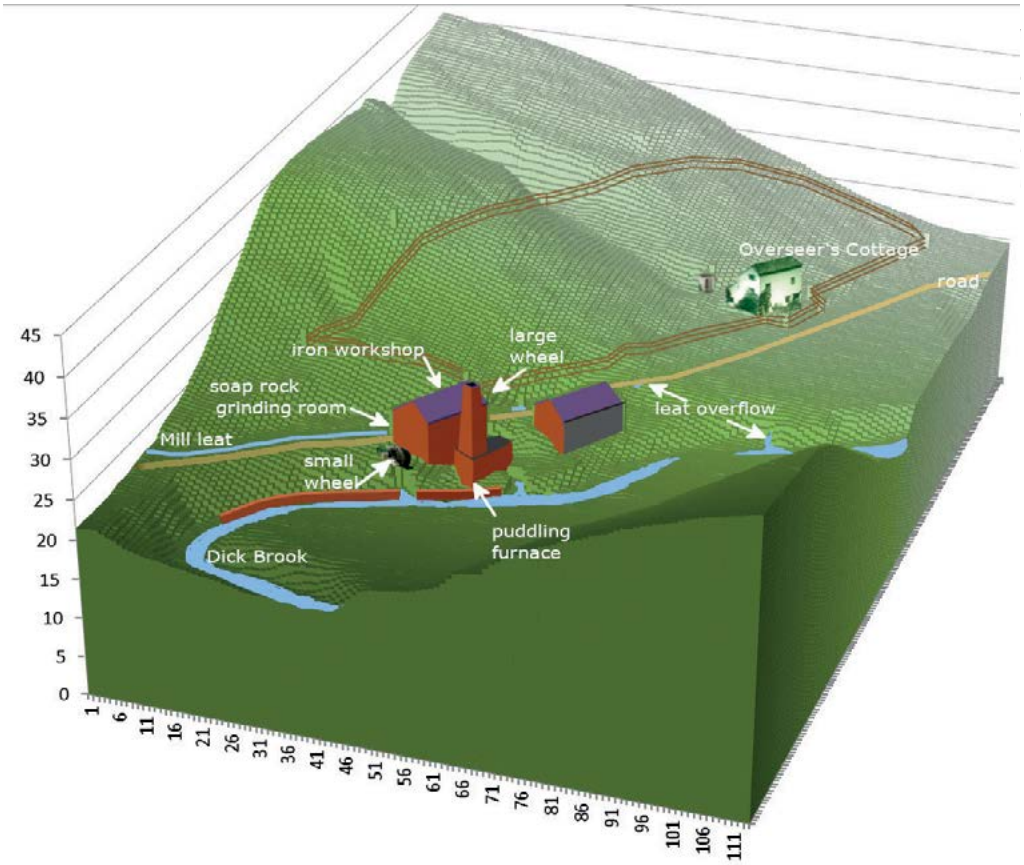
Most blast furnaces lasted many decades or a few centuries. Why was Astley Furnace abandoned after only eight or so years? Various factors are possible causes. The Roman cinder contract ran out after eight years. More powerful competitor Ironmasters most likely monopolised the charcoal supply, freezing Yarranton out. Another possibility is that a Nutnell flood overwhelmed the sluice: water reaching the furnace then would have led to an explosion that could have been the last straw.

Astley Forge Mill and leat

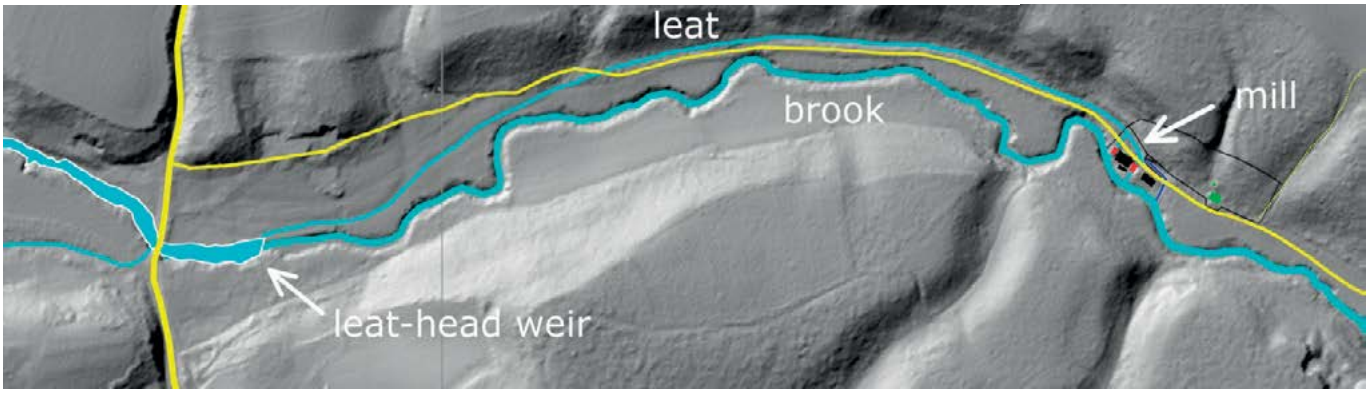
The history of this site is described in (chapters Astley Forge Mill p.103 and Tale of Two Rivers pp.82-95).
The site was excavated by Cantrill and Wight in 1929 and in 2009 by the North Worcester Archaeology Group[7], revealing the remains of three main buildings as well as the mill leat, culverts and channels associated with the water for the mill. Cantrill and Wright followed the leat to its junction with Dick Brook and found a sandstone structure in the banks of Dick Brook close to the road bridge and concluded that this was the remains of the leat-head weir. A map surveyed by Cotterell[8] in 1817 is so accurate that Dick Brook is congruent with the LiDAR at every twist and turn. This map shows the leat running along a course matching a groove visible in the LiDAR DTM, joining Dick Brook exactly as recorded by Cantrill and Wight as indicated in (12).

The LiDAR data collected by the Environment Agency to study flooding of the River Severn[9] are ideal for investigating the water courses associated with the mill. They show an average gradient of around 14 cm per 100 metres along the 2014 ground surface of the course of the leat from the leat-head weir to the leat sluice by the mill, a distance of 720 metres (13).

If the leat-head weir raised the level of the brook by 1.5 metres and the leat was dug to around 1.5 metres below the 2014 ground level, water from the brook would flow freely down the leat. The fall of 14 cm per 100 metres is somewhat less than that in another historical leat, where the least fall was 20 cm in 100 metres.[10] Above the weir the water level would come up to the top of the lower wall by Glazenbrook Cottage (14). This leat provided a usable head of around 3.2 metres at the waterwheels (15, 16).



11. 3D reconstruction of the forge/mill in 1811 from the LiDAR Digital Terrain Model (DTM), viewed from the southwest. The appearance of the Overseer's House is derived from an old photograph; its position and that of the fence around it is shown as that on the 25 inch Ordnance Survey map surveyed 1883, which shows a small building behind the house, interpreted here as the outdoor privy. Scale in metres: vertical scale metres above Ordnance Datum. The ground plan of the Forge/Mill buildings and water channels is taken from a site plans resulting from archaeological excavations. According to Cantrill and Wight, the leat overflow was a walled harbour and there was wide enough access and high enough bridge under the road for barges to leave the brook and dock there.

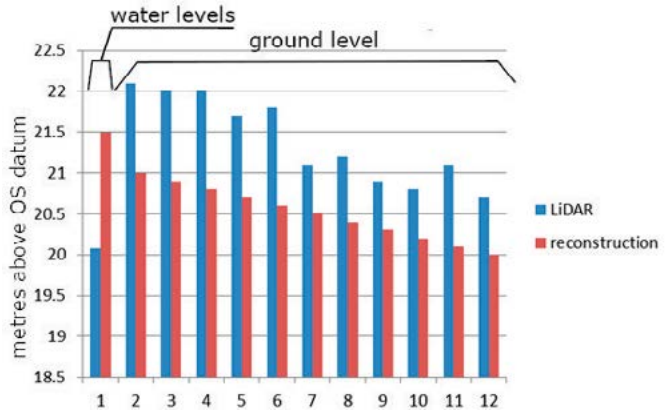


12. LiDAR DTM decorated with the brook, leat (as surveyed by Cotterell 1817) and road (as shown on the OS 25 inch map surveyed 1883). The leat-head weir will have flooded the brook valley upstream as indicated.

In a disastrous storm on Saturday July 10th 1728[11] "*two Corn-Mills, a Paper-Mill and a house were swept down Astley Brook into the River with great trees and Part of a Hop-Yard*". One could readily imagine that flotsam, swept down the brook by the flood, piled up on the leat-head weir, diverting all the swollen brook down the leat so that it overwhelmed the sluices by the mill, cascaded through the wheel pits carrying the wheels away, and if the overseer's cabin had been on the level ground above the stepping stones, this would have been swept down the brook to the Severn as well. The Hop-Yard was most likely that later in 1839 mapped as tithe 477.

The original three corn mills

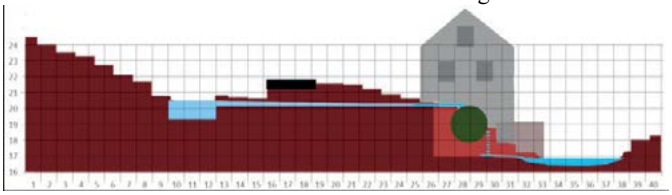
Because of successive floods and disasters afflicting the site of the mills, we can only speculate what the original arrangement was. The history of mills at this site first emerges in documents from 1665, as described in (chapter Astley Forge Mill p. 103). This and subsequent documents makes it clear that there were three "mills" and that these were close enough together to be described as under one roof in 1761. Excavations have only revealed two wheel pits; the supposition is that the small wheel powered one millstone and the larger wheel two, the term "mill" referring to the millstone rather than the wheels or buildings. At least some parts of these mills were most probably built from local stone: the possible quarries are shown in (20).



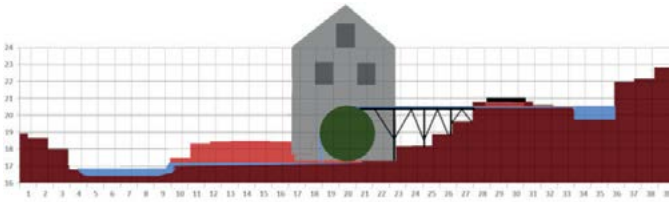
13. LiDAR heights above Ordnance Datum along the course of the leat sampled every (approximately) 72 metres (blue) and height of water by the weir and the bed of the leat (red), with a fall of 14 cm per 100 metres



14. The old Glasshampton Bridge looking north. The lower embankment below Glazenbridge Cottage may indicate the level of the brook when the leat-head weir was functioning.



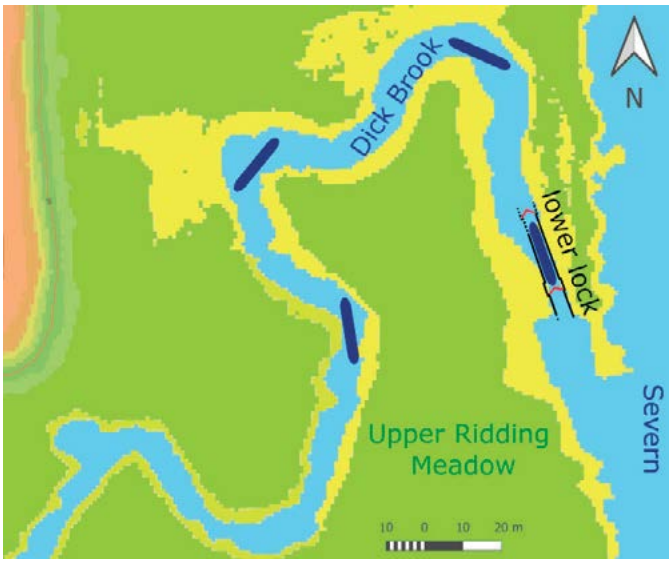
15. LiDAR-based cross-section along the course of the water flow for the small wheel looking east. The grid marks 1.0 metre squares. The mill building is behind the plane of this section and the brook embankment is at an angle to the plane and so the mill building appears to protrude into the brook. The leat has been deepened here to compensate for the detritus that filled it between 1811 and 2014; the present distance from road surface to floor of the culvert is 1.00 metres. The level of Dick Brook is that on 12/12/2014, when the brook was raised an estimated 0.3 metres from its typical summer level. Allowing for the feed to and drainage from the wheel, the head available at the wheel was around 3.2 metres.



16. LiDAR-based cross-section along the course of the water flow for the large wheel looking west;

The locks

Soap rock was transported to the mill along Dick Brook. We have no regular flow data for Dick Brook, but Dowles Brook, which flows from the west into the Severn just north of Bewdley, may for this purpose be taken as a surrogate for Dick Brook. The data (21) suggest there might briefly have been just sufficient depth for a shallow draft cargo vessel on the odd occasion in the first six months of typical years, but that would be against a strong current; therefore locks were needed. There are remains of a lock near the outflow of the brook into the Severn that could raise the level in the brook, to much the same level as seen in the LiDAR of 12 December 2014, which shows a water level at the lock close to the supposed top of the lock gate. The structure of these locks was described in detail by Lewis *et al* in 1969, who considered them half locks. Others have concluded they were pound locks[12] because of the dressed stone sides extending the length of the pound[13] and cills at each end indicative of gate closures. Such a pound lock would have kept the level of the lower section of the brook at much the same level as on the LiDAR.



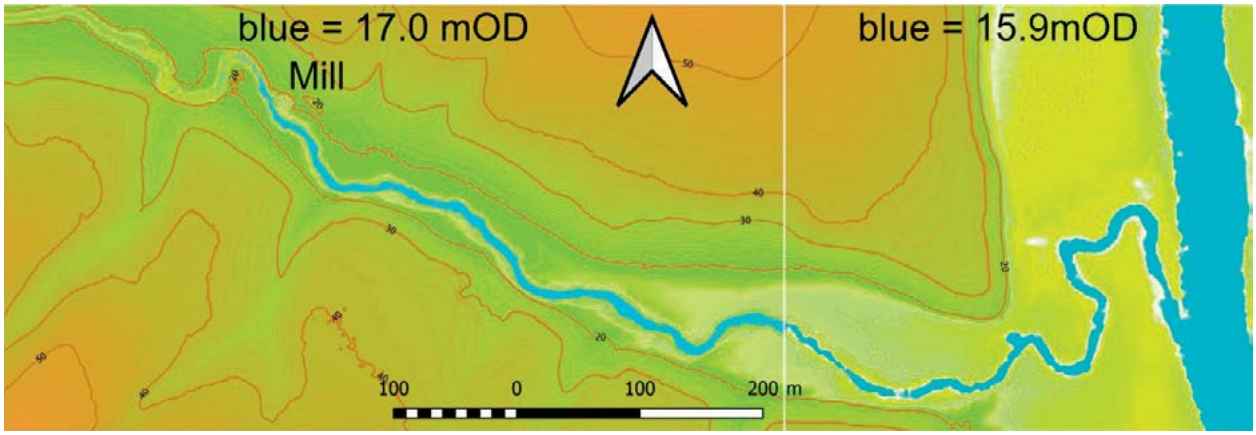
17. Map of the junction between Dick Brook and the River Severn based on the LiDAR DTM of 12/12/2014. The lower lock is shown as a pound lock with a 60 foot (18.3 metre) long vessel. Despite the meanders, this length of vessel could navigate up to Astley Mill.

Just at the point where the influence of the lower lock ran out (judged by the water levels on 12/12/2014), 520 metres above the lower lock there is another lock, again debatably a flash lock or a pound lock. (18)

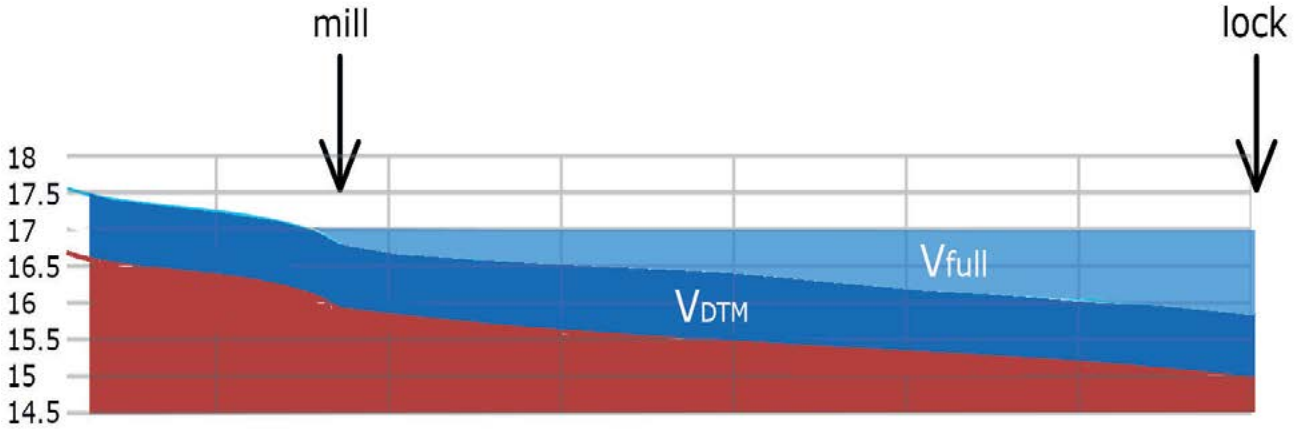
The level of the water surface at the mill on 12/12/2014 was 16.8 metres above Ordnance Datum (19), giving a depth around 0.9 metres (estimated by the difference between the LiDAR surface and the bed of the brook at the stepping stones). This is a scarcely adequate depth for even a shallow draft vessel, explaining the need for a second lock. Although there is a strong probability that this was a pound lock that would have kept the brook full above it, several authors have considered these were flash locks.[14,15] The calculation on (19) strengthens the case for a need for a pound lock.

The upper canal?

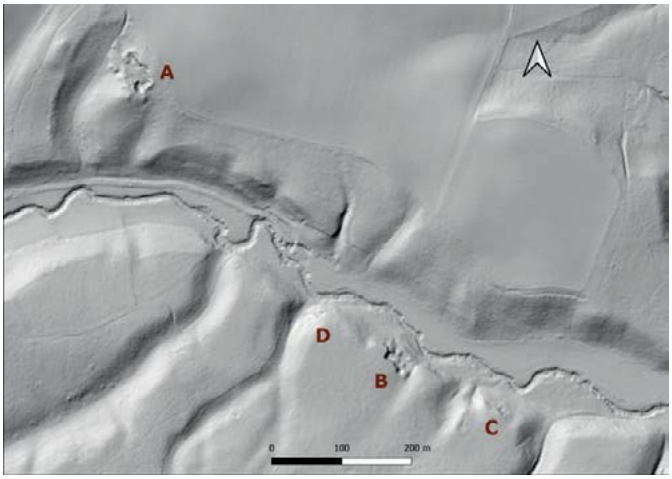
If the leat-head weir had been built on Dick Brook somewhere near the midpoint of the leat it would have provided an equal head of water at the mill and a good-sized millpond. Why did they go to the effort of continuing the leat all the way up to near Glazenbridge? One possibility that has been considered is that this was used as a canal to transport materials to the furnace that was later buried by Sharpley Pool dam when it was built around 1700. This idea has been firmly rejected on very good grounds: see (chapter Tales of Two Rivers p. 93-4) yet from a purely practical point of view, it was not an impossible concept. The leat head weir built across Dick Brook would have raised the water high enough so Nutnell Brook, which joined Dick Brook immediately above Glazenbridge, could have been canalised as far as the site of the Lodge Pool dam that was built there later soon after 1800, at which point a further lock would have been needed to raise the canal to the same level as the Lodge Pool. It then would have reached the site of the furnace, allowing transport of the Roman cinders all the way from Worcester with just one manual transfer at Astley Forge Mill. The depth of digging the channel for this top section would have been reduced by a further lock at the junction between Nutnell Brook and Dick Brook. Although possible, the evidence seems strongly against this concept, not least because the locks we see the remains of today were probably not constructed until long after this furnace had finished working. This leaves us with the conundrum of why the leat was so long. Conceivably land ownership was the problem: the millpool created by the lower dam would have flooded land on the Shrawley side of Dick Brook that by 1839 was tithe 477, a hopyard.



18. Map of Dick Brook and the River Severn based on the LiDAR DTM of 12/12/2014. With water levels at 15.9 metres above Ordnance Datum (mOD) Dick Brook is navigable to just above the upper lock. To make Dick Brook navigable as far as the mill would require at least 1.1 metre step in level at the upper lock.

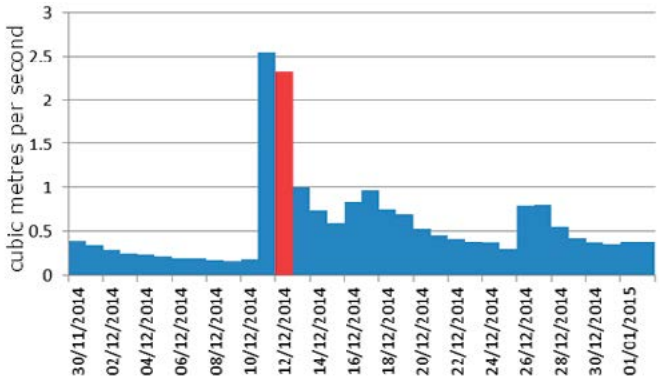


19. Profile of the brook bottom (brown) derived from the surface on 12/12/2014 as plotted from the LiDAR DTM (top of dark blue): grid is 0.5m vertically, 100m horizontally; v_{DTM} is the estimated volume flowing in this segment on 12/12/2014. v_{full} = extra water needed to achieve 1.0 metres up to the mill with low flow (light blue), taken as the 17.0 metre level. v_{full} = 1906 cubic metres calculated from the DTM as the volume between the brook surface, the brook banks and the 17 metre plane. The area of the brook surface between mill and lock on 12/12/2014 = 2214 square metres, giving v_{DTM} = (0.9 x 2214 x c_u), where 0.9 metres was the measured depth, c_u is a correction factor for unevenness of the brook bed. Taking c_u = 0.8 this gives v_{DTM} = 1594 cubic metres. Therefore at lowest summer flow, the maximum volume needed to achieve the 1.0 metre depth at the mill by closing the upper lock is 1096+2214 = 3310 cubic metres. With summer low flow levels (21b) this would regularly have taken the better part of a day, sometimes longer to make the upper stretch navigable, strengthening the case that it would have been far preferable to have a pound lock. 17 mOASD is the very minimum that would be needed and the actual level was probably higher, thus prolonging the filling time and increasing the need for a pound lock rather than flash lock.

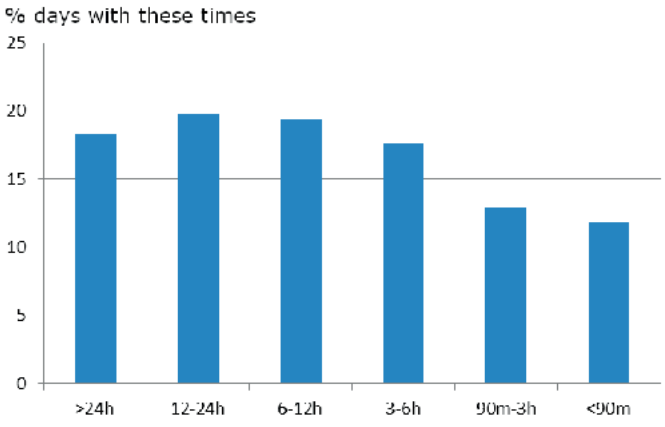


20. Quarries that might have provided stone for the Forge/Mill and locks. “A” used to be larger but has been partially filled in in recent years. ”D” is so small it may have been exploratory; “C” may have provided stone for the locks or repairing the track along the south bank.

Supporting data



21a. Dowles Brook flow on 12/12/2014, the day of the LiDAR survey. If Dick Brook had a similar pattern of flow, on 12/12/2014 it would have been much deeper than on most other days.



21b. Time taken to accumulate the 3310 cu. metres calculated in (19) to fill from the upper lock to the mill, derived from 48 years of continuous observations in Dowles Brook, correcting for the catchment areas of 46.8 sq. km. for Dowles Brook and 36.6 for Dick Brook. Despite the obvious caveats, this graph suggests that many days in the year would cause significant delay to the cargo vessel if the upper lock were a flash lock.

Table of distances from The Severn to the leat-head weir.
Flow charts for Dowles Brook (21): these show the intermittent pattern of flow, the likely flow in Dick Brook on 12/12/2014 when the LiDAR data were collected and the time for Dick Brook to fill from upper lock to the Mill.

Way points	*metres*
Severn to upper end of lower lock	54
Upper end of lower lock to upper lock	521
Upper lock to stepping stones	474
Stepping stones to upper spillway	60
Sluice at the mill to the weir at the leat-head	720

Acknowledgements
Many thanks to Francesca Llewellyn for historical information and maps, to Pete Byfield for information on the locks, to Mike Averill for information on Dowles Brook, to Peter King for instruction on the history of the iron industry.

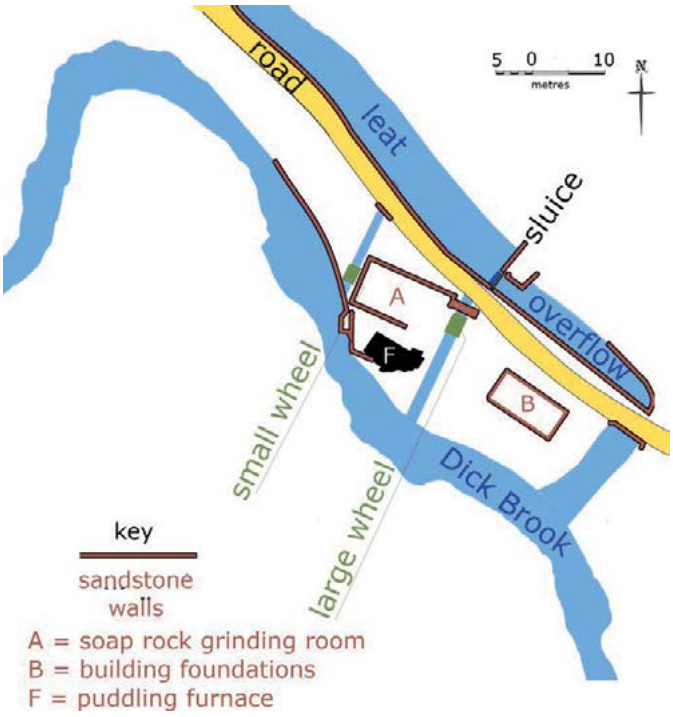
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Astley Forge Mill

Francesca Llewellyn

The earliest documentary evidence for a mill in the Lower Dick Brook valley is in 1665 when John James gave to his son Higgon James, among other property, three water corn mills in the estate called Woodend[1]. Woodend is the name of the farmhouse by Glazenbridge and the estate was between there and the River Severn. The mill subsequently became a fulling and a paper mill as well as being used in the scythe industry before being acquired by the Worcester Porcelain Company in 1763.



01. Layout of the Forge/Mill site as determined by archaeological excavation..

The Worcester Tonquin Manufacture was established in 1751 by, among others, Dr John Wall and William Davis. They had been experimenting to try and produce a hard paste porcelain which could withstand boiling water. In 1752 the Worcester Company acquired the factory of Millar and Lund in Bristol. The company wanted to acquire Lund's recipe for making porcelain as well as the source of the 'magic' ingredient, soaprock. Richard Holdship, one of the founders of the company, acquired Lund's Licence for the soaprock. This could only be found in certain places in Cornwall such as Gew Graze and other sites in the parish of Mullion from where it was shipped to Worcester.

The Astley Forge mill was bought so that the porcelain company could grind the soaprock; perhaps a secluded valley, 10 miles from Worcester, enabled them to keep the importance of the soaprock secret. After the soaprock was ground, it was shipped back down the Severn to Worcester. The Shrawley Wood books record several purchases of wood between 1766 and 1768; e.g. in 1767 67 feet of timber was bought and in the following year another 17 tun 48 feet as well as 1700 long oak. In that year £46 -14s -4d was spent on timber[2]. Perhaps this wood was being bought to build or rebuild the structure and the wooden water wheel as well as the pans used for grinding the soaprock. The last reference to the china company was in 1800 when they bought timber for the repair of Riddin Bridge.[3]

The Worcester Porcelain Company used the mill until 1806 when it became a iron forge operated by Richard Shinton and Richard Cook Lowe[4]. They made a number of metal objects including *rolled as well as Hammered Iron, Rods, Hoops etc.*[5] In 1806, Mr Shinton is recorded in the wood book buying *56 foot of timber @ 3/6 Per foot* costing £9 - 16s - 0d and 15, ½ Cord of Oke Cord wood @ 13/- etc for £10 - 1s - 0d. Perhaps he was renovating the premises. In 1810 and 1811, he bought *One Crap of a Tree by Forge* for 15 shillings and *A Crap of a Tree* for 12 shillings.[6]

However, their occupation was relatively short-lived. On 27th May 1811 there was, for them, a disastrous flood when the River Severn rose six feet in one hour and nearly 20ft in 24 hours[7] and the water backed-up to the forge while they were making wrought iron in the puddling furnace. Recent excavations have found a large piece of slag left in situ after this event.[8]

Two days later their partnership was dissolved. This was announced in an advertisement in *Berrow's Worcester Journal* of 18 July 1811 that the Partnership ... in *the Business of Ironmasters, carried on by them at Astley, ... was on the 29th Day of May last Dissolved by mutual consent.*[9] The mill and the estate on which it stood was sold to the Rev Denham James Joseph Cookes[10] who already owned a large majority of the land in Astley. No more commercial activity was carried on at the site, but the nature of its last use stayed on in the name of Forge Cottage into the twentieth century

SOURCES

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Pools in Shrawley

F M Llewellyn



Dam	made	breached
Sharpley	1707	1924
Lodge	1817	1924
Layes	1805	2005
Middle	1812	
Grove	before 1816	
Holders	before 1813	
New	1850	
Shotgrove West	before 1731	1980?
Shotgrove North	1883-1901	2005?
Shotgrove Middle	after 1921	1980?
Dingle	after 1945	

01. Pools with dams within the Parish of Shrawley.

The earliest references to ponds in the parish of Shrawley are in the Shrawley Compotus Rolls of 1389/90 and refer to fish ponds (stews), especially to the '*10 wagons hired as if for one day to carry earth to the head of the upper fishpond*' and '1 *cart for 2 days to carry earth to repair the head of the lower pool*',[1] and in 1433 an account records the sale of fish for 40 shillings from two pools called Shrawley Pools to the use of the hospice of the earl at Salwarpe by ordinance of William Morley steward there.[2] It had been thought these pools were in Shotgrove rather than in Shrawley Wood, perhaps because of a misunderstanding of the manorial records of the period.[3] The appendix to this chapter gives Valerie Powick's translation of the section of the 1389/90 Compotus Roll with details of the expenses associated with these pools.

By the early nineteenth century Sharpley and Lodge New Pool were referred to in the Shrawley Tithe Apportionment of 1838[4] which were owned by Maria Henrietta Cookes, widow of Rev Denham James Joseph Cookes, late of Astley. These, along with the Nutnell Pools, were part of the Glasshampton Estate. Sharpley and Nutnell Pools are shown on an 1817 plan of the Glasshampton Estate[5] and may have been created when Glasshampton House was rebuilt by Sir Thomas Cookes Winford in about 1707. Newspaper advertisements of the mid 18th century[6] regarding the letting of Glasshampton refer to 'a Fish-pond about two acres, well stock'd with Fish'. Lodge New Pool was established between 1817 and 1839[7]. It is not on the 1817 plan; the area is called Furnace Meadow. Sharpley and New Pools no longer exist, being swept away when the dam burst in 1924.[8]

The sale description for Severn House Estate, in the Worcester Herald for 1835[9], lists among its other amenities, Fish Pools. Now called Severn Bank House, located near to Shrawley Brook, this property was known as Cock Baylis and occupied by the Severne family for many years. It was acquired by Thomas Taylor Vernon in 1835 for £11,000[10]. There was a pool or stew near the house and another by Shotgrove coppice[11]. (see chapter Shotgrove p. 309). By the end of the nineteenth century, this pool had decreased in size as part of it had dried up. Another pool in Shotgrove was not shown on the first edition 25 inch Ordnance Survey map,[12] but does appear on the second edition of 1903.[13] Near to the pool in Shotgrove is a field called Washing Pool Meadow which still has a small pool in it. In 1835 it was over 10 acres in size,[14] but had been subdivided by 1840.[15] It is possible that in the past there had been a pool here, perhaps used for cleansing livestock.[16] Its position by the road would make it easy to bring animals from the parish to be dipped here.

Near to Shrawley Wood, but on the Shrawley Court land is Holders Pool. In 1808, it is described as 'Seven acres with Pool etc' consisting of 'Mead[ow] & Past[ure]' and was 7 acres and 3 perches in size.[17] On the tithe map, it is shown as Number 24; Pool; 3 rods in size, owned by Mary Bourne and occupied by Robert Brazier[18]. In 1857, the pool was sold as part of the Holders Estate, 'consisting of Two Cottages, Fold and Pool and several pieces of excellent Land .... on the East side of road from Shrawley to Stourport'. The buyer was Mr H. Bearcroft, solicitor on behalf of Thomas Bowater Vernon.[19]

Mary Bourne owned another field, also occupied by Robert Brazier described as Barley Green Orchard and Court Pool.[20] Although

called Court Pool and listed on the tithe map and apportionment as No 40 (pasture), there is no water; but there is a reference in 1810 to the Cort pool geat or grate.[21] This was later incorporated into New Pool in Shrawley Wood.

By the end of the nineteenth century, there were three pools in Shrawley Wood called Layes Pool, formerly Frog Pool, Middle Pool and New Pool and in the twentieth century, two new pools in Shrawley were created, at Dingle Farm after 1945[22] and Curriers Orchard in 1998.[23]

The earliest maps of Shrawley are the Dougharty maps of 1731.[24] One is of Shrawley Wood, the other is a map of the estate in the parish of Shrawley. These plans are part of a collection of maps of the estates belonging to Bowater Vernon, Esq who had inherited the property of his father's cousin, Thomas Vernon, in 1721. The map of Shrawley Wood, although showing the paths or rides through the wood, does not show any pools. It is very possible that the streams flowing through Shrawley and the wood have been dammed at various time over the centuries, but no documentary evidence has been found to substantiate this. However, by 1826, when an application was made to the Quarter Sessions[25] to divert a road and footpath, the accompanying map shows a pool by the side of the wood near Frog Pool. The newspaper notice[26] of the closure (rather than diversion) of the footpath describes the pool as 'a Pool called Frog Pool'. This pool is also shown on the Tithe Map[27] when it is described as 'Lower Pool' (403) and as 2 acres and 13 perches in size. There are no references in the Tithe Apportionment to Frog Pool, but in the 1841 Census there are people living there.[28] The name Frog Pool may have been superseded by the name Layes Pool.

Two streams flowed eastward through the Shrawley Wood. The more northerly stream, Layes or Frogpool Stream or Middle Brook had been dammed to create Layes Pool.[29] The Shrawley Tithe Map of 1839[30] shows two pools in the Wood. These are number 403, Lower Pool of just over two acres in size and Upper Pool (Number 493) which is 2 rods, 30 perches in size. The map shows a dam separating the two pools which later became the larger Layes Pool. The same stream was dammed further eastward to create Middle Pool. At one time the ride from The Wood House into the wood crossed this brook, but that was later blocked by the creation of Middle Pool. Ladywell Brook flows from the south west corner of the wood and originally met Middle Brook; a dam was built at their confluence to create New Pool. It is interesting to note that part of New Pool was on land which was in 1732 the Wood Hop Yard shown on the Dougharty map.[31]

In the Vernon archives held at the Hive by the Worcestershire Archives and Archaeology Service is a collection of books called the Shrawley Wood Books.[32] These, dating from 1764 to 1850, with some gaps, give a detailed picture of work carried out in the wood and how much these activities cost. In the book for 1805 is the note: '*1 Oct To Makein a New Pool in J Housemans Bottom*'[33]. The field by Mr Houseman's bottom was called Lays Field, hence the name Layes Pool. This pool was emptied of water in June 2007[34] when the dam burst during the torrential downpours of that summer.

In 1807 various payments are made for 65 days' work by several workmen *'for Makin A New Pool in Wood by Mr Houseman'*.[35] The cost was £6-10-0d. In 1808 more payments were made for *'makein the Stew'* William and Thomas Jones, James Kings, John Bridges, Richd Griffiths and John Okey were paid a total of £6-4-0d. for 62 days' work. Carpenter John Cooke was paid nine shillings and two pence for *'making a Trunk for a Stew in wood and puttin in Bolt Screen etc'*[36]. A trunk was a conduit for the water and the wooden framework would enable the others to lay the stone to complete the structure at the pool head to regulate the water level in the pool. I believe that these accounts are for the construction of what eventually became Middle Pool. John Cooke provided other carpentry work to the estate, mainly repairs to the pool head or the grates over many years.

Over the next couple of decades, it seems that almost annual repairs were needed to the pool grates and the poolhead or debris needed clearing out. In October 1810 Thos Jones was paid six shillings and three pence for two & ½ days work repairing the poolhead and on 6 February 1811 John Bunts received £1-2-0d *for Repairin poolhead Cleaning*.[37] In 1812 John Preece was paid two shillings and six pence for *One day Gettin Stone for poole heads*[38] and in October 1813 Wm Jones was paid £1 for *8 days Repairing Pool Heads @ 2/-*[39] In 1815 it cost £9-10-0d for *'Clensing the Pool by Mrs Hausmans 380 yards @ 6/- per yd'* as well as five shillings for *2 Days Mending Pool Head @ 2/6 ye day* (Wm Jones) and ten shillings for *4 days work Mending the Pool heads @ 2/6 ye day* (Wm Bozard).[40] In October 1816 Jno Cooke received twelve shillings *for 6 days Work mending Pool head* and in November Wm Bozard was paid £9 for making a New Pool Head.[41] In 1818, Wm Jones received 10 shillings for *5 Days Mending Culvert at Pool* and Thos Jones 6 shillings for *3 Days Mending Culvit at Pool.*[42] It is interesting that most of this work took place during the autumn and winter.

In 1837 there are references to work at the Bath pool - '*Mar 9 Paid Saml Harris for getting & working 10 yards of Stone for the Bath pools £1 11 6d*'[43] and J Powick was paid 12 shillings *Drawing stone to the Bath etc.*[44] This may be the pool in front of the Wood House. One of the two small pools shown on the Shrawley Tithe map and the later Ordnance Survey maps in the grove to the south of the Wood House may well be Grove Pool. There is a reference in 1816 to Wm Jones being paid four shillings for 2 days' work in riding the ditch at Groves Pool.[45] Nothing more was specified as being done to this pool until 1843 when J Cooke was paid four shillings and six pence *'To making grate fixing Iron Works etc To Grove Pool ½ day 3/-'*.[46] More work was carried out in 1849 when Saml Harris was paid £8-5-0d for *'Mudding Grove Pool'* as well as £1-10-0d *'for 60 yards of stone @ 6d per Yard'*[47] and another £2-7-3 for *Stone in Grove Pool Head 3/6 per yard; 13½ yards stone as per Bill.*[48]

In 1850, Thomas Jones and James Thomas were paid £5-10-0d for *'Pudling the Grove Pool Head to Stoning the 2 Water falls as per Bill & Contract'* and another £26-10-0d spent on *'Rasing Stone to workeing & Setting to Carpenter Work to Sawing to Team Work & Pudling To Big Pool and too stewes in the Grove as Recent Contract'*[49] In October and November 1850 £5-5-9d was spent on *'repairing the Stone Bridge at Grove'* and *'getting clay and stone to Pool in Park & left in wood'*[50] Money was also spent on mudding Grove Pool and getting mud out of Grove Pool, which seems a bit of a contradiction.

The estimates for this work which were sent to T B Vernon's Guardian, G. C. Vernon at Hanbury are also included in the Vernon archives.[51]

Shrawley 29 May 1850
Sir
Richard at the Wood as sent to mee to examine the pool at the Grove and it Wants Puddlin it looses Water through the Stone Work at the Water fall and to get stone to get clay to face the Heade to rise Head for the Water to go to hits proper place in time of flud will be a grate Dale of Labour and I should Estimate the Expence at £5-10-0 as pool work is Expensive to do it properly
I am yours act servant
Thomas Jones

Shrawley 30th July 1850
Sir
James Thomas as been examming the big pool and the too stewes in the Grove and the estimate to raise stone to Face the Heads to get Claye to puddle to carpenter work of post and rail to making new trunk for stewe and Cleansing out the too stews
Will be the sum of *£23-10-0d*
Do for handling Stone *£ 3-00-0d*
£26-10-0d
Thom Jones Mast
James Thomas Would Wish an Answer Emadetely[52]

August 5th 1850 To Sam Harris
To getting working and Setting 13½ yds of stone to the Grove Pool at 3/6 per yd £2-7-3
1850 August 15th Received Sam Harris his mark.[53]

28th September 1850 Received from G C Vernon Esq five pounds ten shillings the amounte of Estimate for Puddling the Grove Pool in Shrawley Wood
£5-10-0 James Thomas is mark[54]

28th September 1850 Received from Mr G C Vernon Esq Twenty Six pounds ten shillings the amount of the annexed Estimate for Stone Work & Puddling at the Pools in Shrawley Wood £26-10-0d
James Thomas[55]

Finally in 1851 a grate was fitted to Grove Pool.[56]

As well as Grove Pool, work was also being carried out on Big Pool. This is, I presume, what is now known as Middle Pool. In 1811, Wm Bozard was paid £5-15-0 for repairing the Big Poolhead[57] and in 1816 money was spent on *15 Quarts to ye Ale for the Men when Fishing the Big Pool.*[58] The accounts show that in 1844 *£1-3-10d was paid to John Hughes Builder Brick-Maker Importer of Slates etc ..... Near the Cattle Market, Worcester for 'Bricks & Labour were used for the Head of the Big Pool in Shrawley Wood'*[59] and Joseph Winsley, Meason, was paid £1-5-3d *'For Puting in Brick Culvert at the Big Pool in the Wood',*[60] as well as three shillings paid to James Powick *'For Drawing timbers to Bigpool Bolt'*[61] In 1850 as shown above, work was done on Big Pool as well as Grove Pool.

In October 1836 Charles Cund submitted *'The Account of Sawin Don For the Leate In Shrawley Wood'* and *'Sawin pool stuf'*,[62] while in 1841 the accounts show that 12 shillings was spent on 6 days' *'mudding a pool'*[63] and in March 1844 it cost 16 shillings for the use of four horses for one day to *'Draw Bricks and Lime to fish pool'*[64] as well as £1-5-3 for the labour and cement *to putting in Brick Culvert at Fish pool*.[65] In the same year J Thrupp received twelve shillings for *iron work pool 24lbs*.[66]

Between 1848 and 1850 the accounts show a great deal of work relating to the pools in the wood. In 1848 eight shillings was paid for the use of two horses for one day to *'Drawing Lime stone etc to culvert at Lower Pool'*[67] and from December 1849 to September 1850 £8-16-0 was paid to James Powick for 26 horse movements over 17 days *'for drawing stone in Shrawley Wood'* and James Barker was paid for 5½ days loading stone and George Morgan 3 days for the same while Josiah Sprad & G Morgan were paid for 5½ days mudding[68] and James Thomas £4 for mudding (the pool).[69] As '*[John] Wormington manager every thing'* describes it *'The mudding & puddling of all the stone work done to the poolheads were done in the autumn of 1850'*[70]
The Wood books also show various accounts over the years for fishing the pools; in most years drink was provided for fishing the pool, in 1839 Thos Wasborn supplied *A New Gutter Nett for the Pooles costing £1-15-0d*;[71] in 1842 money was spent on stocking up a New Pool in the Wood and in 1844 *For Mooring the fishing Boat on the pools in the Wood twice*.[72]

Despite an unfortunate gap between 1818 and 1836, these accounts show that the modern pools in Shrawley Wood and the park were constructed during a fifty year period in the first half of the nineteenth century as ornamental features, although money was paid for *'fishing the pool'*. The amount of money spent, which converts to approximately £7340,[73] was in today's money quite reasonable, considering in 1850 it was thought '*pool work is expensive to do it properly*'. The pools were created in phases, the first from 1805 to 1816, created the '*New Pool in wood by Mr Houseman'*; the second in the eighteen thirties created the Bath Pool, which may be the pool near the Wood House, shown on the Tithe Map and the last phase especially between 1849 and 1850 established the pools as they are known today. There have been claims that the pools were associated with ironworking in the past,[74] but as the appendix shows, the medieval pools were constructed as fishponds and the modern pools are purely for decorative purposes.

A description of the pools in given in the book 'The Story of our Museum showing how we formed it, and what it taught us' published in 1881.[75] It describes how Henry Housman and his elder brother Frank, when young, established a museum at their home in Woodchester. Henry and his brother were sons of Mary Vernon, daughter of Thomas Shrawley Vernon, (1759-1825) who married William Housman. The events he describes in the book occurred in the 1840s. Henry describes visiting his grandma (Elizabeth Vernon 1769-1850) at Wood House which '*stood in a small park on the edge of Shrawley Wood - a forest of between four hundred and five hundred acres, abounding in noble oak trees, with an undergrowth of the small-leaved lime'*.

He describes the fishing in the wood and refers to the Upper and Lower Pools *'A rivulet enters the wood at the northern end and forms the Upper Pool; leaving this, and wandering for some distance through ozier beds, it spreads out into the Lower Pool, and then, turning eastward, finds its way to the Severn, which forms the eastern boundary of the wood'* as well as *'the sport of lading the brook'* in the grove adjoining the gardens of the Wood House. This involved, under the guidance of the keepers, building stanks to trap the trout and eels in the *'merry, warbling little stream, that, on leaving it, wandered a winding way through the grove till it passed into the great wood beyond'* and return them to the trout pond at the head of the grove. He also refers to *'a fine new lake covering many acres of ground having of late years been made in the wood'*.

The first edition 25 inch Ordnance Survey map of 1883 shows the pools as a magnificent addition to the landscape. They flow eastward from the back of Wood Farm through Middle Pool and then New Pool curves round to near the back of Shrawley Court forming an arc around the edge of the parkland of the Wood House. Two large dams separated Middle and New Pools with a marshy area. There were also a couple of ponds and a boat house. Above the pools is the summer house, erected by the Vernon family for picnics. (See chapter Summer House p. 228) The work involved in creating these pools was substantial, with high quality craftsmanship, since there does not appear to be much expense involved at the end of the nineteenth century in repairing the pools, although there is a gap in the estate accounts between 1850 and 1875. The later accounts only list maintenance work. In March 1891 A Medlicot and H Brooks were paid 2s 4d and 2s respectively for a day's work in *Geting Stones Out of Brook*.[76] Later two sluices were added to Layes Pool and Middle Pool, shown on the 1903 second edition 25 inch Ordnance Survey map.[77]

The first description of these pools is by Edwin Lees[78] in 1856 who described them as *'line of pools, closely surrounded by trees, gives a pleasing feature to the scene .... where a perennial spring fills a sandstone basin'*. And the pools have been pleasing visitors to the woods ever since, even if it is now from a distance.

I would like to thank Richard Pumphrey for all his help in writing this account and for providing the accompanying map.

Appendix: Pools in the Shrawley Bailiff's Account: 1389/90

Richard Pumphrey

A typewritten document has been in circulation in Shrawley History Society and beyond with a partial and inaccurate transcription of Valerie Powick's translation of Bailiff Robert Hullhampton's *Compotus* Roll.[1] This is unfortunate as her full translation of this section was also available. Here is an annotated full transcript of Valerie's notes for the accounts describing the expenses involved in work that year on the fish ponds, as seen handwritten in pencil between the lines of a photocopy of the Shrawley Bailiff's Accounts.

Item 33 workers hired to work around the head of the fish pond [vinar^{e}]. *Price per work ½d. =16½d..*
Item 10 wagons [plaustr^{e}] *hired as if for one day to carry earth to the head of the upper fishpond* [vinar^{e}]*, taking 8d for each day = 6s. 8d.*
Item 83 men hired for the day to throw earth there for the foundations for the pipe and filling in the said cart to each of them taking per diem 3d = 20s 9d
Item timber carrying for same work to the park 6d.
Item paid to carpenters hired to make the bolt and for the pipe for the head of said pool [vinar^{e}] *for 15 days taking per day among them 7d = 8s 9d.*
Expenses Richard Lygon Bailiff being there both by day and by night for the safekeeping of said fishery for a fortnight and for all, being accounted ~~3s 5½d~~ *20d.* (This sum edited by the scribe).
Item paid [Frelkyn(?)] for one net seeking at Hartlebury and taken thither by command J More 3d
Item 1 cart [wagon] *for 2 days to carry earth to repair the head of the lower pool* [stagnum] *16d.*

Commentary
Compotus translates as Account; the scribe for these accounts used "u" in many places we would use "i", as in Mull for Mill and Rudding for Ridding, so we would probably call the bailiff Robert Hillhampton. We have used the literal transcription Hullhampton throughout this monograph.

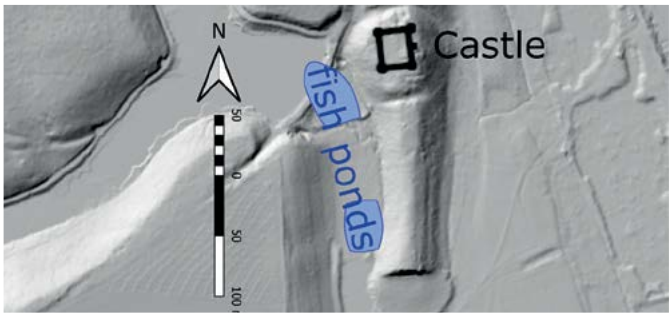
These works in 1389-90 built the dam (pool head) and overflow system (pipe and bolt) for the Court's **upper fishpond** (*superioris vinar^{e}*). At this time the Court was based in Shrawley Castle on top of Oliver's Mound and I think that its **lower fishpond** (*inferior^{e} stagnum*), clearly in need of repair by this time, was in the valley just below the castle (02). The different terms for fish pond may be significant. *Vinar^{e}* equates with *vivarium*, a breeding pool, maybe drained every five years or so to restock the *stagnum,* which was the supply pool for the kitchens.

These fish ponds were probably more of a status symbol than a practical necessity. Shrawley Castle stood right by the *Ffisshfe* fish weir in the Severn, which surely could have fulfilled any need for fish in the castle's kitchen. Building and maintaining ponds was an expensive business, as these accounts prove.

The initial 33 man-days paid at ½d were maybe clearing vegetation in preparation for the earth movement or clearing an access route for the wagon.

This existing *stagnum* may have been well stocked with fish, hence the need for the Bailiff to keep a close eye on it with all those labourers around the place. 3s 5½d would have been 3d per 24 hours less ½ d for the missing night. Was this changed to 20d (1½d per 24 hours less 1d) because he was already being paid a standing rate?

Given that the work lasted two weeks (six working days each), the wagon hire provided for one wagon on site all that time and 83 man-days provided for five men loading and two men tidying the soil dumped by the wagon. Given that a wagon may have carried two tons, and the time taken for five men to fill it was at least an hour with the tools they had available, only sixteen tons or so could be added to the dam each day: 160 tons over the ten days. These calculations are at best a rough estimate, but at least this quantity of earth seems consistent with a dam up to 40 metres long, 3 metres wide and one and a half metres high, compatible with a typical fishpond of one metre's depth.



02. Tentative guess at the position of the two stews.

The exact site of these pools can only be guessed at because traces were probably obliterated by work on the New Pool during Victorian times. Fish ponds (*stagna*) at the time of this Account Roll were generally relatively small, maybe 40 metres by 20 metres and one metre deep; the fish ponds in the Bishop of Worcester's old park, Grimley provide a local and roughly contemporaneous example.[79] Breeding ponds (*vivaria*) may have been bigger, depending on the landform where the pools were situated. Both upper and lower stew could have been fitted in the valley close under the castle but the upper vivarium might equally have been higher up the valley, where the middle pool is now. The water course through this valley has very occasionally seen drastic torrents that have washed way more recent and bigger dams: there seems little chance that anything could have survived since 1390. Additionally, any shallow pond here would have silted up in a century or two. (02) shows possible locations: *Court Pool* indicated on the tithe map of 1839 may have been a relic of these fish ponds. Trenches dug in 1998 during the investigations prior to damming a new pool here[23] may have been too far south to have intersected with any remains of the fish ponds.

The Park is discussed on page 28. "*Timber carrying for same work to the park*" is consistent with this location of the Upper Pool head. The carpenters paid at 7d for 15 days had time to assemble a complex structure for the bolt and the pipe – maybe along the lines of a gully with a grid to stop flotsam entering and blocking the pipe and a sluice (bolt) for draining the pond. A pipe is mentioned in other medieval fishpond construction as part of the overflow arrangements.*

There seems no logic behind the previously suggested location for these works in Shotgrove – a supposition that should now be dismissed.

* *Historical Aquaculture in Northern Europe* 2016. Edited by Madeleine Bonow Håkan Olsén and Ingvar Svanberg: accessed 5 April 2022 as a PDF from https://sh.diva-portal

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Timeline for Shrawley Wood

Francesca Llewellyn & Hugh Milner

Important events through time: *entries in this font are comments on that text*; a numbered source list is at the end

804	Aethelric, a Mercian noble, son of Aethelmund will bequeath Screfleh (Shrawley) to the estate of Deerhurst Minster	(8)
1086	Domesday Book. *It is believed Shrawley Wood is included in the contiguous Astley Wood*	(8)
1212	Radulphus de Thoni holds Schraveleg (Shrawley) by military service *(elsewhere Thony is Todeni, Toeni, Tony or Tosny)*	(93)
1234-97	Held by the Poer family as under tenants of the Beauchamps	(1)
1235/36	Rogero de Poer holds the fee of Scraveley (Shrawley) of the barony of Redulfi de Tony	(93)
1304	Edmund Mortimer and Margaret his wife were jointly seised of the manor	(1)
	Shraueleye. A messuage, 40a. arable, 3a. meadow, a third part of a park, and 2 customers rendering $^1/_2$ a mark yearly, held of the earl of Warwick for $^1/_3$ knight's fee; whereof the said Edmund and Margery were jointly seised by Aline la Poer to them and the heirs of the said Edmund.	(10)
1309	Inherited by Alice, Robert de Toeni's sister, who married Guy de Beauchamp Earl of Warwick in 1310	(9)
1327	Edmund's son and heir Roger Mortimer, 1st Earl of March granted the manor to his daughter Katherine when she married Thomas Beauchamp 11th Earl of Warwick	(1,9) *See 1397*
1390	10 wagon-days to move earth, 33 + 83 man-days to make the dam for the fishpond.	(9, 31) *See p. 107*
	150 bundles of rods are sold for three shillings and a further 300 are delivered for *(wattle?)* new stables at Salwarpe *2s per 100 (3s was worth £100 in 2019)*	(74)
	201 workmen are hired to make the Close around the Park and elsewhere where it is necessary this year 8s. $4^1/_2$d.	(31)
1392	400 bundles of rods are sold for eight shillings *2s per 100*	(9)
1397	Manor forfeited from Thomas, Earl of Warwick granted to John, Earl of Salisbury but Shrawley Wood and advowson are reserved from this sale. *(This was reversed on accession of Henry IV, see 1399)*	(60, 75)
1399	Thomas, Earl of Warwick, reinstated in all his possessions	(1)
1399	until 1446: Manor held by male line of the Earls and Dukes of Warwick	(1)
	Sale of wood for £22 *See Record of Activities*	(16)
1403/4	Richard Lygon is the Woodward *This may be Richard Lygon, born c.1380, son of Thomas Lygon, born c.1350 & Margaret. He may have been from Kidderminster. The Lygons did not have Madresfield Court until 1423*	(16) (81) (82)
1406 Mar 15	Sale of wood and pannage from a field in the 'Oldepark' *See discussion in the Record of Activities*	(16)
	A fishery called Le were *(weir)* is let at 12d	
1406/7	The Fryth Coppice is cut and sold for £14	(16)
	Wood is sold for 32 Marks & 211 poles from	(91)
1409/10	Le Outewode (bind)	(16)
	Pannage is let for xiij^{d} *(13d)*	
1411	Sale of wood and pannage from a field in the	(16)
1412 Apr 16	'Oldepark' *See discussion in the Record of Activities*	(16)
1415	Sale of underwood from the park to John Breweare for £22 *(Worth £17,000 in 2019)*	(9) (74)
1422	Pannage is let for xviij^{d} *(18d)*	(16)
1422-23	The Brechyng Coppice is cut and sold for £20	(91)
	The Roche Coppice is cut and sold for £22	(91)
1423-25 May 17	Pannage is let for xvij$^{d1}/_2{}^{d}$ *(17$^1/_2$d)*. Wood is sold for 20 Marks	(16)
1425	Thomas Severne and Thomas Bruar buy 1 *bayne post* called Le Aleye in Shrawley Wood	(9)
	Pannage is let for xvij^{d} *(17d)*	(16)
1426 Apr 12	Pannage is let for xviij^{d} *18d.* Wood is sold for xx^{li}xiii^{s}iij^{d} *(£20-13s-4d)*. Thomas Severne & Thomas Bruwr work in le Aleyebaynepost *The Alley Bind*	(16) (16)
Oct 13	John ffysher repairs flood damage to the 'Shraveley Wer' (weir)	(16)
1427 13/5	Pannage is let for xix^{d} *(19d)*	(16)
1431-32	The Elbow Coppice is cut and sold for £16	(91)
1433	Sale of wood in the park in *capicia* called Blakewyche for £23 *(c.£17,000 in 2019)*	(9) (74)
1434 17/4	Wood in BlakeWyche bind is mentioned	(16)
1439	Thomas Brewer and Thomas Severn buy wood and underwood for £20 *Bought from Le Aleye Bind? (Worth c. £12,000 in 2019)*	(9) (74)
April 12	Pannage is let for x^{d} *(10d)*	(16)
Nov 12	Wood & underwood is sold for xx^{li} *(£20)* John Hull tenants a croft called Cokysterum *Cockthrum.* Richard Ind repairs 'ShraveleyesWer' *(weir)*	(16)
1437-38	The Wendleyes Coppice is cut/sold for £16	(91)
1441 May 18	Pannage is let for xvj^{d} (16d). A 'ffysshe fee' for the River Severn is mentioned. 'Ladywalyate' is mentioned *Ladywell Gate*	(16)
	Wood is sold for 12d. William Hortyll, John	(16)
1443 May 15	Stone & John Parker sells wood from 'les Entwodes' *The Outwoods binds*	
1444 31/4	Pannage is let for ix^{d} *(9d)*	(16)
1446-49	The manor is held by Ann, Countess of Warwick who died an infant	(1)
1447	Wood is sold from Takeleysheld *A bind*	(16)
1448/49	The Aley Coppice is cut and sold for £10	(91)
1449-71	Held by her Aunt, Ann, the wife of Richard Nevill, Earl of Salisbury (Richard Nevill, Earl of Warwick)	(1)
1450	Will Bulfenche 'Custodian' of the wood sells from a 'byne' xlj^{li} *(£12)* *A bind*	(16)
1452	Schraweleys were *(weir)* in the River Severn & Werecroft are flooded	(16)
1455	Sale of wood makes £25 *(c.£22,000 in 2019)*	(9, 74)
1461	Pannage is let for viij^{d} *(8d)*	(16)
1466-67	Tagleyheld Coppice is cut/sold for £11.6.8	(91)
1469	Thomas Martyn buys a byne of wood called Le Fryth for £32 payable over three years (Worth c.£25,000 in 2019)	(9) (74)
	Tenanted by Thomas Severne, le Were House is destroyed by a flood	(16)
1471	Manor settled on Richard Nevill's daughter, Isabel, wife of George, Duke of Clarence	(1)
1472	John Jones and others' wood work in 'le Outewodesbyne' sells for xlijmarcs,vj^{s}, viij^{d} (£28-16-4)	(16)
1472-73	The Outwood Coppice is cut/ sold for £11.8.4	(91)
1476	Held by George, Duke of Clarence	(1)
1476-77	The Blackwych Coppice is cut/sold for £19	(91)

1480/1	The herbage of the old park is sold for 30 shillings *(Worth c.£1,000 in 2019)*	(9) (74)
1481	Reference to Long Wankes bind. Sale of wood to Thomas Sevarne senior and John James junior, paying £24 over three years *(Worth c.£19,000 in 2019)*	(9) (74)
1481-82	The Fryth Coppice is cut/sold for £13.10.0	(91)
1487	Anne Countess of Warwick restored to the Warwick Estates and then surrendered to Henry VII *Perhaps by seizure. See 1397*	(1, 75) (75)
1487	until 1544: Manor held by the crown	(1)
1487-88	The Brechyng Coppice is cut and sold for £12	(91)
1489-91	Sale of wood products to John Jones, John Truell, Robert Martyne & John Severne	(9)
1492-5	Sale of wood products to Thomas Cooke, John Johnes, Robert Martyn & John Trewell	(9)
1494-95	The Fryth Coppice is cut and sold for 113s.4d	(91)
c.1495	The following Coppices are rated by their tenants, Brechyng 16acre £14, Tagleyheld 7acre £9, Aley 12acre £12, Fryth 16acre £14 Outwood 15acre £13.6.8, Roche 16acre £14 Blackwych 16acre £14, Roughscentz with Shopgrove 16acre £14 and Elbow 16acre £14	(91)
1507-37	Rafters in St Mary's Church, Shrawley are dated to this period. *It is highly probable that the oak came from Shrawley Wood*	(58)
1508	Reference to Le Brechynge bind	(9)
1510	Reference to wood, underwood & coppice	(16)
1519	Reference to Blakewich bind	(9)
1526	Reference to Elbow bind	(9)
1527	Responsibility for the sale of wood from Shrawley Wood passed from the Receiver of Land Revenue for Worcestershire to the Surveyors/Masters of Wood *An administrative change of Henry VIII*	(9) (75)
1538	William Paytwen makes waste in the lord's wood and is fined 8d. Francis Turner fells an oak sapling	(9)
1544	Manor of Shrawley is granted to Queen Catherine Parr for life	(1, 3)
1545 Feb	Lease of Shrawley Manor is granted to William Sheldon of Weston, Warwickshire for 21 years. (Weston-by-Cherington in the parish of Long Compton; later of Beoley) from the lands of Queen Catherine Parr *But she did not die until 7/9/1548. It seems what Henry VIII could grant, he could take away*	(1, 3,) (75)
May 3	Reference is made to 'Tymber' Trees	(16)
Aug	Reversion of the manor in fee by Henry VIII *William Sheldon was leasing it. Did he buy the freehold? See 1558*	(1)
1548	Richard Stone makes waste and cuts wood. William Winnall of Ombersley is fin(e)d 6d because he had cut two trees called *limes* in the wood of the lord and carried them away without licence *(6d was worth c.£10 in 2019)*	(9) (74)
1549	Robert Brewer cuts divers trees called *rafftons* in the lords wood without delivery by the bailiff	(9)
	William 'payhough' fells a 'Byrtche' tree in the wood	(16)
1550	William Randle and his servants cut trees without licence of the bailiff, for which he is fined sixpence and ordered not to offend again under pain of forfeiting twenty shillings *(Worth c.£400 in 2019)*	(9) (74)
1558	Shrawley Manor is sold by William Sheldon, now of Beoley, who keeps the Wood and reserved a rentcharge of £9 to William Gower of Redmarley. *(Worth c.£3,000 in 2019)*	(9) (74)
1562	No one shall *sache* any wood within Shrawley Wood but only their own parte under paid *(pain)* of forfeiting 3s 4d *(Half a noble, worth c.£50 in 2019)*	(9) (74)
1564	John Paytwynne's servants cut firewood and he is fined 2d. Robert Bruar forfeits a pain of 10 shillings by not repairing the hedge of Shrawley Wood and permitting his draught animals to break into it *Probably oxen (10 shillings was worth c.£200 in 2019)*	(9) (74)
1565	No one of this manor shall remove any firewood in …Shrawley Wood without the licence of the bailiff unless according to the division made, upon his proper part under pain of forfeiting 6s 8d *A Noble, third of £ (Worth c.£100 in 2019)*	(9) (74)
1567	William Stone is guilty of taking firewood. It is ordered that no one of this manor nor any stranger go into Shrawley Wood or any groves or coppices with bows, arrows, or nets with the intention of chasing or hunting under pain of forfeiting 10s. Richard Marten, Thomas Cooke, and Hugh Salway are directed to view Shrawley Wood for fallyng and leasing *whyttardes* and cutting out of there (sic) wood and every man having a part there shall use it in such order as they appoint also under pain of forfeiting 10s *(Worth c.£200 in 2019)*	(9) (74)
1570	That Thomas Cooke, Richard Martin & Hugh Salween do oversee every man's parte in Shrawley Wood for the falling and cutting of trees out of their wood & teasing of the Whyttards & that every man having a parte shall use it in such Order as they or any of them shall appoint under penalty of paying 10d	(16)
	The wood passes from William Sheldon (after his death) to his son Ralph	(67)
1571	The order was that no one who inhabits the Manor should send oxen by law into the brush under Shrawley Wood unless they shackled them well and pigs to use them for themselves and to destruct below the trees under penalty of 10s	(16)
1574	The pains of 1570 are repeated (in full), but with Robert Severne, Walter Severne and John Marten viewing every man's part in Shrawley Wood	(9)
1578	Hares, rabbits, pheasants & partridges are mentioned around the wood	(16)
1579	Law states that no one who lives in this Parish should shoot somewhere snare catch somewhere hares rabbits cord pheasants or partridges in or around the Lords wood called Shrawley Wood without permission under penalty of 20s	(16) (9)
	It is ordered that all who held parts in Shrawley Wood should assemble on a day appointed by the bailiff to amend the ways in the wood for the easement of carriage under pain of forfeiting 3s 4d *Half a Noble, 1/6 of £ (Worth c.£50 in 2019)*	(74)
1579/80	Shrawley Wood is sold to William Childe of Northwick by Ralph Sheldon of Beoley, son of William Sheldon	(1) (16)
1580	Ralph Sheldon obtains a license to alienate the Wood	(9)

1593	The manorial jury presents that Thomas Yarranton had a *lyne trye* in a lane called The Hollow Lane lying there to the nuisance of the way and was required to move it before the feast of Holy Cross	(9)
	Not in Shrawley Wood but nearby. The Feast of the Exultation of the Holy Cross is on September 14th	(43)
1597	William Childe, the first, settles the Wood on his eldest son	(9)
1607/8	William Childe, the second, lets Shrawley Wood to William Childe, the third, for 21 years for a rent of £160	(9)
	(Worth c.£35,000 in 2019)	(74)
1630	A dispute occurs over the rent of Shrawley Wood	(9)
1632	Chancery Proceedings over the above dispute about Shrawley Wood	(9)
1640-50	William Childe, owner of Shrawley Wood, supports King Charles during the English Civil Wars	(2)
1645	*By other Letters out of Worcester, it was thus advertised; That a great distraction continues in that County, and many Countrymen have forsook their own dwellings, and betook themselves into a Wood called Shraleyes Wood, which is near to the River of Severn, to hide themselves from the Kings forces*	(15)
	The Royalists in Worcester order 100 loads of timber from ShrawleyWood, but the Parliamentary news-sheets claim that these would be intercepted	(29)
1646	Colonel Henry Washington, Royalist Governor of Worcester, raided what was left in the ravaged county, and hauled 1,000 loads of firing from Shrawley Wood, and destroyed all houses without the walls of Worcester that might give cover to the enemy	(44)
1650s	Shrawley Wood (clear felled?) to pay a fine *Said to be 1000 acres. Was this Wood Pasture? Were bind boundaries no longer individually dead-hedged from this period?*	(9)
1654	Chancery Proceedings over enclosing a newly cut coppice against browsing livestock	(70)
1663	Manor of Shrawley and Shrawley Wood now held together by Thomas Childe (died 1678)	(9)
1679	Under the will of Thomas Childe of Northwick Co. Worc. Esq. his daughter Margaret is to have Shotgrove in Shrawley and that Shrawley Manor is to pass to his son in law Thomas Stephens Esq. *But see the following*	(16)
1681	William Childe sells the whole manor to Allan Cliffe	(1)
July 7	Shrawley Manor inc Shrawley Wood & Shopgrove is stated to be 1040 acres	(16)
1687	Allan Cliffe's will did not include Shrawley Wood, 'there lately purchased & settled by Indenture of the same date'	(16)
1689	Andrew Yarranton the younger, starts to manage the trade in basten ropes from Astley Wood and Shrawley Wood with the agreement of Allan Cliffe	(9)
1695	Another agreement between Andrew Yarranton the younger & Allan Cliffe	(9)
c1699	Mr Yarranton's Survey, 19 binds @ 34 acres Giving a most unlikely 646 acres	(9, 33)
1699	Alan Cliffe's nephew Allan Cliffe succeeds to the manor	(1)
	Richard Vernon visits Shrawley Great Wood and produces a report *Second cousin to Thomas Vernon, see 1700, 1708-10 & 1730*	(9, 33)
1700	Allan Cliffe sells the manor [and Advowson (23)] to Thomas Vernon of the Middle Temple, lord of the manor of Hanbury (1) reportedly for £13,000	(9)
	(Worth c.£2,000,000 in 2019)	(74)
1705	*Messuage or tenement in Kings' Hill Binde in Shrawley Wood with all buildings belonging and all grounds lying in the said binde containing 15 acres more or less to Joseph Hopkins 99 years* *This lease lasted perhaps only eight years and by 1883 all of Kingshill Bind had been converted to parkland as a back-drop to the Wood House*	(34)
1707	Another agreement between Andrew Yarranton the younger, John Wilson of Camden, William Vernon and the majority of owners of parts of Astley Wood for ropes to be made in these woods	(9)
1708/9	2nd Feb, Candlemas agreement *'between Richard Cook Edward Smith John Atherage William Severne John Spragg William Jones senr Robert Marshall and Randle Severne of Shrawley Woodcutters of the one part and Richard Vernon of The Webhouse, Hanbury Agent for Thomas Vernon of Hanbury Hall Esq on the other part to fall mark bind faggott and work up all the underwood and crops and tops of trees shall be appointed to them'* *This excludes the timber from any standard trees that may have been there* *'And in the same manner at the proper season of the year to fall the oake' to be completed by June 5th in the Lesser Noutward bind in Shrawley Wood* *These oak may have been 'black poles' from oak coppice or overstorey standards.*	(34)
1709/10	17th Feb, agreement *between Richard Cook Edward Smith and Robert Marshall of Shrawley, Woodcutters and Richard Vernon of the Webhouse, Hanbury to fall & work up the wood of the Tadglyhill bind in Shrawley Wood*	(34)
1721 5 Feb	Thomas Vernon dies, his second cousin Bowater Vernon succeeds him	(23)
1730	Richard Vernon dies, aged 76 *See 1699*	(82)
1732/33	A Map of Shraley (sic) Wood ..... belonging to Bowater Vernon Esq (is made) by.....Jos Dougharty	(6)
1735 30 Nov	Bowater Vernon dies, his son Thomas Vernon succeeds him	(23)
1736	The last recorded date of bast production John Anthonies becomes licensed gamekeeper and is paid £5 a year for managing the Wood	(88)
1742	The wood is said to be 365 acres *This is probably quite accurate*	(23)
1745	*Oct 21. Reced. for 1800. Basten Ropes at 5s. pr C. 4..10..0* *So 0.6d each*	(88)
1746	*Oct 23. Reced. for 1000. Basten Ropes at 5s. pr 100 2..10.0* *This is the last record in the Vernon accounts of rope making from lime bast, most likely from Shrawley Wood*	(88)
1749 Feb 9	*Received of Thomas Vernon by James Brasier £5 for the use of Abigail Collins who informed against Wm Knight for killing a hare John Antonis*	(76)
1760 April	604 Maiden Oaks growing in Shrawley Wood are for Sale and are sold for £1600 to timber merchants in Glos & Hef *If 12 per acre, this gives 50acs, so 2 binds, 2 years* *(£1600 was worth c.£200,000 in 2019)*	(7) (74)

1764	First known Shrawley Wood Book lists the production of 24,000 'hoppoules', 1110 'faggotes' and 300 'shidwood' in this year	(49)
	Revd. Mr Piercy becomes Vicar of Shrawley	(90)
1765	Worcester China Company buys wood *Perhaps for refurbishing the Dick Brook mill*	(84)
1768	Worcester China Company buys wood	(84)
1771	Thomas Vernon dies, his daughter Emma	(23)
Dec 9	Vernon succeeds him	
1772	*Delivered to the Church Wardens of Shrawley: 3 Tun & 6 feet of Timber for to Hang the Bells £7 16s 0d*	(49)
	(Worth c.£1,000 in 2019)	(74)
1774	383 oak trees are sold to Mr. Childs for £170	(66) &
Nov 13	at The Hop Pole Inn, Worcester	89)
1776	Emma Vernon marries Henry Cecil, future	(23)
May 23	10th Earl of Exeter	
1777	Henry Vernon Cecil, son of Henry & Emma	(82)
June 12	Cecil is baptised at Hanbury	
July 10	Henry Vernon Cecil is buried at Hanbury	(82)
1778	250 Maiden Oaks sold to Mr. Edines.	(66)
	Wenliss Fall One Bind/First Wenliss Bind cut	(79)
1779	Kings Hill Bind cut.	(49)
	265 oaks sold to Mr Chiles	(66)
1782	Revd. Mr Piercy dies *See 1764*	(90)
1784	Tageley Hill Bind cut	(79)
	Mr Honeyborne buys cratewood for the first time *See 1808*	(50)
1791	Henry Cecil divorces Emma. Oct 13 Emma	(23)
June 10	marries William Sneyd	
1793	Aug 2 William Sneyd dies	(23)
1795	Emma marries John Phillips	(23)
1800	Flight & Barr (Royal Worcester) bought timber to repair Riddings Bridge *Dick Brook*	(50)
1801	Mr Diggory (Degrey) buys clogwood for the first time *See 1805*	(50)
1804	Henry Cecil dies, Emma Phillips née Vernon	(23)
May 1	succeeds him	
Sept 10	40 days planting oak in the wood	(50)
1805	Mr Diggery of Dudley buys cratewood and other wood.	(50)
	£51.17.6 is paid out of the wood account for the Poor Levy *(Worth c.£4,000 in 2019)*	(50) (74)
1808	Mr Honeybourne of Moor Lane near Brierley Hill buys cratewood	(50)
1811	*'Pd the woodmen Planting young Oakes'*	(84)
1811-12	Game including woodcock, hares, partridges, wildfowl, duck and fish, is sent from Shrawley to Hanbury and other places	(50)
1812	Wenliss Fall One Bind/First Wenliss Bind cut	(50)
1813	Kings Hill Bind cut	(78)
1814	*'Pd to Woodmen for parting the Fall called*	(53)
Jan 1	*the Great Rotchpoles 0..10..0'*	
Oct 22	12 days planting *Oke*, Willow and *Oke Quick*	(53)
1816	9 days replanting *Oke*	(84)
1818	Tageley Hill Bind cut	(79)
Mar 21	Emma Phillips née Vernon dies, Thomas Shrawley Vernon succeeds her	(23)
1825 Mar	Thomas Shrawley Vernon dies, his son Thomas Tayler Vernon succeeds him	(23)
1828	Sale of 50 Maiden Oak Trees growing in wood *So this is a Standing Sale*	(7)
1829	Sale of 40 Maiden Oak Trees growing in wood *So this is a Standing Sale*	(85)
1830	Sale of 30 Capital Oak Trees growing in wood *So this is a Standing Sale*	(85)
1831	Sale of 50 Maiden Oak Trees growing in wood *So this is a Standing Sale*	(7)
1832	Sale of 50 Capital Oak Trees growing in wood *So this is a Standing Sale*	(7)
	*(H)*Ither Thrift Bind cut	(79)
	William Harris is convicted of trespassing in Shrawley Wood in pursuit of game, is fined 20s and 13s expenses	(7)
1834	Sale of 35 Oak Trees growing in wood *So this is a Standing Sale*	(7)
	Large Oak struck by electric fluid *(Lightning)*	
Apr 11	Harry Foley Vernon is born *(See 1859)*	(23)
1835	John Rice of Stourport buys cratewood and other wood	(84)
	'Mr T Spragg Hartlebury 2 Oak trees Addam & Eve 132f..9l (£)26..11..0'	(83)
	(Worth c.£3,000 in 2019)	(74)
	132 Hft is 4.76m³. Each tree was substantial. At over £4 per Hft, this implies they were of high timber quality. Thomas Spragg was a cooper, so the stems of these trees were destined to be barrel staves, which had to be straight-grained and knot-free	
	Tageley Hill Bind cut.	(79)
Dec 22	Capt Thomas Tayler Vernon dies, his son Thomas Bowater Vernon succeeds him	(23)
1837	Hewett Cottrell Watson in his supplement to 'The New Botanist's Guide to the *Localities of the Rarer Plants of Britain* refers to Tilia parvifolia in a natural wood at Shrawley. His informant is Mr Edwin Lees	(24)
1838	Shrawley Tithe Apportionment: Shrawley Wood is 376 acres, 1 rod, 25 perches in size. Owned and occupied by the Trustees of Thomas Bowater Vernon (a minor)	(57)
	Shrawley Wood is mentioned in J C Loudon's *Arboretum et Fruticetum Britannicum*. He was informed about the wood by Mr Edwin Lees, Hon Sec of the Natural History Society of Worcester	(14)
	John Hughes buys the Curriers Estate to get Rowl Meadow for a brick works	(84)
1839	Further Thrift Bind cut.	(79)
	John Hughes evicts John Bucknall to clear the way for extracting clay in Rowl Meadow	(84)
1840	Kenrick Watson described the management of the wood	(22)
1841	George Jorden wrote in his diary about Tilias and Shrawley and Astley Wood. They cover nearly three square miles and are for the greater part densely wooded with Tilias	(20)
	Lops and etherings are sold for hedging	(84)
1842	*'pd The Woodmen For Parting a part of the Grate outwards ..10..' 10 shillings, now 50p*	(71)
	(10s was worth c.£50 in 2019)	(74)
1843	*'paid the Wood men for parting the Bind called the Grate Wenlifs no bill 0..10..0'*	(68)
	(10s was worth c.£50 in 2019)	(74)
	132 oak trees are 'butted, topped and rounded'	(71)
	1300 ash plants are bought	(71)
1845	*'Paid The Woodmen for parting Bind Called the Aly Bind no bill ..10..' (= c.£50 in 2019)*	(53) (74)
1846	*Paid The wood men for parting the Bind*	(77)
Jany 13th	*Called The (H)Ither Witch*	
1850	Last surviving Wood Book but see later 19th century accounts	(80)
1854	Bricks are advertised for sale	(7)
1856	*'A great part of the underwood of Shrawley is made up of the small-leaved Lime (Tilia parvifolia), which, as it is periodically felled, never flowers; and the leaves are mostly as large as those of T. Europea. The old trees, however, on the verge of the wood are all T parvifolia, and no record exists that the lime tree was planted in this wood at any time'.* *T. parvifolia is now T. cordata*	(5)
1859	Thomas Bowater Vernon dies, his brother	(23)
Sept 22	Harry Foley Vernon succeeds him	

	John Pountney of Shrawley found guilty of catching rabbits in Shrawley Wood fined 2s 6d. *Half a Crown, 1/8 £ (Worth c.£10 in 2019)*	(7) (74)
	George Massey arrested and pleaded guilty of night poaching in Shrawley Wood and assault of a gamekeeper	(7)
1860	Sale of Whittern underwood	(73)
1861	Vernon Land Agent Henry Clutton lives at Kings Hill, Shrawley *See Glossary*	(23)
1862	Sale of Cratewood, Underwood and 60 Capital Oak Trees felled last spring, and lying close to the River Severn	(7)
1863	Sale of Whittern underwood, ash and 1100 feet of oak timber sold	(73)
1864	Sale of Whittern and ash underwood and 40 oak trees	(73)
1865	Visit of Worcestershire Naturalist' Field Club to Shrawley Wood by horse-drawn boat up the River Severn	(7)
1867	*'Shrawley Wood is remarkable for its under-growth of lime'* *The coppice underwood. This implies the oak overstorey, for which the wood had been celebrated, was no longer as remarkable*	(26)
1868 Dec 12	For sale *'About 500 superior Oak Timber Trees felled and lying in Shrawley Wood'*	(87)
1869	Visit by the choir of St Clement's Church, St John's, Worcester to Shrawley Wood by river steamer	(7)
1870	Visit to Shrawley Wood by Worcestershire Naturalist'Club and Malvern Field Club	(20)
	The compositors of the *Worcestershire Chronicle*, with a number of friends visit Shrawley Wood	(73)
	The choir of St Clement's Church, Worcester visit Shrawley Wood *All three visits by river steamer*	(73)
1872	Visit of Worcestershire Naturalist'Field Club to Shrawley Wood by omnibus	(7)
	'*Shrawley Wood, of nearly 500 acres in extent, is known to botanists, throughout England, for having its underwood almost entirely formed of the small-leaved Lime-tree (Tilia parvifolia), which is here indigenous, and is cut down periodically as coppice wood, and sent to the Staffordshire Potteries to be used up in the formation of crates'*	(45)
1873	Visit of members of Holy Trinity Church, Worcester Voluntary Choir to Shrawley Wood by river steamer	(7)
1874	Worcester & Worcestershire Law Students Society visit Shrawley Wood	(7)
	Friends of Alderman Edward Webb of Worcester visit Shrawley Wood *Both visits by river steamer*	(73)
1876	Excursion of Messrs Munt and Cosford's of Worcester Assistants to Shrawley Wood by river steamer	(7)
	St Clement's Church, St John's, Worcester Parish Workers Visit Shrawley Wood by river steamer	(7)
	Excursion of Pump Street Wesleyan Chapel, Worcester Choir to Shrawley Wood by river steamer	(7)
1877	Harry Foley Vernon buys the 37acres (12ha) Shrawley Court	(23)
	Excursion to Shrawley Wood by the Wesleyan Mutual Improvement Class and Chapel Choir of Worcester by river steamer	(7)
	All Saints Church, Worcester Choir Annual excursion and picnic in Shrawley Wood by river steamer	(7)
1879 July 3	Wm Gnome has a leg & arm broken when a log fell from his cart onto him in Shrawley Wood and dies in Worcester Infirmary 4th July	(87)
1881	Worcestershire Naturalists' Field Club Visit Shrawley Wood by river steamer	(7)
	'*The strong western storms of October which had stripped the adjoining woods, and laid numerous limes and willows prostrate, had spared these silver boled sisters (birches) we noticed along the valley'* *The storms of October 14th & 15th, 1881*	(38)
1882	Visit to Shrawley Wood by the Worcester Ladies College by river steamer	(7)
	Excursion to Shrawley Wood by friends of Mr and Mrs Skyrme of the Bird-in-Hand Inn, Worcester and Grand Stand, Pitchcroft, Worcester by river steamer	(7)
1884	Sale of Alder, Birch, Hazel, Lime and Ash Poles with a few Timber Birch, now growing in Shrawley Wood	(7)
	Excursion to Shrawley Wood by St Clements Church, St Johns, Worcester Choir and Parish Workers by river steamer	(7)
	Worcestershire Naturalists Field Club visit Shrawley Wood by carriages	(7)
1885	The 'Berrows Worcester Journal' and 'Worcester Daily Times' excursion to Shrawley Wood. The Worcester Guardians excursion to Shrawley Wood *Both excursions by river steamer*	(7) (7)
	Sweet Chestnut replanted in several groups through the wood	(25)
1890	Visit to Shrawley Wood by the Dudley and Midland Geological Society by river steamer	(7)
1892	Worcestershire Naturalists' Field Club visit Shrawley Wood. Visit to Shrawley Wood by the Worcester Debating Society *Both excursions by river steamer*	(7)
1893 Jan 6	The Earl & Countess of Dudley's shooting party shot over Shrawley Wood	(73)
1895	Worcester Musical Society's pic-nic in Shrawley Wood by river steamer. Visit of Young Women's Bible Class of the Sansome Walk Schools, Worcester to Shrawley Wood by river steamer. Worcestershire Naturalists' Club's annual fungus foray in Shrawley Wood, visiting by a brake	(7) (7)
1896	Juvenile Foresters of Worcestershire (Friendly Society) outing to Shrawley Wood	(7)
	St Nicholas' Church, Worcester outing to Shrawley Wood. Worcester Baptist Chapel's Young Women's Guild & Bible Classes outing to Shrawley Wood. Messrs Courtney and Co's Sauce Manufacturers of Worcester outing to Shrawley Wood. All Saints' Church Worcester choir picnic in Shrawley Wood	(7) (7) (7)
	The wedding party of Miss Margaret Walford and Mr Sidney Thomas Steel from Worcester visit Shrawley Wood *All six outings by river steamer*	(73)
	Worcestershire Naturalists' Club's annual fungus foray in Shrawley Wood, by carriages	(7)
1897	Worcestershire Naturalists' Club fungus foray in Shrawley Wood by wagonette	(20)

1902	Hubert Edward Vernon, second son of Sir Harry Foley Vernon, dies in South Africa	(23)
1903	Sale of 1000 magnificent Oak Trees in	(87)
Jan 29	Shrawley Wood at the Grand Hotel, Birmingham	
1904	Sale of 704 oak trees realised £2590	(64)
Mar 21	*(Worth c.£300,000 in 2019)*	(74)
Mar 24	Sale of furniture from Wood House, Shrawley as it was being given up by C. Ackland Allen Esq.	(61)
1906	Worcestershire Naturalists' Club's fungus foray in Shrawley Wood, visiting by carriages, motor cars and cycles. Visit to Shrawley Wood by Henry John Elwes	(20) (21)
1910	Shrawley Wood has 392.906 acres of 'osier beds, coppice - various parts' *This includes the former Rowl Meadow Brickworks etc. Note the former celebrated oak overstorey is not mentioned*	
	Rateable value: £12,517. Market value of Fee Simple: £14,215. Market value (if divested of structures and things growing on land): £1375. Timber valued at £12,540 plus £200 calculated at 1 shilling per acre *(12.36p per hectare, even after the big felling of 1904) (£12,740 was worth c. £1,000,000 in 2019)*	(30) (74)
1912	British Mycological Society fungus foray in Shrawley Wood, local leader C. Rea	(39)
1913	The Trees of Great Britain and Ireland by H J Elwes published	(21)
	Worcestershire Naturalists' Club's fungus foray in Shrawley Wood, visiting via New Inn gateway	(20)
1917	Worcestershire Naturalists' Club visit Shrawley Wood	(20)
1919	Worcestershire Naturalists' Club fungus foray in Shrawley Wood	(20)
1920	Sir Harry Foley Vernon Bt dies, his son	(23)
Feb 1	Bowater George Hamilton Vernon succeeds him	
1920s	I L Wedley is guided through the wood by a 70-year-old 'Shrawleyite'	(86)
1921	British Mycological Society fungus foray, local leader C.Rea	(39)
1922	Worcestershire Naturalists' Club visit Shrawley Wood	(20)
1923	Worcestershire Naturalists' Club fungus foray in Shrawley Wood	(20)
1925	The last time most of the lime coppice was cut *(on rotation). It was cut again in the clear fell of the northern areas in the 1940s q.v., then restored by FC from 1975, q.v.*	(25)
1927	Worcestershire Naturalists' Club fungus foray in Shrawley Wood, attended by G.C.Druce	(20)
1929	Worcestershire Naturalists' Club visit Shrawley Wood via the New Inn entrance	(20)
1936	Worcestershire Naturalists' Club fungus foray in Shrawley Wood	(20)
1938	Ruth Annie Powick of Shrawley, a maid at	(23)
Feb 17	Hanbury Hall, becomes Sir George Vernon's companion and changes her name by deed poll to Ruth Annie Vernon	
1939	Mr Cyril Powick clears the sides of the main avenue to restore the vista	(13)
1940	Sir George Vernon second baronet, in ill-	(23)
June 14	health, shoots himself dead and is buried in Shrawley Wood within the former foundations of his fondly remembered Summer Cottage *See 2017*	
	Ruth Annie Vernon succeeds him and moves from Hanbury Hall into Shrawley Wood House for the rest of her life. Sir George's widow, Lady Doris Vernon moves in the opposite direction	(23)
	Worcestershire Naturalists' Club fungus foray in Shrawley Wood	(20)
1940s	The northern part is clear-felled, leaving a scatter of trees *For the war effort and/or death duties of Sir George Vernon?*	(25, 62)
1945	726 oak trees are granted a Felling Licence	(65)
Sept 18	by the Forestry Commission	
1946	Ruth Annie Vernon marries Frederick 'Rick' Horton	(23)
	Worcestershire Naturalists' Club fungus foray in Shrawley Wood	(20)
1948	Report on Oaks from Shrawley Wood being felled for repairs to the House of Commons	(19)
	Worcestershire Naturalists' Club fungus foray in Shrawley Wood	(20)
1948/9	Forestry Commission survey of private woodlands throughout the UK	(36)
1949	Brian Waters records 'Marcus Aurelius' (a boatman) took many boatloads of Shrawley *(lime)* poles to the crate-makers of the Five Towns, and 'scotched' poles at the rate of Sixpence a hundred	(18)
1950	Worcestershire Naturalists' Club fungus foray in Shrawley Wood	(20)
1952	Visit to Shrawley Wood by V M Conway, of the Nature Conservancy. *See 1955 & 1967*	(12)
	Worcestershire Naturalists' Club fungus foray in Shrawley Wood	(20)
1955	The greater part of Shrawley Wood is designated a Site of Special Scientific Interest (SSSI) by the Nature Conservancy Council	(27)
	Worcestershire Naturalists' Club fungus foray in Shrawley Wood	(20)
1956	The last time any lime is coppiced *(until FC restarted this in 1975)*, it was used for chip basket making in Gloucester *This was written in 1963 and probably refers to the private part of the woods*	(13)
1961	Conveyance of Title WR99919 from Ruth	(4 &
June 14	Annie Horton of Shrawley Wood House transfers the freehold to Forestry Commission (FC) via MAFF of the northern 237 acres (96ha) part of the wood. Here poor oak woodland and firewood are cleared over time and poorly stocked lime coppice is left *This is classed as 'Devastated Woodland' following the substantial fellings of the 1940s, q.v. At £11 per acre, FC paid £2,607 (Worth c.£60,000 in 2019)*	41) (74)
1962	The Forestry Commission gives permission to G E Simmons of the Rural Studies Dept. of the Worcester College of Education to use the 260 *(sic)* acres to introduce a woodland ecology course and to manage a small area of *Tilia cordata* for special investigations concerning school forestry	(32)
	British Mycological Society fungus foray, local leader F. Fincher	(39)
1963	Forestry Commission cleared fells a 50-acre area of Douglas fir, Norway spruce, European larch and Tilia cordata	(11)
	Simmons fells the majority of lime stools in 1/10 of acre. Douglas fir, beech & other species are replanted *See 1962*	(11)
	Douglas Fir is replanted by FC in Sub Compartment 89l *i.e. 89 'ell'*	(25)
	Shrawley Wood by Miles Hadfield is published in RFS' QJF	(13)

1964	Forestry Commission replant Douglas Fir in the above area	(4, 11)
	In July this area is a 'sea of riotous colour'. Otter spraints are seen by Dick Brook. An Otter is seen in the centre of Laze *(Laye)* Pool	(11)
	Small scale cutting of Sweet Chestnut for fence posts for use elsewhere. Spraying with 2-4-5T for bramble control	(17)
1965	In July this area is a 'sea of riotous colour' *from the ground flora*	(11)
	First sighting of muntjac deer west of the River Severn is seen in Shrawley Wood	(20)
	The lime stools in Sub Cpt 2071a were stored *(singled to best stem)* and the birch cut over	(63)
1966	End of initial Forestry Commission work of clearance and replanting	(17)
	Douglas Fir is replanted by FC in Sub Cpt 89d	(25)
1967	Visit to Shrawley Wood and report by G. R. Peterken, Nature Conservancy	(12)
1968	As a result of felling activity, the last badger sett was vacated at this time *They returned*	(11)
1969	Douglas fir is replanted by FC in Sub Cpt 90d and Poplar in 90g	(25)
1970	Study on Shrawley Wood by Gordon E Simmons published *See 1962*	(11)
	Worcestershire Naturalists' Club visit Shrawley Wood	(20)
	Douglas fir is replanted by FC in Sub Cpt 89a	(25)
1970s	Donald Pigott, on his first visit, noted that the *"wood was still recovering from the attempts by the FC to eliminate the lime-coppice by herbicide and some stools appeared dead, others dying, some re-sprouting and some apparently undamaged. Although this is now ca 50 years ago it should be remembered when investigating such a long-lived tree as Tilia cordata."*	(52)
	SSSI documentation is revised	
1971	Douglas fir is replanted by FC in Sub Cpt 89c	(27)
1972	Small Leaved Lime coppice is cut by FC in	(25)
1975	Sub Cpt 89g	(25)
1975 & 1976	The serious droughts in these two summers affects the trees	(42)
1970s late	This is Harry Green's first visit to both parts of Shrawley Wood	(42)
1980	Ruth Annie Horton, formerly Vernon née	(46)
Oct 24	Powick of Shrawley Wood House dies & is buried at Hanbury	
	Her estate is valued at £3,018,833 *(Worth c.£13,000,000 in 2019)*	(74)
1981	The SSSI documents are revised again	(27)
1982	"*Shrawley Wood*" by Pamela Gough is published along with "*Wildlife*" by John Day, Field Officer for Worcs Nature Conservation Trust in 'The Parish of Shrawley'	(3)
	Western Red Cedar is replanted by FC in Sub Cpts 89b & c and Douglas Fir in 88b	(25)
1982-1983	Between autumn 1982 and spring 1983 an arsonist burns the FC Mortimer Forest Office and its contents, which included all the local FC records of Shrawley Wood	(47)
1984-1993	A detailed survey of birds in defined plots of the wood in both private and FC sectors, a unique record, is conducted by R J Fuller and G H Green, see 1998	(37)
1985	Oliver Rackham visits Shrawley Wood.	(42)
May 16	Photographs taken by him that day, mainly in the private zone, are on the dust jacket and in '*Trees and Woodlands in the British Landscape'* (1990) Dent. A third is in '*Woodlands*' (2006) Collins	
1986	The SSSI papers are reconstructed	(27)
1987	Shrawley Wood is recorded as a Nature Conservation Review site by NCC Chief Scientists Division. This refers to the SSSI, which lies partly in the private and partly in the FC sectors	(48)
1989	Worcestershire Naturalists' Club Fungus Foray in the FC part of Shrawley Wood	(20)
1990	Frederick 'Rick' Horton of Shrawley Wood	(35)
Mar 19	House dies and is buried at Hanbury	
	His estate is valued at £5,755,180	(46)
	(Worth c.£13,000,000 in 2019, c.f. 1980)	(74)
Oct 1	Conveyance of Title WR99919 Wood House and the southern, 44.55ha (110acs) private part of the wood, excluding an area around the tomb of Sir George Vernon and the remains of the Summer Cottage, to Mrs Jacqueline Louisa Jeavons-Fellows	(41)
1992	The Forestry Commission launches a new	(72)
May 14	SSSI management plan to secure the future of this "national treasure, probably the best lime wood in England"	
	The lime coppice restoration programme is restarted	(4)
1993	Worcestershire Naturalists' Club visit the FC part of Shrawley Wood	(20)
1996	Worcestershire Naturalists' Club visit the FC part of Shrawley Wood	(20)
1998	The report of the ten-year bird survey is published in *Forestry 71: 198-218,* see 1984	(42)
2000	Two 'Millennium Oak' saplings are planted	
May	near the Viewpoint in the FC section and named 'John' and 'Mary' by Shrawley Parish Council	(51)
2001	Worcestershire Naturalists' Club Fungus Foray in the FC part of Shrawley Wood	(20)
2004	Worcestershire Naturalists' Club visit the FC part of Shrawley Wood	(20)
2006	The 96ha (237acs) at the north is transferred	(41)
Jan 19	from MAFF, FC to DEFRA, FC, following the change of name of this government department	
2008	The Malvern Group of Worcestershire Wildlife Trust hold a fungus foray in the FC part of Shrawley Wood	(43)
2009	Worcestershire Naturalists' Club Fungus Foray in FC part of Shrawley Wood	(20)
	Harry Green, approaches Jill Butler, Woodland Trust seeking research into lime abundance in West Worcestershire including Shrawley Wood. Jill passes this to the Limewood Working Group (LWG) who including George Peterken meet on 16th July in FC part of Shrawley Wood, the first time	(42)
	Joint meeting of local county fungus groups to spread ashes of Tim Bateman (ex-chairman of Worcestershire Fungus Group) in the FC part of Shrawley Wood	(40)
2010	The SSSI condition is recorded as 'unfavourable, recovering'	(27)
2011	Location of individual Oak and the yew thicket are plotted *Former FC Cpt 89 becomes Cpt 2070 and 90 becomes Cpt 2071)*	(28)
2012	A Giant Redwood sapling is planted in memory of Andrew Yarnold, son of Ann née Powick in the FC section at the cross-rides, also to replace one of two lost long ago.	(51)

2013	An astounding email string develops over a three-month period, involving over 30 interested people, from most diverse disciplines, discussing Shrawley Wood's very special characteristics. Pete Byfield unearths a huge historical record from the 14th century to more recent times. George Peterken remarks that this has become the most researched wood in the country. A Limewood Working Group subgroup, chaired by Jonathan Spencer, meets at Astley and decides to produce a wide-ranging monograph. The many subsequent meetings are chaired by Harry Green	(42)
2014	The SSSI condition remains 'unfavourable recovering'	(27)
2015	Members of the Royal Forestry Society hold	(59)
Jan 22	a whole-day meeting in Shrawley Wood.	
	The Worcestershire Recorders in association with the Worcestershire Biological Records Centre visit the FC part of the Wood	(55)
	The Worcestershire Bryophyte Group visit the FC part of the Wood	(56)
2017	The monograph group start a stand-type survey in the FC part of the wood	
May	Mr John Jeavons-Fellows of Shrawley Wood House dies	(54)
	Consent is given by Mrs Jeavons-Fellows to extend the stand-type survey into the private part of the Wood, which is a third of the total area. Sir George Vernon's tomb is found in the wood besides the ruins of the Summer Cottage, close to the dividing ownership boundary	
2018	A full analysis of the Wood Books is done, revealing an enormous amount of detail about Shrawley Wood, its historic management and the Village, see the following chapters, *Shrawley Wood 1700-1763, The Parish of Shrawley during the Rectorship of the Reverend Mr Daniel Piercy, Shrawley Wood 1764-1850* and *Shrawley Wood 1875-1897*	
2019	Shotgrove Copse is investigated when it became apparent that it was formerly worked as one of the binds with Shrawley Wood, see the chapter, *Shotgrove* p. 307, *Coppices & Binds* p. 200.	
2020 June	Small-leaved lime in the wider landscape of the local area is studied to draw a comparison with its presence in Shrawley Wood, see *Limewoods* p. 42-64.	
	Shrawley Wood House, its garden, parkland and the private part of Shrawley Wood are put on the market with a selling price of £5,000,000	(69)
Nov	The Brickpits, Weir Inn, Curriers and Shrawley Court Estates are studied in detail, see the chapter, *Shrawley Wood 1764-1850* p. 183 and Appendix to *Remote Sales* p. 242.	
2021 Mar	Shotgrove and the fields of Church Farm are put up for sale by private treaty	(92)

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Shrawley the Word

An investigation into the Place-Name 'Shrawley' and the relationship between Shrawley village and Shrawley Wood

Hugh Milner

Introduction

Shrawley village lies in the Worcestershire countryside 8 miles north of Worcester, 4 miles from Stourport on Severn and 6 miles from Bewdley. The parish covers 785 hectares (1940 acres) with the River Severn on the east, Dick Brook to the north, Shrawley Brook at the south and the Parish of Witley to the west. 23% of the parish, 182 hectares (459 acres) is woodland, mostly the ancient Shrawley Wood. 16ha (40ac) is water, the remainder is mixed agricultural land and 161 dwellings occupied by about 350 people. With the school closing in 1981, the demographic is of an older generation[1]. This was not the case, not so long ago.



01. The Parish of Shrawley, boundary line in black, is dominated by Shrawley Wood

Woodland begets Village

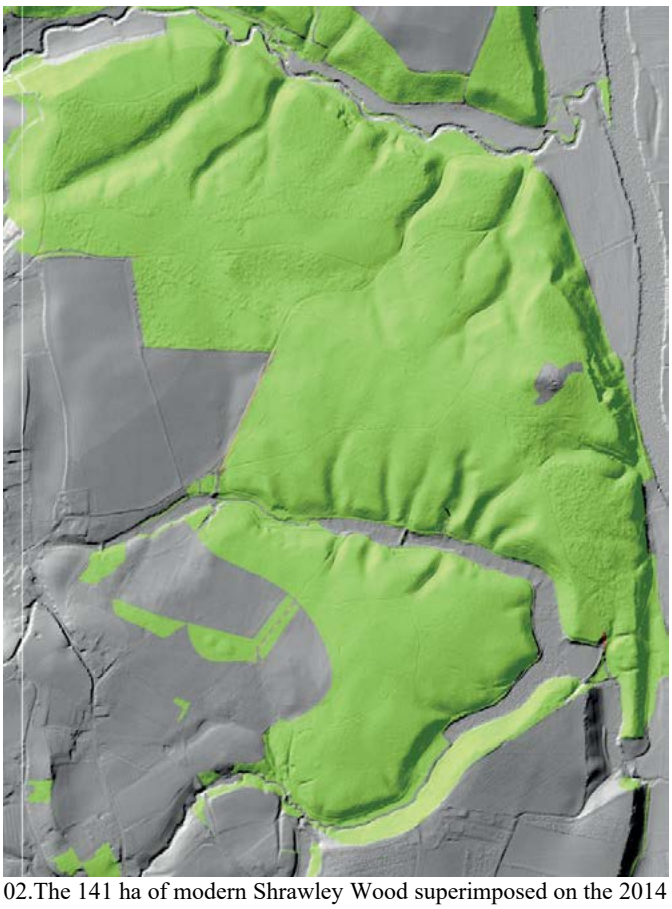
Here we contend the village is named after the wood, not the other way around. The wood came first. Because of its composition of both pedunculate & sessile oak with birch and small-leaved lime, Peterken stand-types 5A and 5B[2], perchance it was rich enough to support a group of 'residents' almost indefinitely. Indeed, the very name describes the woodland, which is ancient and most likely a remnant of a more extensive Wildwood but heavily worked for centuries for what it could provide for the very existence of its villagers (and of course owners).

Gelling, quoted in 'Perceptions of Place'[3] suggests 'the topographical as opposed to the habitative type of name may sometimes be the earliest in the district.' In the same book Dodgson's suspicion (p.165) is that, '*burna*, a stream, *lēah*, a wood, *feld*, "open field", are the first to be used by settlers in a new land.' Carroll and Parsons[3] go onto say, 'Place-names offer an insight into a word-stock, even a register, which is under-represented in literary and other sources – that is the vocabulary, view-point, and concerns of medieval people who got their hands dirty, the land-working peasantry.' These are the folk who named Shrawley Wood and their village because of what they saw when they were working in their wood.

'The Wood-Pasture of the Dingles'

Shrawley, the word is considered now by its two syllables, 'Shraw' and 'ley', from the Old English *scræf* + *lēah*. First recorded in 804, Shrawley, found in *The Place-Names of Worcestershire*[4], see p. 121 Appendix A, scræf is considered to be 'cave, den or hovel in a wood or a clearing in a wood' but this was published in 1927 and great advances have been made in understanding and further defining place-names in the following 90 years, particularly by the English Place-Name Society. Thus, a wide range of other sources, many more recent, have been consulted, see p. 121 Appendix B. However, EPNS 1968[B1], Ekwall 1960[B2] and Mills 1998[B3] remain fairly consistent giving a 'cave or hovel', a 'hole or hollow' or a 'recess in a hill'. Whilst a hovel is possible, a cave has been discounted, the nearest, the Redstone Caves, being two miles (3km) away, opposite Stourport-on-Severn.

A den or hollow does seem most likely when the topography is considered. Dry gullies form major features in the wood. The local term for a gully in the Welsh Marches and the West Midlands is 'Dingle', indeed there are 390 dingles in Worcestershire alone[5]. As recorded in the *Record of Activities and Glossary of Terms* listing qv, as early as 1425 these gullies in Shrawley Wood itself were termed 'Alleys', a narrow passageway[6] and 'Dingle' is first recorded in 1810. In strong support of this modified interpretation EPNS 1968 states OE *Denu* is a valley and ME Dingle, is a deep hollow, a narrow valley[5]. The dramatic images below illustrate their significant presence.



02.The 141 ha of modern Shrawley Wood superimposed on the 2014 LiDAR image. Note the three main gully features and the numerous smaller dingles running into the northern two. These 17 dingles form a major topographical feature incising the general plateau upon which this ancient woodland lies. The brooks in the wood all drain into the River Severn, immediately to the east, which flows south to Worcester.





03. Two of the many Dingles or Hollows. Small-leaved lime dominates the canopy with yew invading the underwood.
(RSH Pumphrey 2018)

The analysis of the Wood Books in chapters *Shrawley Wood 1700-1763, 1764-1850* and *1875-1897,* reveals a great deal of work being conducted in Shrawley Wood to provide a very wide variety of products (130! See *Products from Shrawley Wood* p. 249) to a wide range of markets near and far, see the *Remote Sales* chapter p. 242. Time out of mind, it was probably always so. Most of this intensive woodland work was conducted by men, women and children from Shrawley village and nearby. For their own use they had to have building materials and firewood, just to survive. This is likely to have been the case for far more than fifteen hundred years.

Gelling & Cole 2000[7] state that it seems probable that both British and later Anglo-Saxon farmers regarded the woods as vital resources. They go on to say (p. 239) that 'An Old English speaker would have no awkwardness in using the word ending -ley to mean 'wood' in Elmley, Worcs. and 'clearing' in Stoneleigh, Warks'. Rackham 1976[8] says that 'names, especially village names, ending in -ley imply that some of the Wildwood remained at the time they were formed'.

Hooke 2008[9] argues that *lēah* 'was often initially associated with a wood-pasture usage, and that it generally refers to the kind of open woodland produced when accessible to stock'. She continues 'It may be significant that the distribution of the oak in Anglo-Saxon sources mirrors the distribution of known wood-pastures'. Oak fared well in such an open sylvan habitat[10] and was a main component of Shrawley Wood until the 1940s, for which it was renowned for its 'capital' oak.

Most relevantly, this Anglo-Saxon expert[9] identifies Shrawley Wood as forming the northern part of 'an extensive pre-conquest *lēah* in West Worcestershire… granted by King Offa of Mercia to Bishop Milred of the Church of Worcester of an estate at *Wican* between 757 and 775. A further grant of 816 shows this lay within *Weogorena leage,* "the *lēah* of the Weogoran"….it is argued here that term was being used …in its earliest usage – as indicative of wood-pasture'. Are the Shrawley village families recorded in the Wood Books descendants of the Weogoran? We would love to think so!

It is thus contended that 'Shrawley' means The Wood-Pasture of the Dingles.

Was Shrawley village dependent upon Shrawley Wood? Until perhaps 1850 locally or nationally when the effects of the Industrial Revolution and the aftermath of the Great War took hold of the rural economy, it probably was. Hundreds of woods throughout the country became derelict as a result. Evidence has been unearthed (literally!) as recorded by Hilts, 2018[11], of the demise of the village of Houghton in Huntingdonshire, occupied between the 11th and 13th centuries, at the very early date for a Deserted Medieval Village of 1154, when Henry II declared all of that County a Royal Forest. Under Forest Law the Houghton villagers were denied access to their local 'Houghton Grove', the very reason for the village's existence, which 'they had relied upon for gathering food and fuel'. Soon the villagers all moved away, probably to the nearby village of Brampton. Adding King Henry's 'insult to injury', the wood is now called 'Brampton Wood'. This regrettable sequence was recorded by William Hyett in 1808. Houghton Grove is remembered in the name of the eponymous cottage very close to Brampton Wood.



04. 1808 The Deserted Medieval Village of Houghton remained in the local memory 654 years later. Houghton has disappeared from the modern map. At 132ha Brampton Wood, a SSSI, is the second largest wood in Cambridgeshire.
(Traced from the Ordnance Surveyor's Drawing).

Wood-Pasture, not an oxymoron

How can a woodland perpetuate if all the natural regeneration is browsed off by livestock? How can livestock graze pasture if all the grass is shaded out by tree canopies? Rackham, 1998[12] explains this conflict and how a successful compromise was devised, 'The earliest wood-pastures, and the only ones known a thousand years ago, were wooded commons, involving trees, grass and domestic animals but deer, if at all, only as wild animals.'

This allows us to picture the '*lēah* of the Weogoran' as an extensive Wooded Common, covering 43 square miles (112 km^2), bounded by the Rivers Severn and Teme to the East and South and a North-South ridge of hills from Abberley to Martley in the west with Shrawley Wood marking this huge area's North-East corner[9].

To provide sufficient light to the ground, for grass to flourish and be grazed and for shrubby growth to regenerate to be browsed, the trees had to be at wide spacing. Perhaps with the current vogue of 'rewilding', wood-pastures will reappear in our landscape but until then, to realise how they looked, envisage the many landed-estates' parklands or the modern in-land golf courses but left unkempt.

Peterken, 1993[13] takes us back to an even earlier time, 'Wood-pasture is woodland which is permanently available as pasture, or pasture with trees. It developed out of the pre-historic practice of de-pasturing cattle within natural woodlands, and survived into historical times on commons and in forests, parks and chases.'

Shrawley wood was referred to as 'The Park' in 1433, perhaps reflecting upon just such a use, see the *Timeline for Shrawley Wood.*

Pannage, the pasturage of swine in woods, was common up to this time, indeed most woods in the Domesday Book are described by their holding capacity for pannage. It was conducted in Shrawley Wood, at least until 1461 (see the *Timeline*) the 'capital' oaks no doubt providing capital acorns. The now dominant small-leaved lime may have been helped to regenerate from seeding by the rooting-around of pigs which turned the soil over and reduced vegetation competition, allowing lime seedlings to flourish, as observed by Donald Pigott[14] in the Forest of Bialowieza, Poland, Europe's most extensive area of nearly-Ancient Natural Woodland (ANW).

Browse was also important for livestock, most likely the old native British White Cattle from the earliest times until the medieval period. They are content to include shrubs in their diet[15], unlike modern domestic cattle[16]. Regeneration was essential and all part of sustainable management of the resource. Pasturing has been reinstated with White Cattle since 2003 in Savernake Forest, Wiltshire, the largest privately-owned wood-pasture in England.

This open landscape was later more intensively managed, much becoming farmland but other areas remaining wooded, thankfully including Shrawley Wood, now the largest Limewood in the country. This woodland, beside the River Severn, could so easily have been grubbed to agriculture but it survived for a number of reasons, the main one probably being that it was needed by man.

Both the overstorey and the underwood were promoted for the variety of produce they generated. The coppice divisions were cut on rotation and their stools protected periodically to ensure regeneration. Rackham[11] continues, 'a compartmented wood-pasture is divided into internal coppices, each of which would be felled like an ordinary wood and then fenced in the early stages to keep out livestock until it had grown sufficiently not to be damaged.'

In Shrawley Wood these 'coppices' were called 'binds', at least from 1423 to 1838, see *The Names of Coppice Binds (Coupes) within Shrawley Wood*. There are no internal woodbanks upon which a temporary fence, a 'paling', might be erected, this 'fencing' was achieved by hedging with stakes and binders (called '(h)etherings' at Shrawley). These internal features may have been 'dead hedges' with no living laid components. There were medieval laws to ensure this regrowth succeeded. The latest version of this is under the UK Forest Standard, where coppice regrowth must reach 1.5m in height within three years of being cut. Failure to meet this standard will necessitate suitable replanting to ensure an area remains woodland.

Historically, it seems there were never many deer west of the River Severn, even extinct in the county by the 17th century, except for fallow within deer-parks[17], so regrowth of the underwood would be rapid, meaning the hedges may have had to be effective against livestock for only two or three years. Once the new growth was above browsing height, livestock (not goats) could be allowed back into a bind to graze. Cattle would have preferred glades, where grasses would be available perennially. (As elsewhere in England, deer, especially roe and Muntjac have proliferated in the last 40 years).

Until browsing, pasturing and pannage by domestic livestock ceased in Shrawley Wood, probably in 1461, stool stocking would have been low, allowing light to the woodland floor, so promoting ground flora, including grasses. After this stool-stocking was increased to ensure straight poles grew up and not **out** from their stool-base and thus have unmarketable basal bends.



05. Sheep have grazed off all the ground flora (except nettles!) but have not browsed the 2-year-old hazel regrowth. Shady Grove, Hampshire. (H Milner 2018)

'The Coppice-Pasture of the Dingles'

With the loss of its oak coppice by perhaps 1800, then its renowned oak standards by 1963, the underwood of small-leaved lime came to dominate the wood but we firmly believe it was always there naturally and not planted, see the Chapter on pollen from Shrawley Wood p. 351. The lime would be highly desirable as a forage crop and until 1746 for rope making. Lime was one of the most nutritious species. But it did not get browsed to oblivion because it is was needed. Good husbandry ensured its continued presence. Rackham (pers. comm.) explained that small-leaved lime would survive in an 'open-forest' location outside its coppices by removing livestock periodically, allowing vigorous regeneration from its established root systems. It has been described as 'eternal'.

Perhaps the Wood-Pasture of the Dingles was actually the Coppice-Pasture of the Dingles.

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Appendix A

'Shrawley' in The Place-Names of Worcestershire[4] OE *scræf + lēah*

	year	source
Screfleh,	804	(11th) Birch Cartularium Saxonicum 313
Scræfleh		1885-93
Escreuleia	c.1150	An early Worcester Survey in VCH
Scrauele(ga)	1220	Book of Fees 140 1922-23
	1235	Book of Fees 526 1922-23, Index Pedum Finium pro Com.Wigorn 1865
Shreuele,	1275	Lay Subsidy Rolls, WoHS 1893-1902,
Schreweley		
Shrou(e)legh	1297	Calendar of Patent Rolls
	1346	Feudal Aids 1899-1920
	1428	Feudal Aids 1899-1920
Schrauleue	1316	Inquisitions Post Mortem for the County of Worcs. WoHS 1894
Shrauele(ye)	1327	Lay Subsidy Rolls WoHS 1893-1902
	1344	Calendar of Patent Rolls
	1349	Worcester Episcopal Registers WoHS 1897-1907
	1361	Calendar of Close Rolls
Shrawley	1431	Feudal Aids 1899-1920

Appendix B

1. English Place-Name Society.1968. *English Place-Name Elements*[3]. Vol XXVl EPNS.University Press, Cambridge

Denu OE daenu (ESax), 'a valley'

Dingle ME, 'an abyss, a deep hollow', in later usage, 'a deep dell', in dialect, 'a narrow valley, found from 13th century. Seems to belong to the West Midlands, 334 in Warks, 390 in Worcs. In Wood Book 1810

Lēah OE masculine, a wood, a clearing in a wood but see Hooke on p.119 above and appendix B2 and B3 below OE

Scræf a cavern, a hollow. Scræf had two principal senses in OE

i) A cave, a cavern, a hole in the ground, cf., Scraford, Salford Bridge, Worcs. nr Scrave medwe cf., Scræfen below.
ii) A hovel, a hut, a poor dwelling

Scræfen OE, 'a hollow place, a place with caves or pits'

Screfen OE (Mercia), 'a place of pits'

Sc(e)orf OE a cutting, an incision in the sense of a hollow, the side of a hollow, a development from the root of OE earfian, to cut, shred; Sceorfan to scarify, scrape and Scræf a cave, a hollow. MHG Schorf, Schoff(e) in the sense of abrupt, something cut off abruptly.

2. v Ekwall, E. 1960. *The Concise Oxford Dictionary of English Place-Names.* Fourth Edition. Clarendon Press, Oxford

Lēah from Latin *Lucus*, a grove. The original meaning was an open place in a wood… with trees scattered so that grass can grow. Two senses are to be reckoned with. The common one is 'open place in a wood, a glade', probably not a cleared place but a naturally open space. If clearing is used, it should be taken in the sense 'glade'.

Shrawley *'*Scræf*leh', 'Screfleh'* 804 etc (see Appendix A above) 'Lēah by a Scræf', *scræf* referring perhaps to the recess in the hill close by'.

3. Mills, A.D. 1998. *Dictionary of English Place-names.* Second Edition. Oxford University Press, Oxford

Shrawley. Scræf*leh* 804. 'Woodland clearing near a hollow or hovel'. OE *scræf + lēah.* (see appendix A above)

Lēah, 'forest, wood, glade, clearing', later 'pasture, meadow'. Came into common use in the mid-8th century, less after the mid-10th. It may be regarded as established that *lēah* is an indicator of woodland which was in existence as ancient when English speakers arrived in any region.

Words Related to the Lime Tree (*Tilia spp.*)

Their Period of Use, Derivation and Definition.

Hugh Milner

Base $_{n}$	Matting. Eastern England[2]
Bass $_{n}$	Fibre. First recorded in the late 17th century[1] The inner rind of a tree. Northern England[2]
Basswood $_{n}$	The American lime tree species Tilia americana[1]
Bast $_{n}$	Fibres from the phloem of hemp, flax, jute and originally the lime tree. From Old English *baest* from the Germanic but of unknown origin[1] Matting. Northern England, *baste hattes* are mentioned in Rates, 1545[2] From the Anglo-Saxon *baest* a lime-tree[3]
Baste $_{n}$	A rope. Anglo-Saxon. *Bot ze salle take a stalworthe baste, And bynde byhynd me faste*, Lincoln manuscript[2]
$_{vt}$	To sew loosely together. From the French *bastir* from the Middle High German *bestan* to bind from *bast* qv[3]
Basten $_{a}$	Made of bast[1]
Baston $_{n}$	A cudgel. Anglo-Norman[2]
Lime $_{n}$	Alternative of line, a variety of lind. First recorded in the early 17th century[1] A thong[2] The European linden tree, also the American linden or *basswood*. A corruption of lind, linden[3] A dog leash[3]
Lind $_{n}$	Also line. A lime tree (or generally a tree of any kind). Old English to the late 18th century. Old English *lind(e)* corresponding to Old Saxon *lind(i)a*, Dutch *linde*, Old High German *lint(a)*, Old Norse *lind*, probably related to the Greek *elate*, a silver tree[1]
Lind-Tree $_{n}$	A lime tree[3]
Linden $_{n}$	A lime tree. First recorded in the late 16th century from the Dutch *lindeboom, Lindeboon*, the German *lindebaum* from linde + boom[1]
Linden $_{a}$	Made from the wood of the lime tree. Old English to Mediaeval English[1]
Line $_{n}$	Cord. Old English, ultimately from the Latin *linea* flax (hence linen)[1]
Linn-Tree $_{n}$	A lime-tree. Derbyshire[2]
Lynd-Tree$_{n}$	Also lynde-tree and lyn-tree. A lime tree[3]
Lyne Trye	King P. *the History of Shrawley Wood* (recorded for 1593, see Timeline)
Pry$_{n}$	The small leaved lime tree. Chiefly dialectal, late 16th century to early 18th century. Origin unknown[1] It is apparently an East Anglian dialect word, Gepp E. 1920. (Rackham O. 1986, used it in preference to small-leaved lime)
Teilen	The birch tree or the lime tree[2].
Tillet $_{n}$	Also tillet-tree. The linden$_{n}$. Coarse material used as a wrapping[3]
Tyllet $_{n}$	The linden[3]
Whit-wood	The lime-tree Worcs[2]
White-wood$_{n}$	The lime-tree[2]
Wydden	See the following entry
Wyf, Wyfen$_{n}$	Lime tree, linden, teil tree[4] (gwyn is white)

1: The New Shorter Oxford English Dictionary of 1993.
2: The Dictionary of Archaic Words, Halliwell of 1850.
3: The Standard Dictionary of the English Language, Funk & Wagnalls, 1900.
4: A Dictionary of the Welsh Language 1987-98.
a: Adjective
n: Noun
qv: Which see
vt: Verb transitive

Places ending in ‘ley’ within about 12 miles, 20 km of Shrawley

Hugh Milner

Place-names ending in ‘-ley’ are derived from the Anglo-Saxon word ‘lēah’, now believed to indicate open woodland where grazing, browsing and pannage took place, alongside woodland management. This analysis indicates just how wooded the valleys of the Severn, Teme and Stour were when these places were first named about 1300 years ago.

Gelling & Cole (2000)[1] note that although ‘Lēah’ may mean ‘clearing (in a wood’)’ or later ‘cattle pasture’, in the area of Wyre Forest, place-names containing ’Lēah’ are mostly Middle Saxon and usually refer to a ‘wood’.

Hooke (2008)[2] argues that lēah denotes an open woodland, a wood-pasture, see Chapter ‘Shrawley the Word’ p. 116.

Astley Wood and Shrawley Wood are good examples of a forgotten meaning. The meaning of ‘lēah’, centuries later, was no longer understood, so ‘wood’ was added unwittingly giving a superfluous ‘wood wood’ ending, see thus * below. The well-known Groveley Wood in Wiltshire is thus ‘Coppiced Wood-Wood-Wood’!

The following were found on the local OS Explorer Maps, 1:25,000. Some are explained in Mills (1995)[3], Gelling & Cole (2000)[1], or less reliably in Ekwall (1960)[4] or Mawer & Stenton (1927)[5]. Great advances have been made in place-name studies in recent decades. Those not so listed have a suggested meaning in square parentheses. The listing is thorough but not exhaustive.

The date of first recording is noted, where known. 1086 is the date of the Domesday Book

Name	OS Grid Ref	Derivation	Date		Definition
Abberley	SO753678	OE Ēadbeald+lēah	1086	Edboldelege	Eadbeald’s Wood[3] (a man)
Alveley	SO763844	OE Ælfgyth+lēah	1086	Alvidelege	Ælfgyth’s Wood[3] (a woman)
Areley (Wood)*	SO790710	OE earn+lēah	1138	Erneleia	Eagle Wood[3]
Astley (Wood)*	SO806670	OE ēast+lēah	1086	Eslei	East Wood[3]
Billingsley	[SO713843	OE Billing+lēah			Billing’s (a man) or Ridge Wood][3]
Bentley	SO812627	OE Beonet+lēah	855	Beonetlege	Bent Wood (a grass)[5]
Bewdley	SO785754	FR Beaulieu	1275	Beuleu	Beautiful Place (not ‘-ley’ place)[5]
Boreley	SO822650	OE bar+lēah	1190	Barlege	Boar Wood[5]
Boxley	[SO767585	OE box+lēah			Box Wood] (a rare native shrub)
Bransley	[SO737729	OE brægen+lēah			Uncertain] Hill Wood? (Is on a hill-top)
Brickley	SO989644	OE Blic(a)+lēah	1255	Blickelege	Blick’s Wood[5] (a man?)
Bromley	SO758812	OE bromig+lēah	1295	Bromiley	Broomy Wood[5]
Chaddesley (Wood)*	SO910734	oE Ceadreslēahge	1086	Cedeslai	Chair-like Hill Wood (CE cadeir,chair)[3]
Chatley	SO851613	OE Ceatta+lēah	1539	Chatley	Ceatta’s Wood[5] (a man)
Chorley	SO698834	OE ceorl+lēah	1231	Churlec	Freemen’s or Peasants’ Wood[3]
Coley	[SO919676				Uncertain] Coal or Charcoal Wood?
Cookley	SO843803	OE Cūlna+clif	964	Culnan clif	Culna’s Cliff (not a ‘-ley’ place)[3,5]
Dunley	SO789693	OE Dunna+lēah	1221	Dunelege	Dunna’s Wood[5] (a man)
Elmley	SO872696	OE elm+lēah	780	Elmlege	Elm-Tree Wood[3]
Foxley	SO704710	OE fox+lēah	1086	Foxle	Fox Wood[3]
Gateley	[SO888687	OE gāt+lēah			Uncertain] Goat Wood?
Gatley	SO801628	OE Catta+lēah	1275	Catteley	Catta’s Wood[5] (a man) or Goat Wood[3]
Grimley	SO836603	OE grīma+lēah	9thC	Grimanleage	Spectre or Goblin Wood[3]
Groveley*	[SO761567	OE græfe+lēah			Uncertain] Coppice-Wood Wood?
Habberley	SO810770	OE Hēahburh+lēah	1086	Harburgelei	Hēahburh’s Wood[3] (a woman)
Hadley	SO863638	OE Headda+lēah	13thC	Haddeley	Headda’s Wood[5] (a man)
Hagley	SO914810	OE hagga+lēah	1086	Hageleia	Hawthorn Wood[3]
Hawkley	SO742695	OE heafoca+lēah	1275	Hauekele	Hawk’s Wood[5]
Hayley	SO760541	OE (ge)haeg+lēah	1274	Hayleya	Enclosed Wood[5]
Highley	SO742835	OE Hugga+lēah	1086	Hugelei	Hugga’s Wood[3]
Longley	[SO734504	OE lang+lēah			Uncertain] Long Wood?
Lulsley	SO739547	OE Lull+ēg	12thC	Lolleseia	Lull’s Island (not a ‘-ley’ place)
Martley	SO753600	OE mearth+lēah	1030	Mærtleag	Wood frequented by Martens[3]
Mawley	[SO688753	OE Malwes+lēah			(a ridge above the R. Rea) Uncertain] Gravel Ridge Wood[3]? or Bowl Wood1 (The river cuts a big oxbow)

Moseley	SO810595	OE mos+lēah	816	Moseleage	Moss or Bog Wood[5] or
		OE mūs+lēah	1086	Museleie	Woodland infested with Mice[3]
Oakley (Wood)*	SO900615	OE āc+lēah	1255	Akelege	Oak Wood[5]
Oddingley	SO913593	OE Odda+inga+lēah	816	Oddingalea	Odda's Peoples' Wood[3,5]
Ombersley	SO845637	OE Ambre+lēah	706	Ambreslege	Ambre's Wood[3,5] (a man) or
		OE amer+lēah	706	Ambreslege	Hammer or Bunting Wood[3]
Peachley	SO811575	OE Pecci+lēah	11thC	Peceslea(g)e	Pecci's Wood[5] (a man?)
Prickley	SO764620	OE pric-(th)orn-leage	1221	Prikelege	
Prizeley	[SO697749	OW prisc+OE lēah?			Uncertain] Copse Wood?
Puckley [See Martley		OE pūca+lēah			Goblin Wood or Puca's Wood] (a man)
					Puckley Green Farm, now lost, was in Martley Parish.
Redmarley	SO760663	OE hrēod+mere+lēah	1086	Redmerlei	Reedy Pond Wood[3,5]
Riley	[SO714596	Uncertain] Rye Wood?			
Romsley	SO782833	OE hremm+lēah	1270	Romesle	Raven Wood, probably[3]
Rowley	[SO803630	OE rūh+lēah			Uncertain] Rough Wood?
Seckley (Wood)*	SO765785	OE Secg+lēah	866	Secceslea	Secg's Wood[5] (a man?)
Shelsley	SO733631	OE Sc(i)eld+lēah	1086	Celdeslai	Sceld's Wood[5] (a man?)
Shrawley (Wood)*	SO808660	OE scræf+lēah	804	Scræfleh	Coppice-Pasture of the Dingles (See Chapter Shrawley the Word p. 116)
Stanley	SO782833	OE stān+lēah	1130	Stanlega	Stony Wood[3]
Suckley	SO721516	OE succa+lēah	1086	Suchelei	Woodland frequented by Sparrows[3,5]
Syntley	SO797686	OE sænget+lēah	1255	Synteleye	Singed or Burning Wood[5]
Trimpley	SO793784	OE Trympa+lēah	1086	Trinpelei	Trympa's Wood[3] (a man)
Waresley	SO843699	OE Wær+lēah	817	Wæresleage	Wær's Wood[5] (a man)
Willy Hill Coppice	[SO712578				Uncertain] Willow Wood Hill Copse?
Winley	[SO701598				Uncertain] White Wood?
Witley	SO753661	OE wiht+lēah	964	Wittleag	Woodland in a Bend[3](of the Shrawley Brook)[5]
Wolverley	SO829793	OE Wulfferd+ing+lēah	866	Wulfferdinleh	Wulfweard's People's Wood[3]
Wordley	SO773688	OE Weord+lēah	1425	Wordisley	Weord's Wood[5] (a man?)
Worsley	SO753687	OE Worf+Lēah	957	Worfesleahges (gemæra)	Worf Wood (the former name of the stream that runs into Dick Brook)[5]

Key C: Century, CE: Celtic, FR: French, OE: Old English, OW: Old Welsh, W: Welsh

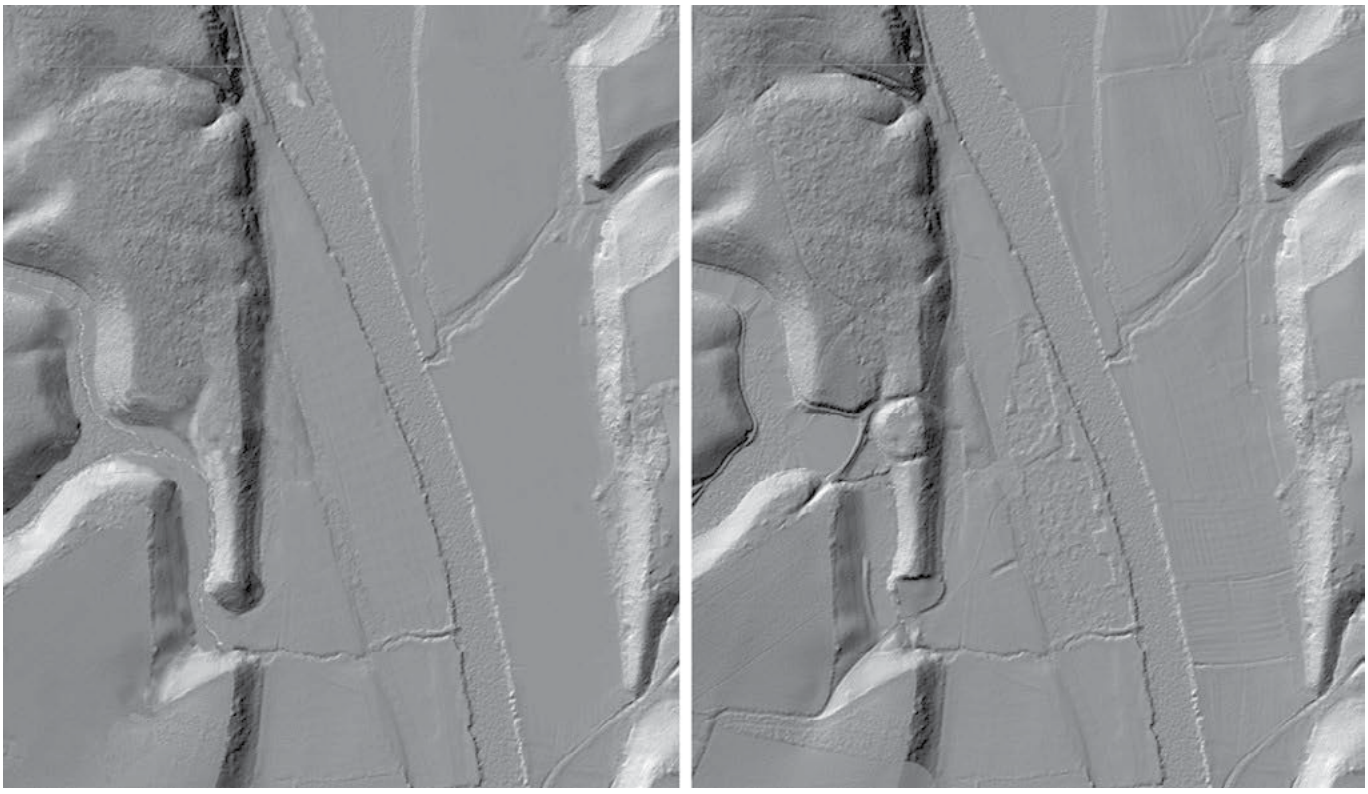
1.Gelling, M. & Cole, A. 2000. *The Landscape of Place-Names*. Shaun Tyas, Stamford
2.Hooke, D. 2008. *Early medieval woodland and the place-name lēah*. In; *A Commodity of Good Names*, essays in honour of Margaret Gelling. Shaun Tyas, Donington
3.Mills, A.D. 1998. *A Dictionary of English Place-Names.* Oxford University Press, Oxford
4.Ekwall, E. 1960. *The Concise Oxford Dictionary of English Place-names.* Oxford University Press, Oxford
5.Mawer, A. & Stenton, F.M. with Houghton, F.T.S. 1927. *The Place-Names of Worcestershire*. English Place-Name Society, Nottingham

Back to the beginning

Richard Pumphrey

Nine authors have contributed to researching the history of Shrawley Wood and each has provided a different perspective. Up until this point, the focus has been on the research of Peter Byfield and Linda Mainwaring, indexed by the timeline compilations of Hugh Milner and Francesca Llewellyn, and further detail provided by Francesca and me. From this point on, there follows another pass through the history, largely based on a single consecutive thread through time with chapters from John Hemingway, Peter King, Andrew Harris, me, Francesca and Hugh Milner, finishing with the understanding that comes from pollen analysis by Suzi Richer. This point in the narrative opened an opportunity for an attempt to reverse the changes wrought on the landscape by all the occupants of Shrawley over the years, focusing on the area round the castle on Oliver's Mound, and wind time back to the beginning of history before starting again with John Hemingway's account of Redmarley.

Throughout history people have altered the land they live in. Making roads, building homes, changing rivers, quarrying for building materials, ploughing fields all alter the surface of the land. These changes can now be measured with incredible accuracy by LiDAR as explained on pages 258-265. I thought it might be interesting to see how the landform looked when all these changes were undone.



01. Left: tentative reconstruction of the prehistoric landform Right: the present landform.

Manmade features were removed one by one, and the resulting changes explored.

The New Pool dam (1850) was removed, replacing the rock and soil taken from either end; the New Pool drained, revealing the brooks in their original course. Tracks along the New Pool Margin were removed. The resulting strip valley was most probably similar to the parts there now that have not been flooded by construction of dams and may have provided good grazing or browsing for wildlife and later livestock. (see p. 202)

The dredgings from the deepening of the Severn (1844-5) that had been dumped on the banks and used to restrict the width by the newly deepened shallows were removed, and the shallows restored (with the possible island that appeared at summer low water). We think that this was for centuries adapted for fishing like many other places along the Severn; in 1389 this place was called Fysshfe (see p. 244).

The brick pits of 1831-52 (see p. 183) were filled in, restoring the level of the flood plain.

The quarry at the south end of the Oliver's Mound spur (?1170) was restored to its original landform. The road from the Castle to the Weir was unmade, restoring the uniform slope of the escarpment. Holloways from other tracks through the wood were levelled.

The ditch around the site of Shrawley Castle (maybe around 1180 but possibly a relic of an earlier wooden fort) was refilled.

The cutting leading down to the Weir Inn was refilled, leading to a vertical rock face near its lower end. If this reconstruction is accurate, it may explain the two parallel routes: the older steps and the newer cutting that allowed wheeled traffic.

The earth moved from the ancient holloway leading from Court Farm to the flood plain (bottom left of the picture on the right) was restored.

Now read on, starting history again from the beginning…

The prehistory and history of Greater Redmarley and its environs

John Hemingway

Shrawley Wood lies in the parish of Shrawley but it is useful to consider its prehistory in the wider context of the area between the Abberley Hills and the River Severn which may be described as Greater Redmarley. This area is large enough to enable the scatter of known archaeological sites and finds to be viewed with enough context to provide a history of Shrawley Wood.

The Last Ice Age: *ca*115,000BP – 11,000BP
The last glaciation, the Devensian, reached its maximum extent about 18,000 years ago with ice sheets extending as far south as Wolverhampton. In England mean January temperatures of -10°C and mean July temperatures of 7°C may have been typical during a large part of the full glacial. Evidence from the confluence of the rivers Tame and Trent suggest that animals like reindeer and woolly rhinoceros coexisted and may have consumed dwarf willow which grew in that area. At its acme, most of England was thought to be 'arid icy deserts of gravel, blown cover sand and loess for much of the year,'[1] Life-forms were precisely adapted to endure the intense cold and seasonal ablation of glaciers would have contributed to flooding and erosion. Rivers were often braided so that the streams that ran into the River Severn would have had sand and silt banks separating the channels. The width of the flat flood plain of Dick Brook suggests that it meandered widely across its valley floor. As meanders would have shifted their positions regularly it is likely that the vegetation was ephemeral.

By 14,000 BP the temperature began to rise and ice sheets virtually disappeared from Britain. Due to the vast amount of ice still to the north, sea level remained low and Britain was connected to the continent of Europe. As the ice retreated plants and animals from glacial refugia began to move north.[2] Birch woods grew in the English Midlands and horse, bear and wolf maintained a presence. Between 105,00BP and 100,00BP there was a climatic hiccup and cold spread south again, but temperate plants and animals quickly returned[3] firstly lichens, mosses and herbs followed by trees such as birch and pine.[4] Grazing mammals returned and the human population increased.[5]

The **Mesolithic Period: *ca*BC6,500 - BC4,200**
By 8500BP the temperature had increased and woodland had developed. The birch and pine woodlands had begun to be replaced by oak, hazel, elm and alder.[6] Oak, elm and alder, however, did not become abundant until the Atlantic Period[7] (5,200 to 7,500 years ago) which was a climatic optimum. Lime trees, 'the most thermophilous of our native trees' first appeared and became widely distributed for about 2,000 years.[8] Perhaps the limes in Shrawley Wood first began to grow at that time? The fact that they are still there, however, has more to do with anthropogenic impacts than natural survival. This was also the period when Doggerland was overrun by a mega-tsunami and Britain became an island.[9]

Evidence of Mesolithic people and their tools appear at Greater Redmarley. These implements, flint artefacts, have been found particularly close to river fords[10] and this may be due to the fact that herds of animals had been observed crossing the River Severn at those points. As these fords and the tracks that led to and from them created open corridors hunter-gatherers would have followed them. Fording places occurred at Larford and Lenchford and to the south at Worcester, there may also have been a river crossing at Redstone (see Map 1).

That Mesolithic people began to change the landscape seems clear.[11] These itinerant hunter-gatherers used birch and hazel[12] and there is clear evidence for burning at this time (see Star Carr).[13] Encampments near water sources aided the trapping of animals. As the population of hunter-gatherers increased it is possible that wild ruminants were adopted by the hunters and livestock husbandry began. Clearing land for livestock would have been imperative so woodland clearance accelerated. Mesolithic occupation sites are difficult to find as this was a time when there was an increase in rainfall and the growth of peat and blanket bogs. Mesolithic artefacts have been discovered by active searching.[14]"

The Neolithic Period (New Stone Age): *ca*BC4,200- BC2,000
By about 6,200 years ago Britain had entered a new period and man had become more sedentary and commenced arable farming. This did not mean that the hunter-gatherers disappeared, but they kept to well-wooded areas like Greater Redmarley while the farmers utilised more open areas as at Martley and Wick Episcopi to the south. This did not mean complete isolation as Neolithic farmers were occupying ford-side areas. A pot-boiler stone[15] and a flint pick[16] were found near Larford, flint debitage was found south-east of Shrawley Churchyard close to Lenchford[17] and a polished stone axe found in the garden of Yarhampton House.[18] These axes were used

1 Buteux, S.T.E., Keen, D.H. & Lang, A.T.O., *Quarrying and the Ice Age — A Handbook* p. 40.
2 Buteux, S.T.E., Keen, D.H. & Lang, A.T.O., ibid., p. 41. The 'Glacial refugia' was in southern France and Spain where the plants and animals had survived.
3 Lewis, Colin A. & Richards, Andrew E., (ed.) *The Glaciations of Wales and Adjacent areas* (Almeley, Logaston Press, 2000), p. 19.
4 Evans John G., ibid. p. 79.
5 Buteux, S.T.E., Keen, D.H. & Lang, A.T.O., ibid. p. 41. The glacial refugia were in southern France and Spain.
6 Evans John G., op. cit., p. 79.
7 Evans, John G., ibid, p. 81.
8 Evans John G., ibid, p. 72.
9 Evans, John G., ibid, p. 84.
10 Dinn, J. L. & Hemingway, J. A., 'General results' in Archaeology on the Blackstone to Astley Aqueduct, *Transactions of the Worcestershire, Archaeological Society* Third Series Vol. 13, (Worcester, Worcestershire Archaeological Society, 1992a.) p. 108.
11Evans, John G., ibid, p. 113. The idea that Shrawley Wood has been woodland since the last Ice Age is not proven. J. Iverson in Denmark in 1941 published a classic paper where he had found through analysis of pollen that four phases of differing environments occurred in a wood. Phase one: 'clearance phase' in which oak declined and herbs became dominant. Phase two: 'cultivation phase' where cereal pollen dominated. Phase three: 'abandonment' when weeds of cultivation plantain etc., became important. Phase four: `regeneration' where birch preceded the dominance of oak. There is a need to perform pollen analysis of at least one of the dew ponds in the wood to find out what the history of the environment was rather than guess at it.
12 Evans, John G., ibid, p. 80.
13 Evans, John G., ibid, p. 81.
14 Evans, John G., ibid, p. 101.
15 Napthan, Mike, Archaeological Watching Brief at Land to the South of Redacre House,
Astley, Worcestershire, 2006. Archive report, Worcestershire Historic Environment and Archaeology Service.
16 Dalwood, C. H., et al. 1996. Salvage recording on the Astley to Worcester aqueduct, Archive report, Worcestershire Historic Environment and Archaeology Service.
17 Jacobs, Alan. 2007. Test Trench to the East of Shrawley Church, Worcestershire W11 Fs. Archive report, Worcestershire Historic Environment and Archaeology Service. WSM 36104
18 Clough T. H. and Cummins W. A., *Database of implement Petrology for Britain* (York, Archaeological data Service, 1998).

for cutting down trees and this one was close to the Redstone Road perhaps indicating that farming settlements were moving inland.

Constant use of an area like Greater Redmarley must have had some effect on the woodland. One of the effects of this was the 'elm decline' which occurred in this period.[19] The use of elm as a fodder crop is well known as animals prefer this rather than the foliage of other species of tree. Animals allowed to graze in woodland areas would decimate elm trees and saplings having significant impacts on the populations of those trees. This evidently began when people started to domesticate animals but it intensified in the Neolithic period as the numbers of stock farmers increased.[20] The elm decline was not the only impact of man on woodland. There was a marked increase in the spread of grassland plants and birch and ash which presumably was a result of the clearances that occurred.[21] Ash is a light demanding tree that would accept broken tree cover.[22]

The Beaker Period (Copper Age): *ca*BC2,000 - BC1,300
The end of the Neolithic and the beginning of the Bronze Age has been described as the Bell Beaker period after a type of vessel that has been found in archaeological excavations. A Beaker pit was discovered by the writer while performing a watching brief on the Blackstone to Astley Aqueduct in 1991.[23] The pit was found at Longmore Farm two miles north-west of Shrawley Wood in a small valley with a seasonal watercourse running through it. The pit had vertical sides suggesting that it had originally been a grain pit that had been later utilised to hold rubbish. The fill was composed of domestic waste which included a worked pebble with a smoothed facet and irregular flake scars suggesting it had been used for grinding and pounding, two flint thumbnail scrapers and 257 flint spall debitage, small pieces thrown away in flint tool production and a few pieces of fired clay. Charred animal bone was collected but it was too small to identify. Parched grain in the form of Emmer *Triticum dicoccum*, a hard red wheat, and hazelnuts *Corylus avellana*. Important pottery finds included 120 sherds of Beaker pottery. Although broken they were unabraded and considered to be the remains of at least six bell beakers. This material was most certainly occupation waste from a settlement close by. The massive amount of charcoal suggested that the occupants were clearing ash and other debris from a hearth which was then transported to the pit. Whether they were hunting red deer or wild cattle or kept animals is unknown but the wheat grains found suggested arable farming indicating open cultivated land around the settlement.

The Bronze Age: *ca*BC1,300 - BC600
Recent genetic studies have revealed that the Celts of the Copper Age and Bronze Age were alike and it is generally believed that the language spoken by these people was Celtic, an Indo-European language that came with them when they migrated to Britain about 7,000 years ago.[24] The Celtic place-names referred to in the Anglo-Saxon Charters are likely to have been in use during this period and some survive to the present day. Some of these terms can be seen in the area around Greater Redmarley. Severn was the name of the river-goddess Sabrina recorded in the writings of the Roman Tacitus. The earliest Anglo-Saxon spelling shows a corrupted version of this in the name *Sæfyrne*.[25] The earlier river-name in Worcestershire was *Vigora* of Celtic origin.[26] This can be found in the corrupted place-names of Wyre,in Wyre Forest in the north of the county and Wyre Piddle in the south. *Vigora* is also the base element in the name Worcester[27] which suggests that the name was familiar locally. Other Celtic water-names in the vicinity of Greater Redmarley are the brook-name *Doferic* which is derived from the word *dwr* meaning water and *Glese* which means bright.

The early place-names on the western boundary relate to topographic features. The area that lay north of Abberley was called *Carcdun Edge*; *carc* is Celtic for cliff and Dun is Anglo-Saxon for hill. *Carcdun* seems to represent the rise of land north and west of Dunley. The earlier Celtic name for the Shrawley and Astley woodlands may have been Charnwood, the present name of a settlement to the west of Shrawley Wood. Charn is a corruption of *carn* the Celtic word for rock and *wode* is the Anglo-Saxon word for wood. The survival of these terms into the Anglo-Saxon period suggests that the residents where Celtic speakers but multilingual.

By the Bronze Age there is much less evidence for the survival of hunter-gatherers but it seems likely that woodland pursuits continued in Greater Redmarley. There was an upsurge of ash and beech in the Bronze Age at the same time as a 'lime decline'. Whether this decline was because of the use of the bark for bast rope making or of the leaves for fodder is presently unknown.[28]

The introduction and number of bronze axes in areas of occupation seems to correlate with the clearance of trees though none have so far been found in the Greater Redmarley area.[29] Bronze Age flints were found at the Dunley Roman site, suggesting that occupation of the area had continued from the Copper Age.[30] Two ring ditches found close to the route that led to the Redstone crossing suggest embanked and ditched farmsteads.[31] During the Bronze Age important individuals were buried in round barrows and a round barrow was discovered close to the Larford crossing implying occupation of the area.[32]

During the late Bronze Age a wetter and cooler period occurred. By about BC650 there was massive erosion in the upper Severn valley leading to the deposition of vast amounts of silt. According to Professor F.W. Shotton this was due to large scale cultivation on the valley sides.[33] Deteriorating weather conditions led to a change in agriculture and arable farming was replaced by stock rearing and ranches became more common. Livestock husbandry must have been important in Redmarley due to the fact that it is a hilly area and not conducive to arable agriculture. This implies little change in agricultural practice in the area.

The Iron Age: BC600 - AD43
Greater Redmarley was evidently within the Iron Age tribal territory of the Dobunni but there were subdivisions in the territory based on

19 Evans, John G., op. cit., p. 75.
20 Evans, John G., ibid, p. 109.
21 Evans, John. G., ibid., p. 113.
22 Evans, John. G., ibid., p. 123.
23 Hemingway, J. A. & Dinn. J. L., A pit containing Beaker pottery, at Longmore Hill, Astley in Archaeology on the Blackstone to Astley Aqueduct, *Transactions of the Worcestershire Archaeological Society* Third Series Vol. 13, (Worcester, Worcestershire Archaeological Society, 1992.), pp. 112-116. HWCM 11.093
24 Baugh, Albert C. and Cable, Thomas, *A History of the English Language* (London, Routledge & Kegan Paul, 1981) pp. 32-33.
25 Stenton, F. M. & Mawer, A. *The Place-names of Worcestershire* (Cambridge, Cambridge University Press 1927), pp. 14-15.
26 Stenton, F. M. & Mawer, A. ibid, p. 20.
27 Some of the earliest spellings of the place-name of Worcester are: *Uueogorna, Wigerna* and *Wigorna*. See Stenton and Mawer above.
28 Evans, John G., op. cit.. p. 123.
29 Evans, John G., ibid, p. 129.
30 Dinn, J. L. & Hemingway, J. A. 'A Roman site at Dunley Road, Arley Kings' in Archaeology on the Blackstone to Astley Aqueduct,' *Transactions of the Worcestershire Archaeological Society* Third Series Vol. 13, (Worcester, Worcestershire Archaeological Society, 1992.) p. 111. 11WCM 1136.
31 Baker, W. A. Oblique Photograph of possible Ring Ditch, Astley, 1961, Archive report, Worcestershire Historic Environment and Archaeology Service. WSM08074
32 Green C. A., Round Barrow at Astley, Worcestershire *Transactions of the Worcestershire Archaeological Society*, 1961. WSM08073
33 Mercer, Roger, (ed.) *Farming Practice in British Prehistory* (Edinburgh, Edinburgh University Press, 1984) p. xvii, xviii.

clan units. Each unit had a hillfort within it.[34] There are three possible hillforts in the area of Greater Redmarley. A major feature is at *Oldbury* (now Woodbury) with two others, one at The Burf, Astley, one at Berrow Hill, and one south of the village of Martley. Nothing is known of these lesser features but it is likely that they predated the larger forts as clan defences. As they have not been excavated this is supposition but it is possible that Woodbury was built as a tribal defence to protect the Severn valley from the west, while the smaller hill forts were for local defence. The Burf at Astley may have been an early centre for Greater Redmarley as it would have been naturally defendable. In the *Gallic War* Julius Caesar commented on the habit of the natives of *Britannicum* of constructing hillforts. He stated that: *'Now the Britons call it a stronghold when they have fortified a thick-set woodland with rampart and trench, and thither it is their custom to collect, to avoid a hostile inroad*.'[35] This may provide a clue to the extent of the woodland around The Burf at Astley that time.

The area of the Burf clan can perhaps be determined by the later district boundaries as a territory stretching west to the Abberley Hills. A tenth century document referring to the Worcester/Hereford diocese records that the boundary between the River Teme and the Abberley Hills was called *Mertleage ecge*, Martley Edge and a place between Abberley and Dowles Brook was called *Carcdune Ecge*.[36] *Carcdune* is evidently the rising land northwest of Dunley which formed a western and northern boundary. The Wyre woodland existed on the northern boundary and separated southern people from those to the north. The eastern boundary was likely to have been formed in large part by the River Severn In the Anglo-Saxon period seven 'hamptons' were grouped on each side of the river (Map 2). Hampton is of Anglo-Saxon derivation and means village or farmed estate. The two areas are effectively a mirror image of each other. They both contain riparian woodland and the same number of settlements. They also both have lime woods with names derived from Anglo-Saxon but their origins must be earlier. Whether these origins are Romano-British or Iron Age is unclear but it is not uncommon to find estates straddling the River Severn.[37] The two units were owned by different groups of people in the middle Anglo-Saxon period. Iron Age occupation seemed to be similar to the earlier periods and remained close to the river crossings. Two occupation sites in Astley were close to the Larford river crossing.[38]

The Roman Period: AD43- AD410

Groups of Romano-British farmsteads lay alongside roads to the fords. Many of the farmsteads were sited on previous Iron Age sites which suggests that the same families continued to cultivate the land. A Romano-British settlement was situated close to the Redmarley route to Redstone. It comprised an aisled barn with parched grain found inside it namely *Triticum spelta* (Spelt wheat), *Triticum turgidum* (Rivet wheat) and *Avena sp.* (Oats). The pottery suggested a date towards the end of the third century or beginning of the fourth century AD (*ca*AD275 – AD335). Other finds include a coin of Constantinopolis dated to AD330 – AD335, a Colchester-manufactured brooch, glass beads, hob-nails, a piece of red sandstone quern and a sheep or goat tooth with tiles, slag and fired clay fragments. This material suggested that it belonged to a nearby mixed-use farm that was used for arable as well as livestock production; the identification of various wheats and oats indicates that grain was processed.[39] Aerial photographs show two Romano-British buildings and an enclosure near Astley Cross[40] and archaeological excavations have revealed that another three farmsteads lay next to the Larford road.[41] Excavations on one site revealed enclosures and a well 73 feet deep.[42] The archaeologists stated that the Romano-British farmers ploughed down a nearby Bronze Age barrow until it was barely visible further demonstrating the existence of arable fields.[43] Another Iron Age and later Romano-British farmstead lay closer to the Larford crossing.[44] Evidence of a Romano-British farmstead has also been found close to the Lenchford crossing with signs of another farm close to Shrawley church with pot sherds found in an excavation on the east side of the graveyard.[45] A pottery kiln was said to have been found south-west of Hillhampton House close to the Abberley-Lenchford road. This may have been in a woodland environment since kiln sites are often close to areas which provide wood for the charcoal fires the kilns.[46] After Roman control of Britain ceased in AD410 the *Civitas Dobunnorum* became the kingdom of the Hecani and its king was mentioned by Gildas in *The Ruin of Britain* written about AD50.[47]

The Anglo-Saxon Period: AD410 - AD1,066

In the sixth century AD the kingdom of the Hecani was divided into two and became the Anglo-Saxon kingdom of the Hwicce in the east and the British Magonsaetan in the west.[48] Celtic place-name survival continued in Greater Redmarley suggesting that the residents were Britons rather than Anglo-Saxons. Della Hooke's study of multiple-estates in Shropshire may be relevant for that county but in Worcestershire the large estates appeared in the early Anglo-Saxon period.[49] The later estate sub-divisions probably occurred in the middle to late Anglo-Saxon period.

That Redmarley (reed-pond woodland estate) was an important estate centre can be seen in a number of facets (see Map 3).[50] It was the site of the hundred meeting place of Doddingtree. This hundred court was the prime local criminal court that was originally responsible for everything from theft to call-up in time of war and was empowered to hang malefactors. It is likely that Dodda's tree stood near the present Hundred House public house. Further evidence for its former importance was the way in which subsidiary place-names surrounded it.[51] The 'east' element of the name Astley (East woodland estate) suggests that this estate was a secondary entity to a larger estate to the west which would have been Redmarley. The 'ley' element refers to an estate with attached woodlands but can also imply clearances. The reconstruction map of Astley suggests that a one and a half mile wide band of

34 Cunliffe, Barry, *Iron Age Communities in Britain* (London, Book Club Associates, 1975) p. 261.
35 Edwards, H. E., (trans.) *Caesar, The Gallic War* (London, William Heinemann Ltd, 1970) p. 261.
36 Finberg, H.P.R., *The Early Charters of the West Midlands* (Leicester, Leicester University Press, 1972), p. 226.
37 Hemingway, John, 'Anglo-Saxon Ripple' *Worcestershire Archaeological and Local History Newsletter,* Vol. 40, (Worcester, Worcestershire Archaeological Society, 1988).
38 Walker, C. I., Excavations on a Romano-British site at Astley 1956-58, *Transactions of the Worcestershire Archaeological Society*, (1958), pp. 29-57. WSM06069; Walker, C. I., 1959. Excavations on a second Romano-British site at Astley and reports from the first site 1958-59, *Transactions of the Worcestershire Archaeological Society*, (1959). WSM34721
39 Dinn, J. L. & Hemingway, J. A., 'A Roman site at Dunley Road, Arley Kings' (1992b) pp. 109-117. HWCM 1136.
40 Baker, W. A., 1959. Oblique photograph of crop-marks in field, Astley. Archive report, Worcestershire Historic Environment and Archaeology Service. WSM08070.
41 Walker, C. I., (1958) op. cit.,
42 Walker, C. I., (1959) op. cit.,
43 Walker, C. l., (1958) op. cit.,
44 Green C., op. cit.,
45 Jacobs, Alan, op. cit.,
46 Bryant, V. Site visit in February 1992. Archive report, Worcestershire Historic Environment and Archaeology Service. WSM03502
47 Gildas, (trans.) Winterbottom, Michael, *The Ruin of Britain* (Chichester, Phillimore, 1978) pp. 30-31.
48 Pretty, Kate, 'Defining the Magonsaetan' in Bassett, Steven, (ed.) *The Origins of Anglo-Saxon Kingdoms* (Leicester, Leicester University Press,1989) pp. 181 -2.
49 Hooke, D., *Anglo-Saxon Territorial Organisation: The Western Margins of Mercia* (University of Birmingham, Department for Geography Occasional Paper 22, 1986).
50 Its importance was later relegated when it became the Great Witley estate.
51 Thorn, Frank and Caroline (ed.) *Domesday Book; Worcestershire* (Chichester, Phillimore, 1982) pp. 15, 9. 10, 20.2.

comparatively open land existed in Anglo-Saxon times running in a north-south alignment with the settlement of Astley in its centre. This estate ran between two major trunk routes. To the north a route leading to Larford (named after yellow flag iris that grew by the riverside) and another trunk route running to the south existed between Redmarley and Lenchford, the ford by the ledge(?) in the south. A highway running north to south separated the woodland on the east from the land to the west. Much of this western woodland was cleared or recleared in the middle Anglo-Saxon period. Astley, excluding Shrawley, Hillhampton and Glasshampton, had only eighteen families recorded in the Domesday Book. Its royal connection is clear with two houses in Worcester belonging to the estate together with a salt-house in Droitwich. An early lord of Astley built a church there which still existed at the time of Domesday, though whether this was then owned by the Dane Ocea, who was said to own it before the Norman Conquest, is not clear.[52]

It is likely that just as Astley was a sub-estate of Redmarley so Shrawley was a sub-estate of Astley. The evidence for this is that Shrawley is not mentioned by name in the Domesday Book but as an appendage to Astley.[53] The place-name Shrawley *Scref Leh, '*cave or hovel wooded estate' conveys much about the people who lived there, perhaps the hovels were their homes. However, Shrawley was valued and as early as AD804 it was recorded as being held by Aethelric Athelmundson, a Mercian noble.[54] Aethelric gave the estate to Deerhurst Minster prior to his leaving on a pilgrimage to Rome. Its value lay in the woodland and this may have been the reason why Astley claimed it in Domesday as part of its property.

According to Domesday the woodland of Astley was one league long by half a league wide, i.e., a mile and a half by a quarter of a mile. Although this is an approximate measurement the wood at the time included Shrawley Wood which ran from its present boundary near Court Farm to below The Burf and west from the river to close to Wood Farm. The main use of this woodland was to provide charcoal for the Droitwich salt industry; Astley had salt rights in the Domesday Book *viz*. 'a salt house in Droitwich which pays 18 measures of salt worth 64 pence.[55] This does not mean that the woodland had no other function but salt was a valuable commodity in this period. H. P. R. Finberg drew up a map showing the routes of salt ways emanating from Droitwich in the Anglo-Saxon period; one of these led to Astley *via* Larford across the River Severn.[56]

The limits of Shrawley Wood in the earlier part of this period may be seen by the groves that lay to the west. Within the woodland was the Lenchford to Larford road and a number of settlement names that suggest woodland activities were ongoing. The name Brant (*Baernet*) derives from the Anglo-Saxon word 'to burn', presumably its inhabitants were charcoal-burners. Charcoal-burners by the nature of their work rarely settled in one place but wandered around the woodlands. Although it does not mention wood in the Domesday Book, Shrawley estate relied on timber from the woodland for its resident's livelihoods. It was valued at only one hide but had 24 families, more than the rest of Astley put together.[57] Quite why Shrawley acquired the East Grove from Hillhampton is not clear. It may have been the Norman sheriff Urse who owned the *vill* as he had a vested interest in acquiring wood, or to be more precise, charcoal, and he did exchange properties associated with the Droitwich salt industry. He lived at Salwarpe. Shrawley had easy access across the Lenchford to Droitwich, the traditional way in which charcoal was transported to enable its furnaces to keep burning.

Conclusion

The area that the writer has designated as Greater Redmarley had a varied early history and much remains unknown. Further practical archaeology and environmental work will aid our future understanding of it. Pollen retrieval from woodland pools will help determine the age of the woodland and whether it was clear felled in the past. Field walking and the search for artefacts will inform man's activity, whether intensive, moderate or possibly non-existent. Knowledge of past human populations will help determine their sphere of influence on the woodlands.

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52 Thorn, Frank and Caroline (ed.) ibid., p. App. V Worcs. G. 10.

53 Thorn, Frank and Caroline (ed.) ibid., p. 15.9. The fact that Shrawley Wood was larger in the past pre-supposes that the surrounding area was woodland. The question is how much of the land was part of the wood in Domesday.

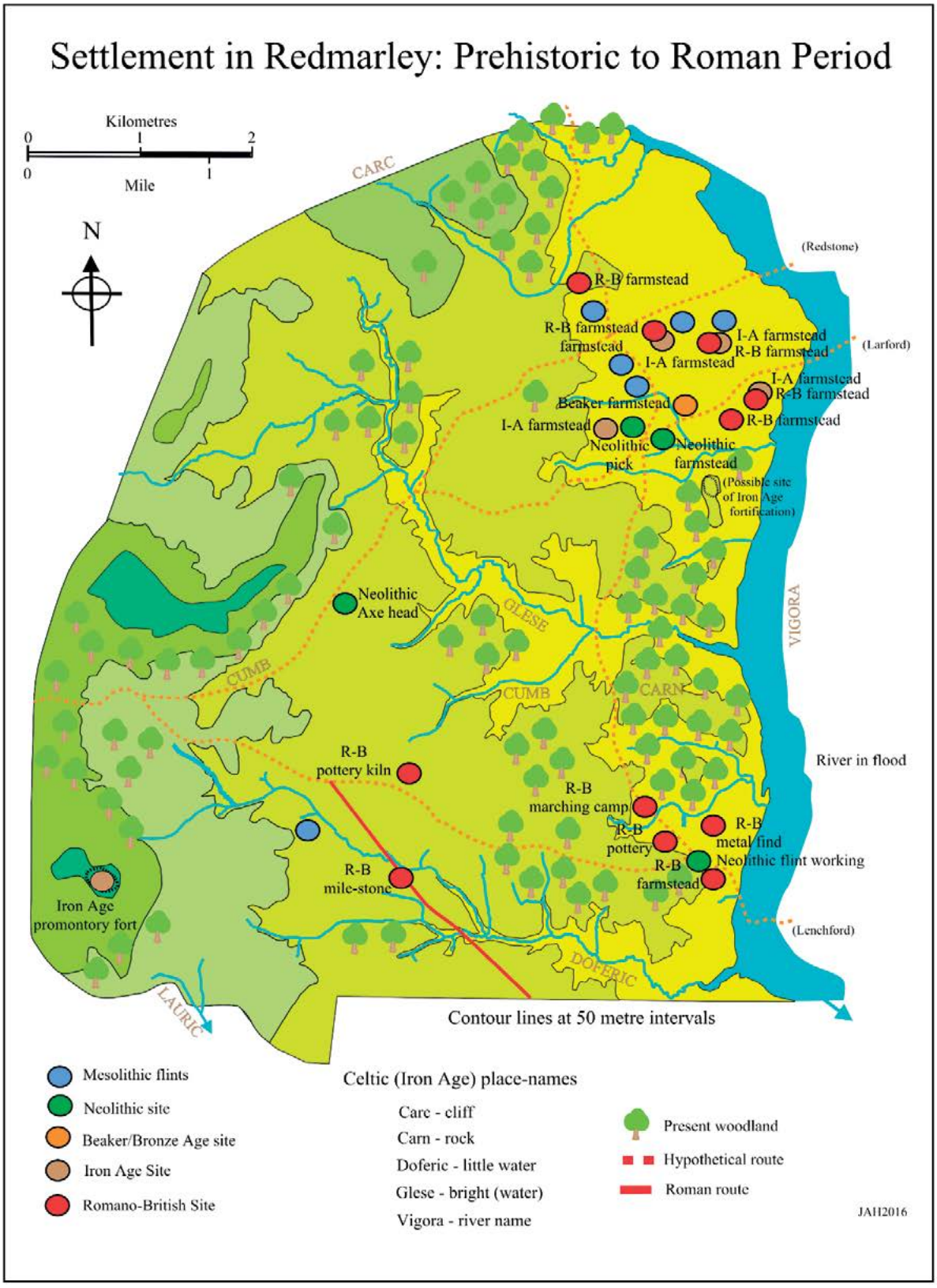
54 Finberg, H.P.R., op. cit., pp. 97-98.

55 Thorn, Frank and Caroline, (ed.) p. 176b. The measure or mitt was reckoned at 8 bushels, this meant that Astley made annually 144 bushels of salt. This calculation, assuming the A.D.1086 mitt was 8 bushels, 040lbs (5.71 cwt), approximates to the traditional weight carried by a packhorse, which is probably what the mitt originally represented, therefore eight packhorse loads of salt a year were made.

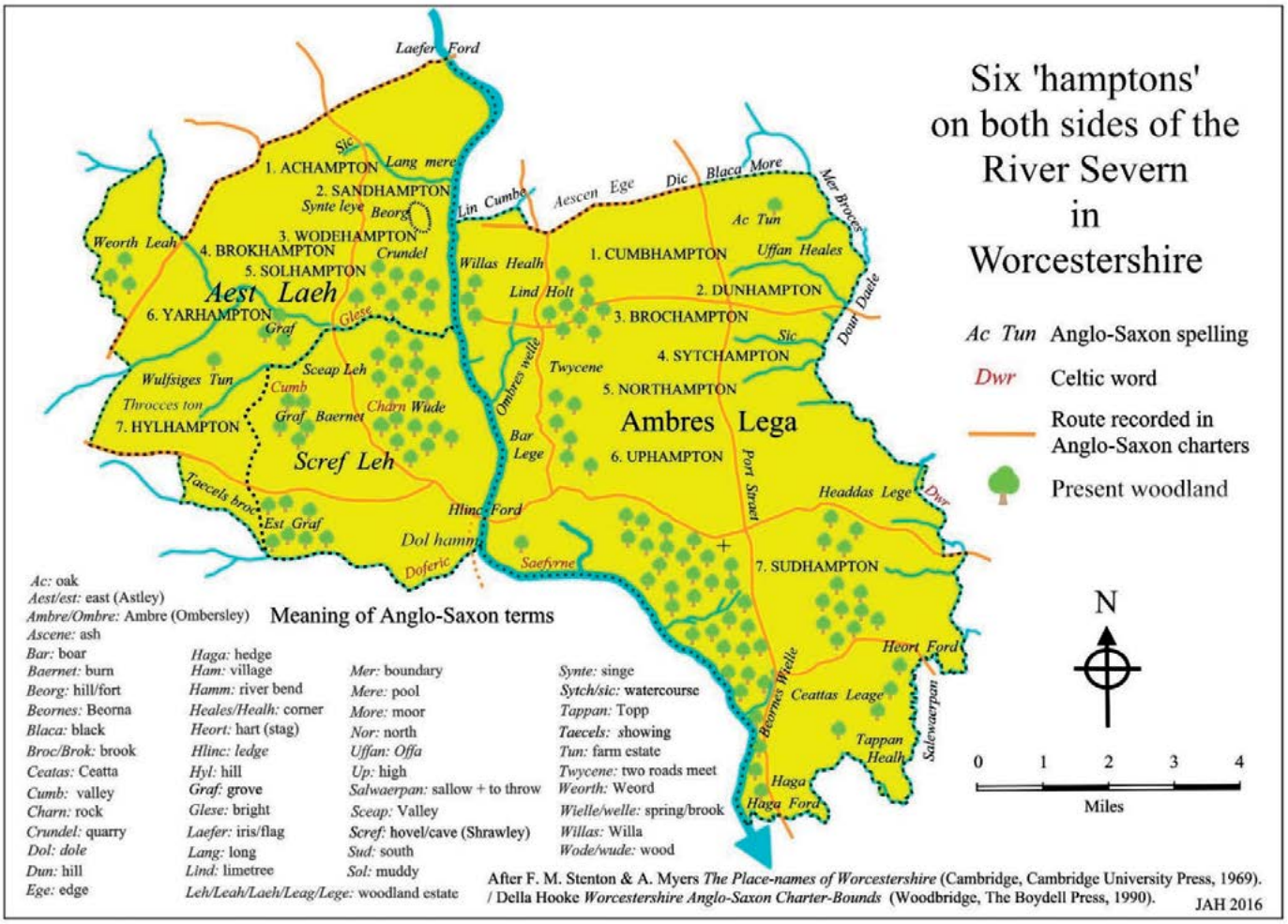
56 Finberg. H. P. R. (ed.), 1972. *The Agrarian History of England and Wales I, AD 43-1042*. (Cambridge, Cambridge University Press, 1972), Fig. 51.

57 Round, *Victoria County History: Worcestershire* pp. 327- 330, Evesham B Domesday.

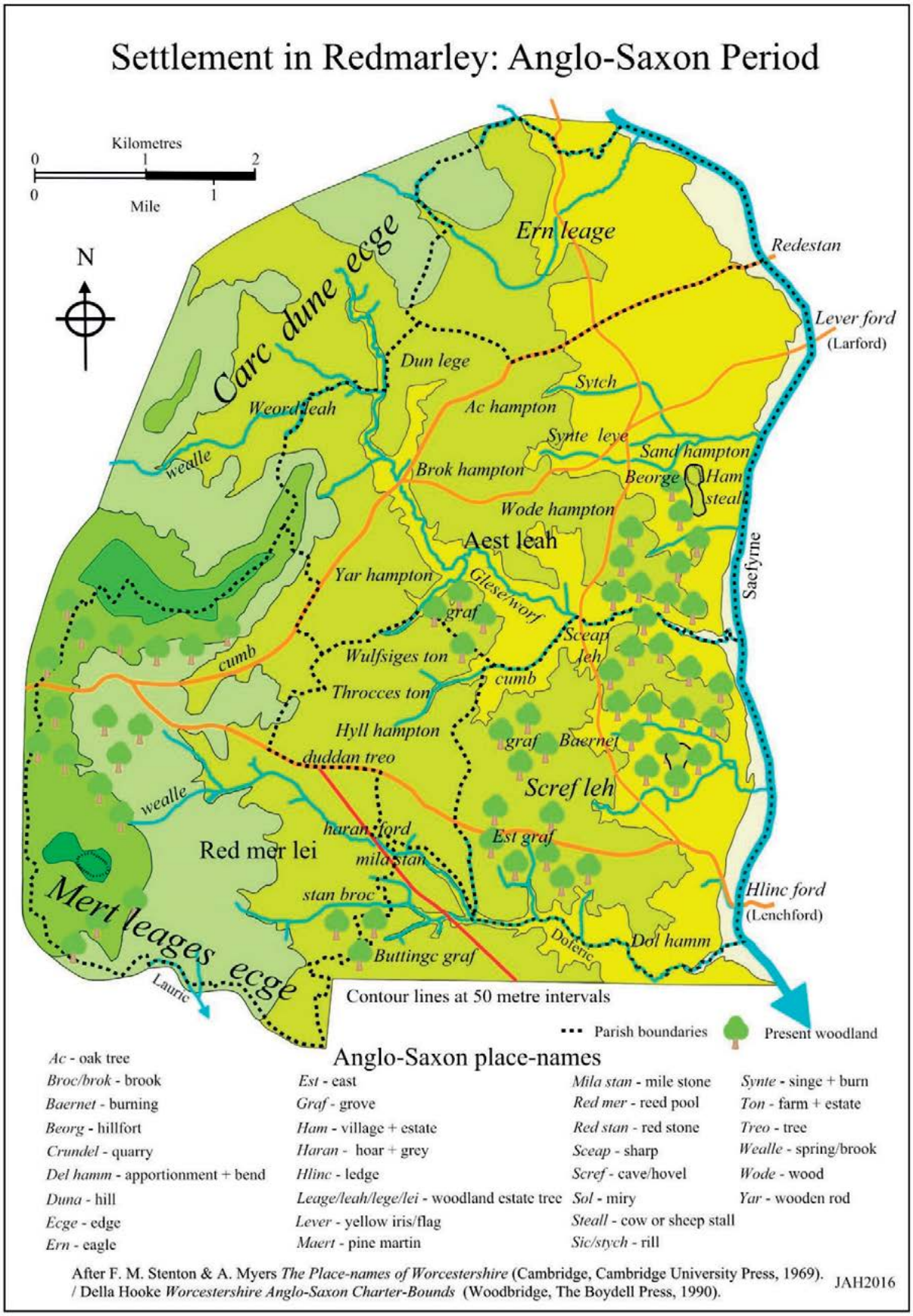
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Map 1. Prehistoric to Roman period. The map is incomplete and further field walking and excavations are necessary. It shows an intensive settlement pattern in the low lying land beside the fords, north and south of Shrawley Wood. The woodland may once have run west as far as the Cumb of Glese/Dick Brook.



Map 2. Astley and Ombersley. The 'mirror-image' pattern of the two parishes suggests that they were once part of the same unit. This may have been before or during the early Anglo-Saxon period.



Map 3. Anglo-Saxon Redmarley. Shrawley Wood may once have extended to the Shrawley parish boundary and further west.

Medieval Shrawley Wood

Peter King

Saxon and Norman Shrawley

Shrawley lies on the west bank of the river Severn.* Its southern boundary is Shrawley Brook, beyond which lie Holt and Little Witley. Shrawley (like Astley to its north) was in Doddingtree Hundred, whereas Holt and Little Witley were in Oswaldslow, being the northern part of a great estate of the bishop and church of Worcester, known as Wick (*Wican*) and stretching south to the river Teme. Some distance to the west (dividing Doddingtree) was the boundary between the dioceses of Worcester and Hereford. Bishop Athlestan's boundary for the latter is described in Saxon document, as running along the Malverns and to the river Teme, then up the Teme to Stanford Bridge, thence to Martley's Edge and along the Edge to Carcdune (probably Carton, now in Bayton) and from there to Eardington (*Eardigtun*). The boundary probably ran north, so that Rock was in Worcester diocese, but not places to their west. The traditional view has been that the boundary descended Dowles Brook to the river Severn.[1] However, there is an alternative route possible, taking Kingswood, a detached township of Stottesdon, and Woodeaves, the part of Upper Arley west of the Severn into Worcester diocese.[2] This boundary is thought to go back at least to the seventh century, as that between the Magonsaete (a petty kingdom covering most of Herefordshire and south Shropshire) and the Hwicce (a petty kingdom covering most of Worcestershire and Gloucestershire).

Between the western boundary of Wick and the Teme lies Martley. Martley was evidently a large and important manor, but appears in Domesday Book in the Herefordshire folios,[3] probably because it had been owned by William Fitz Osbern, Earl of Hereford. Despite their distance from Martley, Areley Kings and Hillhampton were detached portions of it. Such detachments often arise from the fragmentation of a large manor (or of a parish), the intervening areas having secured their independence from the original property.[4] The situation is further complicated by the nature of the medieval and later manor of Abberley, which contained scattered areas of land, including also Lindon (two townships in Rock Parish), Alton (also in Rock), and Bayton (all Domesday manors) as well as a share of Redstone Ferry (in Astley).[5] Of these, Bayton was beyond Bishop Athelstan's boundary, while it, Lindon, and Abberley each have separate Domesday entries. It thus seems that Ralph de Tosny (or one of his successors, who spelt the name de Toeni) amalgamated his various demesne manors and administered them as one. Ralph de Tosny was the successor of Ralph de Barnack (*Beornaco*), sheriff of William Fitz Osbern.[6] Elsewhere in Worcestershire, Ralph only had Elmley Lovett. All this seems Drogo Fitz Poyntz had Glasshampton (*Glese*) and three other small properties in the area, Hollin and Stildon (in Rock) and a virgate explicitly part of Martley, and Ralph de Mortimer had one. These together cover all the land between Wick, the early diocesan boundary, and the river Severn, except Ribbesford, a dependency of Kidderminster.[7] Arguably, Martley and the lands of Ralph and Drogo made up a single entity earlier, sandwiched between Wick and the diocesan boundary, but there is nothing to confirm that (or deny it). The names Worcester and Wyre Forest both include the element *Weogran*, thought to be a regional name. Both Wick and the area just described were presumably part of this, but how far it may have extended remains wholly unknown.

Astley had been part of Ralph de Tosny's lands, but he had given it to the French church of St Taurin,[8] which founded a priory there.[9] Astley was six hides. A hide is a fiscal assessment of land, divisible into 4 virgates and 120 acres. In Worcestershire, at least, hides are the same as *cassati*, *mansae, manentes*, and cognate terms by which estates were described in Saxon charters. This measure originated before 700 AD,[10] and had long ceased to be a precise measure of the productive capacity of an estate, save in general terms; the acres are not statute acres of 2240 square yards, but it is possible they reflect the actual cultivated area in perhaps the seventh century. St Taurin's Church had four hides, and one hide was held by Urso, which probably means that Ralph retained one hide in Astley in demesne himself. Glasshampton (also in the parish) remained a separate property, forming an estate in the early 19th century that stretched across the parish boundary to include Woolstan's Farm in Hillhampton, possibly the (fiscal) virgate in Martley.[11]

Urso who held one hide is almost certainly Urso D'Abitot (or *De Abitot*), the Sheriff of Worcester, who held extensive lands mostly in north Worcestershire. His heiress was his daughter Emmelline married Walter de Beauchamp. Her inheritance also included Elmley Castle on the north flanks of Bredon Hill, which became the head of the honour of Elmley Castle.[12] Shrawley is not named in Domesday Book, but a document entered in the Evesham Cartulary says that William de Beauchamp held a hide in Shrawley from Ralph de Toeni. This seems to identify Shrawley with the unnamed hide held by Urso from Ralph given under Astley. Urso had three ploughs in demesne, while 3 villeins, 15 bordars, and two freemen had seven ploughs, but no wood. If each plough was cultivating a ploughland or carucate of 120 acres, then 1200 acres were in use, not the 120 acres suggested by the hidage. Astley's woodland is included in the extent of that manor. It was a league long and half that wide. A Domesday league is twelve furlongs, making the wood twelve furlongs by six. This is not dissimilar in size to Shrawley Wood together with the adjacent Astley Wood. This suggests that Shrawley Wood has continuously been woodland for the last 900 years. Astley Wood stretched north from Dick Brook (the northern boundary of Shrawley Wood) to Hampstall Lane, but was inclosed in 1814.[13]

Details of the tenure of manors in the centuries after Domesday Book do not need to be given in great detail. The manors of Abberley (into which the de Toeni family's lands west of the Severn were combined) and Elmley Lovett were considered part of the family's honour of Colwyn (a castle in mid Wales). This descended in that family until the male line failed in 1309, when it was inherited by Robert de Toeni's sister Alice, who later married Guy de Beauchamp Earl of Warwick, the lord of Elmley Castle.[14] Ralph de Tosny seems to have consolidated all his Domesday manors in the area as the manor of Abberley, which subsequently existed as a number of discrete parcels of land scattered across several parishes. Besides Abberley, it included Bayton and *Linde*, the latter subsequently Upper and Lower Lindon, two townships in the east of Rock, one of which became known as Heightington after a chapel was built there.[15] Gladderbrook, High Oak, and Westridge Farms (now in the east of Rock) were formerly a detached part of Abberley parish (and presumably manor).[16] It is not clear whether Wermeslai (of Domesday Book), another of manors where Ralph was tenant in chief, was Wordley in Astley or Worsley in Rock, but a manor of Wordley was a submanor of Abberley by the 14th century. *Cintley*, mentioned with Abberley in the 14th to 17th centuries, is presumably Syntley Farm in Astley;[17] a parcel called Syntleys was certainly held freely from the manor of Abberley in 1662, as was a messuage and certain free land called Heightington, while one of the two passages at Redstone Ferry was copyhold of Abberley.[18]

Syntley and the manor of Berrow would seem together to make up the remaining hide of Astley. The manor of Berrow had been subinfeuded from the manor of Abberley by the 13th century.[19]

* This chapter results from research carried out jointly by the author, Pete Byfield and Francesca Llewellyn. The views expressed differ at some points from those expressed by John Hemingway in another chapter, as a result of differing syntheses from the available evidence. This is at times capable of more than one interpretation.

When Walter Winford was succeeded by his son John in 1615, he owned the manor of Berrow with a capital message, but also messuages in Brockington and Yarranton and a mill in Astley.[20] The tenure in chief of the latter two suggests they had been part of the Priory's manor of Astley. It has been suggested that the manor was near Astley Burf,[21] whose name is cognate with Berrow, but its location has not yet been discovered. William Yarrington of Yarrington (died 1598) had a leasow called Berrow Lyes, which he held of the crown by socage and not in chief.[22] His son John agreed in 1612 to settle his property on the marriage of his daughter Jane to Walter Farley. The inquisition on his death mentioned Berrowes Leys, Gamefields, Berrow Meadow (of three days math) and Berrowes or Bigles Meadow bought of John Higley after the settlement, all held of the king as of the manor of Berrowe in free and common socage by a rent of 5½d.[23] These seem to be the rest of the manor of Berrow, but none of these names appear in the tithe award, so that their location is also unknown.

St Taurin's church administered its lands by establishing a cell (priory) at Astley. The Priory of Astley was thus an alien priory, which was seized by the crown in 1380 during the Hundred Years' War. An extent taken then recorded that the prior had 16 marks of rent (£5.6s.8d), tenants' works worth 6s.8d, two carucates of land (240 acres) worth 20s, 10 acres of meadow worth 20s, a dovecot worth 40s, pleas and perquisites of court worth 40s, and 9s rent in Worcester.[24] The priory was formally suppressed in 1414. In the meantime, it had been granted to the Earl of Warwick. In 1468, Edward IV granted it to the College of Westbury-on-Trim in Gloucestershire. The College was surrendered to Henry VIII in 1544 and quickly sold by him.[25]

Medieval Shrawley

One of the Beauchamps granted Shrawley to a member of the Poer (or Poher) family, who were probably constables of Shrawley Castle, a site now known as Oliver's Mound, at the southeastern corner of Shrawley wood. Oliver's Mound was investigated archaeologically in 1928 and again in 2008. The castle consisted of a keep, along one wall of a rectangular courtyard with at least one octagonal corner tower.[26] It has been claimed that this was guarding a ford on an east-west route across the Severn,[27] but the roads leading to such a crossing point are not obvious. Four generations of the Poher family seem to have owned the manor of Shrawley, ending with a daughter Aline. In 1297, she recovered property in Eckington and then granted it all her property to Edmund Mortimer of Wigmore, Lord Mortimer, and Margaret his wife.[28] Pottery finds from the recent excavation point to occupation of the castle only during the period of Poher ownership.[29] Edmund's son and heir Roger 1st Earl of March granted it to his daughter Catherine in marriage to Thomas Beauchamp 11th Earl of Warwick in 1327.

Thus, all manorial interests in Shrawley passed to the Beauchamp family. Their son Thomas Beauchamp, 12th Earl was in 1397 arrested by Richard II for treason and forfeited his estates, but the attainder was reversed and all lands were returned to him in 1399 after Richard II was deposed.[30] The estates descended in that family to an heiress (Thomas's granddaughter) Anne, who married Richard Neville. He was created Earl of Warwick in her right.[31] Their two daughters married Richard III and his brother George Earl of Clarence. The Warwick lands in the Midlands were allotted to Clarence and his wife under a Parliamentary partition in 1474-5. Clarence died in 1478, attainted to treason against Edward IV. His lands were seized by the crown during the minority of his heir Edward, whom Henry VII kept imprisoned in the Tower, until he was executed in 1499 for alleged complicity in Perkins Warbeck's rebellion. However, the lands were in fact the heritage of Anne Countess of Warwick, not the property of her deceased daughters and the sons-in-law, who had fought to control them in the 1470s. Anne was in sanctuary at Beaulieu Abbey, and in 1486 petitioned Henry VII for the restoration of her lands. She appears to have been allowed to recover some of them, on condition that she remitted the rest to the king.[32] The Warwick and Spencer lands were described in 1509 as 'purchased' by the king.[33] Thus the Warwick lands (including Shrawley and Abberley) passed to the crown.

There is very little detail available on Shrawley Wood itself in the medieval period. In Domesday Book Astley is recorded as having a salthouse at Droitwich, which paid 18 measures of salt and 64d, but the wood was worth nothing.[34] This could be because the wood was providing fuel for boiling salt and its value was counted in that of the salthouse, but that remains uncertain. The wood is probably the park, a third of which Edmund and Margaret Mortimer had by grants of Aline Poer in 1304.[35] In 1390, 300 bundles of rods were sold for six shillings and a further 300 delivered for the works of Salwarpe. Two years later, 400 were sold for eight shillings. These rods may have been etherings, flexible rods that could be woven to make wattles. In 1415, £22 was received from the sale of underwood from the park to John Breweare. In 1433 £23 was received for the sale of wood in the park in *capicia* [coppice?] called Blakewyche. The same account records the sale of fish for 40 shillings from two pools called Shrawley Pools to the use of the hospice of the earl at Salwarpe, by ordinance of William Morley steward there. However two other surviving 15th-century account rolls show no wood sold.[36] The lack of sales in those two account rolls may be because a two-year agreement had bene made the preceding year. This is suggested by a survey of the woods in 1490 (see table 1). This shows the wood being managed as 10 coppices (*i.e.* binds), which were cut over a cycle of 20 years, with most binds taking two years to cut.

date	regnal year	previous sales	coppice called	years falling	contains (acres)	value
1422/3	1 Hen VI	£20	The Brechyng	2	16	£14
1487/8	3 Hen VII	£12				
1466/7	6 Edwd IV	£11.6.8	Tagleyheld	1	7	£9
1448/9	27 Hen VI	£10	The Aley	2	12	£12
1406/7	8 Hen ?IV	£14	The Fryth	2	16	£14
1481/2	7 Hen VII	£13.10.0				
1472/3	11 Ed IV	£11.8.4	The Outwood	2	15	£13.6.8
1494/5	10 Hen VI	113s.4d				
1422/3	1 Hen VI	£22	The Roche	2	16	£14
1476/7	16 Ed IV	£19	Blackwych	2	16	£14
		none noted	Roughscentz & Shopgrove	2	16	£14
1437/8	16 Hen VI	£16	The Wendleys	3	27	£24
1431/2	10 Hen VI	£16	The Elbow	2	16	£14
	[totals - not in orignal]			20	157	£142.33

01. Survey of Shrawley Wood c 1495, as rated by the tenants together with value of previous sales, noted in a broad margin of the original document. Note: TNA catalogue describes this as 1490, but the date cannot be earlier than 1495 as a sale in 10 Henry VII is mentioned [Source: TNA, E 315/83, f.56]

The manor rolls record sales by the bailiff: in 1425 to Thomas Severne and Thomas Bruar of 1 *bayne post* called Le Aleye; in 1439 to Thomas Brewer and Thomas Severn of wood and underwood for £20; and in 1455 a further sale was made for £25, spread over two years. Thomas Severne senior made a sale of wood without licence worth a shilling and Thomas Severne junior destroyed the lord's wood in *browsing lez croppez* with his draught animals and Thomas Severn of Severn placed a draught animal in the wood between *bruses* and *croppez unmuseled*. Each was fined the large sum of 3s 4d.[37] In 1469, Thomas Martyn bought a byne of wood called Le Fryth for £32 payable over three years.[38] It is unusual to find wood sales recorded in the manor rolls, but presumably it was useful to an absentee lord to have it recorded locally, so that the receipt would be picked up as part of the accounting process.

The surviving manor rolls for the late 15th and early 16th centuries record no more sales, but sales continued. Ministers' accounts for Warwick Lands in Worcestershire show regular sales between 1480

and the mid-1520s. It is difficult to determine an average amount raised by the sales, as not all accounts survive, but the average was about £7 per year. The practice of making a sale covering two or three years seems to have continued. The buyers in 1481 were Thomas Sevarne senior and John James junior, paying £24 over three years; 1489-91 they were John Jones, John Truell, Robert Martyne and John Severne; and much the same group in 1492-5: Thomas Cooke, John Johnes, Robert Martyn and John Trewell.[39] In subsequent years the sales were merely recorded as to 'several persons'.[40] In 1527, responsibility for the sale of woods was passed to the Surveyors of Woods (also called Masters of Woods),[41] bringing Shrawley Wood under the same administration as Henry VIII's forests. Details of these sales appears in table 2.

Conclusion

While the evidence for the late medieval and early Tudor period is incomplete, it seems Shrawley Wood was already being managed as a series of coppice compartments ('bines') that were cut cyclically. The bines are usually not named, but the 'woods' (evidently coppice divisions) cut were called Le Aleye in 1439, Le Fryth in 1469, Long Wanlees in 1481, Le Brechynge in 1508, Blakewich in 1519, and Elbow in 1526.[42] In 1480 and 1481, 30 shillings was also paid for the sale of the herbage of the old park. These accounts also record wages paid to 15 customary tenants working for 24 days upon the enclosure of the park at a halfpenny a day according to ancient custom.[43] However, the wood had apparently ceased to be a park. Many of the later accounts are much less detailed referring to back to the amount paid being the same as in an account of 1489 (then accounting for increases and decreases in rent).[44] Accordingly in this period it was seem that the sale of underwood and herbage in Shrawley Wood provided the king with an income of about £10 per year. Whilst there was some inflation in the subsequent period, related to the debasement of the currency, this income is a mere fraction of that achieved by members of the Childs a century later, as will appear in the next chapter.

year to Michaelmas		reference: TNA,	sale	Other details
4 Henry VII	1488	SC 6/HenVII/989	nil	
6 Henry VII	1490	from next account	£8.6.8	to John Jones, John Truell, Robert Martyne and John Severne
7 Henry VII	1491	SC 6/HenVII/990	£8.6.8	
8 Henry VII	1492	DL29/645/10467	£11.10.0	as appears by court roll
9 Henry VII	1493	DL29/645/10468	£13.10.0	
10 Henry VII	1494	DL29/646/10469	£5.13.4	to Thomas Cooke, John Johnes, Robert Martyn and John Trewell
11 Henry VII	1495	DL29/646/10470	£5.13.4	
12 Henry VII	1496	DL29/646/10471	£8	to several persons
13 Henry VII	1497	DL29/646/10472	£8	to several persons
16 Henry VII	1500	DL29/646/10473	£9	to several persons
17 Henry VII	1501	DL29/646/10474	£9	to several persons
18 Henry VII	1502	DL29/646/10475	nil	
21 Henry VII	1505	SC 6/HenVII/992	nil	
24 Henry VII	1508	SC 6/HenVII/993	£6.10.0	underwood called Le Brechynge
3 Henry VIII	1511	SC 6/HenVIII/3997	£10	
4 Henry VIII	1512	SC 6/HenVIII/3998	£6	
5 Henry VIII	1513	SC 6/HenVIII/3999	£6	
7 Henry VIII	1515	SC 6/HenVIII/4000	£12	
8 Henry VIII	1516	SC 6/HenVIII/4001	nil	
9 Henry VIII	1517	SC 6/HenVIII/4002	£14	
10 Henry VIII	1518	SC 6/HenVIII/4003	nil	
11 Henry VIII	1519	SC 6/HenVIII/4004	£14	wood called Blakewich
13 Henry VIII	1521	SC 6/HenVIII/4005	£14	
14 Henry VIII	1522	SC 6/HenVIII/4006	nil	
17 Henry VIII	1525	SC 6/HenVIII/4007	nil	
18 Henry VIII	1526	SC 6/HenVIII/4008	£14	coppice called Elebow
19 Henry VIII	1527	SC 6/HenVIII/4009		to be accounted for by Sir John Mordaunt and Roger Wiggeston
21 Henry VIII	1529	SC 6/HenVIII/4010	nil	
22 Henry VIII	1530	SC 6/HenVIII/4011		to be answered by the master of woods
23 Henry VIII	1531	SC 6/HenVIII/4012		
24 Henry VIII	1532	E36/73	£5.6.0	by Thomas Severne vendor of wood (in account of Sir John Mordaunt and Roger Wiggeston)
34 Henry VIII	1542	E101/149/7	£7.16.0	by John Mynne of William Pynnok receiver of Warwick lands from the sale of coppices called Rough land and Shortegrene

02. Sales of wood from Shrawley as recorded in Ministers' accounts.

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Early Modern Shrawley Wood

Peter King

The late Tudors

A new era started in the 1540s.* The crown sold off the manors that had by one means or another come into its hands. Astley manor was granted to Sir Ralph Sadler and his wife Ellen in 1545 with the rest of the recently surrendered College of Westbury on Trim, with income from the time of the surrender.[1] Sadler had risen in government service as a follower of Thomas Lord Cromwell, but survived his fall, to serve Henry VIII, Edward VI and Elizabeth in various roles.[2] Some property apparently quickly passed to Thomas Blount.[3] However, Ralph Sadler probably retained substantial property at Astley until in 1571, when he had licence to alienate the manor of Astley and all his lands in Astley, Great Witley and Kidderminster to Robert Blount.[4] It seems that the transaction involved was not a straight sale or perhaps there had been an earlier transaction without a licence in alienation. On the death of Walter Farley in 1620, his land at Yarranton (in Astley) was said to have been purchased from Ralph Sadler and Helena his wife by William Pooler.[5] Robert Blount died in 1573 seised of the manor, but his will refers to rents of varying amounts between 13 and 32 shillings issuing out of lands in Astley of about 15 men.[6] It would seem that Sadler enfranchised the copyhold lands of all his tenants at Astley, substituting what are technically rentcharges for the old customary rents and services, probably higher than the old rent. The result of this was that the yeomen of Astley found themselves holding their lands direct from the crown. This was probably not recognised initially, but was apparently uncovered in 1606, when an inquisition post mortem was held on the death of Anthony Giles, when his land was said to be held of the king in chief by an unknown part of a knight's fee.[7] As Henry VIII's grant to Sadler had been at fee farm, not a grant by knight service, the tenure should not have been a military one, but the land was certainly held in chief, so that the precise tenure made little difference.

The following year, a large batch of Astley inquisitions was held in January 1607, mostly for men who had died in the 1580s or 1590s. James I's court was perpetually short of money, leading to considerable effort being put into discovering neglected royal rights that could be exploited for money. This evidently involved a search for concealed wardships, something to which the landowners of Astley found themselves subject to. The 1607 batch of inquisitions comprised the following:

- William Yarrington of Larvorde [Larford] (died 24 Sept 1592), his son Walter then being over 30.
- William Yarrington of Yarrington [now Yarhampton], whose son John was also over 30.
- William Yarrington of Redstone (died 18 Jan 1597), whose son Robert was then over 40.
- William Hanbury (died 2 April 1589) with land at Ockanton [Oakhampton] leaving a son aged 8.
- Walter James (died 17 Nov 1596) with land at Berrington and Woodhampton.
- John Chamberlayne with land at Woodhampton.
- John Hill (died 27 Apr 1595) with land at Astley, his son William being 24.
- William Brooke (died 13 Sep 1586) with land at Astley, his son Walter being 30.[8]

Each of these men had one share out of 33 of Astley Wood and Penny Park, except Walter James who had two. It would seem that Astley Wood and Penny Park were included in Sadler's sale that broke up the manor of Astley. From these and subsequent inquisitions, the ownership of about 18 of the 33 shares can be identified, with the Winford family, lords of the manor of Berrow having three. Astley Wood and Penny Park are always described as wood, though Penny Park is sometimes referred to as a grove – an enclosed wood, such as a coppice. It is not clear how a wood was managed in which 25-30 people each had one or more shares, but clearly it was exploited by some means, as will appear in due course. No manor rolls survive for Astley. The most common reason for a manor to continue to operate was that there was copyhold, whose conveyancing took place in court, but Sadler's sale meant that there was none. It is conceivable that a manor court operated in the 17th and 18th centuries to deal with the petty offences from village life and that the rolls were destroyed when Glasshampton House was burnt down. The wood continued to be owned in 33 undivided shares until inclosed in 1814. By then, D.D.J. Cookes (a descendant of the Winford family) owned all but nine shares. Astley Wood amounted to 189 acres and Penny Park (somewhere north of Astley Burf) was nearly 7.8 acres. Astley Burf and Astley Common (which adjoined a common in Areley Kings) were dealt with separately under the same inclosure award.[9]

Shrawley manor was sold to William Sheldon (subsequently of Beoley) in August 1545.[10] In 1558, he sold it to William Gower of Redmarley (Great Witley), but reserved a rentcharge of £9 and retained Shrawley Wood.[11] The manor belonged to Gower and his descendants until 1663, his heirs being daughters who married Edward Hugford and George Nash. Ursula Nash's share passed to her son John and then to his daughter Anne who married Charles Adams. Anne Hugford's share passed to her son George Rotherham.[12]

In the period when William Sheldon was lord (and just before), the jury presented:

- In April 1538, William Paytwen had made waste in the lord's wood and was fined 8d.
- In October 1538, Francis Turner had felled an oak sapling.[13]
- In April 1548, Richard Stone had made waste and cut wood.[14]
- That October William Winnall of Ombersley was find 6d because he had cut two trees called *limes* in the wood of the lord and carried them away without licence.[15]
- In 1549, Robert Brewer cut divers trees called *rafftons* in the lords wood without delivery by the bailiff.[16]
- in 1550, William Randle because he and his servants had cut trees without licence of the bailiff, for which he was fined sixpence and ordered not to offend again under pain of forfeiting twenty shillings.[17]
- In 1564 the servants of John Paytwynne had cut firewood and he was fined 2d; and Robert Bruar had forfeited a pain of 10 shillings by not repairing the hedge of Shrawley Wood and permitting his draught animals to break into it.[18]
- In 1567 William Stone was guilty of taking firewood like Paytwynne three years earlier.[19]
-

The 1558 sale had excluded Shrawley Wood (now no longer referred to as a park), but the manorial jury continued to make presentations relating to the wood as if it was still part of the manor. In the following period, the orders of the manor court concerning the wood are quite different from anything before 1558 or after 1580. One possibility is that William Gower was not interested in taking over the wood, thinking of it as of little value and instead William Sheldon persuaded a syndicate of manorial tenants to lease it from him at a rent. The facts would fit with him granting a 21-year lease. Robert Blount of Astley (died 1573) referred in his will to 'my interest or term of years in a wood called Shrawley Wood and the

* This chapter is based on research carried out jointly by the author, Pete Byfield, and Franseca Llewellyn. Hugh Milner made a number of useful suggestions.

profit thereof',[20] though this sounds more like a lease of the entire wood, not merely a share in it. Orders about the wood included:

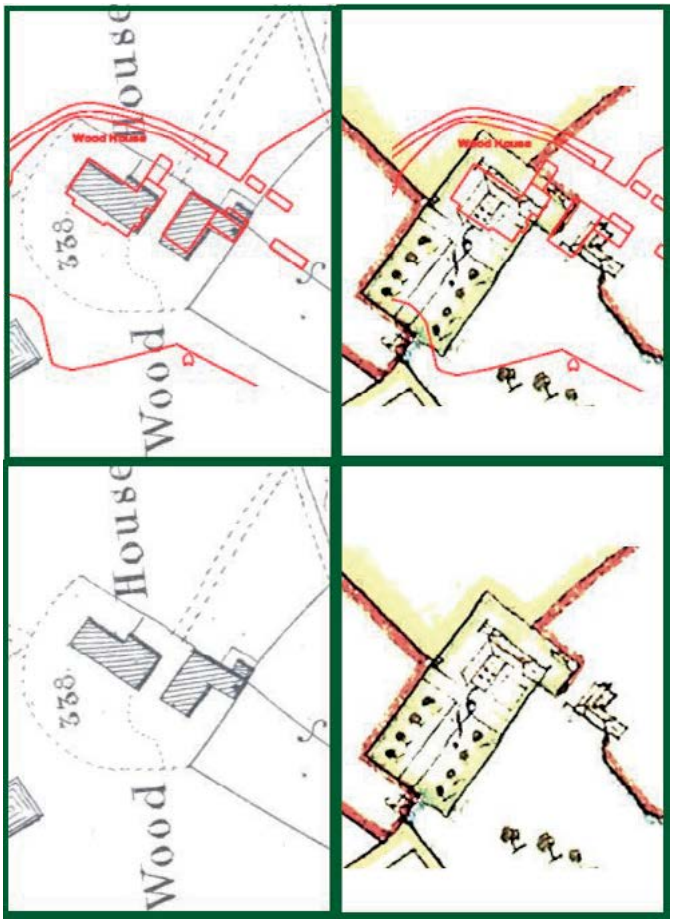
- In 1562, no one shall *sache* any wood within Shrawley Wood but only their own parte under pain of forfeiting 3s 4d.[21]
- In 1565, no one of this manor shall remove any firewood in … Shrawley Wood without the licence of the bailiff unless according to the division made, upon his proper part under pain of forfeiting 6s 8d.[22]
- In 1567, it was ordered that no one of this manor nor any stranger go into Shrawley Wood or any groves or coppices with bows, arrows, or nets with the intention of chasing or hunting under pain of forfeiting 10s. Richard Marten, Thomas Cooke, and Hugh Salway were directed to view Shrawley Wood for fallyng and leasyng *whyttardes* and cutting out of there (*sic*) wood and every man having a part there shall use it in such order as they appoint also under pain of forfeiting 10s.[23]
- These pains were repeated (in full) in 1574, but with Robert Severne, Walter Severne and John Marten viewing every man's part in Shrawley Wood.[24] The pains were continued in the following year,[25] and probably for several years after.
- In November 1579, it was ordered that all who held parts in Shrawley Wood should assemble on a day appointed by the bailiff to amend the ways in the wood for the easement of carriage under pain of forfeiting 3s 4d.[26]
-

The term *whyttardes* is puzzling. This is discussed elsewhere in this volume (Glossary).

The Child family

In September 1580, Ralph Sheldon obtained licence to alienate the wood, together with a rent reserved from the manor of Shrawley and the advowson of the church, and sold them to William Childe and William Child junior.[27] There had been a previous licence for the advowson of (right of presentation to) the church in favour of William Childe of Pensax.[28] From this point manorial orders cease concerning the wood, except occasional orders for mending its outer hedges. Orders concerning other issues continue: for example, in March 1593 the jury presented that Thomas Yarranton had a *lyne trye* in a lane called The Hollow Lane lying there to the nuisance of the way and was required to move the tree before the feast of Holy Cross [probably 3 May].[29]

William Childe was subsequently of Northwick. The wood descended in the family for over a century, but family archives from the period have not been traced. William died in 1601 aged 80. His son also William died in 1633, also aged 80. His eldest son was also William who married Catherine sister of Lord Keeper Coventry, their eldest son being Thomas.[30] The first William settled the wood on his eldest son in 1597.[31] Barely eight months later, his son and grandson jointly sold their Pensax property. In 1607 or 1608, William let Shrawley Wood to the third William for 21 years at the substantial rent of £160, taking a fine of £200. He reckoned the wood was worth £230 per year, giving his son a profit of selling £70 per year. The son was authorised to cut two bindes the first year to pay the fine and then one bind. The rent was paid until a dispute arose in 1630, resulting in Chancery proceedings in 1632. Some other property had been settled on William and Catherine in 1605, which was probably four years after their marriage.[32] This suggests that the original Shrawley Wood House was built as a home for William and Catherine in the 1600s. The Vernon map of Shrawley Wood by Dougherty, dated 1732 appears to show an L-shaped building (01). The present house there was built in the 1820s. It is not clear whether the latter was wholly a new build or may incorporate elements of its predecessor.



01. Wood House through the centuries: the left pair shows Wood House on the 1839 tithe map, the right pair shows Wood House on the Dougharty map surveyed 1731-2. The upper pair is overlaid in red with the outline of buildings on the current OS map. Given the probability of some inaccuracy in the older maps, it is not easy to tell how much of the oldest buildings might be left in the present structures.

The third William was declared a delinquent by the Parliamentary County Committee during the Civil War and had his estate sequestrated. His address (as in 1632) was consistently given as 'of Shrawley'. He had settled his property on his son Thomas on Thomas marriage in 1643 retaining a life interest in (amongst other things) a capital messuage and certain woodlands and a yearly rentcharge worth £215 per year, somewhat less than his father's estimate. William also had a house in Worcester and had been living there during the siege. He had been named as a Commissioner of Array, though he obtained a certificate from the County Committee that no sufficient matter had been proved. However on appeal the Barons of the Exchequer refused to discharge his sequestration, due to proofs in January 1647 and August 1648. The fine to recover his estate, was £1844 18s 6d, being one sixth of the value of his estate.[33] He had apparently married again to Elizabeth, who presented him with four small children. He borrowed £2000 from her cousin Thomas Colwall, a London scrivener, which he proposed to repay by selling his woods.[34] Deeds of this period refer to Shrawley Wood (with Shopgrove) as being 1040 acres,[35] though this is a severe over-estimate. Thomas Child objected to his cutting 1000 acres coppice in Shrawley Wood, because the wood cut had not been inclosed, according to statute to preserve the spring; without this, grazing animals were liable to browse the young shoots from coppice stools and prevent the coppice from regenerating. The son could not object to the felling of timber, as his father was not impeachable with waste. Perhaps to avoid technical points being taken against him Thomas alleged that 300 acres were under 14 years old and the rest under 24 years old. He also said that his father had 'raised a considerable yearly' income from the wood and supplied the area with 'with wood for their firing, farming and all necessary occasions of husbandry'.[36] The implication seems to be that the wood was

being managed as a coppice, probably with standards to provide structural timber for buildings, ploughs and carts.

William Child made a will giving legacies to his wife and her children in December 1655 and died that January allegedly aged 90. The widow remarried, to Edward Belson, but was largely destitute. Thomas Colwall proved the will as the other two executors renounced probate, but the estate was barely solvent.[37] The debt to Colwall was partly satisfied from a mortgage dated 1642 for £1000 secured on the manor of Tetchwicke in Buckinghamshire, due from Dame Anna Mary Jenkinson and her son Robert, apparently the portion of Thomas Child's wife, rather than William's second wife. This may explain why William was having difficulty in recovering the money.[38] Thomas Child named Andrew Yarranton as an alleged co-conspirator in cutting the wood, but unfortunately no answer by him has been found.[39] However, Elizabeth alleged that Foulke Eastopp and Andrew Yarranton owed £100 for wood, and Robert Severne of Shrawley and others owed £400 for bast. Belson had three bonds from Severne totalling £195.[40] Colwall's receipts included £400 by or for Mr 'Yarrington' in William Child's life and £180 from Severne after his death, but Colwall complained that the money to be paid for the wood was only due three years later.[41]

Andrew Yarranton and iron

The reference to Andrew Yarranton is interesting. He should have put in an answer, but none has yet been discovered. He is a significant figure, who stands on the fringes of the story here. Locally, it has been assumed that he was associated with the blast furnace discovered when the dam of Sharpley Pool broke in the 1920s,[42] on a tributary of the Dick Brook, which is the boundary of Shrawley Parish, but the direct evidence for that (apparently correct) assertion has hitherto been weak, being mainly based on his being from Astley. He is more widely remembered as the author of *England's improvement by sea and land*, published in two instalments in 1676 and 1678, towards the end of his life.[43] All accounts of his life rely to some extent on this, but often without adequately considering other material available on his life. Some of this biographical work has gone beyond what is known into the realms of speculation. Some of this does not stand up to scrutiny in the light of further documentary discoveries. In particular, the claims that Astley Forge, the lowest mill on the Dick Brook was his and that the lower reaches of the brook were made navigable by Yarranton are unsubstantiated. Both the forge and the navigation (but only up to it) were real, but their attribution to Yarranton depends on nothing but that he was a local man, who might have made them. Astley Forge was previously a fulling mill, then a paper mill, and then grinding materials for the Worcester China industry, before briefly becoming a forge in the early 19th century;[44] and what Yarranton said about his navigation achievements can be better explained as relating to the Warwickshire Avon, the Worcestershire Stour, and the Salwarpe, rather than including the Dick Brook.[45] The fullest biography is that in *Biographical Dictionary of Civil Engineers*, but because of its context that focuses mainly on his river improvements and his surveys,[46] rather than what he did close to home.

Yarranton was a local man, born in 1619 at Larford, close to the bank of the river Severn in Astley. He was not the eldest son and was apprenticed to a linen draper in Worcester in about 1632. He did not like this and left to live a 'countrey-life for some years'. This consisted of a 'messuage and a virgate of land meadow and pasture in Larvord in the parish of Astley and seven acres of land in a place called the Redding and a parcel of meadow called Caudwall next to the river Severn' with one share in Astley Wood and Penny Park. This had belonged to his grandfather William (died 1593), though the inquisition post mortem on his death was not held until 1607.[47] Walter his father died in 1630, when Andrew's elder brother (also Walter) was 15, but the inquisition (delayed until 1637) revealed that the older Walter had settled a lease of two-thirds of the property on his wife Sarah in 1624.[48] He also purchased a house and lands in Variartun in the parish of Nantmel, Radnorshire. His personal estate amounted to £150, including £64 in farm stock and £47 in debts owing to him, probably mostly loans made by him.[49] After his mother's death, Andrew in 1641 took out administration on the estate.[50] It thus seems Andrew left the draper's trade because his brother's death made a place for him at home.[51]

Yarranton fought in the Civil War. Unusually in such a royalist county as Worcestershire, he was a roundhead. Little is known of what he did in the First Civil War, but he may have participated in skirmishes in the Forest of Dean and (as a captain) commanded a party garrisoning Madeley Church in Shropshire in 1645. After the war, Colonel Turton became governor of Hartlebury Castle and Yarranton was probably part of the garrison. He successfully prevented a royalist rising in 1648, by surprising and arresting a party who had gathered in Boscobel Woods, planning to seize Dawley Castle and Madeley Court. Parliament awarded him £500 for his 'ingenuity, discretion and valour in discovering the plot'. The party surprised included Colonel Dud Dudley, [52] who saved his neck only by escaping from prison, while the warders were in church. Dudley's experience may have caused personal hostility between him and Yarranton over 20 years later.[53] Yarranton raised a troop of horse to oppose the Scots invasion prior to the battle of Worcester, participating in a skirmish at Ombersley, then being drawn up at Pitchcroft (now Worcester Racecourse), and finally being quartered at Holt after the battle. After the war he was appointed a Commissioner for Sequestrations for Worcestershire, but was involved in disputes over his actions both in that capacity and during the Scots invasion.[54]

At the end of the war, substantial sums were due to Parliamentary soldiers for their pay. His captain's pay of 10s per day was (like that of the rest of the army) greatly in arrears. Parliament sold off the Crown estate and those of the abolished bishops and cathedrals to pay the army. Debentures were issued for this pay, which could be used to pay for estates being sold. Yarranton and some of his fellow officers (including Captain Godfrey Ellis) availed themselves of this opportunity to speculate in land, some of it in distant places, which they sold on.[55] Yarranton's father seems to have been a prosperous yeoman, but the profits of war made Andrew a gentleman.

He did not sit back on his laurels, but involved himself in a number of enterprises. The first of these concerned the iron industry. Iron was a military material, of which the Forest of Dean was a significant producer. Yarranton's time as a soldier probably brought him into contact with the industry. Sir Basil Brooke of Madeley Court had been a farmer of the king's ironworks there at two earlier periods;[56] and the Coalbrookdale ironworks were in his manor of Madeley, though little is known of the ironworks there in this period, but the steel furnaces whose remains have recently been identified there will be his.[57] Interestingly there is another link, though purely incidental: Shelsley Forge seems to have been built by a partnership of Sir Walter Blount of Sodington with Sir Basil Brooke, George Mynne, and Thomas Hackett, who were together partners in the Tintern and Whitebrooke Wireworks in the Wye valley, as well as being farmers of the King's ironworks.[58] Sir Basil Brooke died in prison during the war and Thomas Foley took over his interest in the wireworks,[59] and presumably also Shelsley Forge. Foley probably also bought the share of Mynne, the other partner, whose estate had also been sequestrated.[60]

Astley Furnace can be directly linked to Yarranton from a passing reference in a paper concerning Shelsley Forge. In 1681, Philip Foley was in dispute with his eldest brother Thomas (who owned it) over repairs. He had recently transferred his stock to Richard Avenant of Shelsley and John Wheeler, previously his managers, who were continuing the rent of £124 for that forge. In setting out his case against his brother, Philip referred to some history. The rent had been £50 'until Captain Yarranton and his partners built Asley (*sic*) Furnace and then being of necessity of a forge to work up their pigs, Sir George Blount he held it in lease rather than let them build a new one and also take that advantage of some to himself assigns the residue of his term to them at £100, which my father [Thomas] improved when he designed to be a partner with him again after he had bought Captain Yarranton and his partners out of Astley Furnace.[61] Thomas Foley was apparently in possession of Astley Furnace by 1661, when an inventory of Wolverley Forge mentions

wood that was taken there from Astley Furnace.[62] Thomas Foley was back in possession of Shelsley Forge by 1662 when there was a payment of £500 between Blount and Foley for the stock of the forge.[63]

Andrew Yarranton recorded that he entered upon the iron trade in 1652,[64] but the idea perhaps arose earlier. In 1650 Godfrey Ellis of Gloucester and Andrew Yarranton for themselves and several other creditors bought the freehold of various coppices in Bewdley (in the Wyre Forest) during the sale of crown lands, Ellis bought Tickenhill House and 460 acres more of coppices near it.[65] They seem to have been making charcoal there in 1653, when there was conflict with Richard Foley, who had a contract with the lessee of the woods.[66] In 1653, Yarranton with Major Esthop and Lieutenant Millward obtained an order from the Chamber of Worcester City Council, enabling them to dig cinders in Little Pitchcroft for eight years. The cinders in question were slag from Roman ironmaking, a ubiquitous material in Worcester, rich enough in iron to be worth resmelting, often in conjunction with fresh iron ore.[67] Yarranton's involvement in the litigation concerning Shrawley Wood is also likely to be related to ironmaking at the furnace, for blast furnaces were voracious consumers of wood. It seems likely that Yarranton and his partners were buying oak cordwood, arising from the branches and tops of the timber trees that Thomas Child was felling in the same period to pay off his debt from compounding for his delinquency. In the 1670s, Andrew Yarranton contracted to sell wood from New Park to Philip Foley, much of it last cut in 1658 and thus nearly ready from cropping again. Foley was to advance money to enable Andrew's son Robert to pay for navigation works on the river Stour. The nature of Yarranton's interest is not clear, but he was probably the owner and Samuel Baldwin (one of the Stour Proprietors) his mortgagee, with Nicholas Baker of Worcester as a trustee.[68] Yarranton's interest may well go back to the 1650s. New Park is the section of the Wyre Forest between Bewdley and Far Forest – within which the present Visitor Centre lies.

The furnace is also mentioned in a pamphlet, *Reasons wherefore the making of the rivers Stower and Salwerp navigable, in the County of Worcester, will be of great advantage unto the County of Salop …*,[69] which must date from the period when the Navigation Act was going through Parliament, from May 1661 to May 1662.[70] Before that period Mr Walker had furnished the furnace with 500 loads of charcoal for six years out of Hammonds Wood in Shropshire, probably at Hall of Hammonds in Kinlet, and Mr Parsons was then providing it with wood from Wem-Brockhouse [unidentified].[71] As a promoter of the navigation, Yarranton probably had a hand in the preparation of this anonymous pamphlet that displays considerable details of its operations. In 1662, Richard Turton of London and Andrew Yarranton had bought timber of Bayton Common and Bach Hay in Bayton from Joseph Walsh and others and were complaining about non-payment, but the various buyers said they had bought the timber of Walsh or his servants. Whether this relates to his ironmaking is uncertain.[72]

Yarranton was also a partner in Sudley Furnace, apparently at Sudeley Castle, near Winchcombe, which he was also trying to sell in the 1670s to finance navigation work.[73] However, he was not a major ironmaster. His main claim to fame is as a navigation engineer and as one of the early people to introduce tinplate manufacture to England. The latter involved a syndicate of local men associated either with the iron trade or the Stour navigation sponsoring Yarranton and Ambrose Crowley (then a Stourbridge blacksmith) visiting Saxony to discover how tinplate was made. The sponsors included Sir George Blount, Thomas Foley and Joshua Newborough (a Stourbridge ironmonger). On their return, they conducted experiments, rolling iron in the slitting mill at Wilden Forge and then finishing and tinning the plates at Kings Meadow (later Royal) Forge at Stourbridge.

Philip Foley and Joshua Newborough, already partners in Wolverley Forge, built a new forge downstream from there, which seems to have been intended as a tinplate mill. This also solved the problem of a shallow ford, which was impeding the Stour Navigation. However, someone else had a patent for tinplate manufacture (though of dubious validity). Attempts by Robert Hooke (the early scientist) to bring the parties together proved unsuccessful. Dud Dudley had been the joint holder of a similar preceding patent and bad blood between Dudley and Yarranton, from the consequences of the attempted rising at Boscobel may have been a factor. Astley Furnace seems only to have been a short-lived affair. The 1662 references to it are the last ones known. Thomas Foley handed over all his Midlands works to his son Philip in 1669, but these did not include Astley Furnace, which had accordingly probably closed a few years before.

In the 1660s, Andrew Yarranton's main activity was working on making rivers navigable. Work was done on the Salwarpe, but for reasons that Yarranton did not explain, 'it was found not to answer' and not completed. Efforts to improve the Stour lasted until 1680. Andrew was a partner in coal mines on Pensnett Chase and later just south of Brettell Lane, both near Brierley Hill. These were connected with the river Stour by footrayles (railways). Barges were then to take coal down to the Severn. The enterprise (like many major engineering undertakings since) was undercapitalised. Yarranton was not initially a partner in the river, only the engineer, but after the money ran out for the second time, 'being a child of my own', he bought into the affair. Later his son Robert leased the river, being provided with the money to (re)complete it. However, each time the money ran out before the works were completed. Andrew had managed to have coal for sale in Worcester once in December 1667, and Robert's work reached Kidderminster in January 1679, but then the available money was exhausted. The enterprise was probably doomed to failure. Black Country coal had to compete along the Severn with coal from Broseley and Madeley, brought down railways to trows in the Severn gorge, on a toll-free river. Even if the Stour navigation had functioned properly (and it never did), the costs of bringing coal down the Stour would probably have made that coal unable to compete with coal from the Broseley area.[74]

Andrew Yarranton the younger and basten ropes

Andrew Yarranton's other navigation enterprise was the Warwickshire Avon. The river had originally been improved by William Sandys of Fladbury, under the authority of Letters Patent, issued during Charles I's period of personal rule. Sandys probably completed the navigation up to Stratford upon Avon, possibly even higher, but he ran into trouble over his involvement with a non-Parliamentary tax on Newcastle coal. After his expulsion from the Commons, he appears to have gone abroad. His estate came into the hands of William Say (probably as a mortgagee) and he ran the navigation until 1660. He was attainted as one of the regicides responsible for Charles I's execution, and Charles II gave Say's estate to his brother James Duke of York (later James II), who sold the navigation to Lord Windsor. The navigation was in reasonable working order up to Evesham: only Pershore Sluice [lock] needed rebuilding, work that Andrew Yarranton undertook.

On the other hand the river between Evesham and Stratford had seriously deteriorated and needed significant expenditure. Yarranton made an agreement in 1664 with Lord Windsor that he and some partners should earn a two-thirds share in the river above Evesham by putting it into repair. Yarranton's partners included Colonel Richard Turton (his old commanding officer) and Nicholas Baker. Andrew gave his two parts of eight in two-thirds of the river to his son Robert in 1669. Robert gave them in 1681 to Mary Viccaris of Astley (a cousin) 'for the competent sum which [she] hath expended in buying of the phisicall medicines and other things for the use and in the time of sickness and for her often attendance and paines taking therein as also for the great love and affection which the said Robert beareth to the said Mary being his near kinswoman'. Mary sold her interest to Andrew Yarranton the younger for £400 in 1682. Andrew sold one of his shares in 1686. He entered into a series of mortgages of his other share from 1700, ending in his passing his interest to the lender in 1706. This ended the connection of the Yarranton family with the navigation.

As part of the 1664 navigation agreement, the elder Andrew secured a concession that the younger Andrew should for life receive the whole profit of the carriage of all beesomes, ladders and bassen [basten] ropes, chairs and stools, and of the materials whereof they are made provided that he sold none below the lock below Evesham.[75] Little is known of the intervening period, but in 1695, Andrew made an agreement with Allan Cliffe. This recorded that Andrew had managed the trade in basten ropes for the previous six years to the 'great advanctage' of Cliffe. Andrew agreed to procure a chapman [dealer] for Cliffe at (probably 5s 6d per hundred), being paid 40 shillings that June and 20 shillings a year.[76] In 1707, there was a further agreement with John Wilson of Camden, Gloucestershire, who had agreed with William Vernon (by then the owner of Shrawley Wood) and with the majority of the owners of parts in Astley Wood, for the ropes to be made in these woods. He agreed to pay Andrew 6d per hundred ropes (a toll) carried up the Avon.[77] This seems to be the last that is known of this trade, nothing is known of how Andrew the younger benefited from his trade in besoms, chairs and ladders. Indeed almost nothing at all is known of the Yarrantons of Larford after this time.

The Vernon purchase

Thomas Child of Northwick mortgaged for £3,300 Shrawley Wood and Shopgrove, stated to be 1040 acres, a messuage in the possession of Francis Johnson and closes containing twenty acres, the advowson and the £9 rent from the manor.[78] Dame Anna Maria Jenkinson and her son Robert Jenkinson (his wife's relatives) had bought one share of the manor of Shrawley in 1648. Thomas Child bought the other share in 1663,[79] thus reuniting the manor and the wood, but he was an absentee, living at Northwick. He sold all his Shrawley property in 1680 to Allan Cliffe of Great Witley. His nephew and heir (also Allan) sold it all to Thomas Vernon in 1700 for £13,000, including other property in the parish.[80] A new era for the wood thus opened in 1700.

Thomas Vernon's purchase was not made on a mere whim. He investigated the value of the property carefully. He was provided with "Mr Yarrington's survey". This could be a survey made by the famous Andrew Yarranton some 50 years earlier, but it was more probably a recent one made by his son Andrew around the time of the sale (see table 1). Richard Vernon who viewed the purchase for him wrote to him about it in detail, giving his opinion of the property. This is not given in full here, as a full transcript appears in chapter Hearts of Oak p.65-6. He then went on to describe the manorial rights (with rents of £18 and heriots) and the value of the parsonage (with an income of £140 per year).[81] The paper that he enclosed was probably the document reproduced in Tables 2 and 3, consisting of the results of interviewing the six woodmen, who worked in the wood.

Whether the survey taken by (or for) Allan Cliffe four years before or Richard Vernon's opinion was better is difficult to judge at this distance in time. However it is clear from both that the underwood produced a substantial profit, of which a significant part was for faggots, followed by bast ropes. Timber (large trees) was not included in this, being instead listed as poles of 'above 36 years growth' (having been left in two 18-year coppice cycles). This may suggest that the timber had been clear felled during the 1650s to pay William Child's sequestration fine. Another absentee from the calculations is the sale of cordwood or of charcoal made from it. Wood purchase records, preserved by the Foley family, from the days when Thomas Foley and then his son Philip were important ironmasters in the Stour valley and beyond suggest that they were buying cordwood from substantially all the woodland in the area. Similarly, Andrew Yarranton presumably built his furnace near the wood with a view to exploiting its resources. The absence of any indications of regular sales to ironmasters is thus unexpected. This may be because much of the underwood was lime and this does not make suitable charcoal. In consequence, cordwood for ironmaking charcoal would only be available from waste from timber trees – tops, branches, and the trunks of dotards, not (or hardly) from underwood.

18 Binds in the Wood	value
Each bind 34 Statute acres.	
In each bind	
40 trees at 20s per tree	£720
300 trees at 10s per tree	£2,700
150 at 7s per tree	£945
240 at 5s per tree	£1,080
In total	£5,445
Each bind	
5000 faggottes & Whiternes at 4s 4d [crossed	108.16.00
Barke	005.00.00
Choice Wood 4000 at 7s per 100	014.00.00
2000 large ballow Whiternes at 8s per 100	008.00.00
[In total]	135.16.00
Charges	
For falling £7 per Fall or 8d per 100	7.00.00
For carriage to Seaverne 9d per 100 [56000]	21.00.00
For faggotting 32000 at 10d per 100	13.16.08
10000 Whitternes binding at 8d per 100	03.06.08
Hard Wood at 12d per thousand	00.12.00
	45.15.04
Bast 15 load in each bind at 7s per 100	£105.00.00
Charges in Peeling	14.00.00
A ½ in Large Ropes 10 per 100	08.11.10
10d per 100 Spining [sic] 3 per 100 twisting	
A ½ in Small ropes for Spinning etc	
1s 7d per double hundred	11.17.00
Total	33.08.00

Table 1 Notes out of Mr Yarringtons Survey of Shrawley Woods & Demesnes. Source: WAAS, 705:7 BA 7335/109(iv)44.

The wood is fell by six men each his equal part.		
One of those parts, in ffaggotts, whittard kids, and shides of hardwood may have		13000
by which the six parts have yearly		78000
all which are equally sold at 4s 8d per hundred		
And com[es] in the whole to		182.00.00
Out of which there is paid, for falling kiding and carrying to Severne, 1s 4d the hundred, in all		52.00.00
leaveing the received sume of £182 but		130.00.00
Of the Great Bast Ropes at 2000 to the Load bringing seven pounds the load		
There may be	7 load	
Of the Small Ropes at the same price	9 load	
Both sorts coming to		112.00.00
halfe of which its all wayes reckoned to cost in pieling, making and carrying to Severne, so that the real profit is but		56.00.00
That of the ffaggotts &c before mentioned		130.00.00
and there may be made of Barke		003.00.00
Of whittard Poles		016.00.00
Of rods and twigs		003.00.00
and of tenyer wood		003.00.00
Making the whole Proffit		211.00.00
out of which there being paid to a bayly to looke after it £12		
there remains but		199.00.00

Table 2 The woodman's account of the yearly profit of the underwood and bast in Shrawley Wood. Source: WAAS, 705:7 BA 7335/109(iv)51.

	poles	shillings apiece
Great Nutward	1414	10
First frith	776	10
Second frith	600	10
Alley Binde	600	10
Kings Hill binde	500	10
Second Kings Hill	232	10
Elbow binde	232	10
Second Elbow bind	442	10
Great Rochpole	454	10
Little Rochpole	451	10
Tadgley hill	161	10
First Border	110	10
Second Border	138	10
first Blackwich	446	18
Second Blackwich	340	15
Rowlane	563	15
Great Winlesses	532	12
Second Winlesses	783	12
Little Winlesses	363	12
Little Nutward	561	12
In all: poles above 36	9945	
out of which deduct	160	
There Remaining	9785	

Table 3 The number of the great poles in the several binds or falls in Shrawley Wood; source: WAAS, 705:7 BA 7335/109(iv)51.

Conclusion

This chapter has covered about a century and a half of the history of Shrawley Wood. It is not clear why Ralph Sheldon retained the wood when he sold the manor of Shrawley. In the subsequent period, the wood seems to have been leased to a body of local people each having shares in the lease. This changed when William Child bought the wood. His son built a house and the family were clearly drawing a substantial income from the sale of wood, many times what was achieved in the time of Henry VII and Henry VIII. This apparently consisted partly of the profits of the sale of basten ropes, made from the under-bark of small-leaved lime trees and partly from the sale of wood, particularly hop poles, but also shidewood (cleft wood). The wood was stripped of great timber, so that a later William Child could pay his sequestration fine, imposed on him as a Royalist in the Civil War.

The evidence is consistent with a wood of oak standards and lime underwood. The number of bines decreased from 20 to 18 and with it the length of the coppicing cycle. The number of bines was reduced again to 17 in the 18th century; the land cleared perhaps being.[82] The most likely occasion for one change is about 1608 when the wood was leased to William Child, who built himself a house, presumably laying with it land that had been two bines. That house is shown as a L-shaped building on Doherty's map (see fig. 01). It was replaced, on much the same site by a new house built in the 1820s for Thomas Shrawley Vernon, then the heir to the Vernon estates. Hanbury Hall was not available to him as it was in the hands of John Philips, the widower of Emma née Vernon. He took possession in 1823, but died in 1825 leaving instructions for it to be completed.[83] This is the present Shrawley Wood House. Its status as part of the wood is confirmed by it (and 16a.2r.160 around it) being subject to the same modus (in lieu of tithe) of £5.0s.4d. as the wood. This 16½ acre property surely represents one of the lost bines. On the other hand, another potential former part of Shrawley Wood was Wood Farm. This was also Vernon property in the 19th century and contiguous to the wood, but was subject to the ordinary tithes. This amounted to a further 31a.1r.18p, and could represent a further two lost bines, lost before 1700, but this included Upper Redding Meadow between the wood and the river. The wood itself was measured for the tithe award at 376a.1r.25p. Shop Grove was a further 11a.0r.28p, suggesting that an average year's crop was over 22 acres.[84] However the actual area of the wood was much uncertainty over the centuries: the survey of *c*.1495 gives areas that total just 157 acres; 17th century deeds say 1040 acres; Yarranton's survey suggests 612 acres. No doubt this is a reflection of the difficulty in measuring a wood within which there would be few lines of sight.

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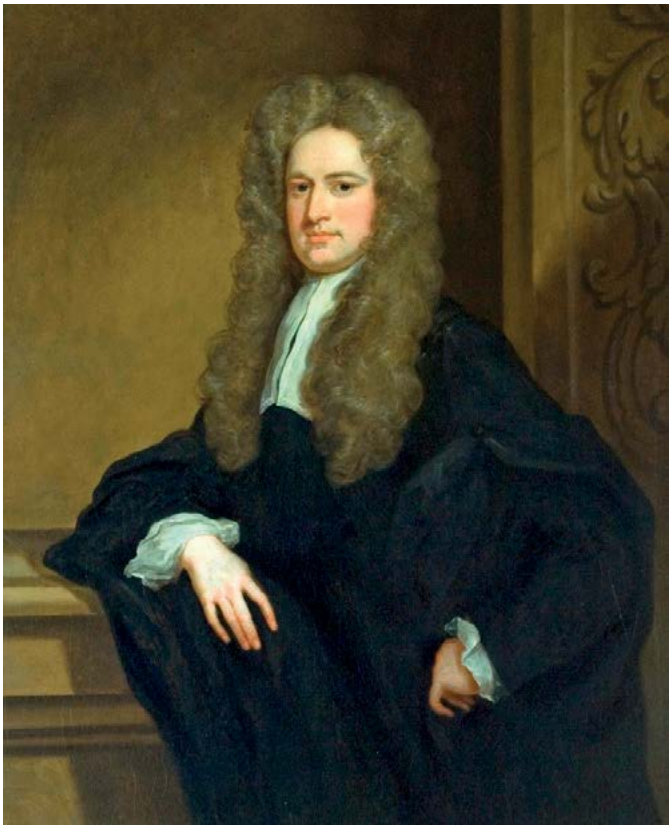
[1] *Calendar of Letters and Papers of Henry VIII, 1545*, XIX(1), 118, grant 266(7); TNA, SC6/HENVIII/1244.
[2] Gervase Phillips, 'Sadler, Sir Ralph (1507–1587)', *Oxford Dictionary of National Biography*, 2004; online edn, Jan 2008 [http://www.oxforddnb.com/view/article/24462, accessed 23 May 2014].
[3] Page, W & Willis-Bund, J W eds 1924 A History of the County of Worcester. Vols 1 – 4 [VCH] *Worcs.* iv, 232.
[4] *Calendar of Patent Rolls, Elizabeth* V: *1569-1572*, no. 2309.
[5] The National Archives (TNA), WARD 7/61/96.
[6] TNA, WARD 7/14/114.
[7] TNA, WARD 7/27/4.
[8] TNA, WARD 7/30/55-63 *passim*.
[9] *VCH Worcs.* iv, 232; Worcester Archaeology and Archive Service (WAAS), Astley inclosure award.
[10] *VCH Worcs.* iv, 358.
[11] TNA, CP 40/1174, part 2, enrollments, m.9.
[12] *VCH Worcs* iv, 338-9.
[13] WAAS, 705:66 BA 4221/7(ii), courts of 29 and 30 Hen. VIII.
[14] WAAS, 705:7 BA 7335/50/27.
[15] WAAS, 705:7 BA 7335/50/10.
[16] WAAS, 705:7 BA 7335/50/36.
[17] WAAS, 705:7 BA 7335/50/11.
[18] WAAS, 705:7 BA 7335/50/28.
[19] WAAS, 705:7 BA 7335/50/30.
[20] TNA, WARD 7/14/114.
[21] WAAS, 705:7 BA 7335/50/35.
[22] WAAS, 705:7 BA 7335/50/22, p.6.
[23] WAAS, 705:7 BA 7335/50/30.
[24] WAAS, 705:7 BA 7335/50/22, p.1.
[25] WAAS, 705:7 BA 7335/50/20.
[26] WAAS, 705:7 BA 7335/50/22, p.2-3.
[27] *Calendar of Patent Rolls, Elizabeth* VIII: *1578-1580*, no. 1432.
[28] *Calendar of Patent Rolls, Elizabeth* IV: *1566-1569*, no. 1832.
[29] WAAS, 705:7 BA 7335/50/44.
[30] Butler, A.T. ed. 1938. *The Visitation of Worcestershire 1634.* Publications of Harleian Society: 20-21.
[31] TNA, C 142/269/143.
[32] TNA, C 6/13/40 and 50.
[33] TNA, SP 23/74, 157-9; SP 23/220, 615-35.
[34] TNA, C 5/398/6, answer.
[35] *E.g.* WAAS, 705:7 BA 7335/20/1-5.
[36] TNA, C 6/41/116.
[37] TNA, C 5/407/101; C 5/398/6 (also C6/41/117; C 2/ChasI/C 120/1).
[38] TNA, C 33/205, pp. 138 256 and 721 (pleadings not found); *cf*. C 5/398/6; SP 74/220, 631.
[39] TNA, C 6/41/116.
[40] TNA, C 5/407/101.
[41] TNA, C 5/398/6.
[42] Cantill, T.C. & Wight, M. 1929. Yarranton's works at Astley. *Transactions of Worcestershire Archaeological Society* n.s., 7:92-115.
[43] A. Yarranton, *England's improvement by sea and land: To out-do the Dutch without fighting, to pay debts without moneys, to set at work all the poor of England with the growth of our own lands. To prevent unnecessary suits in law; with the benefit of a voluntary register. Directions where vast quantities of timber are to be had for the building of ships; with the advantage of making the great rivers of England navigable. Rules to prevent fires in London, and other great cities; with directions how the several companies of handicraftsmen in London may always have cheap bread and drink* (2 vols., London 1677 and 1679).
[44] F Llewellyn 'Documentary Sources' in Excavations at Astley Forge (in preparation) from WAAS, 705:550 BA 4600/31 and newspapers.
[45] Yarranton, *England's Improvement* I, 194.

[46] King, P. W. 2001. Andrew Yarranton' in A. W. Skempton *et al*. eds. *A Biographical Dictionary of Civil Engineers*. Thomas Telford, London: 808-12.
[47] TNA, WARD 7/30/59.
[48] TNA, WARD 7/90/85.
[49] WAAS, consistory probates, 1631, no. 123.
[50] WAAS, consistory probates, 1641, no. 224.
[51] Another Walter died in 1635, but this was probably Walter Yarranton of Hartlebury, whose will directed that he should be buried at Astley. He left several children and other relatives, and does not seem to be from the Larford family: TNA, PROB 11/168/163.
[52] Brown, P.J. 1992. The military career of Andrew Yarranton. *Transactions of Worcestershire Archaeological Society*, 3rd ser. 13, 193-202.
[53] Brown 1992; King, P.W. 2002. Dud Dudley's contribution to metallurgy. *Historical Metallurgy* 36.1: especially 46-49.
[54] Brown 1992.
[55] TNA, E 320/ F22, G1 G11, Q7, Q14, V20-21. Some of these refer to Ellis only; others were joint purchases.
[56] Hart, C. 1971. *Industrial History of the Forest of Dean*. David & Charles, Newton Abbot: 12-18
[57] Belford P. and Ross, R. A. 2007. English steelmaking in the seventeenth century: excavation of two cementation furnaces at Coalbrookdale, *Historical Metallurgy* 41.2: 105-9.
[58] TNA, E 214/459 and 523; cf. 124 163 and 213.
[59] Paar H.W. and Tucker, D.G. 1975. The old wireworks and ironworks of the Angidy valley at Tintern, Gwent. *Historical Metallurgy* 9.1: 1-14.
[60] Mynne still had a share at Tintern. Foley also bought his Whitland Forge in Carmarthenshire: *Calendar of the Committee for the Advancement of Money* i, 200-5; TNA, C 7/419/8.
[61] Herefs RO, E12/IV/30, 26 Jun 1681.
[62] Herefs RO, E12/VI/KE/24, f.1
[63] Herefs RO, E12/IV, Thomas Foley of Witley personal, 21 Jun 1662.
[64] A. Yarranton, *England's Improvement* I, 193.
[65] TNA, E 320/V20-V21; cf. E 317/47/2-3.
[66] TNA, SP 24/15, 21 44 141 148 & 209 and SP 24/16, 61 etc.
[67] Brown 1992: 199; David Bick, 'Early iron production from the Forest of Dean' *Historical Metallurgy* 24(1) (1990), 39-42; *cf.* Hallett, M.M. & Morton, G R 1968. Yarranton's furnace at Sharpley Pool, Worcs. *Journal of the Iron & Steel Institute* 206:689-92.
[68] Herefs. RO, E12/VI/KC/33-47.
[69] Staffs. RO, D(W) 1788/P59/B3.
[70] *Journal of House of Commons* viii, 317 371 374 379; *Journal of House of Lords* ix, 250 255 282 287 400 473.
[71] *Reasons wherefore the making of the rivers Stower and Salwerp navigable ... will be of great advantage*. The town of Wem in Shropshire is too distant to be probable.
[72] TNA, E 112/537/32.
[73] King 2002, 49-50. J.H. Parker Oxspring, Andrew Yarranton, "Worcestershire Worthy" 1619-84: his life and work with special reference to … the river Stour (TS in Worcester City Library, Local Collection, class 386.2) interpreted a reference to Sudley as a misspelling of Shrawley and suggested that it referred the furnace at Sharpley Pool, but multiple sources (cited in the article on Dudley) indicate the presence of a furnace near Sudeley Castle or at Winchcombe.
[74] King 2001; King, P.W. 2010. The First Shropshire Railways, in G. Boyes ed., *Early Railways 4: Papers from the 4th International Early Railways Conference 2008.* Six Martlets, Sudbury, 2010), 70-84; King, P.W. 2014. Seventeenth century footrails: a confusion of terminology, in D. Gwyn (ed.), *Early Railways V: papers from the 5th Early Railways Conference, at Bangor, June 2012.* Six Martlets, Sudbury: 12-21.
[75] Shakespeare Birthplace Trust RO, DR444, box 7, bundle 3.
[76] SBT RO, DR444/6/2/29/5
[77] SBT RO, DR444/6/2/3/15.
[78] WAAS, 705:7 BA 7335/20/1-5.
[79] *VCH Worcs* iv, 339.
[80] WAAS, 705:7 BA 7335/49(i), 1-3.
[81] WAAS, 705:7 BA 7335/109(iv), 46.
[82] See chapter (1764-1850) *This volume* pp. 180-199
[83] Harris, A. 2009. *The Vernons of Hanbury*, *passim.* Or see chapter Vernons pp. 144-148.
[84] Shrawley Tithe Award and map.

The Vernons of Hanbury and Shrawley

Andrew Harris

The first Vernon to come to Hanbury in 1577 was Rev. Richard Vernon, who, through a good marriage and a rich living, built up a small estate, which was enhanced by his son Edward who bought the manor of Hanbury in 1630. His son was another Richard, a parliamentary supporter who lived mostly in London and who died in 1679. But it was his son Thomas (01), who lived from 1654 to 1721, who made the biggest contribution to the family fortunes through his successful career as a top chancery lawyer. He boasted later in his career that his earnings had exceeded £100,000, and, having no children, he set about investing in land to enlarge the family estate, and building himself a country seat, Hanbury Hall.



01. Counsellor Thomas Vernon

Thomas's purchases would have been primarily intended to add to this local estates, and on his death these comprised most of the northern part of the parish of Hanbury. But he also made purchases elsewhere, for example in Shropshire from his brother-in-law Roger Acherley, but his largest purchase was from another relation, Alan Cliffe of Great Witley, which was manor and advowson of Shrawley for £13,000 in 1700. The connection was that Alan Cliffe was the father of Elizabeth Cliffe, who had married Thomas's first cousin once removed, John Vernon of Hanbury. This Alan Cliffe was the nephew of another Alan Cliffe who had bought Shrawley in 1681, and whose father and grandfather, again both named Alan, had successively been rectors of Great Witley from 1554.

As Thomas spent most of his time in London, he had developed a good relationship with his cousin Richard Vernon of the Webbhouse in Hanbury, who acted as his local agent. Correspondence still exists between the two about the merits of buying Shrawley, including the yield to be expected from Shrawley Wood, although in the end Thomas seems to have paid a little more than Richard recommended.

Thomas Vernon continued to work until his death in London in 1721, and, having no children, his heir at law was Roger Acherley. But Vernon and Acherley had fallen out in a big way, and for some time Thomas had been grooming his second cousin Bowater Vernon (02) as his heir, who was so named in his will. But Acherley disputed the will and the court cases dragged on for some years, although in the end Acherley lost. Bowater found himself the owner of a large estate amounting to around 7,000 acres, but as Thomas's widow Mary had the right to live in Hanbury Hall during her widowhood, Bowater lived mainly in New Bond Street, London, till her death in 1733. In fact Bowater only had another two years to live, as he died from a stroke in 1735, leaving a son Thomas (03) aged 11 and two daughters.



02. Bowater Vernon

Until Thomas was of age the estate remained in trust, but then he effected a recovery making them his personal property. He served a short time as MP for Worcester, and seems to have divided his time between Hanbury, London, and Bath, where his sister-in-law lived. There is some mystery about Thomas's wife and family – no record of his marriage to Emma Cornewall, nearly 13 years older than him, has ever been found, nor that of the baptism of his daughter and heir Emma. So there seems to have been some doubt about Emma's legitimacy, which led to a claim, much later, that another member of the Vernon family was the real owner of the estates, although this eventually failed.

Like his father, Thomas's life was ended by a stroke in 1771 on his daughter Emma's 17th birthday. Emma and her mother spent the next few years in London, and her mother's search for a suitable husband ended in 1776 when Emma married Henry Cecil (04) in the fashionable London church of St George's, Hanover Sq. Cecil was the nephew of Brownlow Cecil, 9th Earl of Exeter, whose seat was Burleigh House, surrounded by the large Cecil estates, and, as Brownlow had never married, Henry was his heir presumptive.

Henry was something of a moderniser, and much of his time was spent in Hanbury where he tidied up the estate and re-arranged the farms, and sponsored an enclosure act in 1783. He made substantial alterations to the inside of Hanbury Hall, although fortunately left the exterior largely untouched, and landscaped the park in the current fashion, sweeping away the older formal gardens.


03. Thomas Vernon

Henry and Emma had a child early in their marriage, but he died after only a few weeks, and there were none after that. They seem to have lived a comfortable life at Hanbury, but Henry spent much time away – he was an MP, and he also kept in touch with his uncle at Burleigh. The Hanbury rector was an acquaintance of Henry's, William Burslem, and in 1783 a new curate, William Sneyd, was appointed. Sneyd's health was not good – he probably had TB – and when ill he was cared for in Hanbury Hall. It was probably this that led to a relationship developing between Emma and the curate. Henry seems to have been unaware of this until one June evening in 1789 when Emma, under tremendous emotional pressure, told her husband about the affair. Henry was dumbfounded and determined to stop it, but Emma was equally determined to maintain her relationship and to look after William. There followed a period when emotions ran very high, and eventually Emma promised to cut her ties with William as long as she could have one last meeting with him.

This was arranged in Birmingham, but as soon as the couple were left alone they eloped, going first to London. Henry returned devastated to Hanbury, and, realising that he had no future there with no children or wife, he decided to go into hiding under an assumed name. Having arranged his affairs in London, he boarded a coach to Shropshire, and, calling himself John Jones, he went to the village of Great Bolas, lodging with a farmer. Soon he bought a small holding, and after making some alterations, went to live there. In the meantime he had formed a relationship with the farmer's 16 year old daughter Sarah, and, probably when she was pregnant, married her bigamously in Great Bolas church in April 1790. The couple lived in Great Bolas and had a daughter Sophia. Henry's uncle died on Boxing Day 1793, Henry inherited, and they went to live at Burleigh House. In the meantime Henry got his divorce act through parliament, and went through a proper marriage with Sarah. But she never settled at Burleigh, and, after having two more children, died in 1797 aged only 23. Henry, now 10th Earl and later 1st Marquis of Exeter, retained a life interest in the Vernon estates, but this ended with his death in 1804 at the relatively young age of 49.


04. Henry Cecil


05. John Phillips

Meanwhile, after the divorce, Emma had been able to marry William Sneyd, and they went to live in Lisbon no doubt on account of his health, but he died there in 1793. Returning to England, Emma married a rich local lawyer John Phillips (05), but as her first husband was still alive they were not able to take possession of the deserted Hanbury Hall, and went to live at Winterdyne, a house just outside Bewdley. However, when Cecil died the estates reverted to Emma and John Phillips, and they were able to live in Hanbury Hall. Much work was needed on the Hall and estates, but John Phillips comes across as a careful and methodical man, and he got the property back into good order. John and Emma had no children, and after Emma's death at Hanbury in 1815 her husband retained a life

interest, and it was not until he died in 1835 that Thomas Tayler Vernon (06), the great great nephew of Bowater Vernon, inherited the estates. After his marriage to Jessie Foley in 1831 they had two sons, Thomas Bowater (07) and Harry Foley.


06. Thomas Tayler Vernon

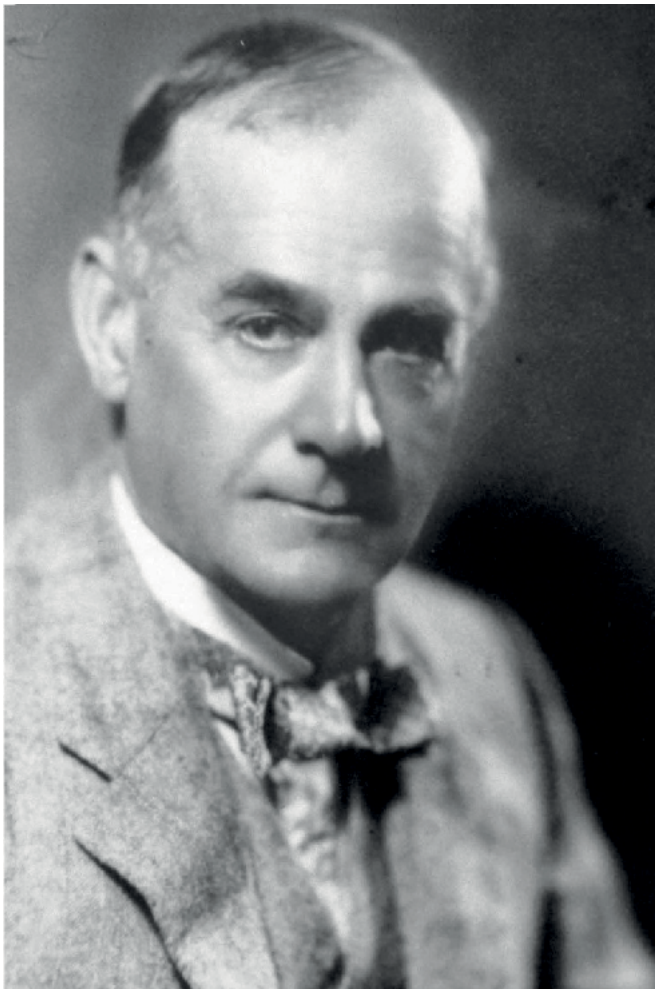

07. Thomas Bowater Vernon

But Thomas Tayler died young in 1835 leaving two small sons who were then brought up by their uncle George Croft Vernon, and it was not until Thomas Bowater reached his majority in 1853 that the Vernon family occupied the Hall again. Thereafter Thomas Bowater lived the life appropriate to the owner of a large estate, but when he died in 1859 he was still unmarried, so the estates reverted to his brother Harry Foley Vernon.

Unlike most of his predecessors Harry enjoyed a long reign of more than 60 years over the estates, during which time he married Lady Georgina Baillie-Hamilton, had four children, served a term as a Liberal MP, and received a knighthood in 1885. In the early days Harry was able to continue adding to his estates, including purchases in Shrawley, but from the 1870s agriculture went into depression, and owners of purely rural estates suffered a big decline in income. Rents were reduced, and, particularly, fell into arrears. Some farms remained unlet – Church Farm, Shrawley was one such, remaining empty for some years. It is much to the credit of Sir Harry that, despite these problems, he retained a dignified front and kept up appearances well.

Sir Harry's eldest son, baptised Bowater George in 1865, was a very different cup of tea (08). As a young man, seeing the estate's financial problems, he was uncertain whether to see his own future as a successor to his father, and, after a short time at University, he spent most of his youth in Argentina as an estate manager. After a short time fighting in the Boer War, and a further subsequent visit to Argentina, he returned to Hanbury in 1902. In 1905 he married Doris Allan. She was the daughter of James Allan, one of the owners of the Allan shipping line, who had come to Shrawley where he rented Shrawley Woodhouse from the Vernon estate. The granting by Allan of a large mortgage to the Vernons and the marriage of Doris and Bowater in 1905 were probably connected. Sir Harry was still living in Hanbury Hall at that stage, and Doris and Bowater went to live at Forest Farm in Hanbury. But Forest Farm was one of the estate's largest properties and George does not seem to have paid any rent, further depressing his father's income. Relations between father and son had probably never been good, and in 1910 Bowater decided to move away from Hanbury and purchased the small Bramfield Hall estate in Suffolk, about as far away from Hanbury in an easterly direction as it is possible to go.

Bowater and Doris remained there during the great war, and only when his father died in 1920 aged 85 did they return to Hanbury. At the same time as they moved into Hanbury Hall, Sir Harry's widow Georgina and Bowater's sister Auda Letitia moved into The Mount, another Vernon property in Hanbury. Sir George (as he now became known) and Lady Doris had had no children, and, with Sir George's reputation for having a roving eye, relations between the couple deteriorated. Finally in 1930 he formed a relationship with a new housemaid, Ruth Powick, whose family had been retainers for the Vernons for 100 years. Disgusted, Lady Doris moved out and spent most of the rest of her life in London, but there was no divorce, and Sir George and Ruth lived in the Hall.



08. Sir George Vernon

After his father died Sir George had got into the habit of spending some of the winter in the West Indies or South America, and he and Ruth also took some more conventional cruises. In October 1939 Sir George went as usual to Jamaica, but on this occasion was not accompanied by Ruth. Sir George was now 74 and his health was deteriorating, and when he returned in May 1940 felt he had little to live for, so took 'the short cut' as he wrote in his suicide note.

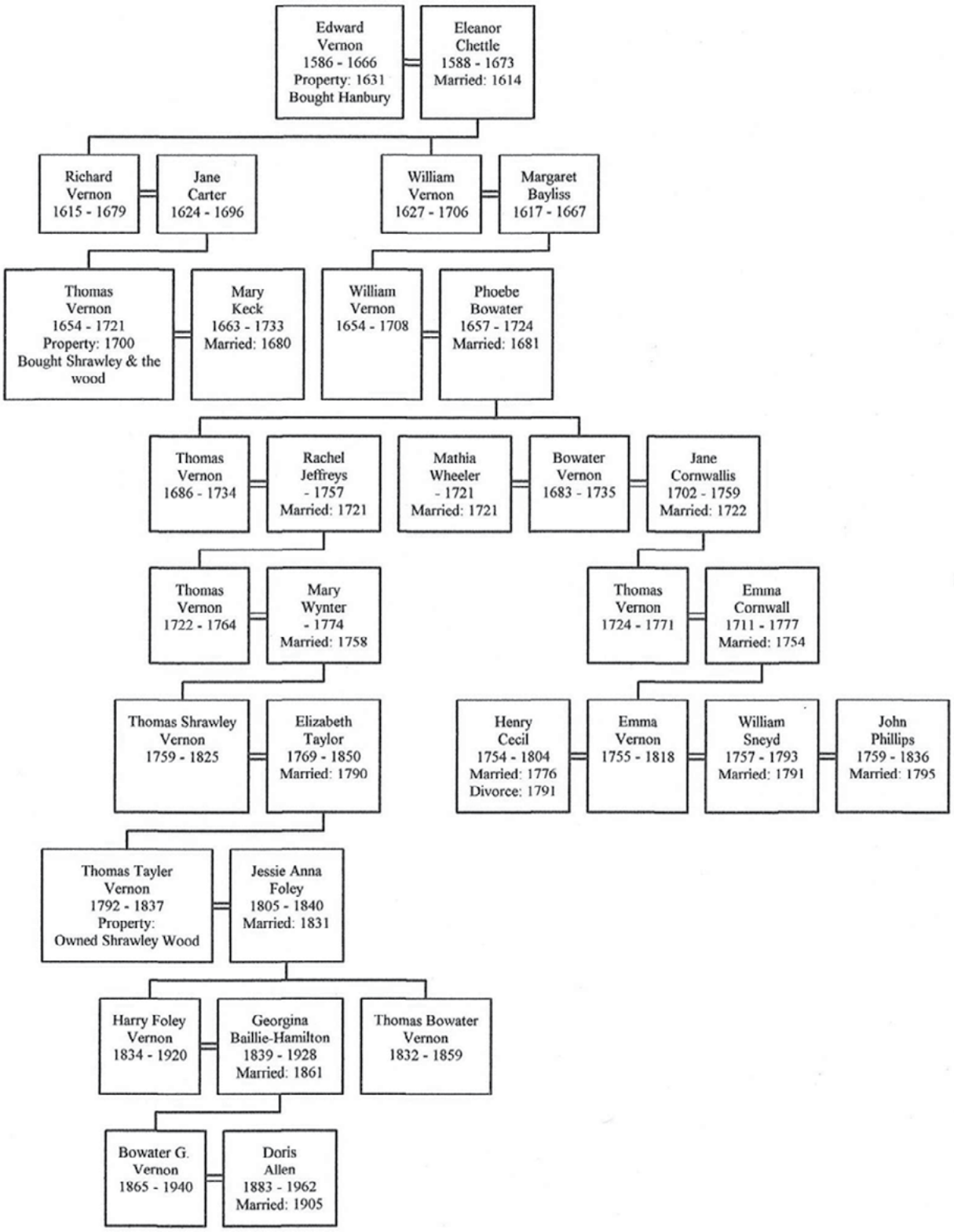
Before his death a complicated arrangement had been negotiated between Lady Vernon, , Ruth Vernon-Horton (as she later became known), and the National Trust. Lady Vernon had a life interest in Hanbury Hall, which after her death in 1962 went, with the park and a small amount of land, to the National Trust, and Ruth inherited the rest, including Shrawley. Ruth and her later husband, Frederick Horton, lived in Shrawley Woodhouse, where she died in 1980, but by this time most of the estate had been sold, some said to pay for their frequent travelling.



09. Ruth and Frederick Horton.

Further reading:
This account is a brief summary of information in
The Vernons of Hanbury: The Rise and Fall of a Landed Family.
Andrew Harris, 2009. ISBN: 9780954419318

Descendants of Edward Vernon



Introduction to the Shrawley Wood Books

Francesca Llewellyn, Peter King & Richard Pumphrey

The Physical Appearance of the Books

Francesca Llewellyn

The Vernon family are well known for their association with Hanbury Hall, Worcestershire. The first member of the family recorded in the parish was the Revd Richard Vernon who was presented to the living in 1580. Hanbury Hall was commissioned by Thomas Vernon c. 1700. Thomas was a prosperous Chancery lawyer; in 1700 he bought the Manor of Shrawley from Allan Cliffe. Included in this purchase was Shrawley Wood.

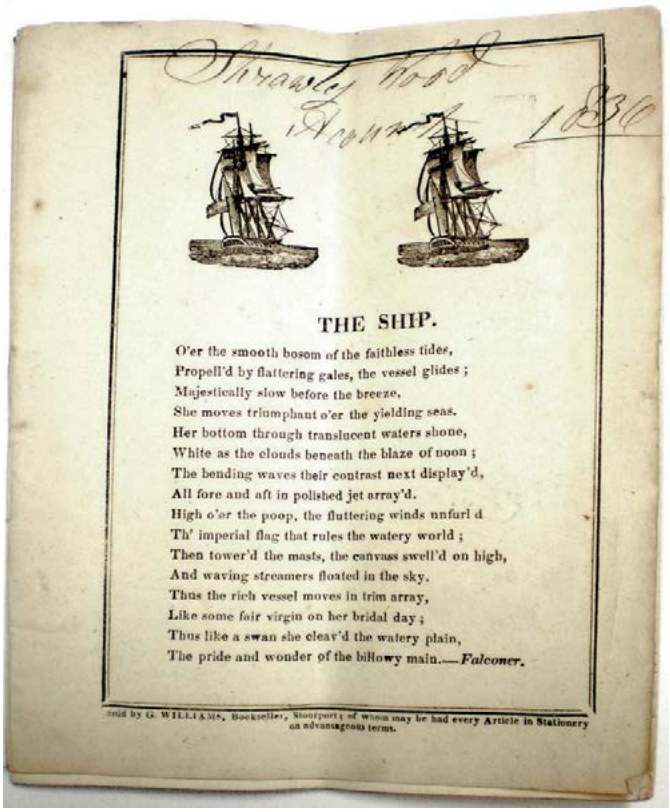
Throughout this monograph are references to the Shrawley Wood Books or the Wood Books. These books are a collection of 58 volumes of accounts relating to Shrawley Wood. They date from 1764 to 1850, but unfortunately there are some significant gaps, especially from 1786 - 1798 and 1819 to 1831.

The books are part of the Vernon Archives, a vast collection of documents, estimated at 13,400 dating from early 13th century to 19th century which were deposited at the Worcestershire Record Office, now Worcestershire Archives and Archaeology, in 1974 by Mrs Ruth Horton of Shrawley[1]. She inherited the Vernon estates and materials from Sir George Bowater Vernon after his death in 1940. The documents cover many aspects of the Vernons' history and land holdings and include Court rolls, property deeds, Estate records, plans, accounts and personal papers.[2] One of the most interesting documents is the set of maps drawn by John Dougharty, junior, Worcester, in 1731 -3 of the lands of Bowater Vernon Esq with a terrier of the properties, but a few estates are not included.



01. Shrawley Wood Book 1767

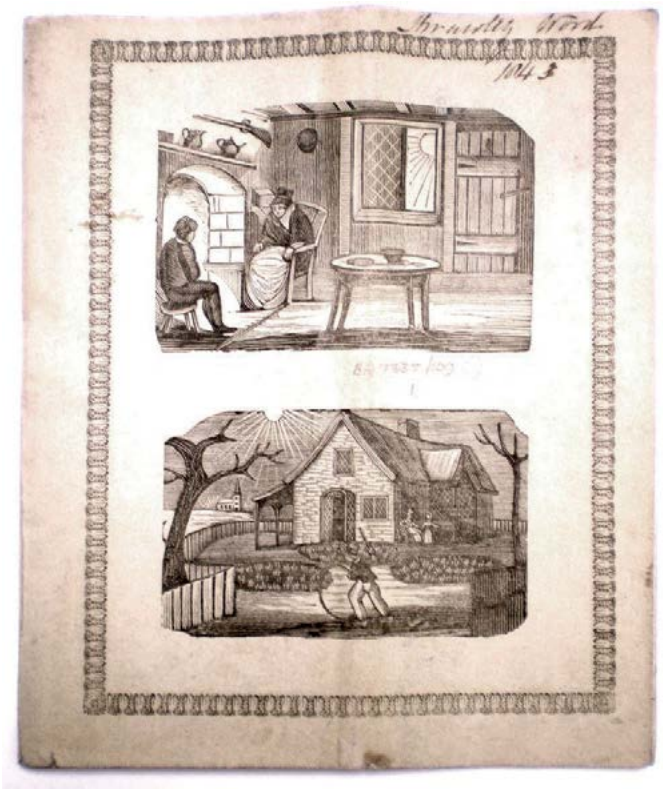
The early Wood Books contain about 10 pages, but as more activity was undertaken in the wood, the books bought needed to be larger and the later volumes are exercise books. Some of these exercise books have plain covers, but a few are decorated with pictures - a horse, a dog, a romantized cottage (some accompanied by a verse). Two books were bought from G Williams Bridge street, Stourport, bookseller. The volume for 1839 has a picture of a slave with a description of slavery and two volumes have tables of measures - land, coal, time, wine with a Mariner's compass in the centre on the back and Richardson's Arithmetical Tables on the front including Hay and Straw measures. The books record the sale of timber to a large number of people from quite a wide area, and the expenditure of a wide variety of activities in the wood and include wages paid to workers, some named, but others are anonymous. These records are dealt with in great detail by Richard Pumphrey in this book.



02. Shrawley Wood Book 1836



03. Shrawley Wood Book 1842



04. Shrawley Wood Book 1843

As well as the accounts of work in the wood and details of the sales of wood, etc there are other entries. In 1800 the Worcester Porcelain Company who occupied the property on the other side of the Dick Brook in Astley paid £1 2s 6d for 15 foot of Timber for the Repair of ye Riddin Bridge.[3] Dick Brook is the northern boundary of the wood and Riddings Bridge is the footbridge over the brook. This mill was later converted into a forge and in 1810 Mr Shinton, who owned the forge, bought *'One Crap of a Tree by Forge'* for 15 shillings[4]; perhaps the tree had been felled in the bind by the forge - *'Pd John Preece for Fallin etc Down by Forge' £2- 8-11¼d*[5] and in 1839 *'For falling the Forge & Pleck Ashbeds'*[6] Thos Jones, senr was paid £1-9-5½d. There is also a number of entries for various pools e.g. in 1805 *'To Make in a New Pool in J Housemans Bottom'*[7] and in 1807 *'A New Pool in Wood by Mr Houseman'*[8]. One important delivery of wood was in 1772 *'Delivered to the Church Wardens of Shrawley 3 Tun & 6 feet of Timber for to Hang the Bells £7-16-0'*[9] In 1806, the accounts start recording the payment of 'Rent of Staverton's Land for the use of the poore of ye Parish of Astley'. Staverton's land was a three acres meadow in Hanbury parish.[10] There is also a tantalising entry in 1799 *'For Wood by the Upper Lock 0 7 0'*[11]

The majority of workers are male, but in 1804 it was recorded that 'Bettey Cook Daughter etc for Carrin Bark to the Roades' was paid 15 shillings and 7 pence.[12] In 1807 Bettey Holloway, Mary Jones and Hannah Jones were employed for 7½ or 8 days, as well as a Boy & Girl 'Carrin Barke to Roades 19 Days & ½' [13]. And in 1814, eleven women were employed in peeling bark - Bettey Etheridge, Mary Jones, Bettey Tereton, Betty Rea, Hanah Rea, Hanah Jones, Hanah Astley, Mary Ridley Ann Ridley, Ann Rodgers and Fanny Jones earned between 4 shillings and 6 shillings for their work.[14]

There are more accounts for work in and sales from Shrawley Wood included in the Vernon Estate Accounts which cover the latter part of the nineteenth century. But there is a large gap between 1850 and 1875. More Vernon papers and documents were deposited in 1991 on behalf of Mr F Horton, the widower of Ruth Horton, but these don't contain any accounts relating to Shrawley Wood. There are also some documents still held at Hanbury Hall.

SOURCES

1. Whittaker, Robin The Papers of the Vernon Family in The Recorder No 57 Spring 1998 Worcestershire Archaeological Society
2. Worcestershire Archive and Archaeology Service (WAAS) Vernon Archives Catalogue at http://e-services.worcestershire.gov.uk/CalmView/Record.aspx Accessed 25/09/2109
3. WAAS 705:7 BA 7335/108 (ii) No 4.
4. Ibid No 14
5. Ibid
6. Ibid 705:7 BA 7335/132 (ii) No 4
7. Ibid 705:7 BA 7335/108 (ii) No 9
8. Ibid 705:7 BA 7335/108 (ii) No 11
9. Ibid 705:7 BA 7335/108 (i) No 8
10. Ibid 705:7 BA 7335/108 (ii) No 10
11. Ibid 705:7 BA 7335/108 (ii) No 3
12. Ibid 705:7 BA 7335/108 (ii) No 8
13. Ibid 705:7 BA 7335/108 (ii) No 11
14. Ibid 705:7 BA 7335/109 (iii) No 1

Management of the Wood 1760-1850

Peter King

The management of the wood is particularly well recorded in the period 1764 to 1850 through the survival of an incomplete series of annual Wood Books, covering 52 years of that period. This period is covered in more detail by Richard Pumphrey in chapter 1764-1850 (pp. 180-199). This chapter is therefore limited to a technical description of the Wood Books as accounts and a discussion of timber sales. These Wood Books are charge and discharge accounts, showing what the person immediately in charge of the wood received and paid. They are not full accounts of a forestry business carried on in the wood, though they are not far removed from being that. The woodward was responsible for managing the wood, paying workmen, and accounting to his masters for what was in his charge. His immediate manager was the steward of the Vernon estate, based at Hanbury Hall, but the steward was in his turn of course accountable to the owner. Each wood book ends by listing any interim payments made to the steward and then with the balance which was then paid over to him.

It is possible that certain aspects of woodland management were not left to the woodward but handled by the steward. Since the woodward handled no cash from sales made by the steward, there was nothing for which he was accountable, so that the sales do not appear in his account. This is likely to apply to sales of great timber, using that term in its strict sense of trees of oak, ash, and elm that will square to ten inches a little above the butt.[1] It might also apply at times to the sale of cordwood, cut from coppice, used to make charcoal for local ironworks. These sales might generate significant sums of money, which the owner wished to receive immediately.[2] On the other hand, the woodward might have paid expenses associated with the sale, such as felling the wood. On that case, though the sale is not recorded, it may be possible to deduce that it occurred.

It must also be born in mind that for considerable periods there was no person with the legal right to sell timber. Timber (the trunks of large trees) was regarded as part of the land. A limited owner (with a right only to the income from the wood) could enjoy the income from cutting coppice wood and such like, but if he (or she) felled timber, he (or she) would be guilty of waste and liable to pay damages to the persons who would subsequently be entitled. No detailed consideration has been given to the terms of the various settlements of the estate. Such settlements might make a life tenant not 'impeachable of waste' (in which case timber would not be sacrosanct), but when the estate belonged to Henry Cecil after Emma left him, it is likely that the agreements made prohibited waste. Similarly after his death, Emma probably only had a life interest, with cousins expected to inherit after her death. Again, a little after

1 English Statutes, 35 Hen. VIII, c.17, s.1; 1 Eliz., c.15, s.1.
2 Hammersley, G. 1973. The charcoal iron industry and its fuel 1540-1750. *Economic History Review*, ser. II, 26: 603-5.

her death, there was an owner, but the estate was managed by guardians during his minority. At these periods, there was probably no one person empowered to dispose of timber. There were thus no timber sales in those periods. There is a literary trope of heirs having their property wasted by unscrupulous guardians. This could be a reality, but the equitable doctrine of waste was applied to prevent that abuse.

After Thomas Vernon bought Shrawley Wood (with the manor) in 1700, it descended in the Vernon family, belonging to successive owners of Hanbury Hall for some two and a half centuries. The detail of this is given by Andrew Harris (see chapter Vernons, pp. 144-148). However for long periods, mostly during the life of Emma Vernon (*c*.1754-1818), there was no owner entitled to sell timber. The sale of underwood was classified as income and underwood was cut regularly, probably every year, but timber (the bodies of oak, ash, and elm) are regarded as part of the land so that a person who sells timber is guilty of waste, if he is impeachable of waste. Emma in 1776 married Henry Cecil (subsequently Earl, then Marquis, of Exeter), but they were divorced in 1791. Under the Divorce Act, Henry retained a life estate in the Vernon property. After his death in 1804, Emma had a life interest, and was able to confer a life interest on John Phillips as her widower. In 1806, he had made an agreement with Emma's cousin and heir-apparent to secure to him money he spent in improving the estate. The heir of the estate was Emma's second cousin Thomas Shrawley Vernon. With Hanbury Hall still in John Phillips' possession, he took possession of Shrawley Wood House in 1823 on the death of the Reverend Mr Wharton and proceeded to rebuild it as his home. He did not live to move in before he died in 1825, but provided in his will for it to be completed. His widow moved in and lived there until her death in 1850. His son, Thomas Tayler Vernon died in 1835 aged about 43, leaving his eldest son still a minor.[3] There were thus significant periods when the owner of the Vernon estate was a minor or a life tenant impeachable with waste, who was not one able (or willing) to sell timber:

- 1771-5 during Emma's minority.
- 1791-1804 when Henry Cecil had only a life interest.
- 1804-18 when Emma enjoyed the estate with a life interest.
- 1818-29 when her widower had a life interest.
- 1835-53 during the minority of Thomas Bowater Vernon.

But during much of this period there is evidence of the cutting of timber on a significant scale, totalling 1056 trees, opening a question as to how legal this activity was. A contract survives for the sale in April 1760 of 604 numbered trees for £1600. The buyers were John Moore of Reanald Dean (Gloucs.) and John Drew of Ledbury (Herefs.) Timber Merchants, who were to fell the trees by Midsummer 1762 and then had another year and a quarter to remove the timber and bark. They were allowed to make sawpits and to take turf to cover piles of cordwood to make it into charcoal. Charcoal was the normal use for wood from trees that could not be used for more profitable purposes, such as dotards that proved to be rotten at the heart.[4] The sale was advertised in the newspapers, both locally and more widely. However this seems to have been a one-off sale. A further sale was advertised in 1778 of 250 maiden oaks, after the marriage.[5] After that the Wood Books record between 15 and 60 timber trees were felled each year[6], reflected in the quantities of bark sold each year.[7]

Between 1828 and 1834, there were six annual sales of timber, a total of 255 oaks. The newspaper adverts often stressed the quality of the timber, 'The above trees are of large lengthy dimensions and it is presumed their quality is too well known to need further comment here' in 1828; 'very straight and clear and is calculated for furniture, coopers or boat builders being of exceeding good quality or for lath or purposes requiring good cleft timber' in 1830; and '35 oak trees containing upwards of 2,500 feet of beautiful timber' in 1834.[8] The 1829 and 1830 purchasers were Charles Bird of Diglis, Worcester, and Thomas Bird of Stourport, both boat builders.[9] This programme of annual sales presumably came to an end with the death of Thomas Tayler Vernon.

On the other hand, for almost a century from 1760, annual sales were made at times, but somewhat spasmodically. It seems likely that the wood was being managed as a coppice with standards, until many of the last of the great oaks were felled in the 1940s. The wood today is largely of small-leafed lime. One of the objectives of this study has been to determine how far back that can be traced. The term 'lime' has rarely been found, but whitturns frequently are. If whitturn (and whittard) is a synonym, it is certain that the wood has had limes, at least since the time of Elizabeth I, though whether lime was always as dominant as now must remain uncertain.

Historical background to the Wood Books, 1764-1850

Richard Pumphrey

Maybe no village can "be an island, entire of itself", but judging by the bit of its history recorded in the Wood Books, Shrawley seems to have felt only minor ripples from the political storms affecting England between 1764 and 1850. During this time Shrawley was ruled over by four monarchs (George III, George IV, William IV and Victoria), governed under nineteen Prime Ministers with 26 changes of government; heard reports of wars including that of American Independence (1775-1783) and the Napoleonic conflict with Europe (1803-1815). The minor ripples that were felt in Shrawley came from factors such as an increased need for oak and rope for the navy and for oak bark for tanners who provided the leather for boots and harness for the army.

While this was going on, the Industrial Revolution was taking place. One consequence of the revolution was the movement of labour from agriculture to manufacture, from the countryside to cities, but whether this affected Shrawley at all is not clear. Then there was civil unrest with the Luddite Riots starting 1811; again, there was little in Shrawley to attract this kind of unrest.

The industrial revolution brought with it many other changes. The need for improved transport led first to the appearance of turnpike trusts. By Acts of Parliament these trusts were enabled to impose compulsory purchases of land for road improvements and to charge tolls to offset the cost of their investment. The road through Shrawley was a turnpike managed by the Worcester Turnpike Trust from 1766[10]. It connected with other turnpikes managed by the Droitwich, the Kidderminster and the Hundred House Turnpike Trusts. There is a map[11] dated 1814 of the "Public Road through Shrawley as widened and improved" with an account of the land purchased. The turnpikes between Shrawley and Hanbury crossed the Severn at Holt Fleet. This was a ferry crossing until 1828, when the Telford-designed Bridge was opened.[12]

Canals were built following a similar model and then, with the impact of steam power, the railways were built, though the closest station to Shrawley was at Stourport. The first canals to affect Shrawley were the Staffordshire and Worcestershire canal and the Droitwich canal, both opened in 1771. These canals connected the River Severn to the increasingly industrialised midlands and opened up a wider market for wood products such as crates and clogs. By

3 Harris, A. 2009. *The Vernons of Hanbury*, *passim*; and see chapter Vernons: pp 144-148.
4 WAAS, 705:7 BA 7335/109 (iv) 4.
5 Shrewsbury Chronicle, 28 Feb. 1778.
6 see appendix Oak Loss pp. 246-249
7 chapter 1764-1850, p.189

8 *Birmingham Gazette*, 21 Apr. 1828; *Worcester Herald*, 7 Feb. 1829 and 3 Apr. 1830; *Worcester Journal*, 31 Mar. 1831, 03 May 1832, and 10 Apr. 1834. There was apparently no advertised sale in 1833.
9 WAAS, 705:7 BA 7335/109 (iv) 48.
10 Acts of Parliament extending Worcester Turnpike Trust to cover Shrawley Road. 7 George 3 c.65
11 Samuel Barnett 1814. *Map of the public road through Shrawley Parish as widened and improved also an account of land purchased*. WAAS 2309 /42 (ii)
12 https://historicengland.org.uk/listing/the-list/list-entry/1301888

1840 the summer delays caused by the Severn shallows had become an insufferable hindrance and the Upper Severn Lock System was constructed in 1845. This improved the river traffic which was good for most of Shrawley, but the Weir Inn that had provided rest and recuperation to the bowhauliers found itself without any trade and closed in 1861.

Although the iron industry had switched to coke, the Knight ironworks at Cookley reverted to charcoal for some of its work and some of this was bought from Shrawley Wood.

In the Wood Books we only hear of those with jobs to do but Shrawley also had its poor and elderly. The "Poors Levy" as it was referred to in the Wood Books was just one of the local taxes. Another was the Hundred Silver, an ancient tax collected from all property owners in the Doddingtree Hundred. Then there were the tithes to pay. The chapter on Shrawley in the time of the Reverend Mr Piercy (pp. 171-6) tells of how these tithes affected the villagers. The old system of collecting a tenth of all produce had already partly converted to collecting money instead; Piercy may have been following a national trend when in 1775 he set the tithe charges for the major contributors by annual agreement rather than basing the tithe on the produce that year. In 1839 the tithes were revised nationally to a fixed system with annual payments based on property holdings rather than produce. The extraordinary charge for hops led to Shrawley villagers finally abandoning hop growing – and so to the end of demand for hop poles, and loss of a longstanding reason for having lime coppice. No wonder Harry Vernon said it would now pay better to grub the lime and plant larch in its place.[13]

It seems few of less well-off Shrawley Villagers were literate in 1700. The first contracts between the Woodmen and Richard Vernon were signed with *X - his mark* and their records were kept on tally sticks, not paper. The school house was in a ruinous state in 1699 and the Cliffes drew up an indenture[14] with leading parishioners including the Rector Edward Burlton to rebuild the School House and use the rent for the support of the poor of the village. Edward Burlton (died 1711) left £40 to support the school for the poor, but its educational effect may have been very limited. Even so, by 1735 at least some villagers, including John Anthonies (Gamekeeper/ Woodward) were able to read and write but often with non-standard spelling.[15] By 1759, the Woodman's notebook has a variety of handwritings (and spellings) suggesting several of the team were literate, including one who, it seems, was also Captain of the Bell Ringers. The Wood books had a variety of handwriting through the years but the general trend gives an impression of increasing literacy. The village school house rebuilt next to the church around 1700 was still in use in 1851; it was not until 1860 that the Vernons built the new village school.

13 Elwes H.J. & Henry A. Trees of Great Britain and Ireland. 1913. Vol 7 p1659. Cambridge University Press
14 Prattinton 1829. Notes on a document held at Hanbury.
15 see the appendix: Glossary pp. 153-166

Glossary and Derivations of Terms found in The Wood Books

(and related documents)

Hugh Milner

It is apparent from some entries in the Wood Books that they took account of the whole Shrawley Estate owned by the Vernons, eg. see Buildings. This Wood Book accounted for repairs to Wood Farm Buildings. Elsewhere in the books income from the Wood paid for candles for the church and repairs to Lenchford House and Church Cottages. It seems that most of the farming element was let, so not 'in-hand' and not thus accounted.
For mention of Binds, Oak Loss & Replanting, Ownership, Poles & Whitturnes, the Timeline, Trees & Woody Shrubs and Products, see separate lists. The cross-references showing these lists are within inverted commas.

The year shown indicates the year for rare terms and the date range for those with multiple occurrences. Entries in Italics are exact transcriptions. Derivations are given for words of particular relevance to the wood.

Many spellings stumbled upon when searching the records of Shrawley Wood were confusingly different from the modern standard first codified by Samuel Johnson in 1755. Although he travelled the country extensively, this information would have taken many years to filter down to rural areas. It is true that the standard of literacy of the various authors was no doubt basic but this has added some charm to the documents and opened a window on the pronunciation of the local Worcestershire dialect of that time.

Odd spellings have caused a few wry smiles but many more have resulted in confusion and initial misunderstanding. Many hours have been spent searching sources, sometimes with no satisfactory outcome until a fresh set of eyes considered them. All this has been compounded by now obscure and long obsolete words. I have delighted in revealing them again. Most helpful has been James Orchard Halliwell's Dictionary of Archaic Words, published in 1850.

The following are a typical selection

Aightee	1761	eighty
Akkons	1759	acorns (OE ækern, 'fruit of the country')
Auferar	1565	take, steal
Authern	1840	hawthorn (dropped 'h')
Ballad	1759	bald (2 syllables)
Bayne	1425	bine, bind (vowel change)
Bin(d)e	1434	station, coupe
Black poles	1807	coppiced oak poles, 34 or 51 years old
Blooke	1811	block or the trunk of a tree
Boren	1761	Bourne (2 syllables)
Bot	1840	bought (hints at pronunciation)
Buchs	1739	birches (vowel change)
Burden, burdin	1781	bound bundle (probably 12 lops)
Copis	1544	coppice
Cras	1765	cross (vowel change)
Dubble groud	1814	34 year-old coppice
Geates	1775	gates (2 syllables)
Gice	1835	joist(s)
Hawling, halling	1758	hauling
Hunderwood	1832	underwood (hyper-correction)
Inges	1849	hinges (dropped 'h')
Kokes, kooks	1753	cocks
Latherpouls	1835	ladder poles
Leady	1778	lady (3 syllables)
Lebourer	1770	labourer (vowel change)
Linetree	1848	Lime tree (linden)
Lops	1806	lopped small branches
Mapul	1845	maple
Marter	1770	materials
Meshuring	1760	measuring
Mesun, meason	1849	mason (double vowel change)
Outerdes	1761	outwards (lazy pronunciation)
Pare	1807	pair
Peepel	1766	people (more precise pronunciation)
Pieling	1699	peeling (hints at pronunciation)
Piking	1758	picking
Plek	1765	pleck (a small plot)
Possis, posites	1777	posts
Prevent	1739	deal with
Rabites	1766	rabbits
Rafftons	1549	converted timbers
Raisein	1805	raising
Relend	1770	lend again
Rems, rims	1768	remains (abbreviation = balance)
Resed	1762	received (abbreviation)
Rite	1761	Wright
Roak	1770	oak ('atter āc' becomes 'at the roak'
Rownds	1832	rounds
Rubil	1759	rubble
Runnall	1817	rundle (a hollow pollard)
Sache	1562	sack (ransack)
Saleis, seales	1760	sallows
Saph	1767	sap
Seats (2 syllables)	1736	setts
Sayers	1775	sawyers
Se(a)ling	1835	ceiling
Seavern, Sevain	1760	Severn
Seges	1759	sedges
Seills	1759	cills
Selef	1770	self (2 syllables)
Sener	1767	Senior (lazy pronunciation)
Senters	1770	centres
Shuvel	1845	Shovel (vowel change)
Soud	1765	sold (lazy pronunciation)
Stattit, stottit	1835	statute
St(e)ales	1804	steles (tool handles)
Stix	1839	sticks
Stokin	1770	de-stocking (destumping)
Takk porc	1412	pig pasturage
Tealing, teeling	1769	telling (counting & recording)
Tenyerwood	1699	ten year (old) wood
Thath	1848	Thatch (local pronunciation)
Threave, thriefe	1739	thrave (24 Burdens)
Triple grown	1807	c. 51-year old coppice poles
Turen	1761	turn (2 syllables)
Turpodines	1778	turpentines
Twernes	1737	hurdles ('twist-turns')
Tywhitturnes	1759	tie(d) whitturnes
Whalter	1799	Walter
Whattlin	1810	wattle making
Whittard	1567	a lime pole
Whittern	1699	a lime pole
Whitturne	1736	a lime pole
Widdw, weddu	1760	widow
Wigin	1766	widgeon

Column ***F*** indicates the frequency of the word in the records studied:
A= Abundant (i.e. most years, often multiple times)
F = Frequent (many years),
O = Occasional (found several times in the records),
R= Rare (only one or two occurrences)

Column ***S*** source references are listed after the glossary

Column ***R*** indicates which chapter in this monograph contains further discussion relevant to the word:

A 1700-1763	p 167-170	O Owning the Wood	p 23-36
B Rev Piercy	p 171-176	Q Oak	p 65-75
C 1764-1850	p 180-199	L Lime	p 42-64
D 1875-1897	p 209-218	R Tales of two rivers	p 82-95
E Extraction	p 235-241		
T trees of SW	p 273-283	P Pools	p 104-108
S Shotgrove	p 305-314		
		M Medieval	p 133-136
G Recent times	p 219-229	N Early modern	p 137-143

Glossary

term	***F***	**year**	**context - actual entry**	**interpretation**	***R***	**derivation**	***S***
Allowed Allowd, A Loud	O	1803	*Allowd the Crate maker 0..5..0.*	Gave an allowance	C		
Arms, Oke	O	1817	*Cutting out 360 Oke Arm^{s}. @ 1$^{1}/_{2}^{d}$, p Arm 2..5..0.*	Removing boughs from (felled) oak standards, probably with an axe. Arm, a large branch or bough of a tree		comm Teut L *armus*, shoulder Aryan *ar-*, join	1, 19
Ashbeds	F	1839	*Falling at the Forge Ashbeds.*	Area planted with ash trees	T	Bed[2]	1
Asp	O	1767	*Resed of the Reverend Mr percey for100 asp & oke 0..7..0*	Aspen	T	OE *aespae*	1
Auferar	R	1565	*No one of this manor shall 'auferar' any firewood in Shrawley Wood without licence of the bailiff unless according to the division made, upon his proper part under pain of forfeiting 6s 8d.*	Remove, steal, take: (6s 8d = one noble, a third of a £)		L *auferre*	7, 68
Authern Quick	O	1840	*21st Dec^{r} Bot at Worcester 400 Ash 1000 Authern quick 1..15..6.*	Hawthorn plants, note dropped 'H', showing the local pron.		OE hagathorn	1
Balers, Balles	R	1759	*Pd the wood men for picking the Balers 0 5 0*	Large rods (Bale, a beam, Salop) Rods		*Baleis)* Salop *Baleis, Baleys*	2 4
Ballard(s) (Whitt/e/u/rne s)	F	1779	*Rec^{d} of M^{r} Green for 900 Ballard Whitturnes, 4..0..0.*	Bald, stripped lime poles.; Ball + ard: bare, meaning peeled in this context.	C		2
Bankin	O	1809	*5th. Dec^{r}. P^{d}. John Bunts for hedging & Bankin 46 pirke of Wood hedge @ 9^{d} per pirke 1..14..6.*	Bank up = Gap up			24
Barked	R	1801	*Payd John Bunts To peeling 4^{Tun}.9^{c}.of Barked @ 14ƒ per tun 3..3..0.*	Probably means debarked oak	C A		19
Barking	R	1836	*Mr (J) Rogers (Stourport) 3^{ton}0^{cwt}2^{lb} of Oak Barking at 6£ pr Ton 3 18 3*	Peeled and dried oak sold to a tannery	A		19
Bars	R	1839	*Pd. Wm Caldwel for cleaving 60 gate bars 3.0.0*	Gate Bars			81
Baskett Baskit	R	1739	40 *Feb. 1. By Venifon Basketts and Rods for Reps 0"13"4*			AN & OF *basket* AL baskettum	49, 84
Bast (e)	F	1700	*Bast 15 load in each bind @ 7s per 100 105..0..0.*	bast stripped from lime poles	L	OE *baest*	1
Baste Barn	R	1739	*Oct^{r}. 13. By 11. Threave of straw for thatch for the Baste Barn 2"17"6*	For drying the stripped lime bast, prob on horizontal 'drying poles'. Was this in the Timber Yard?			
Baste Work	O	1736 1737	*No$^{vr.}$ 17 Pd. M^{r} Griffin for Baste Work as P^{r}. Acct. 0"4"6 June 8. Paid John Anthonies for Baste Work 3"13"0*	The felling of lime coppice poles, stripping of the bark and piling it up to dry	L		19, 81 81
Basten Ropes [Great; Small]	O	1689	*May 23. Reced of John Anthonies for 200 Basten Ropes at 5^{s}. pr 100 0"10"0 Oct^{r}. 23. Reced. for 1000 Basten Ropes @ 5^{s}. pr 100 2"10"'0*	Ropes made from Lime bast, the inner bark of small-leaved lime,	L		19
Beast	R	1771	*Received for beast £1.1.0d.*	Is this a forfeit for a cow, ox or bull that broke into the wood? This usually refers to a cow but could be a deer			2, 24
Beast	R	1832	*for Beast to Hanbury 0..2..0.*	Beast or best wood?	C	OF *beste* f L *bestia*)	1, 24
Beesom Birch Besom Stuff	O	1843	*Sold to John Brown A lot of Beesom Birch 2..10..0.*	Materials suitable for besom handles & heads (besom = stable brush)	C		19
Best(e)	R	1777 1809	*300 of best whitturns* *two Burdins of Beste to go to Hanbury.*	Should this read 'Best Etherings'?	C		19
Bilders	R	1838	*2500 of Bilders for the Cround 3..12..6.*	Probably building bricks c/f fire bricks etc.			19
Bind Faggot	R	1708	*fall marke Binde faggott and Worke up All the underwood*	Tying up faggots		OE *bindan*	100

Bind(e)	A	1738	*parting and falling ye Rowlane Bind*	Bind or Fall, local term for a 'cant', coupe', 'panel' etc. a division of the woodland for management of the underwood, where, in the named bind, the underwood is cut over in one year and any standards are thinned as necessary in the one operation. Bind is pron '*beind*' in Wo.		OE *bind(an) binnan* 'Bind round'. Byn, 'within'; Bind n 6.; bounds, stint Bind[1], Bind[2] related to 'bound'.	1, 2, 4, 20, 24, 2, 4, 82
Binding, Whiterney	R	1700	*10000 Whiterney binding at ld per 1000 3-6-0*	(Error, 79.2d per 1000). Tying up young lime poles			1, 2
Burch Rails	F	1804	*Falling Burch & Burch rails*	Fencing rails made of birch	C		54, 56
Black Pole(s)	O	1807	*124. foot of Black poles @ 2^{d} per foot 1..0..8.*	Coppice oak after 3 cycles	C		
Blooke Wood Block wood	R	1811	*20 Cords & half of Blooke Wood @ 5f P^{r} C^{d} 5..2..6.*	Thick billets, (4ft long?)	C	Block[1] 1 per F *bloc*	1, 2, 4, 55, 57
Boatin(g)	R	1816	*P^{d} M^{r} Evans for Boating 0..2..0.*	On one of the pools in the wood or on the R. Severn			19
Bob saw	R	1896	*Sep 3 Fileing crosscut and Bob saw 1s 6d*	A Bow Saw	E		92
Bolt	R	1805	*making a trunk for a stew in wood, puttin in Bolt Screen &c*	Part of the pool overflow system	C P		19
Boltin	R	1764	*pd the widdow mitin for 5 thriefe of Boltin 1 10 2*	Bolt is straw of pease, bought no doubt as horse feed	A		2
Bosc.	R	1412	*Apr 16 Vend bosc. xxxd, takk porc custom xjd, le field in le Oldepark*	Wood or Underwood (see takk porc)		L *boscus* wood	70
Boughs	R	1739	*Ap. 30. By a Man cutting the broken and Dead Boughs out of Trees 0"10"0*	This was a sound silvicultural operation to improve timber quality, for which the wood was celebrated			19, 84
Bowin(g)	R	1801	*P^{d} Phillip Jones 11. Days Bowin of timber &c. 1..2..0.*	Delimbing boughs after felling			2
Brads	R	1847	*15 lb flooring brads: 10 lb seling nails*	wire nails with asymmetrical head			1
Brister Lime	R	1763	*payd for 3 pekes of Brister Lime and Caridg*	Probably Briss or Brissy, dust, so lime dust (powdered lime)			24
Broken Faggots	R	1760	*Pd Edward Atherig for tying the Broken faggots 0 5 0*				
Bruch	R	1760	*Deliverd to John Johnsons of Bewdley 1000 of bruch 3 0 0*	See burch			101 130
Brushwood	F	1739	*Ap. 30. Paid Workmen at Shrawley for cutting up the Brushwood and Burning it befor the fallers 10"4"6*	This is clearance of all unutilisable growth within the underwood before coppicing and thinning the overstorey			19, 81
Bruſshin(g) Ro(a)des	F	1780	*P^{d}. John Cook for Bruſshing Rodes 0-3-0.*	'Brushing' is the cutting and clearing of brush (brash) from access roads and rides	C	F *brosser*, underwood	1
Burch	A	1809	*fallin & trimmin & toppin 244 Burch*	Birch was consistently written *burch*	C		19, 83
Burden(s), Burdin(s)	A	1806	*1809 20th. March P^{d}. The wood men for Cuttin 1209 burdins of Etherins @ 1^{d}. per Burden 5..0..9.*	Notionally what a man could carry. Arch, a load, in this case a bound bundle of etherins. There were probably 12 lops to a burden, to do 1 perch of hedge But Kendrick Watson wrote "A bundle of headrings, &c, is considered to be twenty-five, according to the size.	C	OE *bypen*	1, 19
Bush, Oake	R	1845	*Tho^{s} Wasband a Oake Bush ..1..10.*	A young oak or more likely a young coppice stool		Bush[1] ME *busk*	1
Butin, Buttin(g)	F	1770	*1807 P^{d} John Cooke & son for Buttin & topin Timber 1..18..8.*	Dressing off both ends of a felled log	C		6, 19
Buts	O	1736 1772	*Recd. of Rich. Comby for 40 Buts of Birch 0.13.4: Rec^{d} of Will^{m}. Cooke for sum Sally Buts 0-5-0.*	Butt, base lengths of, in this case felled birch: Exact repeat of order in following year			6, 19
Buttins, Oke	O	1800	*M^{r} Beech New Inn for one load of Underwood 0..6..0, $^{1}/_{4}$ of hun^{d} of Oke Buttins @ 1$^{1}/_{2}$0..3..1$^{1}/_{2}$.*	The small wedges of root spurs axed off the butt lengths of timber, prob used as firewood			19
Capicia	R	1433	*Sale of wood in the park in capicia called Blakewych £23*	A coupe for coppicing, literally 'Head-struck'		L *Cap,* head, *-ico,* strike	7
Chaice, Chais(e)	O	1771	*Received from Mr. Green for 900 & halef of chais Whitturnes 4-15-0.*	1s per 100. Grooved poles, may mean a debarked strip on either side or may just mean 'peeled' or 'chaice' may be a dialectal pronunciation of 'choice' wood qv	C	Chase[4]	1, 2
Choice Wood	O	1700 1737	*Choice Wood 4000 at 7s per (100) 14-0-0.*	Selected quality	A	OF *chois*	1 81
Choich Witturns	O	1757 1758	*Payd for Hawling of 3500 of Choich Witturns*	A misspelling of 'choice'	A		
Cleanin	O	1810	*Cleaning and weeding Quick @ 1/-*		C		
Cleavin, Cleefin, Cli(e)ve(i)n	F	1807 1809	*29th Oct^{r} P^{d} W^{m} Hide for Lath Cliven as per Bill 9..3..5.*	Cleaving mainly knot-free oak, probably from Black Poles to produce laths, posts or rails	C		6
Cleever	F	1814	*31st July P^{d} the Lath Cleever as per Bill 3..7..3.*	A skilled cleaver of laths	C	Cleaver[2] OE *clifan, clifian*	1

Cleft	F	1806	*1807 To Halling Cleft out of Wood for Lath 2..2..0*	Splits or logs c. 4' long, separated down the grain by billhook, axe, froe or for larger diameter wood, with wedges and beetle to make laths (q.v.). Note 'cleft' as a noun	C		6
Clogwood	F	1799-1818	*Mr Pemberton Worcester fir 8. Cords & $^{1}/_{2}$ of Clogwood @ 39f4$^{1}/_{2}^{d}$ per C^{d} 16..14..8.*	Was he a clog-maker?	C		
Coalin	R	1812	*To Two Days Halling Cordwood To gether for Coalin 2..2..0.*	Gathering cordwood into heap(s) to make charcoal	C	OE Col cf G Kohle	6
Coling Wood	R	1845	*April 24th Paid M^{rs} Susanah Collicott For Drawing Turf for Coling Wood no Bill ..3..*	Coaling Wood, wood suitable for making into charcoal, in this case with an earth-burn, where the mound of wood was covered with turves to restrict the rate of burn	C		6
Colliers	O	1760-1850	*Colliers cabbens - one for the old wood, one for the new cordwood*	Wood collier = Charcoal burner	C		19, 81,84
Coppice	O	1400-2020	*Hors Lessow Coppice*	Area of coppiced woodland	T		19
Coppice Barke		1780	*Rec^{d}. of Owner Rebols for 3 tun 5 hun^{d}. of Coppice Barke at 50f £8-2-6.*	Bark from coppiced oak was sold at a premium	C		19
Cord, Cordwood Cd.	A	1708-1900	*13^{Cords} 7^{feet} New Cordwood, 10^{Cord} 3$^{1}/_{4}^{feet}$ Stottit measure 9..7..3$^{1}/_{2}$.*	Coppice stems cut to 4ft lengths, stacked in piles 8ft long, 4ft high; 3ft lengths for yard wood used by colliers	C		21, 28
Cras Cuttin		1765	*may ye 30 payd John Atheridg for Cras Cuttin 66 Cubes for Lath at 2^{d} pence pur 0:11:-*	Cross cutting 66 (Hoppus) cubic feet (2.38m3) to length, blanks for later cleaving into laths @ 2^{d} / Ft^{3}. 'Cras' shows local pron			19, 39
Crate Makers	O	1784-1809	*Allowed the cratemaker 5/-*	Visiting cratemaker working in the Wood	C		
Creſs		1840	*2000 of tiles; 1 dozen of Creſs*	Crest – type of tile			19
Crib/curb(?)	R	1839	*Setting up Well Curb /Crib at John Preeces*	Well head woodwork: handwriting indistinct			1, 19, 81
Crop	A	1808	*received of Mr Rea for three small crops of trees: 15/-*	15s	C		
Croppin(g)	A	1739 1812	40 *Feb. 9. By Workmen for cropping to this day as Pr Book 2"0"5*	Removing the branches and crown of a tree after felling	A C	f F *courbe* f L *curvus,* bent	6, 19, 84
Crosscut		1896	*October 1 filing crosscut saw 1s*				78, 93
Croſs Cutting	O	1771	*Buttin, Topin, Croſscuttin poplar in Riddin.*	Using a two-man cross-cut saw to cut logs to length			87 4,19
Cubes	R	1765	*payd John Atheridg for Cras Cuttin 66 Cubes for Lath at 2^{d} pence pur 0:11:-*	Cubic feet of timber, probably of Hoppus measure			19
Culver Tiles		1841	*Account of Bricks Tiles etc … Brickworks in longmeadow… Culver tiles, 1,223*	Culvert, a channel to carry water under a road		etym dub	1, 94
Culvits	O	1809	*15th. Nov^{r}. P^{d}. W ^{m}. Jones for Two Days Getting Stone for Culvits in wood 0..4..0.*	Culvert, a conduit to carry water under roads and tracks to ease passage of carts etc			1
Cuttin(g) out the poules	A	1764-1850	*Falling the Timber & Stubwood, Cutting out the Craps & poules*	Coppicing the stubwood	A		19
Cutts	O	1807	*P^{d}. John Cooke for Buttin & topin Timber To 18 Gubbin Cutts @ 5^{d}. 0..7..6.*	Cross-cutting timber to the length needed for bucket and barrel staves	C		19
Day Work	A	1832	*John Preace* (h)*is Day Works &r. 70$^{I}/_{2}$ Days @ 2s..0d £7..ſ1..^{D}0.*	Basic labourer's payment	C		
Deal	R	1847	*Paid William Cound Sawyer 10 Deal Cutt ..5…*	Cutting planks: deal is pine/fir 7"- 9" wide, 6' long, <3" thick		OE thille	1
Desest	R	1771	*September y^{e} 2, Geme taken for the use of Tho^{s}. Vernon Esq^{r}. Desest for one faisan 0"1"0*	Received (misspelling)			86
Ditchin	O	1760 1807	*June ye 12 payd …. for 8^{0} perCh of Ditchin in the wood 0 16 8*	Ditching 'Hedgin, Pleachin & Ditchin' is reinstating a 'woodbank'	C	OE *dic*	1, 19 11
Draught Nett	R	1809	*9th Jan^{y} P^{d} J Langford for a new Draught nett 10..10..0.*	Prob used for catching fish		ME draht Draught[1]	1 2
Drawing	O	1737-1850	*M^{s} W Bray Load of Lime 1..1..0 For Drawing ..1.*	To pull, carry, drag	C	Draw[1], OE *dragan*	1, 84
Drier Pols	R	1848	*Recd from Joseph Rodgers Stourport for 50 drier poles*	He was a tanner	C		
Dubble groud Dublegrown Dubble Grours	F	1814	*Mr Digery For 11 Dublegrown Ash etc. 15 foot @ 2ſ per ft 1..10..0.*	Double grown. Birch, Oak or Ash poles, grown for twice the normal 17 years of the lime coppice cycle, so 34 years	C		3
Dubble tens	R	1836	*300 of Dubble tens at 1ſ 4d p 100 £0-4-0.*	Wire nails			19
Dutch	R	1802	*To Settin Dutch willow seates &^{c}. two days 0..3..4.*	From Germany, including Netherlands and Flanders			1
Dutcheſs	R	1842	*100 Blew Dutchess Sleates to Kings Hill £0..18..0*	Duchess refers to the dimensions of this Welsh blue slate, in this case 24" x 12"			78
Eightpeny	R	1836	*600 of Eightpeny p 100 £0-4-0.*	Nails, costing 8d per 100			1, 19
Etherin(g) Hethering	A	1750-1845	*cutting & carrying 24 burdens of Etherings*	Flexible rods used to bind the stakes in a hedge by weaving them in	C		

Faggot(t)(e)s Faggottingh	A	1708-1850	*tiing 4800 of whiturne faggots*	Bundle (armful) of sticks, or brushwood, variously 2-4ft long and ½-2 inches dimeter, bound by a kidband; (to fag-up is to use a billhook)	C		81 85
Faggotwood	0	1764	*fallin hoppoles shidewood & faggotwood*		C		53
Fall	A	1708-1900	*teeling of last years fall that went in 1772*	The area felled that year in that Bind	C		6, 19 82
Fallers	O	1739-1774	*July.20. Paid for A hogshead of Cyder for the Timber fallers 2"12"0*	Fallers = Fellers. This is the thinning of the (oak) overstorey after coppicing the (lime) underwood, one of the most strenuous jobs, swinging 6 or 7lb felling axes and pulling four-man cross-cut saws to and froe	C		19, 81, 84
Fallin(g), Fallying Fawling	A	1567-1900	*pd Edward payk for 35 Dayes & haloff fallin 1 15 6*	Falling included thinning the overstorey & coppicing the underwood in one operation in one *Bind or Fall*	C	Fall[1]1, Fell[4] cf G *fallen*	1 53 19 6 19
Fell	O	1699	*The wood is fell by six men each his equal part*	Felled	N	Fell[4]	1, 53
Felleas, Felly	O	1894	*32 Felleas at 6 pence each 16.* (s)	A section of a wooden wheel's rim.Felloes	C	OE felg	1, 24
Fencin, Fensin	F	1801	*4[1]/2 days at James Spraggs Repairing fensin £0-11-3.*	Fencing (defence). This would have been post and rail or palisade fencing, wire fencing was not invented until c.1850	C		1
Fileing	O	1896	*To Thomas Bunce for fileing crosscut and Bob saw 1/6*	Filing to sharpen the teeth of both saws	D		78
Foot	F	1765	*Deliverd two M[r] night 38 Cord 5 feet of wood.*	In this case, a foot is $^1/_8$ Cord eg. 4ft is half a cord, being half way along an eight-foot long stacked cord. In other cases, it is a linear imperial measure of 12 inches **or** a volume measure if Hoppus feet. 1Hft = 0.036m^3	C		1, 19
Frock	R	1753 1765	*July 16[th]. For a frock 2"2"0 Recd ... in full 'JA' John Anthonies*	A frock coat, issued, seemingly, to denote position of authority		f F *froc* cf Med L *froccus* & OHG hroch	86
Furnace Sticks	R	1892	*Nov 17 E Powick cutting…100 furnace sticks £0-1-0.*	Sticks for firing a furnace, kindling		f OF *fornais* f L *fornus* oven	1, 19
Furs	F	1801	*10[th] March for plantin the Beech in y[e] wood etc. and furs upon the Waste Land & fencin in y[e] same £2-10-0.*	Furs in this context are conifers, 50 Larch	C D		19
Gappin Gapin	O	1774	*P[d]. Will[m]. Atheridge for five Days A gaping at Shapgrove £0..5..0*	Gapping-up, infilling a (hedge)	C	Gap ON = chasm	1, 24
Gettin up	O	1806	*Getting up oke plants* (*quick* 1812)	Lifting seedlings or saplings to transplant			19
Getting it together	R	1807	*30[th] Sept 16 Cords of wood To Getting it together 6[d] per C[d] 0..8..0.*	Gathering/stacking into cords			19
Glatting	O	1813-1818	*Glatting the hedge.*	Gapping-up the hedge. A *Glat* is a gap in a hedge	C	W Eng	2, 19
Ground, Young	R	1835	*500 of Hoppouls for young Ground 1..0..0*	Was this a recently created hop field?			19
Gubbins	F	1845	*40 foot of Gubbins @ 2ſ per foot 4..0..0.*	Short sections of oak trunk for coopers to cleave into staves for barrels and buckets. Elsewhere Gubbins are any kind of fragments	C	OF *gobbe,* gobet, a mouthful	1, 2, 19
Gutrin, Guttering, Gutturin, Guttein	O	1762 1773	*July y[e] 24[th], P[d]. John Smith for 16 days Gutturin in the wood Bottom 0..16..0, P[d]. Tho[s]. Jones for 16 Days0..16..0*	They probably worked as a pair edging and bottoming, achieving several chains per day in this light soil, making/cleaning open drains in the woodland, possibly now where the pools are. 'Gutter', a fast-flowing stream or a woodland drain, as a term, still in use in the New Forest, viz: Jacob's Garn Gutter		OF *gutiere* L *gutta*	1, 2, 19
Halling Hawling	F	1805	*To Halling Timber To Sawpit for Hanbury for Railes &c. 0..15..0.*	Hauling (conveying) wood produce usually by horse or oxen and cart, pole-wagon, sled, timber bob or carriage but with a looser meaning including ground-skidding; that is to draw, pull, drag, tug or tush	C	Hall M16 variety of Hale OE geholian; Haul 1. OF *haler* f OHG *halon* G *holon* (fetch)	1, 19 87
Hard (Faggots)	O	1757/8 1771	*Payd for the Making of 16700 of hard (faggots) at 12 pence p[r]. C 8=07=0 Deliverd to Owner Reboles 9000 of hard faggots @ 5[s] p hun[dred] 22-10-0.*	Harden means aired in Salop (& so in Worcs)			2, 83
Hard Wood	R	1699 1700	*Shides of hard wood at 12d per thousand.*	Hardwood is from broadleved trees, not conifer These are probably Oak Shides or hart laths **or** less likely, Hard (Faggots)			1, 19 19
Hart Lath	F	1767 1773 1843	*Sold to M[r] R Jones 100 Hart Lath ..5..6.*	Split/cleft Oak heartwood for house walls etc., superior in durability to Sap Laths q.v.	C		19
Have	R	1767	*June ye 18 payd for three Bushil & halef of have and the Carridg 0..5..0.*	Hav, Haver = Oats for horses	C	ON *hafre*	2, 20
Hedgin(g) Hegin	F	1807	*20[th] Dec[r] P[d] John Taylor for Hedgin & Ditchin 7 pirk & [1]/2 of Wood Close Hedge @ 8[s] per pirke 0..5..0.*	Hedging is laying, Pleaching or Plashing. It is believed that each bind was dead hedged until about 1800, after which the woodland edge hedge was maintained regularly (until 1920?)	C		10, 81
Hipper	R	1889	6[th] Dec, Blacksmith: *new ironwork to Hipper 2/-.*	An agricultural tool with discs to make ridges, like a disc plough		LME Hipe: throw in a particular way	1

Hogshead hogsH	R	1811	*6bnBarrelsmartHoops 6bnKilderkin 2bn Punchin 7bnPipe 2bnHogsH 10bnFirkin*	A large cask of $52^1/_2$ Imperial gallons (94 litres)	C	etym dub	19, 81
Hoop	R	1811	*Pd. R Thomas for Hop Shavin [hoop shaving] in wood*	hoops to barrels	C		14, 19
Hoops, Hazles for	R	1810	*859 Hazles for Hoops @ 8ſ per h.^{d} 3..8..0.*	Hazel rods for splitting or shaving to make hoops to bind barrels		Hoop[1] 1. OE hóp	1
Hoppo(u)l(e)s , Hop Pol(e)s	D	1760-1850	*Pay^d. John Smith for Falling and Cutting out 2000, of Hoppols at 6^d. per hun^d. of o^c..10^s..0^d*	Poles sold specifically for hops to grow up. Sold by size/quality as 5s, 6s, 7s, 8s, 10s [and 12s for ash poles]	C		15, 19, 84
Hops	R	1814	*To a Bill for Cloth & Hop^s ~~21..17..8~~.* (deleted)	Or are these hoops for a dress? Made from hazel?		Hop[1] 1.	1
Hopstix	O	1835	*1000 of Hopstix.*	Hop sticks, the same as or smaller than hop poles?Stick 12.		OE *sticca*	1, 19
Ivey	R	1740	*Oct. 6. By (John Anthonies) for cutting the Ivey off the trees 2"10"0*	Most likely from the (oak) standards, the coppicing cycle prob too short to allow much ivy		OE *ifig*	84
Jams	R	1846	*M^r J Cooke 2 Door Jams 0..6..9.*	Jamb		F *jambe*, leg	1
Keeper, The	R	1739	*Dec^r. 31. By The Keeper A years Board Wages due 30 Nov^r. 13"0"0*	Gamekeeper John Anthonies		Keep[1] Late OE *cépan*+er	84
Kidbands, Kidbonds	A	1809	*900. of Kidbands @ 2^d. per h^d. 0..1..6.*	Split rods for binding faggots, usually of Hazel or Willow, hence 'withes' elsewhere but Lime may well have been used here. A Kid is a faggot	C	To kid, kydd is 'to bind up'	2, 6, 19
Kidneybanestix	O	1841	*Thomas Jones Juners (Junior) Day Work &^{c} 1 B^n of Kidneybanestix .. ..3.*	Kidney Bean Sticks; similar to peasticks			19
Kids		1700		Faggots, bundles of brushwood for fuel			6
Kill	R	1770	*June y^e 18 p.^{d} George Folley for y^e halling of 500 of Brick for the kill at Kookthrum 0..2..6*	Hop kiln at Wood Farm	C		2
Kill Rods	R	1799	*Rec^d of M^r. Jacksons for 70 Kill Rods 0^c-6^s-0^d.*	For hop drying. *Kill rods* is also a term for a tripod for drying other crops	C	*Kill,* Kil/kiln, to dry. OE *cylene*	1, 20
Kills	O	1809	*26th Feb^y P.^{d} M^r Bromley for a Load of Lime for the Culvitts in wood & worke at Kills &.^{c}.*	Note more than one (hop) kiln			
Kokes Kooks	R	1771 1753	For 12 Cupel and a halef of kooks 0"8"4	Woodcocks, kinds of game birds related to Snipe			86
Ladder poles Latherpo(u)ls	F	1799-1850	*Recvd. Of Mr Lett of Shrawley for 2 ladder poles*	Pairs of or one very straight, knot free pole, probably of Ash, made into a ladder by sawing or cleaving exactly in half to make an identical pair of ladder sides. Once the rungs are inserted, the finished article is termed a 'pole-ladder'	C		19
Landing Places	R	1811	*repairin road to landin place*	most likely at the Weir Inn but may have been at Dick Brook		Land 2 OE	19
Lap(p)s	A	1843	*555 B^n of Laps at 1^d per B^n 2..6..3.*	The same as Lops q.v. Technically lopping is the cutting of laps	C		6
Larch Fur	O	1845	*Paid M^s A Wood & Co For Larch Furs as per bill 2.;.10..0.*	This is likely to have been for 2000 transplants	D		
Lath Cleaver	F	1847	*Paid John Tylor Lath Cleaver For Cleaving Lath as per Bill 7..3..1 .*	3ft long straight grained oak, cleft to 1-2 inch planks then cleft again to ¼ inch laths	C		
Lath, sap Lath, heart	F	1760-1850	*300 hart lath @ 5/-* *100 sap lath*	Heart lath is more durable so worth more	C		19
Lathhooks	R	1847	*Sept 1st Paid Joseph Smith Nailer For Nails and Lathhooks as per Bill 1..0..10.*	type of nail for ceiling laths			19
Laced	R	1836	*Aug 16 Paid Calder of marking* *30 gates at 2/6 £3 15 0d* *2 do do double laced £0 6 0d*	Two cross-ties			95
Leases	R	1841	*Mr Piper 5 Bord and Leases for a Gate ..10..*	'Leases' are prob the diagonal brace rails. The two vertical ends are 'stiles'		Lease[2] 1. To pick-up	4
Leasow, Lesow	R	1773	*Recd. Of Mr Beach for the Hors Leasow Coppice £3.0.0*	Meadow. This coppice was between the north border of Shrawley Wood and Dick Brook	E T	Lesow. Pasture-ground, W Eng	2
Leasyng, Leasing	R	1570	*falling and cutting of trees out of their* (Shrawley) *wood and leasing of the Whittards*	To lease is to glean or 'strip', hence peeling to obtain the bark. cf 'releasing'		Leasing (2), Gleaning (1)	1, 2
Lev(e)y	F	1818 1840	*Rev. J. Vernon Road Levey for Wood £3-16-6.*	Various charges on Shrawley Wood A parish levy on landowners for public road maintenance	C		1, 19, 88
Lime (Mineral)	F	1849	*Paid Tho^s Rea To $^1/_2$ Load Lime as per Bill 0..10..0.*	Prob lime for mortar	D	Lime[1] 2	1, 87
Linetree Pols	R	1848	*M^s Humphris 48 linetree pols 2..0..0.*	Lime tree poles, Tilia cordata, the dominant tree species in Shrawley Wood, mostly underwood. They are 10 times the price of hop poles at this time and the price of 3.3 cords of cordwood. Surely, they must have been double grown, at least. Such trees could have yielded bast q.v. & would have flowered and fruited (>27 years)		Lime[3] *lind*	1, 6
Load(s) Lode	F	1781	*...five hundred Loads of Charcoal yearly... M^r. Houseman For A Load of Wood 1..15..0*	Prob a cart load for wood, for charcoal a load was twelve of one cwt sacks.	C R		84
Loding	R	1847	*Paid John Eaton $1^1/_2$ Loads of Lime 7..10..0* (mineral) *Turnpikes and Loding ..3..*	Loading		Load[2]	1

Long Burch/Oke		1764-1807	*Resed of Joseph Smith for 100 & quarter of long oke £0..10..0.*	Long oak typically bought along with hop poles, so maybe oak hop poles.	C		
Lop(p)s	F	1806 1810	*40. Thrave & 20. Burdins of Lops @ 8/6 per thrave 17..4..11$^{1}/_{2}$.*	Elsewhere small branchwood lopped by axe from tree stems, faggot-wood. Gathered & bound into faggots or burdins and sold by the thrave but in Shrawley lops and laps were always related to hedging q.v. and not bound into faggots but brought to the hedges with the hetherings	C		6
Lot	R	1812	*P^{d}. Them over in the Lot 1..0..0 (Wm Jones & Co).*	This seems to be an extra payment or payment in the woodland lot			19
Lugging	O	c.1890	*Allan Medlicott lugging (everything)*	Extracting produce from the Wood	D	Lug[3] 1. cf Sw lugga LME (pull forelock)	1, 6, 49
Luggs	O	1737-1758	Reced. of John Anthonies for a parcel of Luggs 1"17"0	Poles, long sticks or spar gads (2' long pliable Hazel rods pointed at both ends and doubled for securing thatch)			1, 2, 6 84 81
Made Waste	R	1538	*William Paytwen made waste in the Lord's Wood and was fined 8d.*	In this context, probably felling an area of the woodland without permission			19
Maiden Oaks	O	1760 1778	*250 Maiden Oaks for sale.*	Standard trees grown from seed, not from stored coppice			6
Markin		1780	*To Markin Wood 0-2-6*	Prob marking in a bind, the overstorey to be thinned		OE *mearcian*	1
Marking Bind	O	1847	*Paid Thomas Greaves 1$^{1}/_{2}$^{lb} Red Paint for marking the fall Bind ..1..*		C	Mark[2] 1.	1
Math	R	1719	*Little Meadow containing five days math; Lowe Meadow containing 6 days math (timber excepted)*	Math is standing pasture		Math, the amount of a crop mowed OE *mæth*, mow	2, 49, 79
Mudding	R	1841	*John Andley 3 days mudding a pool 6/-.*	Treading clay mud in a drained pool bottom to seal it			19
Nailer	O	1810	*M.^{r} Smith Nailer for one Cord of wood @ 14f per C^{d} 0..14..0..*	A nail dealer/user			2
Nett	R	1840	*Tho^{s} Wasbourne a new Gutter Nett for the Pools £1-15-0 No Bills.*	Likely a net to catch leaves and twigs			19
Offal Wood	R	1779	*The Chats and Offal Wood which has usually been reserved to the Poor of the Parish of Shrawley is reserved out of this present Sale by the Vendor.*	Dead wood? Material probably smaller than cordwood?	C	Inferior wood = 'off-fall', what falls off	1, 6, 90
Oler, Oller	O	1758-1775	*falling & peeling 1200 Oler Poules*	Alder			19
Orle	O	1799	*P.^{d} John Smith for 11 Days fallin Burch & orle.*	Alder		Orl, west Eng.	2
Oven	R	1838	*Oven, fream and Dore.*	Relates to installing probably a cast-iron oven, frame and door in an estate cottage			19
Overseer	O	1770	*Pd. Edmd Amyes overseer for poors rate for Shrawley Wood*	Overseer of the Poor			82
Oziers, Lot of	R	1845	*Tho^{s} Wasband lot of Oziers ..5..*	Osiers. He was the village basket-maker who also made and mended nets	C		19
Pailin	R	1758	*Mar ye 8 pd Edward Smith for halling the timber for the pailin 0-4-6*	Hauling, extracting timber for a paling fence			
Pair of Wheels	R	1844	*Thomas Greaves for making a pair of wheels for drawing timber*		C		
Pales	R	1805	*Pd. Edw Willits for squarin & sawin railes & pales for wood fence by Cockpit Orchard*	Pales are the upright members of a wooden fence usually made from cleft Oak			6, 19
Pannage		1412	See takk porc				
Parcell(s)	R	1737/8	*Tho Tolley a parcel of Wood 0"6"0*	Undefined collection of wood products. This word is still in use when timber is offered for sale			6, 81
Parting (the) Bind or Fall	F	1765	*Payd the wood men for parting the Fall Cald By one of the Thrifes 0 5 0*	Dividing that year's Bind or Fall amongst the woodmen, before coppicing begins			19
Perch, Pearch Peorch Perk(e), Pirk(e) Pircth	F	1760-1850	*making 41.5 perch of hedging round the Kings Hill Fall*	Perch, a rod, a pole **or** Perch, a statute measure of 5.5 yards (16.5') but varied locally between 18' and 24'	C	L *pertica*, a pole	1,2,6
Peasticks	F	1843	*8 B^{n} of Peasticks 2^{d} (0)..1..4.*	The finest twigs cut to support edible or sweet peas			15
Peel(e)d	O	1809	*10th. Dec^{r}. Rec^{ed}. of M^{r}. Green for 3 Cords of Peeled Whitturnes @ 65f per C^{d}. 9..15..0.*	Peeled (and shaped?) whitturne for cratemaking	C		6, 19
Peelers	R	1806	*23rd May P^{d}. to the Astley Barke peelers 1..5..0.*			Peel[3] 1	1, 2
Pellin	R	1773	*January 13 Pd for fellin & pellin 600 of Oler poles £0 7s 0d*	Peeling			108, 8
Perching	O	1893	*6th April, perching and stripping timber 3/-.*	A bill from Thomas Bunce, Sawyer. To set up on raised place, in this case on a wooden frame, prob beside the sawbench in the timber yard	D	M16, LME, OF *percher*	1
Piecein	O	1811	*30 June To John Cook for piecein the Trunk in Big pool head 0..6..0.*	Assembling (piecing together) the wooden parts of the conduit overflow. He was a carpenter	C P		19
Peeling Pieling	F	1699	*to cost in pieling making and carrying to Severnne.*	This was peeling Lime poles, producing bast for rope making	N		19, 53

Pikin(g)	O	1758 1760	*July ye 18 payd the wood men for pikin the Balardes whitturns 0-6-0 pd (the woodmen) for piking the Chaice Whitturnes 0 12 0*	Picking, selecting			19
Pimpels	R	1766	*June ye 18 payd the pikin of three Load of pimpels for Bunfeels 0 3 0*	Pimp is a very small faggot about 6" long and 3" thick, made for kindling, perhaps what remained from cleaving. Bunfeels was Bonefields Farm			6, 19
Pit(t)wood, Pit(t) Wood	R	1806	*Mr. Digery Dudley for .. 1 1/2 (cord) .. of Pitt wood @ 32/6d. per Cd. 2..8..9.*	Mining timber, 13' or 6' 6" lengths for props **or** sawn from Oak, Birch & Alder, made into chocks, lids & wedges to support workings. Thick birch and lime poles went for props	C		9, 10, 13
Pleachin(g)	F	1808	*22nd Decr. Pd John Bunts for pleachin 20 pirke of the wood hedge@ 8d per Pirke 0..13..4*	Cutting and laying a hedge **or** platting the top of a laid hedge with Etherings q.v. to make it stockproof	C	Pleach, entwine (ME *pleche*)	1, 6, 14, 16
Pleck	O	1781	*January 10th., To 400 of Ash, To Ash in the Pleck at 4f per hund. 0..16..0 Pd. Edwd. Powick for 4 days Setting Ash Do. 0..4..0*	Pleck, a small plot of ground, Warw, Wo		ME *Plek,* LG prob OE	2, 3, 23, 49, 67
Pleck	O	1839	*Wm Jones for Falling the Forge and Pleck Ashbeds*				
Plek	R	1765	*Soud two Mr Eddertes one plek of wood for the use of the Cheney Cumpaney for two pound & two Shiling 2.2.0*	Prob a standing sale of part of a Bind.			101
Poles, Poules, Powels	D	1700-1900	*8th Augst To Halling 500 & ¾ of Ash poles @ 3f per hd 0..15..9.*	Poles derived from young, clean, slim coppice stems (not timber) 2nd & 3rd rotation poles (34 & 51 years old) < 6" Qtr Gth at breast height, 4'3''	C	OE *pál*, L *palus*, a stake	1, 19, 81
Pool Head	O	1811	*30 June Pd. to Wm. Boyard for Repairin the Big pool head 5..15..0.*	Dam at the head of the pool	C P		19
Poor(e)s Levy	F	1736/ 1812	37 *Jan. 8 Pd a poors Levy for Shrawley Wood 2"12"0 20th July To J. Robinson a Poores Levy 5..0..2. £s d*	Paid each year from the Wood Account to the Overseer of the Poor	C		85
Porc Takk		1412	*See takk porc*	Porc is pig		L *porcus*, a hog	1
Prentice	R	1816	*Joseph Bateman paid a premium for taking a Parish Prentice Bound to him 29 July last year £11..0..0*	This demonstrates the Estate's caring attitude, subsidising this apprenticeship		f OF *apprentis*, apprehend	1, 19
Prevent		1739	*Aug 15 By the wood Colliers to Drink, to prevent & halling ?eaves 0-5-0*			Arch: 'deal with'	1, 84 112
Privet Rate	R	1842	*August 9 Mr Edwd Amys A poors Rate made 26 July 9..12..( ) A privet Rate 3..4..0.*	Was this a secretly negotiated deal, paying only one third of the calculated amount?		Private 6 Prive	1, 2
Propes		1759	*July ye 9 pd Edward Smith for halling the Seills and propes to the Wood House*	Props for windows at the Wood House			101 195
Props, Mapul	R	1845	*Thos Wasband 4 mapul props (£0)..3..(0).*	Prob clothes props or props for netting. TW was the village basket maker and net mender		Prop[1]	1
Pudling	R	1850	*Thomas Jones & James Thomas To Pudling the Grove Pool Head* (q.v.)	To seal its base			1
Quarreys	R	1806	*10th Decr P.d Mr Creane of Bell Broughton for Quarreys for the Revd Mr Wharton 4..10..0.*	Probably Quariers, an old form of large square wax candles for use in the church			2, 4
Quarter	O	1782	*July ye 24 delivd to Mr Betmon one quarter of hoppoules 0-2-0*	25 poles		Quarter[1]	1, 19, 82
Quarter, Quartering	R	1848	*8feet 6in Oake Quartering at 4d per foot..2..10.*	Black Poles cleft into quarters? An upright timber in a partition			2
Quick	F	1811	*Paid Edw Gittins for 6 days digging for Hawthorn Quick &c*	Live plants for replanting	C	OE *cwicu*, life	2
Raisein	O	1805	*Pd. them for Raisein stone in the wood for repairin the Roades &c. 8, days 1..4..0.*	Digging (perhaps from the nearest quarry – there are several) and loading		Raise 4 ON *reisa,* rise[1]	1, 19
Rakestales	O	1804	*Joseph Bateman for 7 1/2 Dozen of Rakestales @ 1f6d per Doz 0..11..3.*	Most likely ash rods. Rake-stele, handle of a rake (2)		Stale n[1] 2 OE *stalu* a tool handle/shaft	2, 49
Rankin	F	1802- 1818	*10th Aug.t P.d John Bunts for Cuttin & Rankin 14 Cord & 6 foot of Cordwood @ 4f per Cd 2..19..0.*	Ranking, arranging, sorting out products		Obs F *ranc*	1
Relend	R	1770	*Epril ye 19 Resed of John Anthonies the contentes of this Bill … marke X of Thos Smith payd in Cash 8.7.5 Relend two wardes timber 3:14:10*	Lent towards timber			87
Rick	O	1811	*May 28th. To Halling Barke to Rick 2 1/2 Days 2..12..6.*	Probably by horse & cart to the Weir Inn quay to make it into a rick for air-drying before shipping to Thomas Baker	C	OE *hreac*	1, 19
Ricking Barke	O	1816	*20th June Pd David Rawlins for 3 Days. Worke Ricking Barke @ 3f p Day 0..9..0.*				19
Ricking Whitturnes	R	1736	*Pait the men for mending of roads and ricking of Whttn. &c*	Stacking			1, 81
Ridding	O	1738 1779	*June 2 Pd. The Workmen for ridding the Wood before the Timbr. fallers* *May 4th Payd The Wood Men for Ridding Under the Trees that was Fall'd this year 4..14..6.*	This describes a Coppice with Standards composition. This was the coppicing of the lime underwood ahead of thinning the overstorey. The Spring dates imply subsequent debarking for bast			19, 81 19, 81
Riding	R	1669	*for falling Riding and carrying to Severne at 4d the hund'= in all 52.0.0.*	Ridding is delimbing or clearing i.e. primary extraction to trackside			1, 53

Riding	O	1816	*Paid Tho^{s} Jones 2 (Days) Riding Ditch at Grove Pool 0..4..0.*	Clearing, to rid	P	ON *rydhja*	1
Ringers	O	1764	*The Ringer's Bill 1764. To Ringing on the Wedding Day 0:10:6*	One of the woodmen may have been captain of the bell ringers	B		19
Roades, Rodes, Rods	F	17601 812	*To Woodmen For Repairin Roads to Hall Bark 0..10..0.*	Roads, Rides, access routes within the woodland to ease management	C		
Roads, Windins	R	1765/6	*Windins Roades*	Winding rods = Etherings q.v			19
[Rods] Latin *Virg'*	R	1389	*Et de cl virg' vend' hoc anno =and for 300 [faggots] sold this year*	Virg could be bundles of sticks or rods: 300 sold "for the new barn at Salwarpe".			
Rods	R	1810 1811	*Rec^{d} of M^{r}. Evans for 300 of Rods for Whattlin @ 5f6 per h^{d}. 0..16..0*	Rigid rods for flexible windings?		Rod 1 OE *rodd*	redo
Roule	R	1835	*Mrs Sarah Powick timber for a new Roule (0)..19..6.*			OF *roule*, a wheel	4
Rounding	F	1811-1849	*Thomas Jones P^{d} (for)Buttin Toppin and Rounding 39 (*Oak*) Trees at 1/6*	Trimming or lopping branches	C		19
Rownds	R	1832	*2 Ladder poles & Rownds*	Rounds of a ladder, rungs, probably ash		Round[2] 1. f F *rond* L *rotundus*	19
Runnall Whitturns	R	1817	*4/4/1817 paid John Thomas for falling 24 Runnale Whitturnes @ 1/6 a tree £1_16_0*	Rundel, a hollow pollard tree of about 18 years (regrowth); Runnel, a hollow pollard tree, W Eng Rundle, a pollard tree dialectal, late 17th cent. For an ancient woodland, there are very few old limes in Shrawley Wood and even fewer lime pollards. This entry suggests they were intentionally removed			2, 6, 50 49
subboscis sbbosci		1411 /12	*Vend sbbosci in le field in le Oldeparke hoc anno p visa Ric Lygon Sen xxx^{s}.*	Underwood			99 P1-11
S(e)ate Rods	R	1843	*Sold to M^{r} T Hickman 60 B^{n} of Seate Rods Small nut Twigs for handles of tools 4..10..0.*	Set Rods, in this case long rods twisted like thatching spars but to hold 'sets' or cold chisels for hammering by a blacksmith without the hand being concussed. The second item are small pieces of hazel suitable for tool handles. Was Mr Hickman a blacksmith?			19
Sache	R	1562	*No one shall sache any wood within Shrawley Wood…*	To sack, to plunder		M16 v[2]t f L *saccus*	2, 4, 49
Sall(e)y Po(u)les Salley butts	O	1759-1836	*Richard Norrise Esq^{r}. For 1500 Salley Poles at 8f 6-0-0*	Sallow, goat willow, *Salix caprea*		Sallow[1], willow (OE *sealh*)	1, 19
Salley Seats Sally Setts	O	1736	*Pd. Workmen for Salley Seats 3'12"0*	Cutting and or planting rootless setts of sallow			
Saplinns, Saplins	R	1770 1809	*To 6 Saplin Cutts @ 2^{d}. 0..1..0.*	Saplings, 'young trees under six inches in diameter at four feet from the ground'. Not coppice, so perhaps Birch or Oak			6
Sashis	R	1763	*Payd M^{r} Jones for Caring The timber Down Two Worcester for the Sashis*	Probably oak to make sash windows		Sash[2]	1
Sawpit(t)	O	1805	*July 10th. To Halling Timber to Sawpitt for J. Phillips Esq. & M^{r}. Morton 0..7..6.*	There was a sawpit at the Timber Yard but temporary sawpits were dug in the wood.	C	Saw[1] 3	1, 87
Scantling	R	1848	*W^{m} Cound Oake Scantling 0..3..0.*	A small beam under 5" in breadth and depth		OF *escantillon*, etymilogically dubious	1
Scuffling	O	1895	*A Medlicott Sep 16 Scuffling for J Taylor 1* (day) *2/4.*	Weeding between rows of prob turnips with prob a horse-drawn scuffler, a sort of plough but with an arrow-heaeded share	D	Lincs	2
Sealing Gice	R	1835	*Sam^{l}. Steel 13 Sealing Gice (0)..3..3.*	Ceiling Joists. At only 3d each these are likely to have been poles			19
Sets, Seates, Willow Seats Salley	F	1770 1809	*P^{d}. (the woodmen) for Cuttin out 600 of Willow seates @ 4^{d}. per h^{d}. 0..4..0.*	Setts, rooted or unrooted cuttings of most often Willow or Poplar for planting out			6
Seges	R	1759	*July ye 2 2 men for 2 Days Cuting Seges Beetween the Sallees 0 4 0*	Cutting sedges clear of young sallow growth		OE *secg*	
Seills		1759	*July ye 9 pd Edward Smith for halling the Seills and propes to the Wood House*	Phonetic spelling of cills			101 195
Seting, Settin	F	1750-1850	*Seting seates in the Bottom*	Setting, planting setts, prob alder, poplar or willow, a rootless cutting			6, 81
Setterup	R	1778	*Payd The Carriers & Setterup Mary Jones 4$^{1}/_{2}$ Days 0..2..3.*	MJ was upending the bark and piling it to dry out		Setter-up 3	4
Shares	R	1802	*7000 of poles in Shares with W^{m}. Holloway & Phil^{p}. Jones @ 8^{d} 2-6-8.*			Share[1], a portion	1
Shavein (Burche)	R	1807	*fallin wood shavin burch wood &c*	Shaving, peeling bark (from Birch) poles			6
Shavin	R	1811	*May To R, Thomas for Hop-Shavin as p^{r}. Bill 15..14..8.*	Hoop shaving by the visiting hooper		Shave[1] 2.OE *sc(e)afan*	1
Shid(e)wood Shibwood	F	1758-1807	*1758 July ye 8 pd Edward Atheridg for the teeling of last years wood 57 For 5000 of Shidwood 0-2-6 The Great Wenlis Bind*	In Worcs 1649: a pole 7½ feet long by 12 inches around, every 100 equals 1 ton'; a plank, a block, a split of wood	C	OE *sćīd*	49 2, 55
Shide(s)	O	1699	*shides of hard wood may have 13000 by which six parts have yearly 78000*	Probably the unit of timber volume prior to Hoppus, half a cubic foot	C	OE *sćīd*, 0.5Ft^{3}	49, 53

Sixpeny Clasp	R	1849	*Paid Charles Smith For Nails 500 Sixpeny Clasp 6^{d} 0..2..6, 500 Duble Tens at 10^{d} 0..4..2, 12^{lb} Eightpeny at 3^{d} 0..4..2, 19^{lb} Duble tens 2$^{1}/_{2}$0..3..9$^{1}/_{2}$ 0..13..5$^{1}/_{2}$.*	Named by the cost per 100			
Slab	R	1847	*Thomas greaves 3 Oake tops and Slab (£0)..3..6.*	Prob 'Slob', a torn bough from a tree			6
Slated	Rr	1780	*Feb.^{y} 5 (Account) Examined Slated & allowed by Tho Cook, Steward £138..16..1$^{1}/_{2}$.*	Slated, reviewed		Slated [2] 1.	109
Slips	R	1780	*The Great Rochpole (March) y^{e} 29th, P^{d}. for Mending two Slips, By y^{e} Brook Side And Planting, some Witthes in It 0..5..0.*	Bank fall in Dick Brook			19
Small Ropes	R	1699	*Of the small Ropes at the same price 9 Load* (81.0.0)	Made from Lime Bast	N		19
Smallwood, Small Wood	R	1773	*Rec^{d} of M^{rs} Redin for small wood that Groud one the Comin 0..7..6.*	Small diameter roundwood			19
Sneadin	R	1807 only	*April 2nd P^{d} Rich^{d} Griffiths for 10 Days & half sneadin Burch Shavein &^{c} 1..1..0.*	Sned, to lop a felled tree		N Eng, Scot OE snaedan, to prune, to trim	2, 20, 24
Soil Out of Bottom		1816	*P^{d}. W^{m}. Boyard for Getting 100 Yards of Soil out of Bottom @ 1f per Yard 5..0..0.*	Prob Yd^{3}, so at 0.765m^{3} = 76.5m^{3}			19
Spike	R	1838	*Paid Bd. Of Chance, Nailer for 6lbs spikes*	Heavy nails			1
Spouting	R	1846	*paid M^{s} F Right Stourport For Red Deals for spouting for the Wood Farm 1..1..0.*	This is Messrs F Wright		Spout 2.	1
Squar(e)in, Square in	O	1805-1808	*P^{d}. Edw^{d}. Willits for squarein & sawin Railes & pales for y^{e} wood fence*	Squaring			6
Squar(e)in, Square in	R	1808	*Squarin barke off Burch.*	Phillip, Wm & Thos Jones were paid 6/- each for 3 days			
Stable Besoms	O	1816	*P^{d}. (John Cooke) for Makeing 2 days of Stable Besoms 6/-.*	Birch besoms are ideal for sweeping uneven Surfaces	C		19
Stadle	O	1816	*21st. June to Haf a Day with Team Halling timber and stone for Rick Stadle 0..10..6.*	For a bark rick beside R. Severn	C	prov Eng or obs OE *stapol*	4, 49
Stake Lenths	R	1800	*M^{r} Jacksons for 37 Stake Lenths at 1$^{d1}/_{2}$ 0..4..7$^{1}/_{2}$.*	Probably 5' 6" oak stock fence stake blanks, to be pointed			19
Stakeing	R	1815	*Stakeing Olor*	Staking Alder when planting, so large saplings or setts were being used			19
Stakes	O	1814	*300 & $^{1}/_{4}$ of Stakes @ 1f per hd 0..3..3.*	At less than a twelfth the cost of the preceding stakes, these are inferior in some way, probably thinner and not oak, so no heartwood		OE *staca*	1, 19
Stakewood	O	1807	*To 7 Cord & half of Stakewood @ 4f per C^{d} 0..6..0.*	Blanks of timber or poles, probably oak, suitable to be made into fencing stakes			10, 19
Statute Mesure Stattit Mesure	O	1848	*Knight & C^{o} The Old Cordwood 12^{Cord} 7$^{1}/_{2}$ feet Statute Mesure at 19^{s} per Cord 12..5..9$^{1}/_{2}$.*	Yardwood was 3ft long so cord prices were multiplied by ¾ to get statue measure (4ft long cordwood)	C		1
Steales	O	1845	*Tho^{s} Hickman 700 of Shuvel Steales 2..1..400 hammer Steales ..9..'*	'Steal, the handle of several agricultutal implements', probably of ash or birch. Perhaps Mr Hickman was a blacksmith		Steal[1] 4.OE *stela* f Gmc	2, 19, 49
Stews	O	1850	*To Big Pool and too Stews in the Grove as Recept & Contract £26-10-0.*	A Stew-pond preserves fish for the table (in this case Wood House) to be drained and filled again.	P	ME OF *estui*	2, 49, 66
Stiles	R	1815	*repairing the wood stile*			OE *stigel* (climb)	1
Stix Stiks	O	1836	*8 of Stiks at 3d ea £0-2-0*	(Bean) sticks, very thin rods, often of Hazel			19
Stocking	R	1814	*24th April W^{m}. Jones & Tho^{s} Jones For Stocking ..1100 hawthorn & quick..& Making a New Hedge Down by the Borders & Outwards Falls 23 Perke $^{1}/_{2}$ @ 3 f per Pirke (No, 3..10..6) 3..13..6*	i.e. planting			19
Stocking Stubs	O	1839	*Tho^{s} Jones Acount of Work for Stocking Stubs for 2 New Rods in the wood £1-0-0*	Is one of these two the creation of the new straight track to the Wyre Inn?	C	OE *stocc*	1[1], 19
Stocking Up	O	1841 1842	*For Stocking up a further part of the Riding Rode 2..0..0*	Grubbing out stools or stumps. Is this a road for horse riding or a road to the Ridding Bridge?	C		6
Stokin the Roak	R	1770	*feb^{y} y^{e} 17 John Crane 2 Dayes a Stokin the Roak and windin the Road for Stuff to Cover the Bridge 0"3"0*	Prob destumping the oak in the new road line for the bridge and clearance of 'winders', small stone on the Roadline to fill the bridge abutments made from the 32 tons of larger quarried sandstone		Rock, H&W ME +OE *atter āc*, becomes 'at the Roak'	25, 87
Stub Wood	A	1760-1805	*Pd two men for falling the stubwood and for cuting out the poules.* *The Whole of the Hop Poles to be cut close to the Stubs*	Wood from coppice stools,	C		6, 19
Stuf(f)	F	1774 1843	*13 B^{n} of Thathing stuf at 1/3 £0.16.3*	Usually refers to minor woodland produce, but in this case, prob thatching spars, gads or slender twigs such as from birch	C	Stuff 1 (OE *estoffe*)	6

Takk porc'	R	1412	*Apr 16 Vend bosc. xxxd; takk porc' custom xjd; le field in le Oldepark*	Sale of wood 30d; customary pannage 11d; the field in the Old Park, envisaged as Wood Pasture with widely spaced oak trees, so triple land use: trees, pannage and cattle pasture		ME, ON *tak,* a fee charged for the right to keep swine, f L *taccum* Tæk/Tak was pasturage in Sa, Gl, He, Wo, Mon, Wa	70 16, 24
Tanyard	O	1812	*To expenses Rick, Weighin at the Tanyard 0..3..6.*	Bark taken by boat on the R. Severn to the Rogers Tanyard, weighed and piled into a Rick	C	Tan F prob f Celt, cf Bret *tann*, oak	1, 19
Tar Pottes	R	1847	*August 26 Paid M^r^ Baldwin Stourport 27 G^l^..* (gallons) *Gass tar Pottes Brushes Barrel and Carrege No Bill 1..9..1.*	Gas Tar, (coal tar) a forerunner of creosote to preserve external woodwork. The barrel, on deposit, was returned later.	C	Tar[1] 1.OE *teoru* cogn w 'tree'	1
Team Halling Team Work Teem Drawing	A	1812	*half day with team halling timber and stone for rick stadle*	A team of horses used to haul produce, most often timber	C	Team 1. OE *téam* cogn w L *ducere* to lead	1
Teasing	R	1570	*And teasing of the Whyttards*	Pulling apart fibres with a tool (unretted bast?) but may just be peeling lime poles or a misspelling for 'Leasyng'? q.v.			4
Teeling tealing Telin Tilin Telein Telling	A	1708-1815	*Due to Edward Atheridg for the teeling of the Last years wood*	Keeping/reporting the tally	A C		
Tenpeny		1836	*300 of Tenpeny – p 100 £0-2-6*	Nails, costing 10d per 100			1, 19
Tenyerwood	R	1699 1700	*Of Rods and Twigs… and of Tenyerwood 3-0-0*	Ten-year-old coppice growth cut for use as rods and branchwood	N		19
Thath Bilding	R	1848	*Paid James Ettridge For repairing Thath Bilding at Timber Yard 0..2..0.*	Thatched Building			19
Thathing	F	1843	*11 B^n^ of Thathing stuff 3^d^ (0)..2..9.*	Thatching	C		19
Thraves (of Lops)	A	1812	*37 thraves 3 burdins of lops @ 1/- per thrave £3.14.5* [therefore 1d per burdin with 24 burdins = 1 thrave]	Thrave; generally, a Bundle, handful **or** one or two dozen **or** an indefinite number (same as Threave) but at Shrawley a thrave was 24 Burdens, enough for six days of Hedging. But elsewhere 12 burdins = 1 thrave or a higher number	C	ME *thrave, threve*	2, 4, 19
Three Sticks/Stikes	O	1775 1780	*Rec^d^. of Mr Green Wribenall for 200 of Three Sticks @ 8f £0-16-0.*	Component in cratemeaking	C	Stick[12] OE *sticca*	1 19
Thrift	R	1766	*march ye 28 payd two peepel for goin two hanbray with trees and thrift 0.2.0*	Two people to Hanbury qv with young transplant trees in damp soil in a box		'An earthen box'	2, 86
Through, n.	R	1770	*January ye 17^th^. 1770 payd William Wormington for two Days a cutting a Through at the new Bridge 0..2..0.*	A conduit or culvert (pron 'thruff' in N Eng)		OE *Þruh*	23
Thumb latch	O	1847	*a pare inges [pair of hinges] & thumb latch*	Door closure		Thumb 2. Thumb-latch	1
Tie(d), Tiein		1771	*Received of M^r^. Mattox for 1000 tie Whitturnes 3-0-0*	Mattox was a cratemaker. (three farthings each, ¾ of a penny)	C	Tie = tiedTie[1], to fasten	1, 19
Timber Dog	R	1889	*2^nd^ Sept, Blacksmith, New timber dog 9d.*	A short iron bar with up-turned spikes at each end for joining Timber		OF *docga*	1
Timber House	R	1840	*Mr W^m^ Cooke 2 Thrave of Straw for Timber House £1-4-0.*	Was this for air-drying timber at the Timber Yard?			19
Timber Yard	O	1848	*repairing thath building at timber yard*		E		
Top Timber	A	1768-1850	*Resed of M^r^ Luis for top timber for possis 2-5-0.*	'Timber' from boughs in the crown	C		19
Top(p)in(g)	A	1800-1850	*buttin & toppin 60 trees*	Removing a tree's top after felling and trimming, 'Lopping & Topping'. Also, the dressing off of the top of a timber length	C		6, 19
Touchwood	R	1840	*In the progress of decay, the ash tree is converted into touchwood, which formerly consttuted the principal part of the yellow powder which the beaux of the last century used in their hair.*	Pale, soft crumbly remains of wood decayed by Polyporus squamosus etc., used as tinder, it will burn for many hours once lit **or** Ash reduced to this yellow powder, used by 18^th^ century beaux on hair or wigs		ME f OF *tochier*	1, 56
Triming	A	1805-1818	*To 10. Days Triming up Okes 1..10..0*	Trimming, debranching, delimbing			6
Trouse	R	1778	*April 10.^th^ P.^d^ W.^m^ Atheridge & Jn^o^ Cook To Cutting & Carrieing Trouse.*	Trous, hedge trimmings, rubbish. Brushwood cuttings from a hedge or copse. N.B. Trounce is to trim a hedge Loppings from growing timber, dead branches used in hedging		OE *trus* per f ON *tros, cf dross* Trousse 2. ProvEng, F	2, 49 4
Trunk	O	1805	*puttin in a trunk, bolt, grate &c*	Every use of *trunk* in the Wood Books refers to the overflow gully for pool overflow	C	OF *tronc, L truncus*	1, 19
Tun	O	1765 1806	*To Halling Barke out of y^e^ wood to Severn 8 Tun 4c of Barke @ 6f p tun 2..9..6.*	Ton, a volume measure of timber, c. 40 solid feet, 50 Hoppus feet in Shrawley Wood, e.g.: *17 tuns 48 feet* = 898 h ft	C		6
Tushin	O	1769	*Tushing stone out of quarry*	Tushing was normally used for wood	E		87

Tushing Wheel	O	1889	*October 31 Sir Harry Vernon Bart To francis farmer for repairing tushing wheel 6(/-) Settled F Farmer X*	Wheels to lift the tree butt when tushing	E C	Tush, orig dial M19 orig unknown, to haul or drag, esp a log, along the ground with chains	2, 15, 49, 58, 59, 79
Twernes	R	1737	*March 23 Pd. (Ed. Etheridge,* Head Woodman*) for making 2 Dosen of Twernes 0 6 0*	Probably a hurdle. The important part is its 'Twist-turn' (which condenses to 'twern'). Twerne is found also elsewhere in a woodman's inventory of 1631^		Twynnen: twined, which is done in hurdle-making	2, 19, 73^, 75*
Twig(g)s		1699 1809	*of Rods and Twigs 3 0 0. 200.Thatchung Twiggs @ 3d. per.hd.*	Fine, slender branch tips thatching spars			6, 53
Two Sticks	R	1777	*300 of two sticks*	Presumably tied together to keep a thing up		Not found	19
Tywhitturns	R	1759	*July ye 23 Deliverd to Owner Rebouls 4000 of tywhitturns*	Component of crates			101 116
Underwood	A	1808	*6 Days Cuttin Underwood By Mr Whartons 0..12..0*	The understorey. Coppice poles, whether growing or cut.	C	ME	11, 19, 53
Underwoodin(g)	A	1813-1850	*Acount of underwoodin Fallin & Cutting as under*	Coppicing and preparing the various products in the wood from that (not the overstorey)	C	Before 1813 written as *falling underwood*	6, 19
Vend	R	1412	*Apr 16 Vend bosc. xxxd*	Wood sale 30d		L *venditio*	12
Wattle	O	1810	*cutting 45 of wattles*	rods or stakes interlaced with windings	C		
Weedes	R	1780	*June ye 20th, payd two men for cutin Weedes out of the Sallee seates 0-5-0.*	Probably woody weeds		OE *weod*	1
Weighen Weighin		1780	*June 17th. Pd. for weighen the Bark down at Severn 0-2-6*	Weighing		OE *wegan*, carry	1
Well Crib	R	1839	*Setting up Well Crib at Mr Preece's*	Probably connected to the following same well			19, 81
Well Curb	O	1839	*Oke tops for Well curb Do (Recd of James Rea?) 0..8..0*	To top the well wall or to make the whole structure, a 'curb'			19
Whattlin		1810	*29th Nov Mr Evans for 300 of Rods for Whattlin @ 5/6 p hd. 0"16"6*	Wattle (2), a hurdle **or** Wattle-And-Dab, a wall infill of clay & straw covered Hurdles, Warks. May refer to wattle fencing		OE *watul*, etym dub	109 14
Whiterney Whitturney	R	1700	*Each Bind 5000 faggots & Whiterney @ ~~4s 4d~~* (deleted) *108-16-00.*	Lime faggots			2, 19
Whititree Trees	R	1760	*Payd the carring of the Whititree Trees 0=1=0*	Carrying with the shot game from (Wyre Forest?) to (Hanbury Hall or to the Wood House?) cuttings of the very rare Whitty Pear or True Service Tree, *Sorbus domestica*?			87
Whittard, Whyttardes	F	1567 1699	*of Whittard Poles 16.0.0*	Lime poles, possibly stripped of bast	A C		19, 42, 50
Whittur(e)n(e)(y)(s) Whtts, Whtts. Any homophone	D	1600-1900	*Pd. the Wood Men for Falling & Peeling the Whitturnes 0..15..0* *Telein 6000 of whiturny 0 3 0*	Lime trees: (?) because of their white wood. Perhaps condensed from 'white-one'	A C D	per f W *pisgwydden,* lime	2, 13, 29, 61, 101 140
Whitturn Tops	F	1806	*Mr. Shinton for a Lot of Whittrn Tops 0..7..6.*	Branchwood from the top of whitturn poles. Mr Shinton ran the forge at Astley Forge Mill 1807-1811. The tops were probably used as kindling			19 66 19
Whitturn(s) Poles	O	1781	*Mr. Farmer, For 25 Whitturns, Poles at 2d. per Pole 0..4..2*	Larger than the hop poles he usually bought			
Whitturnes Rytters	R	1774	*Recd. of Mr. Jones for…100 of Whitturnes Rytters 1li..13s..4d*				
Whitturnes, Ricking	R	1736	*Pd. For mending roads and ricking of Whtts. etc 0"13"6*	Not a regular occurrence; this is most likely to have been to preserve them for selling in following years			19, 81
Whitturny Faggots	R	1757/8	*Payd the Woodmen for making 4400 & a half of Whitturny faggots att 8d. pr C 1=09=8*	Lime faggots			19, 83
Windens, Windin(s)	O	1565 1772	*Recd. of Mr. Barrow for…thatchin stuf And Windins 2li..0s..0d*	Supple hazel or ash binding rods for the top of wattle-work			2, 15
Windings Winding Walls	O	1817	*To Cutting 20 Bd. of Windings for Winding Walls at Sam Prices & Martin Jones @ 3d 0..5..0.*	Making wattle for walling			84 6, 19
Wittan Creatwood	R	1894	*June 28 E Powick with Allen cutting 6 cord of Wittan Creatwood £1 4 0d*	See cratewood			104 53
Witthes	R	1780	*Mending two slips by ye Brooke Side and planting some witthies in it*	Withies, Willow		OE *with the, withig*	
Woodman	A	1699	*The Woodmans account of the yearly Proffit of the underwood and Bast in Shrawley Wood*	Labourer with regular employment in the Wood		Wood 6. OE *Wudu* + man	1, 53
Wodeward	R	1403/4	*Ricus Lygon Wodeward*				99 p5
Woodward Woodkeeper	O		*[Warning notice 1801] THOMAS COOKE Woodward*	The Keeper of a wood, Head Woodman		OE	19, 49
Yard	O	1848	*repairing thath building at timber yard*	Timber Yard			
Yard Wood	F	1781	*Recd. of Mrs.Clare for the use of John Knight Esqr.For 102 Cord & 5 Foot of Yd. Wood is 76c 7ft @ 14/6£55..16..0*	Wood billets 3 foot long for charcoal burning			19

Yarn Pouls Yarn Poles.	O	1836-1839	*John Wright Stourport 100 of Yarn pouls £1..0..0.*	Possibly peeled poles specifically connected with carpet manufacture at Kidderminster, q.v. hung horizontally and from which yarn was suspended to dry or doubtfully lime poles to peel to obtain bast, q.v. for yarn making.		Yarn, the individual strand of a cord or rope	1, 19, 42
Young Ground	R	1835	*500 hoppoles for young ground*				
Zinc Troughing	R	1845	*Paid John Smith For Making zinc Troughing as per Bill 1..6..0.*	Livestock drinking troughs. (Zinc plating was invented in 1800)		Zinc 1	1

Abbreviations, mainly in Derivations

abbrev: abbreviation [[AF: Anglo-French [[AL: Anglo-Latin [[agric: agricultural [[AN: Anglo-Norman [[Arch: Archaic [[AS: Anglo-Saxon [[Bret: Breton [[Celt: Celtic [[cf: compare [[cogn: cognate [[comm: common [[Dec: December [[dial: dialect/ dialectal [[Du: Dutch [[E Eng: East England [[E16: Early that century [[etym dub: etymologically dubious [[f: from [[F: French [[Gaul: Gaulish [[G: German [[Gk: Greek [[Gl: Gloucestershire [[Gmc: Germanic [[He: Herefordshire [[inc: including [[L: Latin [[Lanc: Lancashire [[LG: Low German [[Lincs: Lincolnshire [[Lith: Lithuanian [[LL: Late Latin [[LME: Late Middle English [[M16: Mid 16th century [[MD: Middle Dutch [[ME: Middle English [[Med L: Mediaeval Latin[[Mon: Monmouthshire [[n: noun [[N.B.: Note well [[N Eng: northern England [[obs: obsolete [[OE: Old English [[OF: Old French [[OHG: Old High German [[ON: Old Norse [[ONF: Old Northern French [[obs: obsolete [[orig: originally [[OTeut: Old Teutonic [[OW: Old Welsh [[Ox: Oxfordshire [[per: perhaps [[Pers. Comm.: Personal Communication [[prob: probably [[pron: pronunciation/pronounced [[prov Eng: provincial English [[q.v.: which see [[Sa, Salop: Shropshire[[Scand: Scandinavian [[sig: signify [[sing: singular [[Staffs: Staffordshire [[Sw: Sweden [[Teut: Teutonic [[Wa, Warw: Warwickshire [[w: with [[W: Welsh [[WB: the Wood Books [[W Eng: West England [[WG: West German [[W Mid: West Midlands [[Wo, Worcs.: Worcestershire [[Yorks: Yorkshire

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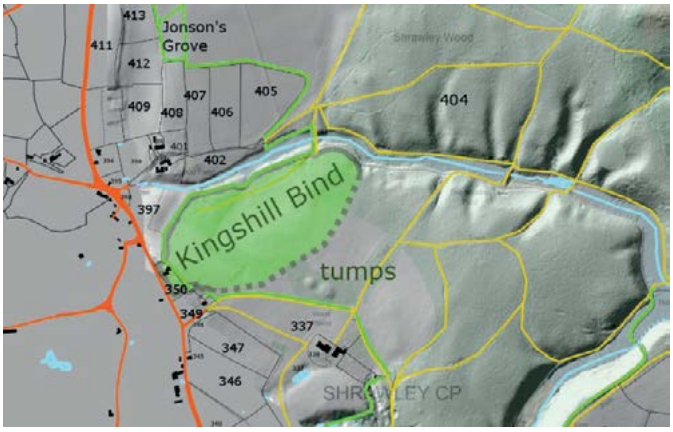
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Shrawley Wood 1700-1763

Richard Pumphrey

The year 1700 marks a turning point in the history of Shrawley and its Wood. Thomas Vernon had been thinking of buying the estate and had arranged for his cousin Richard to look into whether it might be a good investment. Cousin Richard's correspondence is reported in chapters Limewoods (pp. 61-4) and Early Modern (p. 141-2). The purchase went ahead in 1700; it comprised the Wood, some adjoining land, dwellings and St Mary's church, which was in poor repair with a fallen tower; reconstruction must have started soon after the purchase because we see in the Church Wardens Presentments:[1]

8 May 1705 Our church & steeple are now finished & in good repaire except the Battlements wch are speedily to be repaired
27 October 1705 Our church with the furniture thereunto belonging is in good Repairation our Steeple is rebuilt and our bells are Casting anew[a]



01. Area of "*15 acres more or less*" including the present Kingshill house, shown on the LiDAR Digital Terrain Model overlaid with a tracing of the 1839 tithe map.

We have an indenture[2] from 1705 agreeing the lease of one of these Shrawley properties at eight pounds a year to Joseph Hopkins, Weaver, his wife Elizabeth and daughter Elizabeth for 99 years if *any of them shall so long live*.[b] The lease was for an area of wood called Kingshill[c] Bind (01) *"containing 15 acres more or less"* and the dwelling built on it, but Thomas Vernon kept for himself *"all timber wood and trees with the crops and tops of the same"* leaving the possibility that Joseph Hopkins could have the underwood. The next time we have account of sales from Kingshill Bind is 1779 (chapter 1764-1850 p. 191). By then the Vernon Estate owned the whole bind which was listed as 21 acres 3 rods.

In 1708 Thomas Vernon put his cousin Richard to work again as his agent, tasked to improve the Wood's profitability by tightening up on the management of the Woodmen. Whatever had been going on before, Richard Vernon drew up an agreement[3] with the Woodmen early in 1708 to keep a tight rein on their activity in the Wood. This agreement was between him as Thomas's agent and eight Shrawley Parishioners (Richard Cooke, Edward Smith, John Atherage, William Sevearne, John Spragg, William Jones, Robert Marshall and Randle Severne) to work in the Wood and defines explicitly the work they should do. Firstly:

fall marke Binde faggott and Worke up All the underwood and what cropps and Tops of Trees shall be apointed to them to work up

To *fall* is to fell; *mark* may here be in the sense of count (see *in tale* below); *Binde faggott* is the tying up of the **faggots** which were bundles of the thinner branches, cut to a length that varied from place to place and time to time, between two and four foot long and tied up with a binding we later find called a *kidband*; kid was an alternative name for some types of faggot.

The **Underwood** was all the coppiced trees of various species and any maiden trees that had grown since the last cut. The coppice was predominantly Small-leaved Lime *Tilia cordata* but including a variety of other species such as birch *Betula pendula and B pubescens***,** rowan *Sorbus aucuaparia*, field maple *Acer campestre* and so on). Spaced out within the underwood were the timber trees, predominantly oak *Quercus robur, Q petrea* and hybrids between these two, but maybe other species such as birch allowed to grow for more than one cycle of coppicing. The **crop** of these timber trees was the side branches removed to yield a single straight trunk and the **top** was the upper branches taken off after the tree was felled.

The next instruction defines the area of the Wood where they were to work that year as the *Second or Lesser Noutward Binde* (see chapter Coppices and Binds p. 201). It is difficult to imagine that Richard chose this bind other than by asking the Woodmen where they planned to work that year. They should "*divide the said binde amongst them to each a suteable part according to his time and ability"*. This may be referring back to the preceding division of the wood between each of a number of Woodmen before Thomas Vernon bought the Wood. Now they were all working for the new owner and had to complete their agreed tasks on time, but it was their responsibility to apportion the work to each woodman so the agreement did not fall behind schedule, agreed as: "*to work up the same on or before the fift day of this Instant February"*, this being to sort out who was going to do what, giving them just three days to come up with the apportionment. This division of the bind into **parts** for each woodman became called "**parting** the bind" and the five shillings Richard gave them to seal this agreement became a tradition that lasted well over a century. In practice it seems more likely that they would work as a team and do the work as and when their health, the weather and their other work permitted but clearly Richard Vernon had a different vision of how it should work. Anyway, they took the five shillings each year after that for "parting the bind".

"and that each and every of theme shall and will compleatly fall mark and deliver in tale all the first wood that according to the custome ought to be fallen therein". Here at least, Richard left it up to the Woodmen how they should cut the wood, as long as it was within the limitations and schedule he goes on to lay out.

In tale is an interesting phrase; it reappears throughout the Wood Books as *teeling* and signifies making a **tally** of what wood has been cut; *mark in tale* was an instruction to keep a count on tally sticks of the wood they had cut. Their payment for teeling was made at the

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[a] The first information on these bells comes from the Rudhall lists, which show that Abraham Rudhall I cast a ring of five bells between 1704 and 1715. The 1715 catalogue lists "Shrawley 5". These bells, of which the tenor is the sole survivor, were evidently supplied in 1705. The tenor originally weighed 9cwt-2qtr-18lbs. The old fifth, recast in 1976, weighed 6cwt-2qtr-27lbs. See chapter Rev Daniel Piercy p.174.

[b] Joseph lived until January 1712, his wife until January 1713. His daughter Elizabeth was only 3 years old at the time of this indenture; she was not married or buried in Shrawley.

[c] We have wondered about the origin of the name Kings Hill. The highway through Shrawley used to be along what is now the back road (see chapter Access, Extraction and Dispatch p. 240), and at this time the track that later became the main road climbed over a short but steep hill here; years later a cutting through the sandstone then removed most of the hill but by this time the house on top of the hill had been named Kingshill. Probably the bind was named after the house when it was all that was left after much of the old Brechyng coppice was converted to arable land (see chapter Coppices and Binds p. 202). An alternative thought is that the tumps by Wood House were ancient round barrows and Kingshill is named after them.

end of each year but this must necessarily have been payment for keeping a running count through the year: the wood they were teeling had already been sold or used for hedging and was no longer there for them to count. Later this was a written account to be used for audit of payments and sales, but the first eight Woodman signatories to this agreement signed with an "*X his mark"* indicating they were not literate. Richard Vernon would have been familiar with tally sticks because they were used by tax collectors for official business as well as by country folk for recording quantities of commodities or stock. Such tally sticks were typically squared-off hazel sticks with marks cut into them to record the count. We don't know what accounts the Woodmen kept before Thomas Vernon bought the Wood, but from this point on their obligation to keep such records explains how we come to know so much about went on in the Wood between 1708 and 1850 – a beneficial side-effect of Richard Vernon's management practice.

The next part of the agreement "*and in every mans part make a just distingtion betweene the Choicewood and other wood that shall be therein fallen*" explains the distinction made in later documents between *whitterns* and *choice whitterns*, whitterns being the local name for Small-leaved Lime. One might guess that the choice wood would be sold at a premium, but the only sales account with both choice and non-choice produce available at the time of writing is for 1736-8 and the prices given do not allow direct comparison between choice and non-choice produce. The Woodmen's judgement of what might be "choice" was apparently not to be relied on, for it was to be checked by the Estate Agent: "*and soe Tale it that it may be planely soe mark in Number of each sort In the judgment of the said Richard Vernon or other Agent of the said Thomas Vernon and their chapmen for it laying the choicewood by it selfe and the other wood on or heapes by it selfe"* – so their tally had to distinguish between choice wood and non-choice wood, not just the numbers of each sort of produce, a different mark on the tally stick or different stick for each.

Next the agreement specified " *And in the same manner at the proper season of the year to fall the oake*". The date set for completion of oak felling and delivery is 5th June, which would be appropriate for peeling the oak bark for tanning yet with every other activity so tightly defined, the absence of mention of oak bark peeling makes it unlikely that this was going to happen.

"and binde mark and deliver in Tale the same in manner as afore Mentioned for the furstwood" Felling the oak timber will also yield faggots as well as the timber, crops and tops.

There had been a tradition in Shrawley Wood for making ropes from the bark of the Small-leaved Lime, peeled immediately after felling and soaked in water for weeks until the strong fibrous inner layer could be peeled apart from the outer bark to form the bast from which the ropes were spun. Cousin Richard Vernon's letter of 1699 (chapter Hearts of Oak p. 66) makes clear the profitability of these bast ropes. Whittern bark was clearly still being harvested for this in 1708 *"and shall and will Bind up and make the like Tale of all the whitterns distinguishing the choice whitterns in parcels by themselves from the other as soone as the Baste is peild*".

The Woodmen were obliged to tidy up after themselves and their efforts would be checked: *"and Imediately after that shall and will ffaggott up in neat and hansome manner all the Cropps Lapps and Shredings and underwood that shall be there and deliver the same in tale according to the tale of the firstwood and to the same satisfaction*". Probably to faggot up was meant in a more general way as to bundle up, including what was later called cordwood – four foot long poles stacked in heaps eight foot long and four foot deep. Richard Vernon was after all not a Woodman and might not be familiar with all the local terms.

The agreement then sets out a precise schedule of work:
"And they doe agree to perform the falling of the first wood and ***deliver the tale*** *in manner aforesaid on or before the* ***thirtyfirst day of march*** *next* – so they had to hand over the tally stick on that date to signify that the job was complete. Maybe, like the tax tally sticks, the tally was split along the grain with the notches showing on each half and half kept by the Woodmen to ensure they got paid, half kept by the estate's agent as a record of the work done and produce available for sale. When this strategy was used for tax collection the halves were called foil and counterfoil: when reassembled both parties could check if the other had cheated by changing the marks.

ensuring and to fall and Deliver the oake in like manner on or before the ***fift day of June*** *next*

and to binde up and make the like delivery of the whitterns on or before the ***twenty fourth day of July*** *next*

and to Faggott and deliver in Tale as aforesaid all the other wood on or before the ***first day of November*** *next"*

Next comes the threat of punishment for making off with any of the wood without paying for it:
"And that they nor either of them shall at any time steale or carry away any part of the said underwood"

…and made them responsible for theft by any other person:
"nor permitt or suffer any to steale or carry away the same but will give account of the name or names of any person or persons that they or either of them shall at any time soe stealing or carrying away the same".

Then there comes a list of payments agreed for this work, to be paid on the agreed date for completion of each tranche of work:

"for falling of the firstwood ***eightpence the hundred*** *on the said thirty first day of March if the same shall then be all fallen marked and delivered in manner as aforesaid and not otherwise*

and the like sume of ***eightpence per hundred*** *for the oake on the said fift day of June if the same be all fallen marke and delivered as aforesaid and not otherwise*

and the like sume of ***eightpence given for binding the whittards*** *on the first day of August if the same be all Bound taled and delivered on or before that day and not otherwise*

And ***foupence the hundred*** *for Makeing the faggotts part thereof as soone as halfe of the whole are made and all the Rest on the first day of November next if all the said wood shall be then faggotted up and not otherwise*

and do them now give them in Earnest five shillings while at the same time threatening them with a fine of £20 if they should fail to complete their part of the agreement.

The second contract is shorter.[4] It was agreed on 17th February 1709 between Richard Vernon and three Shrawley parishioners: Richard Cook, Edward Smith and Robert Marshall. Why did this not include John Atherage, William Sevearne, John Spragg, William Jones, and Randle Severne who were party to the first contract? Had they found that so many were not needed? Did these others not want to take the risk of the £20 penalty for failing to complete their side of the agreement? We think the Lesser Noutward Bind was right next to Noutard[d] Green where the Woodmen lived but Tadgeley Hill was the far side of the Wood by the Severn; did the others baulk at walking that far before starting their day's work? Had the three who did agree planned to hire in any other labour needed? Whatever the reasons, these three undertook to:

"*Fall and worke up the wood of the Tadglyhill binde in Shrawley Wood this pesent year in such manner within such time and at such Rates to be paid in the same manner as they the said Richard Cook Edward Smith Robert Marshall and others agreed to fall the Lesser Noutward binde the last year"*

d Later renamed Noutard's Green by the Ordnance Survey.

The three woodmen then *"Recd in Earnest of the Bargane five shillings and thereon for the true performance of the said falling and working up of the said wood in all Respects according to the Agreement that they with others made for falling and working the wood of the said Noutward Binde the last year, they and each of them doe for themselves their Executors and administrators Bind themselves to the said Richard Vernon his Executors and Administrators in the penall sume of ten pounds apeice.*

So the penalty for failing has been reduced from £20 to £10, which nevertheless would have been a huge burden if for any reason the work was not completed on time or the piles of wood were not neat enough for Richard Vernon.

The format of these two contracts taken together suggests the 1708 contract was the first attempt by Richard to organise the Woodmen, and the second suggests that the work had been completed satisfactorily the first year and he simply wanted things to continue on the same course. That the agreement was with just three men suggests that he was now prepared to let them organise their local workforce as they saw fit, as long as the work got done.

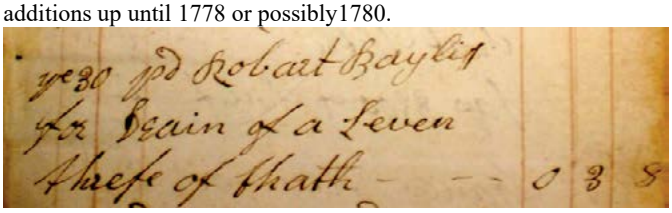
In 1721 Thomas Vernon died and the Wood passed to his second cousin Bowater Vernon, who engaged the Dougharty family to create a book of maps recording all his estates. The surveying of Shrawley Wood took place in 1731-2 (chapter Historical Maps p. 266). The map included a drawing of Woodmen working in an area that may have been part of the Elbow Bind (see figure (03a) in chapter Coppices and Binds p. 201). It seems likely that the system of management set up by Richard Vernon in 1708 was still running smoothly.

The next available document[5] is an account sheet for 1736-8. The format and content is similar to the earliest Wood Books (see Introduction to the Wood Books p.149). Of particular interest is payment to Mr Griffin for baste work: this is the last mention of bast in any document from the archives that we have yet examined. Another line records the delivery to Mr Hales of three loads of bark. This is the first record of bark being delivered, presumably to a tannery. This document gives the bind cut in 1737 as *Ye 2nd Blackwhich Bind* and in 1738 as *Ye Rowlane Bind*.

The Woodmen in 1736 are John Anthonies, Randal Seavern (possibly the nephew of the Randal who joined the 1708 agreement, or maybe the same man age 24 then and 55 now) and Edward Atheridge (probably the 46-year-old son of John in 1708). Payments were made to "the workmen" suggesting the Woodmen hired others to help them, maybe a continuation of the system running since 1709. The carter at this time was William Yates, paid for "halling" (hauling) wood. John Anthonies seems to be the lead Woodman. We know he obtained his gamekeeper's licence in 1736 and that year was paid £5 for looking after the Wood; an analysis of bills for game he sent to Hanbury is given in an appendix at the end of this chapter. It is also clear that John Anthonies is managing the accounting for work in the Wood. Another change since 1709 is that the Woodmen are arranging sales and deliveries, and collecting the money to hand on to the Vernon's steward – James Brazier until around 1768 when his son George took over [see chapter 1764-1850 p. 185 (06b)]. The numbers recorded in the written accounts until after 1800 have a format suggesting they were possibly still derived from tally sticks with different shaped notches signifying thousands, hundreds, halves and quarters. So we see 3000 and half and a quarter of hoppoules instead of 3750.

Sales from the Wood include *Choice Whitterns* showing that the distinction between choice and other wood demanded by Richard Vernon was still made. This is the last reference we have found yet to choice wood, though *chaise whitturnes* were sold in 1772 and 1775. It seems likely these were whitturne wood prepared for crate making rather than an alternative spelling of choice (see Cratemakers in chapter 1764-1850, pp.187-8).

The next information comes from a recently investigated Woodman's notebook[6], much worn, started around 1758 with additions up until 1778 or possibly1780.



02. Payment in January 1759

One of those who wrote in this book used spelling that has caused us some amusement and some difficulty. An example (02) from *Jan ye 30th 1759* is:
"*Pd. Robart Baylis for Deain of a Leven threfe of thath*".
We interpret this as
"Pd. Robert Bayliss for doing of eleven thrave of thatch".
He was paid 3s 8d for this which is 44d, so 4d per thrave supporting the idea that *a Leven* means eleven -- possibly the scribe thought that *a leven* was one less than *a dozen.*. *Thathin stuff* was often used for thatching materials. *A thrave* was, in some contexts at least, 24 burdens, and a burden was what could be readily carried, such that a burden of lops was 12, lops in this case being the upright staves used in hedging (see chapter 1764-1850 p.196, fig. 34). Context has helped with some of the interpretation: the next entry on that page is.

Pd Edward Atheridge	
for a dayes thathin at Baylisis	*£0 4s 4d*
Pd him for cutin thath in stuf	*£0 0s 4d*
Pd his Sarver for 4 days	*£0 3s 4d*

at 10d per day, this *Sarver* was probably a boy helper. The dialect words in this book predate the otherwise helpful dialect dictionaries, and taken together with the flexible spelling, often leaving us guessing the true meaning. In 1761 we find:

Pd Mr Rite for 4 Haefe of Boltin Stra	*£1 4s 0d*
Pd Thos Saley for one threfe & halef of Boutin	*£0 9s 0d*
1762 payd Thos nayer for four threfe of Boutin	*£1 4s 0d*
Pd Thos Saley for four threfe of Boutin	*£1 4s 0d*

It seems likely that Boltin Stra and Boutin are the same; possibly pease haulms bailed up as horse fodder. Might these have been on the wood account because the horses were being used in the Wood for *halling* and *tushing* out timber?
Some of the content of this book such as payments and sales from 1764 onwards are discussed in the chapter on the Wood Books (see chapter 1764-1850 pp. 180-199). The Woodmen in 1758 (Edward Atheridge, Philip and Thomas Jones, Richard Price, Edward Smith and Edward Payk) are the same people as in 1764 in the first Wood Book and payments to them and other service suppliers and receipts from sales of wood produce during 1758 to 1763 are similar to those that followed 1764 onwards. Interesting points are:

1 1763 is the first time we have seen reference to an allowance for a collier's cabin (five shillings) and the first record of cordwood. The cordwood sold to Mr Knight that year would have been converted to charcoal in the Wood and used for his iron smelting. Later Wood Books refer to *yardwood* which the colliers preferred matrerial: these were oak branches cut to three foot long for conversion to charcoal. Cordwood was normally cut to four foot long but in this first record of wood for charring the distinction between cordwood and yardwood has not been made.

2 There is no record of peeling or delivery of oak bark during 1758 to 1763 despite the 1736/7 record of three loads delivered to Mr Hale and bark peeling and delivery every year from 1764 onwards. Absence of record does not mean record of absence and as discussed in chapter 1764-1850 (pp. 189, 198), many years had either bark peeling or bark sales but not both, so it would be no surprise to find a record hidden in the archives of oak bark being

peeled and delivered for tanning in all the years between 1737 and 1763.

3 The record has broadened from simply being payment from work in the Wood and income from sales of produce: payments for the Bell Ringers and payments to the poor are also recorded, and building work around the estate properties such as *"Octor. Ye 5 1759 Pd. Thos. Cook, Edward Smith & Thos Jones for hallin the rubil from Wood House"*. Work went on at Wood House for years: "*June ye 24 1768 Pd Mrs Broom for hallin a load of stone to Wood House for the drains".*

Conclusion

For the first time in the Wood's history, Richard Vernon's agreement of 1708 gives us solid detail of the Woodmen's work patterns. The note books and account sheets fill in the quantities of work and produce with an indication of where it all went to. The next few chapters continue the story and fill in further details of the role of the Wood in the social life of the Parish.

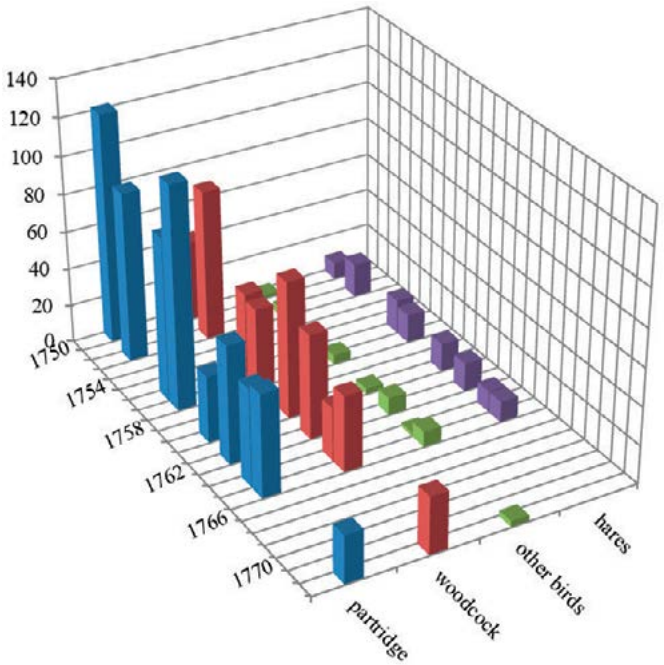
Appendix:

Shrawley Gamekeeper's Accounts for Game sent to Hanbury

We have an incomplete series of bills for game sent by the Shrawley gamekeeper to Hanbury; bills in 1750-1772 were from John Anthonies and those in 1780-1811 from Thomas Cooke. Many other bills on the Gamekeeper's account are presented in Appendix B of 1875-1897 (p. 218).

In 1750-1, 1756-7 and 1757-8 the accounts distinguish between live and shot partridge in the ratio 92:30, 40:22 and 43:8, respectively, suggesting partridge were reared locally. Bills in 1878 and 1789 for repairs to the pheasant coops near Curriers show that pheasant rearing had started before then. Pheasants were only mentioned once in the game bills and that was Mr Olives's account: although this was found in the same box as the Shrawley files, it seems likely that these birds came from another of Vernon's Estates.

Partridge were sent in September and October while Woodcock were shot from November to March. Hares were shot from the end of October through to February. Other occasional birds 1750-1772 include land rail, water rail, moorhen, quail, snipe, mallard, teal and unspecified wild ducks. Only once (1765-6) was one couple of rabbits sent to Hanbury by John Anthonies. (A01)



A01. Game sent each year to Hanbury by Gamekeeper John Anthonies.

Next we have bills for 1780, 1810 and 1811 from Thomas Cooke the Shrawley Gamekeeper who reported to another Thomas Cook who was Steward for the Vernons. Lower numbers of partridge (55, 19, 10) and woodcock (12, 14, 26) were dispatched from Shrawley than in John Anthonies days but there were more rabbits – 14 in 1780 and three in 1810.

Another regular charge on these bills was for journeys – taking the game to Hanbury. This was an eleven mile trip each way which until 1828 also involved taking the ferry across the River Severn at Holt Fleet; the charge for a journey was one shilling in 1762 at a time when a bird was charged at four pence, a hare at six pence and a duck at a shilling. In 1810 and 1811 some journeys to Hanbury bore no game – just fish.

Game was also dispatched (by coach?) from Worcester to associates of the Vernons in London and Bristol. The baskets to contain the game in 1810 cost ten pence, the transport to London four shillings nine pence for a payload of four partridge and a hare worth in total one shilling & four pence.

Each year two or three horses and bags of barley were bought to feed the dogs. In 1756 and 1757 wheat was bought to feed the partridges. In 1810 and 1811 five dog licences were paid for. The rate of dog food purchase suggests that The Shrawley gamekeeper kept three to five dogs throughout this period. Thomas Cooke's gravestone carving shows three dogs with him out shooting birds (p. 191).

Acknowledgements

Grateful thanks to Francesca Llewellyn for help researching all the relevant documents and to John Westwood and Chris Pickford for information on St Mary's and its bells.

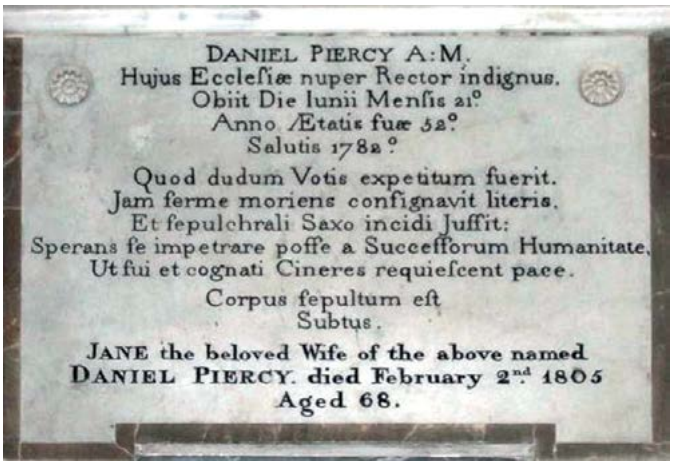
References

1. Worcestershire Archive and Archaeology Service [WAAS] 807 BA2289/18/iii Church Wardens Presentments
2 WAAS 705:7 BA 7335/18/1/6 Lease of land in Kings Hill Bind, Shrawley Wood 1705
3 WAAS 705:7 BA7335/18/i/1-20 c.20 deeds relating to property in Shrawley. Vernon, Weaver, Severn and other families. 1701 - 1733. Vernons of Hanbury Hall. Document No. 11
4 WAAS 705:7 BA7335/18/i/1-20 c.20 deeds relating to property in Shrawley. Vernon, Weaver, Severn and other families. 1701 - 1733. Vernons of Hanbury Hall. Document No. 12
5 WAAS 705:7 BA 7335/68 9-14 Household and estate accounts. 1736-69. No 13. Accounts of Shrawley Wood
6 WAAS b705:353 BA 3803/2 Estate Account Book 1758 - 1777

The Parish of Shrawley during the Rectorship of the Revd. Mr Daniel Piercy 1764 – 1782

Richard Pumphrey

Daniel Piercy came to Shrawley in 1764 under the patronage of Thomas Vernon Esq; he succeeded Rev William Wilkins who had died in April that year. Piercy was no novice at the job, having been rector in Kington[1] (Worcestershire) since 1755. As expected for a rector, he was a well-educated man: he matriculated into Balliol at Oxford[2] aged 16 and graduated through BA to MA (AM as an Oxford degree) by 1754, thence on to Kington as Rector.



01. Memorial in St Mary's Church, Shrawley.

Shortly after arriving in Shrawley, Piercy wrote down "*The Names of Ye Inhabitance Sutters*[a] *1764*"[3] – the names of all the heads of households attending church, each tagged with either *a/c, oss* or *exd,* maybe relating to their seating in the church or their pew payment?

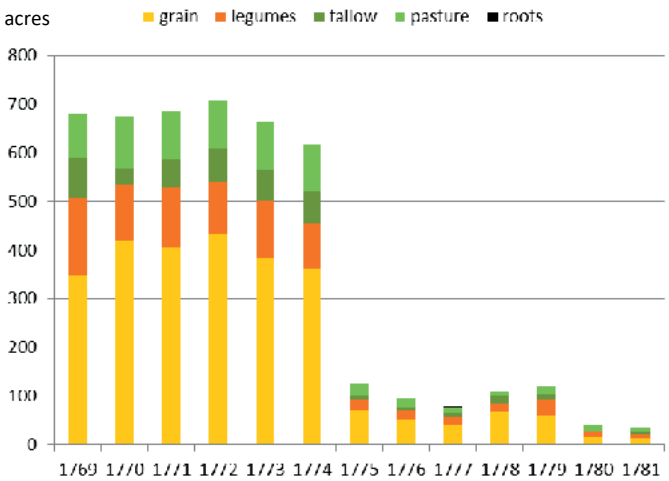
His later notebook "*An account of the Corn and Hay Tythes &c, as given by the several Occupiers of Land in the Parish of Shrawley*"[4] records tithes paid to him between 1769 and his death in 1782; it gives a fascinating insight into the workings of Shrawley Parish. In particular we are interested in the Woodmen and their work: they were parishioners and the tithes they paid prove that their work in the Wood was typically a seasonal and intermittent part of their life. We also have the Wood Books (chapter Wood Books introduction p. 149) for these years,[5] allowing a detailed analysis of the interaction between Wood and parish. To round this off, we have the parish registers for his rectorship which record all the baptisms, marriage banns and burials.[6] Tragically, five of these burials were of his daughters:
Eleanor age 10; June 1766
Sarah age 10, October 1767
Mary age a few days; Feb 1775
Jane age 2; May 1776
Ann age 6; Oct 1778
To judge by the rest of the burial register, these deaths in childhood were in no way exceptional. Finally, he himself was buried aged 52 on 24 Jun 1782.

Altogether, 95 people are mentioned in the Suitors List, eleven of whom had died by the first year of the Tythe Book; between them, the list and tithe book name 183 individuals. Some disappear without burial – maybe moving elsewhere and some move into the parish from outside. Some are landowners living outside the parish, whose tenants have to pay tithes. Clearly the Suitors List names only a portion of the Shrawley residents, omitting the poor, all children and the landless lodgers that may have formed a substantial proportion of the workforce.

Summary of tithes collected by the Rector

Around 1775, Daniel Piercy changed the system for tithe charges. Apart from hops, the tithes had previously been based on acreage for arable and pasture, and on volume for flax, hemp, hempseed and wheat grain. On exceptional occasions, tithes were still collected in kind: for example, in 1775 "*by his own desire*" Joseph Watmore paid his tithes in the old way comprising 5½ bushels of wheat, 1¾ bushels of peas and vetches, 3 bushels of oats, 3 bags of apples, 3 bags of barley, 3 bags of hops, clover and hay mowed and a colt. It is not clear from the record but it seems possible that the rector usually collected most of the hop tithes in kind apart from 1773 when he recorded financial charges.

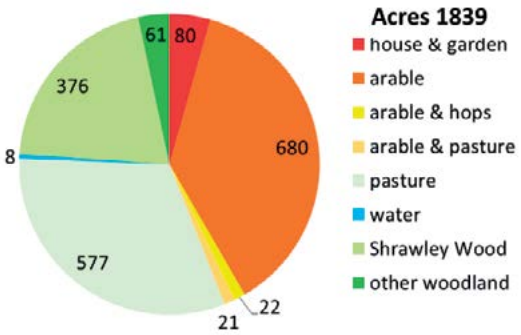
Before 1755 few tithes were paid as a modus[b]; most notable was the £3.4s.0d modus for Shrawley Wood, paid by the current owner of the Vernon Estate (1764-1771 Thomas Vernon Esq; 1772-1775 Miss Vernon; 1766-1781 Henry Cecil Esq). Another fixed payment of this sort came from George Churchyard for the mill (10s 6d). The church also took a cut in some of the rents e.g. Mr Richard Lowe of Astley for a meadow by the Severn, rent £14 per annum rent tithe £1.8s.0d. Most tithes associated with rents were at 2s 6d in the pound rent until 1772, then 3s in the pound. But before 1775 the majority of tithes were based on the acreage of each crop (02), with the charge depending on the crop: wheat 3s per acre increasing to 4s from 1775; 2s per acre for barley, oats, pease, pulse, and most other crops including clover and vetch, while most grass in 1769-70 was 1s 6d except for 2s for the rich meadows by the Severn; 1771 onwards, all grass was 2s per acre. Hemp and hempseed were charged at 4d per peck, flax at 6d. The charges for livestock seem a bit random, 2s 6d for a lamb in 1769 but 3d per lamb later on, and varying between parishioners. The difference may be that 2s 6d (30d) was the price of the one lamb in ten for the tithe and the 3d was a tithe on the value of each lamb.



02. Acreage basis of tithes for arable and pasture. Tithe on roots (turnips) was charged only once in 1777 and the black fill on top of that year's column is scarcely visible.

[a] This word is spelled *sutters* on the list heading but *suitors* on the reverse as a title to the note. In medieval documents a suitor was a tenant obliged to attend his lord's court. In this context probably used as one obliged to attend church.

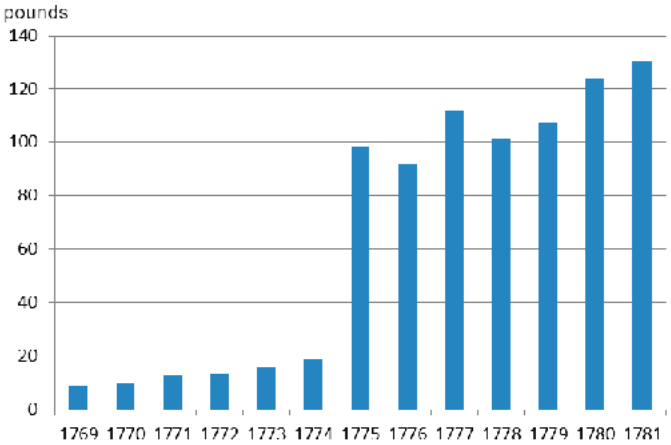
b A *modus* is an agreed amount paid in lieu of a tithe.



03. Shrawley Parish acreage as listed in the tithe allocation of 1839.

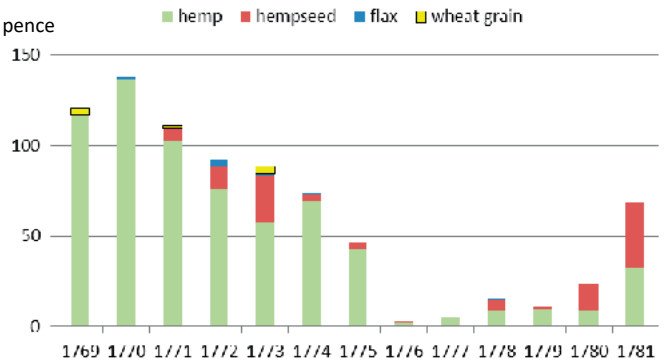
The tithe allocation documents[7] and map of 1839 explicitly cover the entire parish of Shrawley and the figures are reasonably accurate (03). This figure allows comparison between the 1770 and 1839 acreages and shows the Rector's calculations may have slightly underestimated the acreage of arable, or that some of the pasture in 1770 had been ploughed by 1839. One is left in no doubt that the church profited more from arable than pasture. The tithes on lambs seems curiously small compared with the acreage of pasture (never as much as one pound in any year), and these records have no mention of cattle or milk which one would suspect were a substantial commodity in the parish. In 1772 he notes "*5 lambs 1s 3d – 5 fleeces to be reckoned for the next year*". This is the only mention of wool.

Then 1775 onwards many of the charges were agreed per annum rather than being based on the crops being grown – easier all round for them but less informative to us about which crops were grown (04).

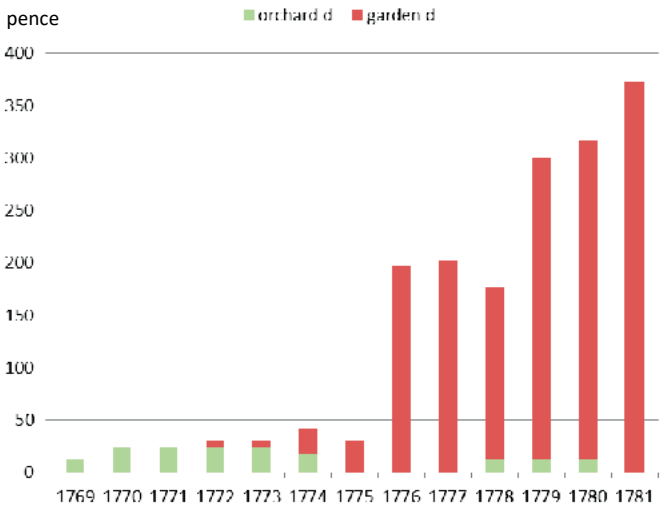


04. Tithes paid by annual agreement between rector and the parishioners with most land.

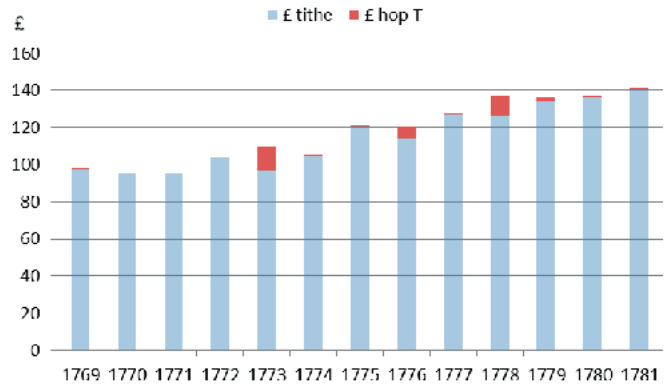
In the early years the Rector noted which parishioners failed to grow hemp. This crop was essential for rope for the British Navy; one might guess it was taken upriver to the rope factory in Bewdley or downstream to the naval yard in Bristol. By 1776 the hemp tithe had all but disappeared (05) and it seems he made up for this by charging for gardens rather more than he used to get from hemp (06).



05. Tithes in pennies paid for hemp, flax and grain.



06. Tithes in pennies paid for orchards and gardens



07. Total value of tithes collected by Daniel Piercy as money.

Over the course of his tenure, the monetary value of tithes listed in his note book grew steadily (07). This was only part of the total contributions and explicitly excludes nearly all the hop tithes except in 1773.

The 1839 tithe allocation fixed the payment to the rector as £ 355, split between the land owners on the basis of acreage and crops. Again, there is no mention of animals or animal produce, an even clearer distinction than Daniel Piercy's notebook which mentions the occasional tithe for a goose, a pig or two and a few lambs.

produce	units	1769	1770	1771	1772	1773	1774
barley	acre	2.5		2.5	2	3	2.5
barley & pulse	acre		4				
beans/pease	acre			1	2	2	2
clover	acre	1.5		1	2.5	2	2
grass	acre	2	2	2.5	1	1.5	1.5
oats	acre			2.5			
pulse	acre	2.5					
wheat	acre	4	5	4.5	4	5	4
total	**acre**	**12.5**	**11**	**14**	**11.5**	**13.5**	**12**
hemp	peck		2	2		3	2
hempseed	peck				2	2	
hops	pence					38	
lambs							11

08. Tithes paid by John Anthonies. From 1775 onwards this was replaced by an agreed tithe of 2 guineas *per annum* (£2-2s-0d). In

1781 Daniel Piercy must have felt generous because he notes *"flung back 5s"*.

The Woodmen

John Anthonies gained his gamekeepers' licence[8] in 1736 and that year was paid an annual salary of £5-0-0 for looking after the Wood.[9] We know a John Anthonies was still game keeper and managed the Wood accounts 1757-1776 until Thomas Cook took over; whether this was the same John Anthonies (b. 1704) and the John Antonies that was buried at St Mary's on 21st June 1788 is uncertain but seems most likely. John Anthonies was on the original Suiters List of 1764, and contributed tithes every year 1769-1781. His house was *Cock Thrum* – now called Wood Farm and his tithes were based around 12-14 acres of mostly arable land; this is consistent with the fields by Wood Farm as shown on Dougharty's map surveyed 1731-2 and the 1839 tithe map. Other Wood Keepers after him also lived in the same building, conveniently placed close to the central access to the Wood.

Unlike most other parishioners contributing hop tithes, John Anthonies never bought hop poles from Shrawley Wood. As his land was surrounded on three sides by the Wood, is seems improbable that he would have gone elsewhere for supplies, and so one might conclude he obtained all he needed as a perk of his custodianship of the Wood.

John had married Elizabeth Severn on 5 April 1730 but she was buried 19 January 1731, the day after their son Thomas was baptised. John later married Alice Anthonies in 1734.

Edward Powick (in the early years his name was spelled Payk), moved into Shrawley sometime shortly before his marriage to another Elizabeth Severn in 1739 (there were three with this name in Shrawley around the time). Valerie Powick (Edward's great-great-great-granddaughter) was a diligent local historian who left copious notes about her research; one of these said Edward lived in Kingshill in 1739. We have not yet found contemporaneous records to confirm this.

Edward was perhaps from the village of Powick, nine miles south of Shrawley. By 1758 he was a Woodman as well as farmer, being paid that year £1-13-0 for 33 days falling[10] (felling timber). It seems probable that at least from 1772 onwards he farmed *Bonefields Farm*; this was later the home of his son John, then after John's death his third wife Sarah, and then grandson James, until James sold up and moved to New Zealand. Bonefields Farm was well-placed as a base for the horses and timber carriages, and Sarah Powick and later James provided this profitable business for Shrawley Wood. (chapter 1764-1850 p. 182-3)



09. The Knowle.

Another son, Edward Powick Junior, also became a Woodman when Edward Senior retired from woodwork in 1785, having worked with his father in the Wood for a couple of years before that. He was first noted in the tithe book as yielding no hemp in 1774. For the next 3 years he paid tithe for a garden, then an orchard and 2 acres of arable, increasing to five acres by 1781. At this point he may have already been living at *The Knowle* on the far side of Shrawley (09). It seems probable that when he had work in the Wood he stayed in *Middle Cottage*, very close to the Wood gate by Noutard Green. It was in that cottage where his son Samuel was on census night in 1841, along with eight-year-old grandson Samuel, who later would become gamekeeper to the Vernons. The Knowle remained home for that branch of the family until around 1900.

Edward Atheridge seems to have been a leading Woodman for many years. In 1738, aged 45, he helped John Anthonies with *teeling* the wood (counting up how much had been produced that year). His first son Edward died when he was only ten years old but another son was baptised Edward on 11 October 1736 and it may be this son who appears in the Wood Book accounts in 1764 age 28 as Edward Atheridge Jr. From 1758 on the elder Edward Atheridge seems to have been head Woodman until the last record of payment to him in 1771; he was buried 30 Dec 1774. From 1769 to 1771 the rector noted that he provided no hemp and he paid no other tithe. Possibly in his later years he had enough to do as Woodman not to have time or energy for other productivity.

Thomas Jones and Philip Jones had worked in the Wood from before the time Daniel Piercy came to Shrawley and were still there after he died; they were joined by Thomas Jones Jr in 1771. Thomas Sr. had half an acre of grass and an acre of arable growing wheat, barley and pease. After 1770 he only pays tithe on hemp/hempseed and after 1776, on a garden. Philip only paid tithe on hemp/hempseed and after 1776, his garden. In 1779 this tithe was paid by Philip Jones Jr.

Edward Smith was paid as Woodman 1764-1781; he was joined in the Wood by John Smith in 1771 and William Smith in 1779. Edward rented land at £12 per annum; he paid tithe on an acre of grass and a couple of acres arable until 1772 when the tithe was fixed at three shillings in the pound rent until he died in 1781. Neither John nor William paid tithes to Piercy.

Richard Price was paid as Woodman 1764-1778: he had a garden in which he grew hemp 1769-1776 and after that was charged 6d each year (12d in 1777). His widow kept the garden in 1780 and 1781 but paid no tithe for it.

John Holloway was paid as Woodman 1765-1775, joined by Humphry Holloway 1770-1780 and William Holloway 1778 – (1809). John Holloway had a garden in which he grew hemp in 1769 and 1771 and hops in 1776-78. Humphry Holloway rented an acre of grass and 3-4 acres of arable on which he grew wheat and lent grain, pulse or beans. William Holloway paid no tithes.

Others occasionally lent a hand in the Wood from time to time. William Leregoe (Ledego in the Wood Book of 1764) was a busy farmer who 1769-81 managed several farms at once, at various times one for Mr William Vernon, for Mr Wormington, for Henry Cecil Esq and Curriers Estate for Mr Bourne. He was paid for tying faggots in 1764.

The Carter

The Vernon Wood account paid George Tolley for halling (hauling) wood and bricks. He paid no tithes to Piercy but he was a Shrawley resident, being married to the Widow Huck by licence in St Mary's Church on 27th February1771. Interestingly the witnesses were Robert Bourne and Thomas Vernon, major landowners in the parish, suggesting that George was well in with the nobs. To be paid for hauling timber, he must have had horses and waggons. He may have moved to Ombersley because later a "George Tolley of Ombersley" was buried in St Mary's Shrawley on 23rd March 1819.

The Weir Inn

William Jones "at the Wear" paid tithes for three quarters of an acre of grass, a garden and lambs, then after 1775 by agreement he paid five shillings. The Wear (Weir, Wyre) was a building by the Severn Weir crossing. No building is shown there on Dougharty's map

surveyed 1731-2 (presumably because the inn was not part of the Vernon Estate) but is on the 1813 map of *Shrawley Court and Curriers Estate* and on the 1839 tithe map. The Weir house had been used as an inn but when the shallow waters of the weir were made deep by the new lock system, trade ceased and the site was abandoned in 1861. George Morris at the Wear paid tithe on hemp only in 1770.

The Quarrymen
Thomas and Joseph Smith were masons "at the quarry" in 1764 and were listed in the tithe records 1769-70. Joseph managed to grow some hemp but Thomas paid no tithes. "The quarry" was most likely the large quarry 200 metres north of the Weir Inn. This was started sometime after Dougharty's survey of 1731/2 and was probably worked out before 1800 – maybe even by 1770. Thomas Smith Mason may well have led a sizeable team of labourers and although the life of the quarry may have been relatively short, over 20,000 cubic metres of stone were removed from the quarry (see chapter LiDAR p. 264-5) We have not yet found any accounts of the quarry in the Vernon's archives.

Sales from Shrawley Wood 1764-1781

When analysing the sales from Shrawley Wood, the Suitors list and tithe book help identify Shrawley residents and so to understand what the parishioners were buying and which sales were for customers outside the parish.

The church bells and the ringers
Daniel Piercy himself was a major customer and among other things, he bought oak timber to rehang the bells in St Mary's (10).



10. One of many purchases made by Daniel Piercy in 1772.

In another woodman's notebook with entries spanning 1758-1780[10], along with the accounts of payments and receipts are tables of bell ringing methods – two were Plain Bob Minor for six bells, one with "B" indicating the Conductor's instruction to Bob, the third a Plain Bob Major for eight bells. These are written on pages relating to 1767 and 1768 but there is no guarantee that they were written on those dates; it seems the notebook was used as scrap paper for various exercises after the accounting had been transferred to the fair copy book. It would be curious if these bell ringing changes had been written in 1767-8 because before Piercy had the bells rehung in 1772, there were only five bells at St Mary's. The present tenor and fifth had originally been cast in 1705 and were part of the ring of five. In 1772, three bells were recast at the Rudhall foundry in Gloucester, an extra bell added, and this ring of six was hung in the new frame. In the years leading up to this, a five shilling payment had been made from the Wood account *"for the Bell Ringers"* around the 19th of June, the last of these being in 1771. Two such payments were made in 1768, "*paid the Ringers for the day that my master dind at Mr Perceys [£0-5-0] and for Ringing the nineteenth of June [£0-5-0]*".

Then 23rd May 1776 *"payd the Ringers for the Wedinday [£6-6-0]"* and 23rd May 1777 *"payd for a quarter baril of Sider for the Ringers for ringin for ye Burthe Day ye 21st May evening [£0-10-6]"*and finally on that page: "*16th Nov 1777; Payd To the Ringers for Ringing for the Birth"*. The wedding was that between Emma Vernon and Henry Cecil and took place in London; the birth was that of her only child Henry Vernon Cecil who sadly died in infancy. Could it be that these payments were made for ringing at Hanbury and paid from the Wood account because the ringers were Woodmen?

To hear the Plain Bob Minor written out on the Woodman's notebook, and rung at St Mary's Church by the Shrawley Bell Ringers, use this QR code to hear the You Tube recording or follow the link https://www.shrawley.org.uk/church-bells.html (you may get You Tube Ads with either link).

Shrawley Wood produce
The principle products from Shrawley Wood at this time were timber for construction, bark for tanning, hop poles, hedging materials (lops, etherings), fencing materials (posts and rails), thatching stuff and windings, laths, cooperage supplies (gubbins for staves, hoops to bind the barrels and buckets), firewood and charcoal. Less common was wood for pumps and well curbs, poles for ladders. Annoyingly, timber sales must have been recorded in a separate ledger which has not yet been discovered, and we only know of a few isolated sales and later sales from newspaper advertisements (see chapter Oak loss p. 246). Customers came from neighbouring parishes and further afield *via* the River Severn. Until 1773 the bark all went to the Price tannery in Wick, probably carted by road as other wood products were later (see chapter 1875-97 p. 211); Wick was another part of the Vernon Estate to the southwest of Worcester. From 1774 onwards the bark went by river to Mr Baker's tannery in Bewdley, carried by Owner Rebols (Owner was the title given to trow and barge owners). Owner Rebols also bought vast numbers of faggots and a variety of other produce from the Wood, presumably for onward sale. Many thousands of hop poles were bought by growers in neighbouring parishes. Mr Coldrick of Bewdley bought thousands of six shilling birch poles each year but we have not yet found out how he used them.

Repairing and pleaching the hedge round the Wood and Shapgrove were perpetually recurring tasks. Several of the Woodmen and their families took part in this during Piercy's time, including Edward Smith, Richard Anthonies, Joseph Farmer, John Holloway, John Cook and William Atheridge.

The term "cratewood" first appears in the Wood Books in 1784, but chaise whitturnes, tie whitturnes and threesticks were sold to Mr Mattox in Worcester from 1770 onwards and Mr Green in Wribbenhall from 1772 on; these may have been used for cratemaking (see chapter 1764-1850 p. 187-8).

Hop Growers
Piercy bought a great deal of other wood: timber, poles and laths for construction, thousands of hop poles every year or three, windings (for hedging, thatching or wattle?) and wood that may have been for other projects or firewood. Notably, the present pews in St Mary's date from around this time and may have been one of Piercy's projects but we have found no confirmation of this.

Other than Piercy, the major hop growers in the parish throughout 1764-1781 were Mr Bourne, Mr Brasier and Mr Davies, averaging 1600, 2000 and 2080 hop poles bought per year respectively and in 1773 paid hop tithes of £4-2-6d, 12s 0d and 13s 6½d. The Gommerys averaged 880 hop poles per year between them and paid 15s in 1773, Thomas Martin averaged 1000 hop poles and paid £1-1-0d, the Tolleys 680 and paid 5s 3d.

Several parishioners seem to have started buying hop poles after 1770, some stopping after a few years. Robert Baylis had only a small plot of land; he bought 200-400 hop poles each year 1770-1774, then seems to have given up. He never paid tithe on hops. Thomas Bunts on the other hand grew hops on his small plot and unlike other hop growers, paid a money tithe on his hops but bought no hop poles from Shrawley Wood.

William Cook bought ash poles most years. He paid tithes only on a garden and there is no hint of hop growing. He helped in the Wood on the odd occasion, helping Edward Atheridge cutting and John Cook measuring wood. We have found no other clue as to his occupation but one might guess he manufactured some kind of

produce from the ash and oak poles he bought. William Cook had a son John, baptised 1759. John Cook worked in the Wood from 1771 onwards, and 1804 with his son John until he was 16, when he started work as a carpenter. It seems possible this was a family of carpenters who worked in the Wood when required.

A recently investigated Woodman's notebook records payments for building work on the Estate's houses, notably new building at Wood House involving: "[1768] *July ye 9 Pd. Edward Smith for halling the seills and propes to Wood House: 2s 6d*
Pd Philip Jones for putin windins for the other house: 1s 0d."
Windings in some contexts are etherings, the thin straight branches twisted round the tops of the lops when hedging (see chapter 1764-1850 p. 196), in a different context may have been thatching ties, but here might they be windows built from the cills and props (side jambs)? Or might they be windings for wattle and daub (the horizontal woven component of the wattle)? The line *"Pd Mr Jones for caring the timber Down Two Worcester for the shashis"* may also be for Wood House, getting the sash windows made up in a specialist woodworks in Worcester.

Coda

At the end of his tithe book Daniel Piercy records flower seeds sown in his garden in 1773. Another page has a list of "*Trees grafted at W^{m} Bach's April 5 1773*" and another of "*trees planted 2nd Dec^{r} 1773 in the rick yard*" and "*in the hedge at the bottom of the garden*". An added note had "*NB These 12 Trees I had from Mr Pershowse of Stanford Bridge*". This list is the earliest record of some of these apple varieties (see appendix by Wade Muggleton below). After his death, Daniel Piercy's son George Henry was able to continue his education, matriculating into Oxford at Worcester College in 1786, age 17. He too graduated through BA to MA by 1794 and became vicar in Chaddesley Corbet, Worcestershire in 1805, where he remained until his death in 1855.

Acknowledgements

I am most grateful to the Shrawley History Society for the loan of their copy of Daniel Piercy's Tythe Book and to Francesca Llewellyn for her help researching documents in the Worcester Archaeology Archive Service (WAAS).

Appendix:

Piercy's Apples

by Wade Muggleton

Early records of apple growing are not that common but occasionally snippets of Pomological history emerge in archives and records that shed new light on the varieties of the past. One such is the tithe notebook of the Revd. Mr Daniel Piercy which also contains a page more akin to a garden diary where he records his apple grafting and planting exploits of 1773.

If we analyse his list of varieties we find some interesting pointers about what may have been popular varieties of the area nearly 250 years ago. Today we consider The National Apple Register (NAR) of 1971 as the most definitive list of varieties and synonyms ever put together and what we use as a base reference for researching named apple varieties so comparing his list to it this is what we find:

Peach apple - the NAR says in existence 1875 first recorded 1818 not to be mistaken with Irish peach that was introduced to England in 1820. Hence assuming this is the same Peach apple we appear to have a record 45 years earlier than previously first recorded.

Large Pearmain - no record, there are several apples with names that end in Pearmain said to be derived from their pear like shape. But there are seemingly no name matches to a Large Pearmain, so it may have been his interpretation of a large apple of that shape.

Lemon apple - in terms of an exact name match NAR states the only record for Lemon apple is in 1883 from Brentford Middlesex or could possibly be just Lemon as listed in NAR exhibited in 1883 first recorded in 1881 so 100 or so years later or could it have been Lemon pippin which NAR states was known before 1700 ?

Dutch codlin - NAR states bought to notice 1783 thus ten years later then the Rev Piercy's notebook.

Margil - an old variety that was known in England before 1750

Moyle - there is a Gennet Moyle or Moyal known to have been a very old variety from possibly as early as the 15th century used for cider but also as a cooking apple.

Lady's finger or Mock Pearmain - no record of a Mock Pearmain and the name Lady's finger appears to have been attributed to several different apples over the years. The Marcher Apple Network have found several variants claiming to be Lady's finger.

Baxter's favourite - NAR states only record is when it was exhibited from Worcester in 1888 so 105 years later than Rev Piercy's record.

Bennet apple - no record as such although there is a Bennet's defiance, also known as fern's apple. But could equally have been a local apple that originated from a a Mr or Mrs Bennet. So could be local synonym of something else.

Garden snout - no known records of that name although several cider apples have the name snout. There is a Brown snout, a Dog's snout, a Cow's snouts and Pig's snout.

Norman Redstreak - the name Norman and the name Redstreak are associated with various cider apple varieties but I have not found a record of the two names put together in relation to a single variety.

Red Stire - or Styre is an ancient cider apple variety believed to have originated in neighbouring Gloucestershire, fell from favour when superior varieties came along in the late 1800's.

Marygold - see Marigold pearmain

Herefordshire redstreak - as for Norman redstreak drawing a distinction between different red streaks

Marigold pearmain - interesting that he has Marygold (above) and Marigold pearmain, are they different or is it merely the spelling of the time. Seems odd perhaps that allowing for spelling he uses the pearmain suffix on one and not the other.

Rupert Margill - Again interesting that he has Margil above, again spelling variation and what is the Rupert part? I cannot find any record of a Rupert Margill

From the several cider apple varieties we might deduce that the Rev had an interest in making cider?

This fascinating insight into 1773 raises so many more questions than it answers; several of these dates are earlier than the National apple register suggests that previous records of those names occur, which is of course quite feasible but as such makes this a fascinating and important find in building a picture of the history of apple varieties in the UK.

Whilst it is unlikely any of these trees still survive today it is possible that some were propagated by grafting in the generations that followed and could still be found in gardens and old orchards of the area.

If any reader has further information please do get in touch with secretary@marcherapple.net

The marcher apple network have for the last 27 years worked to research and recover the rare varieties of the West Midlands and Marches area.

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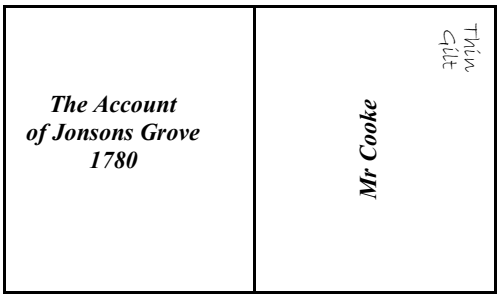
Shrawley Wood - Jonsons Grove 1780

Hugh Milner and Richard Pumphrey

The following is a full transcription of an account, extracted from a Wood Book, made solely of Jonsons Grove, which lay west of and adjacent to Shrawley Wood as shown on the map following. The 'K' fields on this Dougherty Map of 1733 were known as Jonsons Grove because they were occupied by Jonson, who therefore lent his name to the adjacent area of woodland but which he did not own.

This account appears to record a clear-felling of 19 Standard trees and underwood from the one acre. However, it remained woodland and is shown on the tithe map of 1838 but had been grubbed along with a larger area adjacent by 1883, probably not long after 1850. All terms are entered in the Glossary. The original entries are in italics, all entries in this font are recent comments.

cover



1780 Pay'd for Cutting Lops Poules Timber &c; in Jonsons Grove for the use of Henry Cecil Esq[3]*.*			
And Mrs Winford (of the adjacent Astley Estate)	£	*s*	*d*
To Cutting 5. Thrave of lops (probably the 'lop& top' from lime(?) coppice poles, as following)	*0*	*6*	*8*
To Falling of 2400 of poules (lime[?] coppice underwood, perhaps 17 years old) *at 6d p hund*	*0*	*12*	*0*
To ye Teeling at 6d p Thoud. (teeling: supervisorial checking and recording of the count)	*0*	*1*	*2*
May 20th. Pd Thos. Spragg for Falling 16 Trees at 9d p Tree (overstorey trees, see N.B. below)	*0*	*12*	*0*
Ye 30th. Pd. Phillip Jones for Peeling 3 tun of Bark at 9ſ p Tun (probably oak)	*1*	*7*	*0*
Pd. For falling 3. Trees after	*0*	*1*	*0*
	2	*19*	*10*

June 16th 1780	*0*	*2*	*0*
To Halling the Barke Down To Severn (3 tons) at 4s 6 p Tun	*0*	*13*	*6*
Do. To Weighin it	*0*	*1*	*6*
Sepr. 28th pd Phillip Jones for Cutting 7 Cord & 1 foot of yard wood[4] *at 22(d) p Cord*	*0*	*13*	*0 ½*
To Halling ye Cord Wood To gether	*0*	*3*	*6*
Decr.16th1780 Allowed the Collier	*0*	*1*	*5 ½*
£	*1*	*15*	*0*

1780, Delivered out of Jonsons Grove			
Mr. Bateman Two Thrave of Lops (The lops were for hedging, a feature of Shrawley Wood's boundary)	*0*	*10*	*0*
Mr. Dickence of Astley one Thrave of Lops	*0*	*5*	*0*
300. of 6ſ. poules (The poles are probably being used as hop poles)	*0*	*18*	*0*
Ye Revd. Mr. (Daniel) *Piercy one Thrave of Lops* (From Piercy's tithe notebook: Jan. 15 1781: *Recd of Thomas Cook for the tythe of Johnson's Grove £0-18s-0d.)*	*0*	*5*	*0*
Wm Beach New Inn one Thrave of Lops	*0*	*5*	*0*
Mr Leregoe 1100 of 8ſ poules	*4*	*8*	*0*
1000 of 6ſ Do.	*3*	*0*	*0*
£	*9*	*11*	*0*

June ye 17, 1780			
Delivered to Owner Rebols[6] *Out of Jonsons Grove*	£	*s*	*d*
3 Tun of Barke at 40 ſ p[er] *Tun* (See N.B. below, note B)	*6*	*0*	*0*
Recd. of Owner Rebols for this Barke in ful	*6*	*0*	*0*
Decr. 16th			
Recd. of Mr. Bowin for the use of Esqr. Knight[7] *for 7 Cord*[8] *& 1 foot*[9] *of Cordwood is 5 Cord*[10] *2 foot 3/4 at 14/6d per Cord*[11]	*3*	*17*	*5½*
	9	*17*	*5½*
Carried over from last page	*9*	*11*	*0*
Received	*19*	*8*	*5½*
Payd For Worke & Tythe (Thus tithe was £0..18..0)	*5*	*12*	*10*
2)	*13*	*15*	*7½*
half Share	*6*	*17*	*9¾*

The Measure of y^e Timber in Jonsons Grove (probably oak logs for sawing or cleaving)

No.	*Ft long*	*In^s girth* (= girth/4)	*Total* Hoppus Ft	girth	Hoppus Feet ← decimal Hoppus tables	m3
1	*27*	*16*	*48*	5' 4"	48.6	1.75
C 2	*23*	*15*	*35½*	4' 4"	35.94	1.3
C 3	*21*	*14½*	*30½*	4' 10"	30.66	1.1
4	*28*	*10½*	*21*	3' 6"	21.44	0.77
5	*28*	*13½*	*35*	4' 6"	35.44	1.28
C 6	*26*	*11*	*21½*	3' 8"	21.85	0.79
C 7	*30*	*12*	*30*	4' 0"	30	1.08
8	*26*	*12*	*26*	4' 0"	26	0.94
9	*20*	*10½*	*15*	3' 6"	15.31	0.55
C 10	*21*	*12*	*21*	4' 0"	21	0.76
C 11	*20*	*11½*	*18*	3' 10"	18.37	0.66
12	*19*	*13*	*22*	4' 4"	22.3	0.8
13	*26*	*14*	*35*	4' 8"	35.39	1.28
C 14	*29*	*13*	*34*	4' 4"	34.03	1.23
15	*24*	*11*	*20*	3' 8"	20.17	0.73
C 16	*30*	*12½*	*32½*	4' 2"	32.55	1.17
17	*15½*	*.7½*	*0.6*	2' 6"	6.06	0.22
C 18	*20*	*.8½*	*10*	2' 10"	10.03	0.36
19	*15½*	*7½*	*0.6*	2' 6"	6.06	0.22
			Total: 467		471.2	16.99
					= 0.89m3 per log	

N.B.

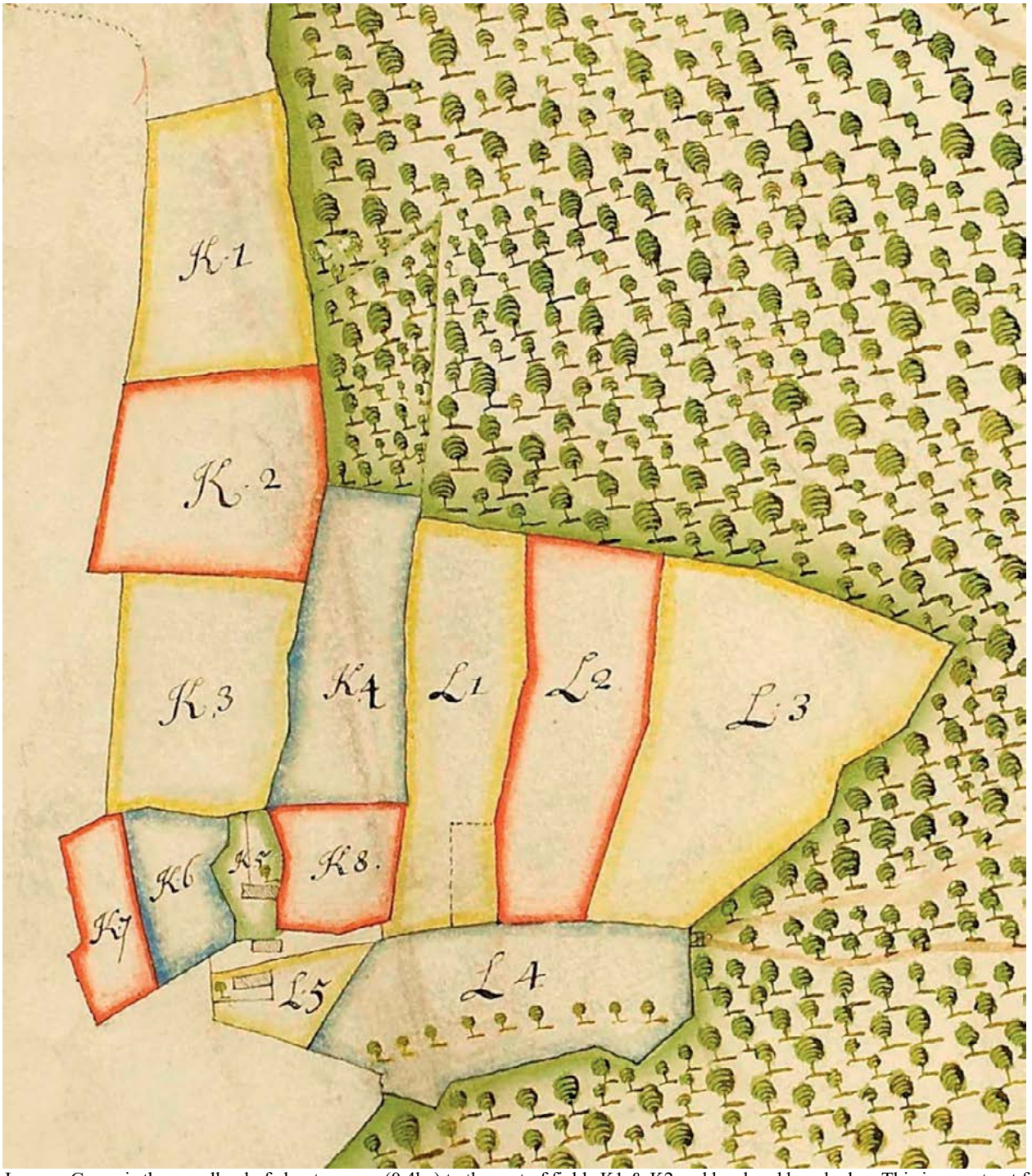
A. Logs 1-16 are from the felled overstorey, probably oak. If the 'C' in the No column identifies those sawlogs derived from stored, i.e. singled, Coppice stools, then the remaining eight logs may be from maiden Standards.

B. It appears that the 19 trees from which these sawlogs came, including all the bark in their crown growth, produced 3 tons of bark, which was sold on by 'Owner Rebols' for tanning leather, see note 6 below.

C. These 19 trees may also have produced 7+ Cords of small diameter wood in the round, here termed 'yard wood' because it was cut to yard (three foot) lengths for ease of stacking to produce charcoal from a 'earthburn'. A cord of yard wood was 3x4x8 ft but cordwood was priced by the statute cord of 4x4x8 ft, so a ¾ conversion is applied to the yard wood volume before calculating the price. Using the statute cord, a measure of stacked roundwood, including interstice totalling 128 Ft^3, 1 cord is 67 Hoppus feet or 2.42m^3, then over 12.56m^3 of yard wood was produced, 42.5% of the trees' volume. This and the average volume of the logs at 0.89m^3, see the total line above, indicate overstorey trees with large spreading crowns, perhaps 80 to 100 years old, excepting trees 17 to 19.

Notes

1. This appears to be a postscript, written sideways in the corner of the cover. It may refer to a spayed sow, gold or money
2. Each page is boxed.
3. Later the Earl of Exeter, married Emma Vernon.
4. Wood of a yard (0.91m) length, for charcoal burning, converted to the statute cord to calculate the price. This was for the collier for charcoal for the Knight Iron Works. See Note 11 below.
5. 'Cs' represents pounds sterling and may simply be a corruption of the £ symbol.
6. The people who owned the trows which plied on the River Severn were titled 'owner'. This bark would have been for onward sale to Thomas Baker's tannery at Bewdley. Mr Baker seems to have had the contract for Shrawley oak bark, a valuable commodity at this time. The going rate was 40/- per ton for timber bark, not coppice bark which was 50/- per ton. Where small diameter oak was concerned, the bark was often more valuable than the wood.
7. See mention of the Knight Iron Works in 4 above.
8. This is the local yard wood cord.
9. Apparently, a local division of a cord, perhaps a Hoppus foot, in which case see 'C' above.
10. This is the converted statute cord.
11. This rate at 14/6 *per* cord was standard at this time for oak yd. wood. The price fell to 12/6 in 1785, then rose again and was 19/- by 1845, falling to 18/- in 1849 (see chapter 1764-1850 p. 195).



Jonsons Grove is the woodland of about an acre (0.4ha) to the east of fields K1 & K2 and bordered by a hedge. This is an extract from the Dougharty map of 1733, 47 years before the above felling took place. L5 is the site of Cock Thrum (now called Wood Farm). Photograph of the map surveyed by Joseph Dougharty 1731/2, [courtesy of Worcester Archaeology and Archive Service.]

Shrawley 1841



01. Homes of the Woodmen and other employees 1841 and clockwise listing of tithe border lengths surrounding the wood.

tithe	name	metre	perch
404	**Shrawley Wood**	3256.7	647.6
	2 Wood Gates by Upper Ridding	25	5.0
479	Upper Ridding	251	49.9
480	Lower Ridding	326.6	64.9
43	Little Glass Field & Weir	156.9	31.2
44	Wood Gate and Weir Inn Gardens	61.7	12.3
45	Little Meadow	105.4	21.0
42	Ash Bed (Pleck?)	72.9	14.5
41	Wood Close [SE]	191	38.0
40	Barley Green Orchard & Court Pool	332.4	66.1
31	Buckfield Hopyard	208.5	41.5
29	Court House Buildings yard gardens &c	25	5.0
25	Part of 7 acres	272	54.1
23	Part of 7 acres	105.6	21.0
	Wood Gate by Ladywell	3	0.6
336	The Folly	204.6	40.7
	Ladywell Brook and rough land	81.3	16.2
337	Field in front of Woodhouse	675	134.2
349	Lodge House Garden	71.7	14.3
350	Kings Hill	87.1	17.3
397	Wood Close [W]	161.6	32.1

tithe	name	metre	perch
403	Lower Pool [Layes Pool]	441	87.7
	Wood Gate by Cock Thrum	3	0.6
402	The Lays	22	4.4
405	Lower Hop Yard	299	59.5
406	Middle Field	66.27	13.2
407	Rye Grass Piece	52.56	10.5
408	Piece above the garden	60.93	12.1
412	Lower Orchard	54.26	10.8
413	Upper Orchard	113.7	22.6
414	Upper Barford	167	33.2
471	Garden (Vacant)	49	9.7
	Wood Gate by Noutard's Green	3	0.6
472	Garden (Samuel Harris)	42.25	8.4
473	Garden (Samuel Powick's)	49	9.7
474	Garden (John Wildsmith)	46.9	9.3
464	Lower Million	135.2	26.9
475	Upper Million	119.8	23.8
476	Great Grove Coppice	293.8	58.4
478	Upper Horse Leasow	188.7	37.5
477	Hop Yard	39.5	7.9
	Dick Brook	961	191.1

Shrawley Wood 1764-1850

Richard Pumphrey

Introduction

Our starting point is 1841: the National Census that year[1] was the first to record names, ages, occupations and residence. Just two years earlier, the parish had been surveyed for an accurate map of tithe allocations[2] which, taken together with the census, tells us where many of the people in the parish lived (01). Family relationships, dates of baptism, marriage banns and burials have come from the registers for St Mary's Church, Shrawley.[3] The Wood Books[4] (Vernon Estate account books for expenses and sales from Shrawley Wood) tell us who was paid for what work for many of the years between 1764 and 1850. Sales from the wood to tanners, crate makers, iron works, coopers, carpenters and hop growers are also recorded, allowing a deeper understanding of the part played by the wood in the local economy. An additional bonus is that a report on Shrawley had been written in 1840 by Kendrick Watson, a local historian.[5] The following account is a synthesis from these sources of information.

1841 *dramatis personae*

The Woodmen

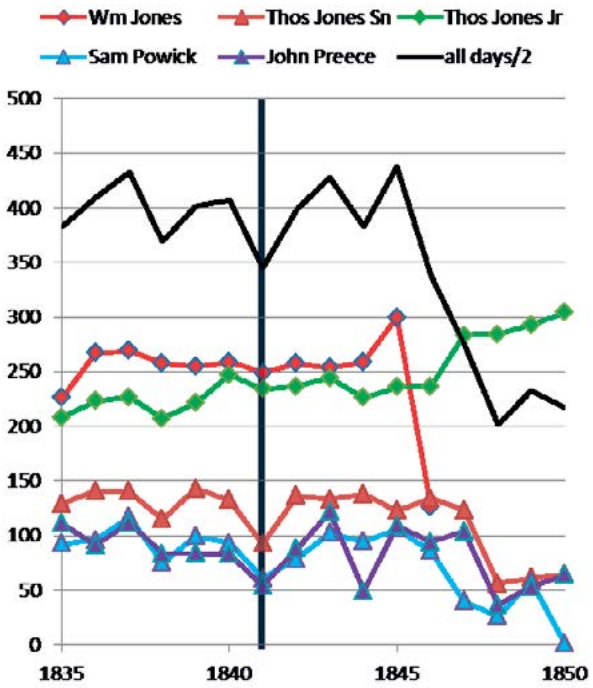
In 1841 the head woodman is William Jones; he lives in Rock House with his wife Sarah and daughters Jane and Hannah. Baptised 29 July 1781, on census day (6 June 1841) he is now close to his 60th birthday. He started working in the wood with his father Phillip in 1803, helping mend the wood fences and pleach hedges. He was soon being paid for several days work a year in the wood helping his father with all the other tasks and it was not long before he was working properly as a woodman, coppicing the lime stools and cutting hop poles on his own. He recalls the days when hoppoles were so much more in demand. In 1815, he cut out 3800 – his share of the 20750 hoppoles cut that year when there were 13 buyers of hoppoles. This year there were just three buyers left whereas in his father's time, in 1770 there had been 23. Last year's new tithe charges and the extraordinary charge for hops has killed any incentive to grow hops, and some local growers like Thomas Houseman have already grubbed up many of their vines[6] and the rest surely soon would follow.

daywork	£	s	d
249 days at daywork @ 2/-	24	18	0
Payment to share out			
peeling 8t:15cwt oak bark @ 27/- per ton	11	16	7
butting topping rounding 66 timber trees @ 1/6 each	4	19	0
	16	15	7
Piecework			
162 postes @ 1d	0	13	6
26 rails @ ½d	0	1	1
cutting 19.5 cords of cordwood @ 5/- per cord	4	17	6
11 gubbins @ 6d	0	5	6
8 cords of cratewood @ 5/- per cord	2	0	0
cutting 556 Bn of Laps 1d a bn	2	6	4
176 of Eth 1d each	1	2	0
5 of Kidbands 3d	0	1	3
4 of thathingstuff 4d	0	1	0
2 of do. Twigs 4d	0	0	8
2 of do. Peastix 2d	0	0	4
650 hoppouls 8d per 100	0	4	4
16 birch rails ½d	0	0	8
32550 lath 1/- per 1000	1	12	6
	13	6	8

02. William Jones's pay 1841

This year for the census William Jones gives his occupation as Wood Cutter; for this he is paid 2/- a day plus a productivity-based supplement (02). By the end of this year he will have been paid for working 249 days; in other words, nearly every day apart from Sundays and church holidays. This daily rate plus productivity bonus has been in operation since the late 1820s but changes were on the way (03). The payments for bark peeling and timber production were presumably for him to share out with those who took part in the work [see *Bark Peelers* below].

William Jones's regular team of woodmen comprises Thomas Jones Junior (age 28), his Uncle Thomas Jones Senior (age 52), Samuel Powick (age 47) and John Preece (age 57). All these men live in Noutard[a] Green, not far from the northern wood gate.
Thomas Jones Junior has recently started to work closer to full time in the wood, preparing to take over as Head Woodman when William can no longer perform this role:[b] this year he is paid for 234 days, not far behind William's 249 days. Thomas Jr. lives in Wood Edge Cottage with his wife Margaret[c] and 2-year-old daughter Rebecca. Thomas Jones Senior had been working nearly full time but in the last year or two has reduced his days: this year he has only been paid for 92.5 days in the Wood. He lives in Spring Bank with his wife Hannah and daughter, also called Hannah.
Samuel Powick and John Preece both give their occupation as Agricultural Labourers in the 1841 Census but it is clear that they are regular workers in the wood: by the end of this year Samuel Powick will have been paid for 61 days and John Preece 54.5 days. Samuel Powick gave his occupation as woodman at the baptism of three of his children. His second wife Hannah died last October (1840) and although he has five surviving older children, only eight-year-old Sam is recorded as living with his father in Middle Cottage on census day; his daughter Mary was listed as head of household at The Knowle on the far side of Shrawley parish. It seems Samuel only stayed in Middle Cottage when he was working in the Wood.



03. Number of days each woodman was paid 1835-1850

Kendrick Watson writing in 1840 about Shrawley Village made the pejorative assertion that "Most of the children are employed in picking sticks for firing in the wood, an occupation which perhaps is

a Later renamed Noutard's Green by the Ordnance Survey
b William will die in 1846. His obituary notice in the Worcester Journal - Thursday 26 February 1846 Page 3 records "Feb 20, at Shrawley, after a long illness, Mr Wm Jones aged 64, many years woodman and a faithful servant to his employers". Also in Worcestershire Chronicle - Wednesday 04 March 1846: "At Shrawley, after a long illness, Mr Wm Jones, aged 64, many years woodman and a faithful servant."
c née Powick, daughter of Sarah and younger sister of James Powick of Bonefields Farm; see Carter/team hauling below

not very favourable to the formation of correct moral habits". 29 boys and 30 girls between the ages of five and ten are recorded in Shrawley in the 1841 census but there is only a small village Dame school in Church Cottage run by School Mistress Hannah Steel; Dame schools were not renowned for their ability to educate effectively and this school cannot have catered for all of the children in the village. A purpose-built school will not open until 1860; an account of schooling in the village[7] in 1851 relates:

> On the church-table is recorded, " Mr. Edward Burlton, the rector of the parish[d], gave £40, the interest of which is to pay for the schooling of five poor children, till they can read well in the Bible, and to be paid yearly on All Saints' day." This was laid out upon a mortgage of a meadow belonging to the family of the Bournes, of Shrawley, who have paid £1 16s., as interest for the same, to a school-dame in the parish. Her name is Susan Brooks; she was appointed June 1, 1851. There are forty boys and girls on the books, twenty to thirty of whom attend—if under five years of age they pay 2d. per week; if over, Id. They have books and slates free, and are taught spelling, reading, Collet's tables, and writing on slates. The proper school house is not used, the mistress being allowed to teach the children at her own residence. This should not be permitted, as it is next to impossible for a woman to give the attention requisite, unless in a room devoted to school purposes alone. Her salary is made up to £8 per annum, out of which she has to find firing. There ought to be five of the children taught quite free, in consideration of the founder's gift.

Young Sam will become gamekeeper for the Vernon family (see chapter 1875-1897 p. 215-6) and by then will be sufficiently numerate and literate to manage his accounts, though his spelling remained idiosyncratic to the end.

Only four years later, the amount paid to the woodmen jointly will plummet to half its previous rate (03) although Thomas Jones Jr. will maintain his day work rate. With the completion of the New Pool dam in 1850 and the rides through the wood[e], it seems the Wood will change emphasis from a productive forest to a play area for the Vernons and their associates. 1851 sees Thomas Jones unemployed after all his hard work in Shrawley Wood for the Vernons.

The blacksmith and constable

James Thrupp, age 69, lives in Holders with his sons Joseph age 30 and James age 27. His smithy is just 300 yards down the road, on the way up to St Mary's Church; son Joseph also works as blacksmith and is the Constable of the village. James Thrupp senior has worked as blacksmith for the Vernon Estate since 1809; before this he had helped out occasionally at bark-peeling time. As Constable, Joseph Thrupp has for the last two years been collecting the Hundred Silver due from the Wood Account (just increased from 2/4½d to 2/6 this year). By 1851 Joseph Sr. will have retired and son Joseph will have taken over the forge, married, had three children and will be living in Bayliss Cross, the house next to it.

Other Tax collectors

Robert Brasier (farmer age 38, living in Church House with his wife and three sons) this year collects the Church rate[f] for the Wood (£2.16.4½d) and Joseph Croyden (farmer age 30, living in Cock Thrum with his wife and two daughters) collects the Poor rate[g] of £9.2.6d (called Poors Rate throughout the Wood Books); later in the year this same Poor rate will be collected again by Robert Brasier. The Modus[h] for the Wood is collected by Rev J (John) Vernon (age 35, living in Wood House); it amounts to £5.0.4d.

The Wood Accounts in some years included maintenance and taxes for some of the Estate properties; which were included seems somewhat random. This year Josiah Croyden and Robert Brasier collect the Poors Rate for Carthouse and Kings Hill cottages totalling £5.19.10½d.

d Edward Burlton was buried 2nd August 1711

e The rides may have been cleared 1839-1842. See chapter Access, Extraction & Dispatch p. 234.

f The church rate was to meet the costs of carrying on divine service, salaries and repairing the fabric of the church.

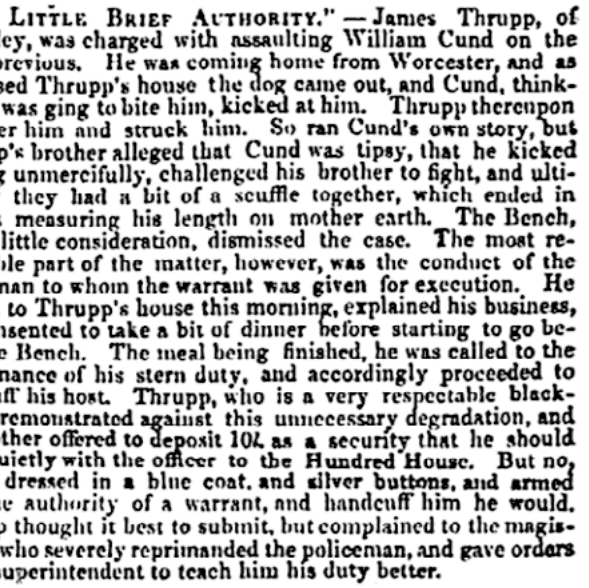
g The Poors Rate was collected for the relief of the poor of the village.

h The Modus was the cash form of the Tithe, replacing the earlier payment in kind.

The Sawyer

Charles Cund, age 70, lives in Whitehouse (now called Primrose Cottage) with his wife Sarah, and grandchildren William [15], Jeremiah [12] Harriot [9 months]; he has sawn wood for the Vernon Estate since 1805.

In 1846 a certain William Cund will become involved in a row with old James Thrupp. This may be son William at the age of 19 but there was also another William Cund, agricultural labourer age 50 living in the village in what is now called The Old Post Office. Whether or not the William Cund in this newspaper cutting[8] was Charles's son, the story gives a lively picture of village life in Shrawley:-



"A Little Brief Authority." — James Thrupp, of Shrawley, was charged with assaulting William Cund on the night previous. He was coming home from Worcester, and as he passed Thrupp's house the dog came out, and Cund, thinking he was ging to bite him, kicked at him. Thrupp thereupon ran after him and struck him. So ran Cund's own story, but Thrupp's brother alleged that Cund was tipsy, that he kicked the dog unmercifully, challenged his brother to fight, and ultimately they had a bit of a scuffle together, which ended in Cund's measuring his length on mother earth. The Bench, after a little consideration, dismissed the case. The most remarkable part of the matter, however, was the conduct of the policeman to whom the warrant was given for execution. He walked to Thrupp's house this morning, explained his business, but consented to take a bit of dinner before starting to go before the Bench. The meal being finished, he was called to the performance of his stern duty, and accordingly proceeded to handcuff his host. Thrupp, who is a very respectable blacksmith, remonstrated against this unnecessary degradation, and his brother offered to deposit 10l. as a security that he should walk quietly with the officer to the Hundred House. But no, he was dressed in a blue coat, and silver buttons, and armed with the authority of a warrant, and handcuff him he would. Thrupp thought it best to submit, but complained to the magistrates, who severely reprimanded the policeman, and gave orders to his superintendent to teach him his duty better.

Carpenter

John Cooke the carpenter, age 46, lives in Stonehill with his wife Betty and son William. He has worked for the Estate as carpenter since he was 16 in 1811. John is son of John Cooke: a certain John Cook(e), [his father?] had worked as a woodman since 1771. "John Cook(e) & son" and "John Cook Jr." were paid in 1804-1808 doing woodman's work; following this, from 1811 (age 16) onwards, John Cooke has been paid as carpenter.

Cooper

Cooper Thomas Marks had died 1833 aged 67 leaving his wife Mary running the business; she is now 69 and lives in The Whitehouse, Sankyns Green (a hamlet within the Parish of Shrawley but a mile or so west of Shrawley Wood). This year the estate pays for repairs to her house including nails, spikes, 12 lbs lime and 200 tiles, and buys a well bucket from her for 5/- [and will do so again in 1844 (6/-) and 1845 (7/6d). This year she buys one oak (10 ft 8 inches) @ 3/6d a ft[i] and 11 gubbins[j] (16 ft 10 inches) @ 3/- a ft. In the next few years she will buy: 1842: 500 hoppoles, 500 ash poles, 36 dublegrours, 12 gubbins; 1843: 36 large ash pouls, 550 ash pouls; 1844: 57 dublegroud Ash = 104 ft 9 inches, 250 ash poles; 1845: 250 ash poles, 39 dubble grown ash 52 ft 7 in, 10 gubbins. She will die age 76 in 1848 and her son James will move back into The Whitehouse, expanding the business. The estate will buy a well bucket from him in 1850 (6/-). James will call himself "Cooper & Hoop maker Employs 10" in the 1851 census. In the 1861 census he will be "Cooper hoop maker and Smith, Employs 6". In 1895 his son John will take on the management of the Vernon's Farm Account.

Carter/Team hauling

Mrs Sarah Powick lives in (Bunfield / Burnfield) Bonefield Farm with her family. Her husband John died in 1814, leaving her running the farm. She owns horses and carts and has been paid each year for

i "ft" here is most probably Hoppus foot, a measure giving an estimate of the usable timber in round logs.

j The Wood Book for 1850 notes that gubbins was a term for wood used by coopers for buckets etc.

the "teem halling" [hauling] or "teem drawing", a team of horses to move cut wood, mostly from the wood to the Severn but on occasion by road to the purchaser. Some of her expenses, for example maintenance of her cart house, have been charged to the Wood account. Next year (1842) her son James[k] will take over from her running the team hauling for Shrawley Wood. The Powicks of Shrawley (04) have had a key role in the history of Shrawley Wood from before 1764 right through to 1980.

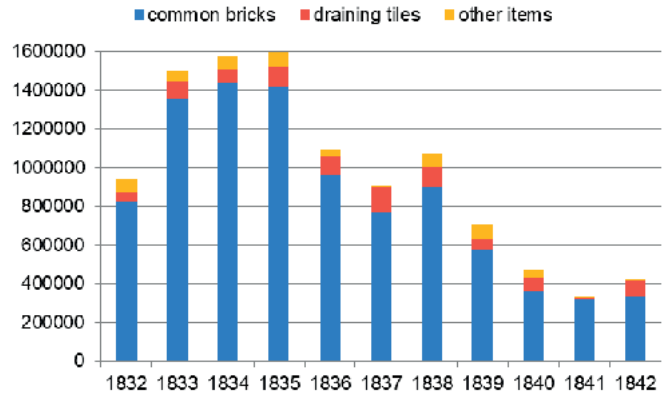
Wheelwright
In the 1841 census, Thomas Greaves (Wheelwright age 30) lives in Church Cottages along with his wife Hannah and baby son Edwin; [his apprentice Samuel Rumney age 15 lived next door]. In the 1844 Wood Book, Thomas Greaves will be paid for making a pair of wheels for drawing timber. James Thrupp will be paid for the ironwork for these wheels.

Basket maker
Thomas Wasband age 60 is the village basket maker. He lives in Frog Pool Cottage with his wife Mary. He also makes and repairs fishing nets for the Estate. The Woodmen are regularly paid for fishing the Brook or the Pool and are given a drink allowance for doing so.

Woodturner
Joseph Bateman, village woodturner age 66, lives in Lower Hampton (now called Vine Cottage) with his wife Ann and two grown-up daughters who work as dress-makers. He buys no wood from the Shrawley Wood account.

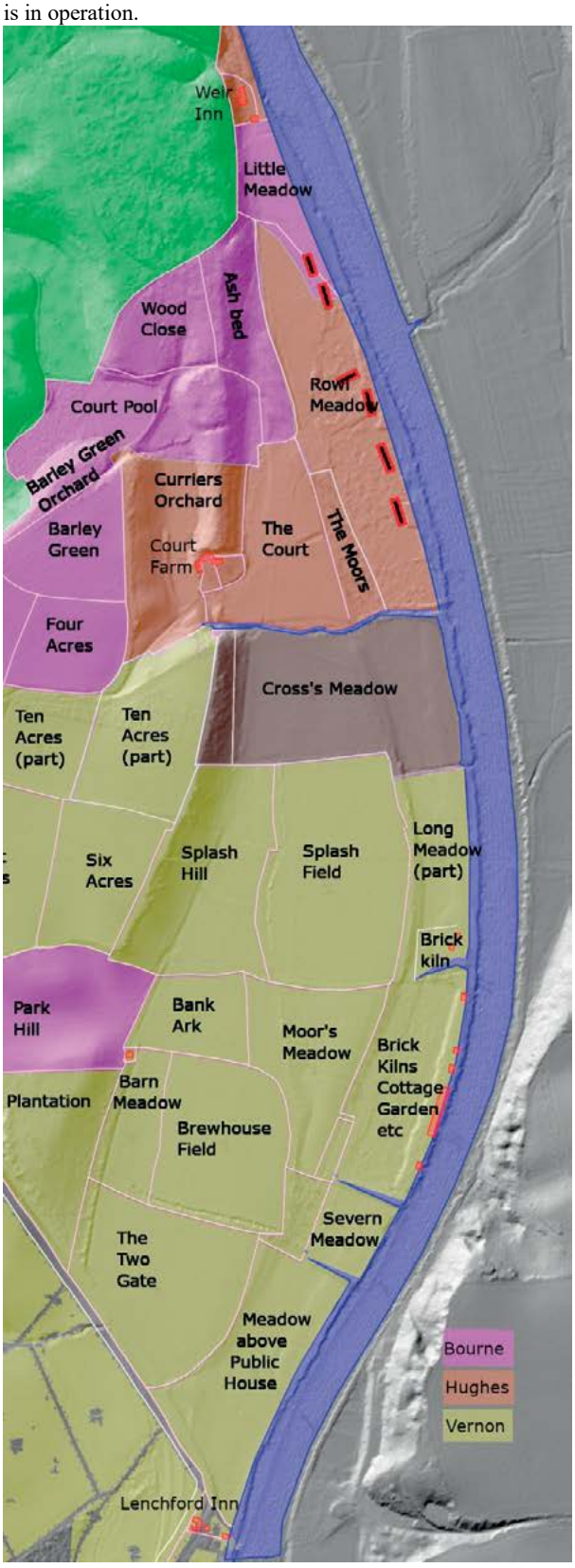
Lath Cleaver
Laths were typically made from straight-grained logs of oak, three foot long. These were first cleft into planks one to two inch thick which were cleft again to produce laths a quarter inch thick, one to two inches wide and three foot long. Laths from the sapwood (pale outer part of the tree) were less durable and so were worth less than those from the heartwood. John Groocut was regularly paid for cleaving lath 1835-1842. John Tyler/Tylor/Taylor was regularly paid for cleaving lath 1843-1850. Neither of these appears in the 1841 or 1851 census returns for Shrawley although there was a John Taylor, carpenter, living just up the road in Astley. Was this an itinerant craft?

The Brick makers
The 1841 Wood Book contains a count of bricks made in Mr John Hughes's brick yard in Long Meadow: common bricks (325,296), draining tiles (2,813), large bricks (1,850), and culver tiles (1,223).



04. Yearly output from Long Meadow brick pit. By 1840 George Allen is the only brick moulder left on site, his team being his wife and children. The flood of 31st July 1839 must have had a disastrous impact on Long Meadow brick production.

The census this year records that George Allen is now the only brick maker left living near the pit and the output from the Long Meadow brick works has dwindled (04). His employer, John Hughes, has recently bought his own land a few fields further upstream (05) and will no longer have to pay royalties to the Vernons once the new pit is in operation.



05. Tracing of the 1839 tithe map showing the brick yard at Long Meadow and Rowl Meadow where the new pit was to be started 1839, just after the tithe survey. The buildings (brick stacks and clamps for burning) on the Rowl Meadow site were not present at the time of the tithe survey but were there for the River Severn survey in 1840.

k James Powick will sell up all his farm equipment, livestock and household goods in 1855, in preparation for emigration to New Zealand. Among the livestock were Snip (a fine cartmare, in foal), Turpin (a valuable bay cartcolt) and Poppet (a fine brown cart filly); there was also a variety of carts and harnesses. Thomas Jones bought up many of the lots and 1861 sees him living in Bunfields Farm with his wife and son.

Brick making is a skilled craft controlled by the seasons:[9] clay is dug in the winter months, piled up and left exposed to rain and frost to help break it down. Bricks are made in the summer month by a team led by the brick moulder, who is fed prepared (tempered) clay lumps by the walk flatter, who gets the prepared clay from the temperer who works with the pug boy. The filled moulds are carried to the stack of drying bricks by the off-bearer and the bricks removed from the mould by the pusher out. George has help from his family and is training his sons in the craft. Their output will be around 14,000 bricks a week this year, low compared to optimal teams elsewhere in the country who might achieve 30-40,000 each week on good years, working 06.00 to 18.00 Monday to Saturday; but the output could be severely affected by the weather. Maximum output would correspond to one brick every 6-8 seconds, 12 hours a day, six days a week. George's team achieved half this rate but they will also make 100 tiles and a few dozen large bricks each week this year. He lives in the cottage and garden by the brickyard with his wife, daughter and seven sons (including 5-year-old twins) and has been there since he moved from Hallow when the pit opened in 1832.

The Wood Book accounts note that these bricks and tiles are the property of G C (George Croft) Vernon Esq. We also know Mr Hughes paid royalties to the Vernons of 2/- per thousand on bricks and tiles for his mineral extraction rights and £12-10-0 rent for the kilns, but he then charged £28-17-5 back against the royalties and rent for running the kilns. On top of this he had to pay the Excise Duty of 5s 10d per thousand on all bricks not exceeding 150 cubic inches and 10s on items above that size. He charged 38/- per thousand for bricks and 40/- per thousand for tiles.[10]

Four years ago (June 1837) Mrs Mary Bourne had advertised the Curriers Estate (part of her land by the Severn) for sale[11] and John Hughes had bought most of it. John Bucknall who farmed on her land, lived with his wife and children in a farmhouse in the quarry by Oliver's Mound that was central to the Curriers Estate. John Hughes had bought the land to get access to the brick clay in Rowl Meadow but this was prime pasture and John Bucknall wouldn't play along with this idea, so John Hughes took him to court (July 1838) to evict him.[12] John Bucknall moved to Hallow near his father-in-law's farm and the farmhouse in the quarry (then called Court Farm) was left empty. It became derelict; no trace of it remains today.

The brick yard is regularly visited by the Excise Officer who counts the bricks before they are burned to ensure the correct duty is paid. George finds this a great inconvenience: starting two years ago, he has had to ensure his piles of drying bricks are correctly arranged to meet the new regulations and he can't burn them until they have been counted. As well as these visits, George Allen has been visited by the tithe surveyor in 1838 and the River Severn surveyors in 1840: The tithe map of 1839 shows buildings, cottage and garden and the kilns in the Long Meadow brick pit (close to the Lenchford) whereas the pit near the Weir Inn at the time of the survey (?1838-9) had no buildings. By last year (1840), the river Severn survey mapped multiple buildings there – all the drying sheds and kilns associated with the new brick works.

Taking a peek into the future, George will move his family to the Weir Inn, closer to the new brick pit in Rowl Meadow. As his children grow older and more skilled in the craft, by 1851 George has time to become publican to the Weir Inn as well as "agent to Mr J Hughes brick manufactuary"[13]. There were now brick makers living with him in Weir House and in one of the other houses recently built close by, later known as Curriers, which became the home of Samuel Powick the gamekeeper, son of Samuel Powick Woodman. In 1853, George's son George will marry Hannah, daughter of Thomas Jones, who by then will have lost his job as head Woodman. The new lock system built in 1845 must have killed off all the bowhaulier trade at the inn because the towpath was on the other bank and the weir no longer an obstacle to cargo vessels. In April 1861 the Weir Inn shuts, George sells off the furniture, brewing equipment and ferry boat and moves to The Severn Trow, a pub in Quay Street, Worcester. His wife Mary was still in the Weir Inn on Census night but must have joined him after the sale. He goes back to brick making in Worcester along with son John at the Severnside Brickworks until his death in 1863. By 1871 Mary has become Publican to the Mug House Inn in Hylton Road, Worcester.

Sales from Shrawley Wood, 1841

Writing in 1840 about industry in the village of Shrawley, Kendrick Watson says:

> "…a good deal of employment is afforded to the inhabitants by the falls which take place from time to time in the woods. The wood is cut down in different portions, which are called binds, once in seventeen years. The crate wood is worth from two to three pounds ten shillings per cord; wood for charring about twelve shillings a cord; ash hop-poles from twelve to sixteen shillings per hundred, those of maple, wittan, mountain ash, and hazel, about ten shillings per hundred; stakes five shillings per hundred; lapps, headrings, kidbands, thatching stuff, thatching twigs, and besom stuff, from fourpence to sixpence per bundle. A bundle of headrings, &c, is considered to be twenty-five, according to the size, &c."

Wittan here is the local word for small-leaved lime and judging by the proportions of these trees in the wood today, the great majority of hop poles must have been wittan.

As recorded in the 1841 Wood Book, sales out of Shrawley Wood this year were "for the use of G C Vernon Esq." George Croft Vernon was uncle of Thomas Bowater Vernon and one of the Trustees to his estate. The woodmen were paid for felling 66 timber trees this year but their sale is not recorded in the Wood Books. An advertisement for timber auction has been found for some years, but not 1841. This oak timber must have been the greatest source of income but it is not accounted for systematically in the Wood Books for reasons explained by Peter King in the Introduction to the Wood Books (p. 150). Next most valuable was Mr Rice's Cratewood, which with nine ash poles and a larch came to £105-7-6d, and Mr Rogers's Bark, which with 24 ash poles came to £46-10-9d. [See below under cratemakers and tanners for details of Mr Rice and Mr Roberts]. Beyond that, there were many lower value purchases of poles, posts, rails, laths, cordwood, pump trees, timber branches, gubbins, and so on, totalling a further £54-0-8d. Individual purchasers of hedging materials (lops & hetherings), faggots and thatching stuff were not listed, but altogether these smaller items yielded a further £94-13-0¾d. Some cordwood and hedging materials were left in the wood unsold.

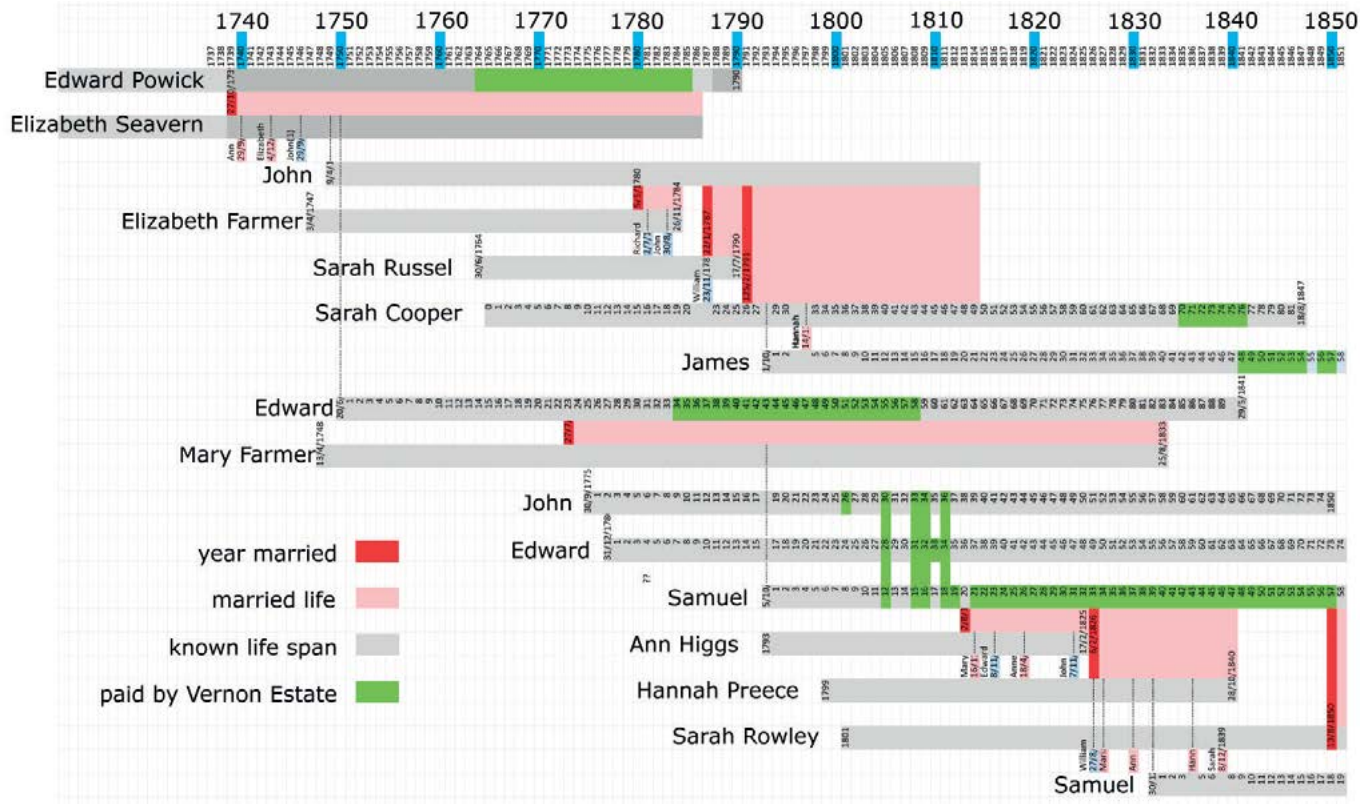
One product cut and sold in 1841 (and most other years) was burch (birch) rails. These were bought along with oak posts, apparently for fencing. Birch seems an unlikely wood for fence rails as it rots too quickly, but Kendrick Watson reports:

> *There are a good many birch trees growing in the parish. The bark of the old birch tree resists decay for a great length of time; it is common to find rails quite hollow, the wood being reduced to powder, while the bark is quite perfect.*

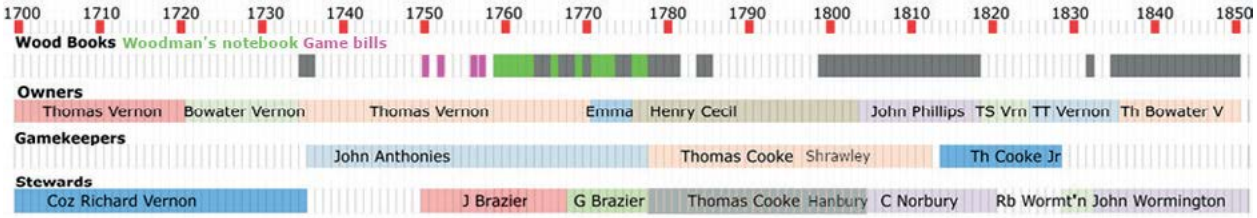
Although green (freshly cut) birch may rot rapidly outdoors, once fully dried to below 15% moisture, birch becomes resistant to fungal attack. Possibly the woodmen were aware of this and carefully air-dried their birch rails.

Hop growers

In the 1839 tithe award there were 35-40 acres of hops in land occupied by John Beach, Thomas Best, Robert Brazier, Thomas Houseman, Thomas Pickernell, Edward Powick and Sarah Powick. Thomas Pickernell never bought hoppoles from Shrawley; the others bought around 6000 each year between them in the years leading up to 1839, then rapidly decreasing numbers. Even by this year,1841, Robert Brazier, the most prolific hop grower, had greatly reduced the number of poles he bought; Thomas Houseman had already grubbed up some of his hops in response to the extraordinary tithe charge for hops and will buy his last poles in 1846; Edward Powick bought none after 1839. This extraordinary tithe charge for hops killed hop growing in Shrawley.



06a.**The Powicks of Shrawley 1764-1850**. Payment to "Edward Powick & son" could have been to any of John, Edward or Samuel.



06b. **Owners, Shrawley Gamekeepers and Owners' Agents (Stewards)**, 1700-1850 with the years for which we have Wood Books indicated by grey shading (green for the Woodman's notebook, purple for the game account). Coz Richard acted as Bailiff/Steward for the first Thomas Vernon. James then his son George Brazier (both Vernon relatives) seem to have been the next Stewards. There were two Thomas Cook(e)s, steward based in Hanbury and gamekeeper based in Shrawley. Coningsby Norbury was a Droitwich Layer and magistrate[14] who undertook "the audit" of the Shrawley Wood accounts. Robert then John Wormington managed the Wood accounts and arranged timber sales.

date	paid	for	days	£	s	d
3/6/1808	John Cooke & son	fallin timber blackpoles &c @ 4/6	24	5	8	0
		Bark peeling:				
	Astley Peelers	" [6/8 a day = 4-5 peelers]	3	1	0	0
	Phillip Jones	" [2/- a day]	23	2	6	0
	Samuel Price	"	23	2	6	0
	John Okey	"	18	1	17	0
	Wm Jones	"	13	1	6	0
	Thos Jones	"	13	1	6	0
	Edwarde Sanders	"	11	1	2	0
	John Preece	"	23	2	6	0
	John Hornblower	"	16	1	12	0
	John Bridges	"	15	1	10	0
	Wm Bayliss	"	16	1	12	0
	Richd Griffiths	"	10	1	0	0
	James Thrupp	"	10	1	0	0
	Edwd Powick	"	13	1	6	0
	his son	@ 1/-	7	0	7	0
	Betty Holloway	@ 1/-	9	0	9	0
	Elizabeth & Wm Lythall	carin bark to roades		1	5	0
	Betty Cooke	setting up barke @ 10d	23	0	19	2

07. Extract from the author's Wood Book transcription showing payment for bark peeling in 1808 when the peelers were listed individually.



a



b



c



d

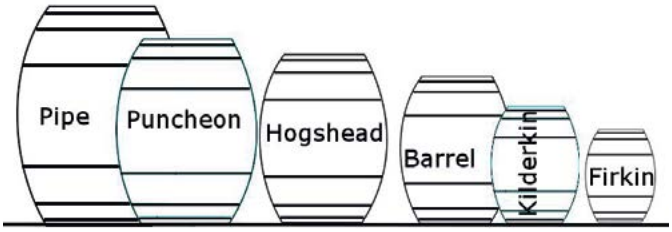
08. Bark Peelers around 1910
b Enlargement to show boys holding peeling irons (bark spuds).
c Bark peeling spuds with long handles
d Close up view of spud heads. [c and d © Roger Plant]

1764—1840 dramatis personae

The Woodmen
In 1764, the Head Woodman is Edward Atheridge Senior, and his team Edward Atheridge Junior, Thomas Jones, Phillip Jones, Edward Smith, Edward Powick (spelt Payk 1764-7) and Richard Price. Although woodmen, some of these villagers had significant other work. Edward Powick paid tithes on 30 acres and an orchard; Thomas Jones paid tithes on two acres; the others paid tithes on small quantities of hemp to achieve their quota. The family names of Atheridge, Jones, Smith, Price/Preece and Payk/Powick recur throughout the Wood Books, and the tendency to name their children with their own or their brother's forename makes kindred relationships more difficult to analyse. However Edward Payk's descendants have been studied in detail by members of the Powick family; they have played a central role in the later history of Shrawley Wood (06).

Bark Peelers
It was all hands on deck at bark peeling time (mid-summer, when the sap made it easier to peel). The woodmen, their families and sundry other locals came to help. One team called themselves the "Astley Bark Peelers" (07). Many years later, it remained the custom that all the family turned out to help. (08). Once dried, the bark was shipped or carted to the tanyard but in 1816 it was ricked locally, maybe because the river was too low. In 1843 some of the bark was damaged and the tannery paid less for it.

Sawyer, Blacksmith
No blacksmith is named in the Wood Books before James Thrupp (who had been paid since 1809) nor sawyer before Charles Cund (who had been paid since 1805). James was succeeded by his son Joseph in 1842 and Charles by his son William in 1846.



b

Mr Cartwright of Bewdley	3 bundles of Punchin Hoops @ 8/- a bundle
	4 Do. Pipe @ 6/-
	8 Do. Hhd. @ 4/-
	1.5 cord Willow Cratewood @ 73/6
Mr Crump Bewdley	33 bundles of barrelsmart hoops @ 3/6
	36 do. of Kilderkin @ 3/-
	31 do. Firkin @ 1/10
	36 do. Half firkin
	12 do. of bottles @ 1/-
Mr Griffin	6 bundles of Barrell smart Hoops @ 3/6
	6 do. of kilderkin @ 3/-
	2 do. of punchin @ 8/-
	7 do. of pipe @ 6/-
	2 do. of Hhd. @ 4/6
	10 do. of Firkin @ 2/-
Mr Evans & Stokes Worcester	4 bundles of Hhd. Smart Hoops @ 4/6
	10 do. of barrel @ 3/6
	10 do. kilderkin @ 3/-
	10 Firkin @ 1/10
	6 half firkin @ 1/6

09. Roger Thomas's visit of 1811: hoop sales to coopers

Coopers and Hoopers
In 1811 a hooper named Roger Thomas came to work in the Wood and his hoop shaving resulted in a range of barrel hoops listed in no other year. The hoop sales went to coopers who were presumably his regular customers (09).

The Marks family of coopers have already been mentioned. Another cooperage in Hartlebury, most probably situated next to the Mitre Oak, was run by Thomas Spragg, husband of Hannah (née Powick, daughter of Sarah Powick of Bonefields Farm). Like other coopers he bought quantities of gubbins, the term used in the Wood Books for timber cross-cut into short lengths for cleaving bucket staves. Among all his other purchases, in 1835 he bought from Shrawley two great oak trees named "Adam" and "Eve"; next year in 1836 he died on 10th June, the day after making his will; Hannah his wife continued purchasing materials from Shrawley Wood until 1839 then on 1 July 1840 she remarried to Henry Guest, a basket maker. Her eldest son Thomas was living with her in 1841 and was a cooper still working by the Mitre Oak, but he didn't buy wood from Shrawley.

Trow and barge Owners

The majority of remote sales were delivered by river and canal (see appendix Dispatch Routes p. 242). The first Owner of river transport recorded in the Wood Books was (barge) Owner John Rebols. His father Thomas was a Trowman; their wills of 1785 (father) and 1786 (son) indicate they were rich property owners as well as boat owners. The difference between barges and trows (10) was explained in 1804 by the engineer George Perry in his description of traffic on the River Severn:[15]

> "This traffic is carried on with vessels of two sorts: the lesser kind called barges and frigates, being from 40 to 60 feet in length, have a single mast, square sail and carry from 20 to 40 tons; the trows, or larger vessels, are from 40 to 80 tons burthen; these have a main and top mast, about 80 feet high, with square sails, and some have missen masts; they are generally from 16 to 20 feet wide and 60 in length… In May 1756 the number of barges and trows on the river Severn, navigating from Welchpool and Poolstake downwards to Bristol, amounted to 376; and since that time… they may now be fairly calculated at double that number. These are navigated by three or four, and some by six or eight men... The freight from Shrewsbury to Bristol is about 10/- per ton, and from Bristol to Shrewsbury 15/- per ton. The rates to the intermediate towns are in proportion."

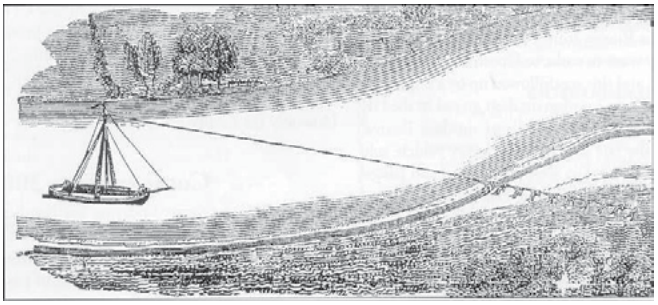


10. The trow *William of Broseley* (© The Ironbridge Gorge Museum Trust)

Owner Rebols bought large quantities of faggots between 1764 and 1786. We have no record of what these particular faggots were used for, but at this time faggots were used to stabilise the banks and narrow the river Severn to increase its depth.[16] Maybe more likely they were for bakers up and down the Severn who depended on faggots to fire their bread ovens (10a).



10a. Kindling a faggot in a bread oven. Photo courtesy National Educational Network gallery.



11. Bowhauliers. . (Figure from the 1810 prospectus for the Horse Towing Company).[17]

Some sales were purchased by the end user, some by the barge or trow owner for onward sale. For example, bark sales to Mr Baker of Bewdley from the mid-1770s onwards were mostly charged to his account, but 1779-1781 the bark was paid for by Owner Rebols for onward sale, presumably to Mr Baker of Bewdley. Owner Rebols bought many other items from the Wood Accounts from 1768-1784. After Owner Rebols died in 1786, trade by boat continued from Shrawley Wood and various other Owners are named as purchasers (Owners Jones 1775-1781, Broadfield 1802-3 and Turner 1812). When the wind was unhelpful, progress upriver depended on bowhauliers. The rope was attached to the masthead (11) to cope with the high banks when the water was low.

In 1840 bark and cratewood were delivered by road to Stourport. Possibly the river was too low for a laden trow or maybe the landing stage had been damaged by the exceptional floods of July 31 1839, or maybe the surveying work for the Upper River Severn locks (Lincomb, Holt, Bevere and Diglis) was interfering with the river traffic. These locks were installed 1843-5 and overcame the problems caused by the many shallows along this stretch when the water level was low in summer. (Dispatch map, Rhodes Section).

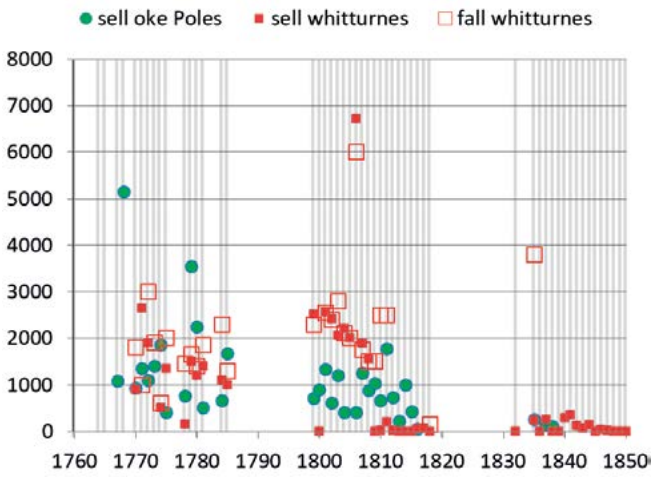
The cratemakers

The crates discussed here have the general structure shown in (12). They are built from two types of wood: the rigid whitturne bars with holes through which the more flexible withies are threaded. An alternative when the rigid stems were too thin for holes had these tied in by thinner stems twisted round: maybe thin withies, osiers or the "tie whitturnes" that were only supplied to Mr Mattox of Worcester from 1770 onwards (and to Owner Rebols, though in his case presumably for onward sale to cratemakers). The role of "threestix", only bought by the cratewood dealers Mr Green of Wribbenhall and Mr Mattox, is unknown. The "three" may refer to their length in feet, or maybe to their position in the order of construction.



12. Crate for glassware: this would be lined with sacking and the glassware packed in straw. [18]

The sales of wood to Mr Mattox and Mr Green from 1770 to 1781 were described as whitturnes; it was not until a visit to the Wood by the crate maker for Honeyborne's glass works in 1784 that the term "cratewood" is first used in the Wood Books, and not until 1808 for the wood sold to Mr Green of Wribbenhall, when it may have been used for the withies because there were matching quantities of witturnes. There is much evidence to confirm that the terms whittern or whitturne or wittan were used in Shrawley to denote the small-leaved lime. This was the most abundant and cheapest wood, so we have to explain the higher prices charged for whitturne cratewood between 1770 and 1840. For instance, in 1835 John Rice bought 52 cord of whitturne cratewood for £208.0.0, a price of 80/- per cord, whereas in the same year John Cook, the wood collier of Bewdley, bought 7 cord 7¾ ft statute measure of (most likely oak) cordwood for coaling at £8.10.4½, giving a price of 22/- per cord. Mary Grice and John Bateman bought cordwood at 12/- per cord – one might guess this was whitturne cordwood, the most abundant. This year too, Mr Perry of Bewdley bought 140 whitturne poles for 23/- (16/5d per hundred), while hop poles were being sold at 10/- per hundred but these may simply have been larger than hoppoles.



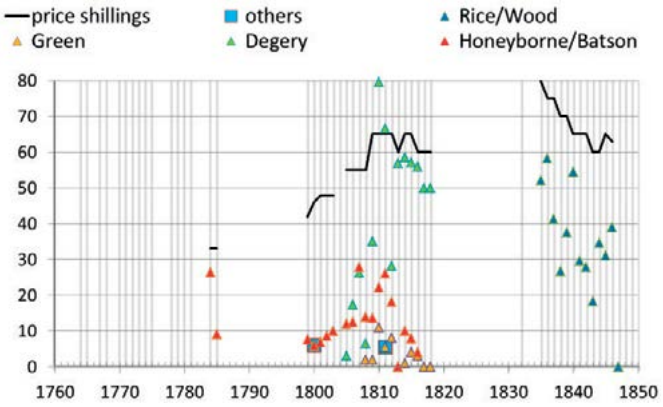
13. Poles sold as oak and those felled and sold as whitturnes. The decreasing sales of oak poles may reflect the disappearance of oak coppice in the Wood, and the falling sales of whitturnes may reflect the change in description to cratewood: see (14).

One difficulty in interpreting this trade is deciphering whether "cratewood" is whitturne or withy: there are no sales of "withy cratewood" but there are of "whitturne cratewood". For example, in 1806, Mr Green bought in the same purchase two cords of cratewood and three cords of peeled whitturnes, both at 65/- per cord: was this cratewood the withies needed to go with the peeled whitturnes? One could understand why a cord of withies was expensive – you need large numbers of withies to make a cord, but why were the peeled whitturne so expensive if they were lime wood?

Many of the whitturne sales to cratemakers were described as peeled or ballard or chaise whitturnes, maybe indicating it was all peeled, cut to size and drilled with holes ready for making the crate.

At this point, it is worth noting that use of each of the terms "cratewood" and "clogwood" in the Wood Books seem to have originated following specific orders for these products rather than being endogenous local woodmen's terms. Maybe they were used because the purchasers had a history of ordering these products from other suppliers, and these were the terms the other suppliers had been using.

The Staffordshire & Worcestershire Canal opened in 1771 and the Stourbridge canal in 1779. Their main concern was transport of coal but they created opportunities for transport of many other goods, including wood from Shrawley. The crate maker to Honeyborne's glass works in Moor Lane, Brierley Hill, certainly used the canal by 1784 but maybe as early as 1781.[l] Curiously, this anonymous cratemaker was given an allowance each year by the Vernon Estate, discounted against the account payed by Mr Honeyborne; possibly this paid for his visit to the wood each year to get the wood he needed. Attempts to identify the cratemaker found Edward Millward, crate manufacturer in Brettel Lane, close to Honeyborne's works. Although we have no direct documentary evidence, it seems possible it was someone from Millwards who visited Shrawley Wood to select the cratewood he needed and maybe peel, split and drill the rigid bars ready for crate making. Honeyborne joined forces with Batson in 1803 and this company made its last known order for cratewood from Shrawley in 1816 (12) .



14. Cords of cratewood sold each year.

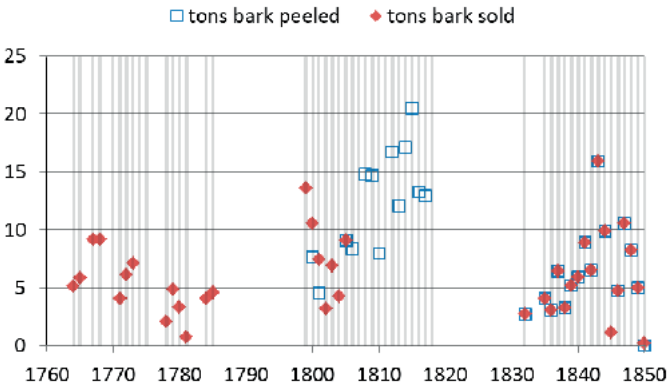
Wheeley & Littlewood placed one order for cratewood in 1800; this was probably related to their Glasshouse in Brettel Lane[19]. They never ordered cratewood from Shrawley again, but from 1805 at least until 1818 on, Mr Degery of Dudley (probably a patten[m] maker and timber merchant supplying to various trades, see clog makers below) bought all the clogwood and cratewood in huge quantities between 1810 and 1818. In 1836-1844 the main cratewood purchaser was Mr Rice of Stourport; his yard was in Foundry Street and Wedley reported in his book Old Stourport[20] "I remember old John Rice lived at the White House, and all along this left-hand side were ranged his big piles of poles and withies."

Before any of these purchasers of cratewood, the Worcester China[n] Co. bought timber, poles and underwood in 1765, 1767, 1768. Although it is conceivable that this was for cratewood, the company had just taken over the mill that was later to become Astley Forge[21] and the wood may have been for refurbishments. In 1800 Messers Flight & Barr of the Worcester Company bought 18 foot of Timber for repairs to the Ridding Bridge; until 1805 they still used the Astley Mill for crushing soaprock for porcelain manufacture.[22]

l This uncertainty is due to missing Wood Books for 1781—1783
m Patterns were a type of clog
n Later the Worcester Porcelain Co. then from 1862 the Worcester Royal Porcelain Co. Ltd.

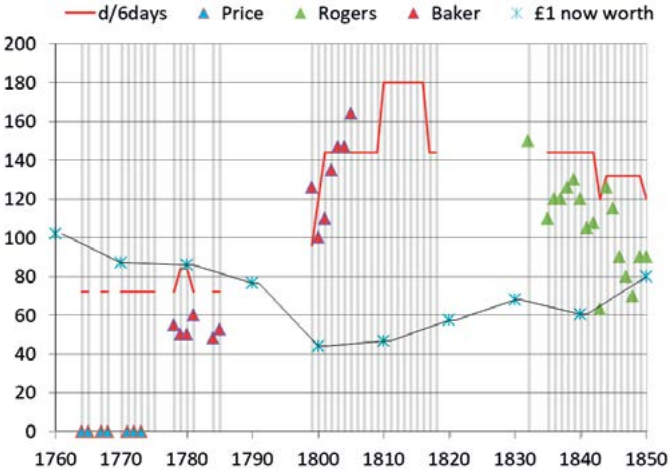
The tanners and bark sales

Throughout the period 1764—1850 oak bark was sold to tanners (15). At the start (1764—1773) it was delivered to Mr Price (1764-6) or Mrs Price (1767-1773) of Wick[o]; The Vernon family had acquired an estate of 200 acres in Wick[p] in 1745[23] and the Price tannery may have been Vernon property, perhaps explaining why the bark was delivered there but no payment recorded.



15. Tons of bark peeled. Each ton came from 175 Hoppus[q] ft (Hft) of oak timber (14lb per Hft – see 1875-1897 p. 211). There is a curious disparity between records of payments and sales at different times.

When Thomas Baker acquired his tannery in Bewdley in 1776, from the start he contracted to buy all the bark from Shrawley Wood (probably among many other suppliers). Sale of bark to Owner Rebols in 1779 (presumably for the Thomas Baker contract) was for timber bark at 40/- a ton and coppice bark at 50/- a ton, implying that the tanners would pay a premium for the coppice bark. This distinction between timber bark and coppice bark was last mentioned in 1781. During Thomas Baker's trade with the Wood, the price he was charged escalated relentlessly (16); this was a national trend due to the great demand for leather resulting from the Napoleonic war[24] together with a fall in the buying power of the pound. Then came Joseph and John Rogers of Stourport who continued buying bark from Shrawley until the last extant Wood Book in 1850 (and probably onwards until their tannery was burned to the ground after a fire was started in one of the bark ricks in 1860).



16. Bark prices shillings per ton, money value as value now of £1 then[r] and Woodmen's pay (pence per working week).

Hop growers

Hop poles (17) were sold in vast numbers in the late 1700s, mostly within the parish (18), but the numbers of purchasers and poles per purchase fell to nothing by 1850 (19). We know from a woodman's notebook[25] that poles were cut to fulfil orders placed before the season's cutting started and the fall in numbers cut reflects the fall in demand.

Orders for hoppoules for the yeare 1767
Samwell Jones of Holt 1000 of 5[s] poules
M[r] gunary (junior) *William 800 of 5[s]*
M[r] Ledego 200 of 5[s]
M[r] Martin 100 of 7[s] 1000 of 5[s]
M[r] Quick 2000 of 5[s] & 3000 of 5[s]
M[r] Purkes 1000 of 7[s]
M[r] Boren 1000 of 5[s] & 500 of 7[s]

This variable pricing of hop poles persisted until around 1800, after which hop poles were a uniform price of seven shillings per hundred, rising to 10 shillings sometime between 1818 and 1832. Kendrick Watson's pricing matches what is recorded in the Wood Books: "ash hop-poles from twelve to sixteen shillings per hundred, those of maple, wittan, mountain ash, and hazel, about ten shillings per hundred;" this tells us that the default hop pole was not only of witan (the local name for lime) but also any other wood that had grown to a suitable size. The Wood Books give us no help quantifying the numbers of each species, but from what we see in the wood today, a great majority would have been of lime. The final blow to hop growing in Shrawley came in 1840 with the tithe supercharge for hops.



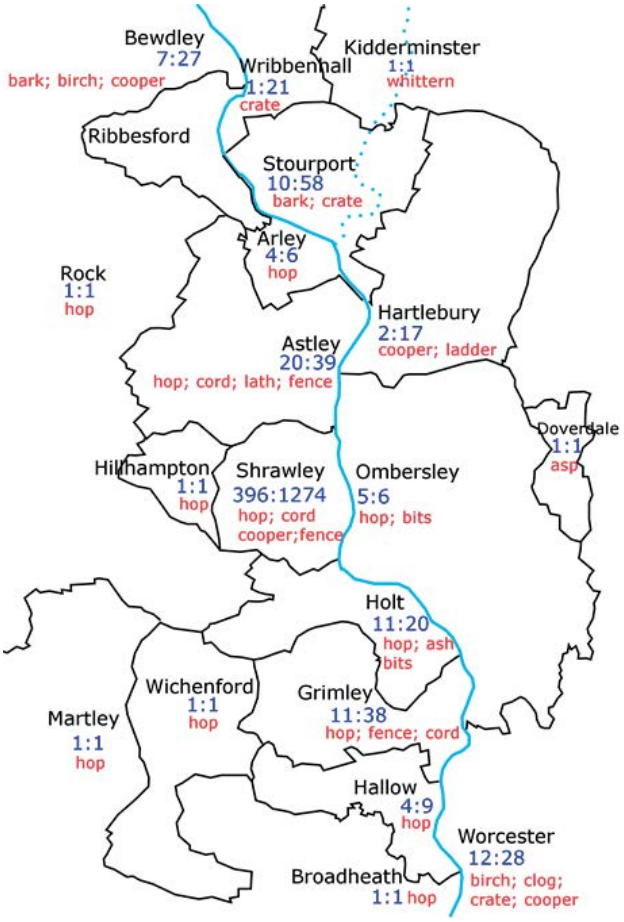
17. Hop poles stored for the winter. The left-hand group are standing in a heated tar tank to preserve their butts. Photo courtesy of Bromyard and District Local History Society and Hereford City Museum.

In 1847, 27 gallons of gas tar (a forerunner of creosote) were bought on the wood account. Around this time, hoppoles were first treated with creosote to preserve them but we do not know if this purchase was used for this purpose.

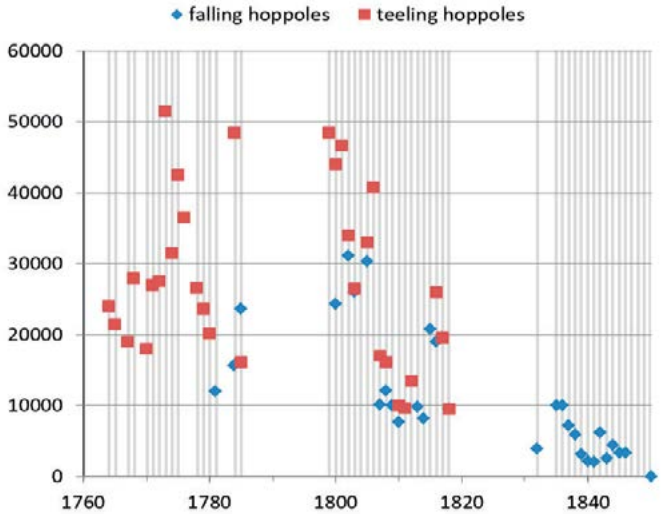
Other traders

Mr Hill of Worcester bought substantial quantities of birch poles and timber between 1784 and 1808. It is possible he was a builder. Several others from Worcester also bought quantities of birch in the same period. Messrs Skey & Brookhurst of Upton upon Severn bought thousands of birch poles 1799-1804. Skey & Brookholding of Bewdley were listed in the 1791 Directory as merchants; it seems possible this was the same company.

o These may have been Mr Samuel and Mrs Penelope Price.
p See 1875-1897 fig (10)
q Hoppus foot is an imperial measure of volume from log to converted timber, accounting for loss. It includes the rounded edges from which the cubic volume has to come.
r Money value data from the Office of National Statistics.



18. Sales to neighbouring parishes from Shrawley Wood: totals for all years 1764-1850 for which we have an accounts record. Purchasers of hedging materials (lop & hetherings) and thatching materials were not accounted for individually apart from 1813-1818. Geographical distribution of these sales was similar to this map. Blue figures = numbers of purchasers:number of sales. Black lines = parish boundaries, blue line = River Severn, dotted blue = canal. Almost all sales were within the parish of Shrawley or to purchasers accessible by river transport. hop = hop poles; cooper = gubbins and other cooper's wood; birch = birch timber; fence = oak posts and birch rails; cord = cord wood; lath = lath; clog = birch clog wood, crate = cratewood, ladder = ladder poles, bits = a mix of small quantities of various produce.



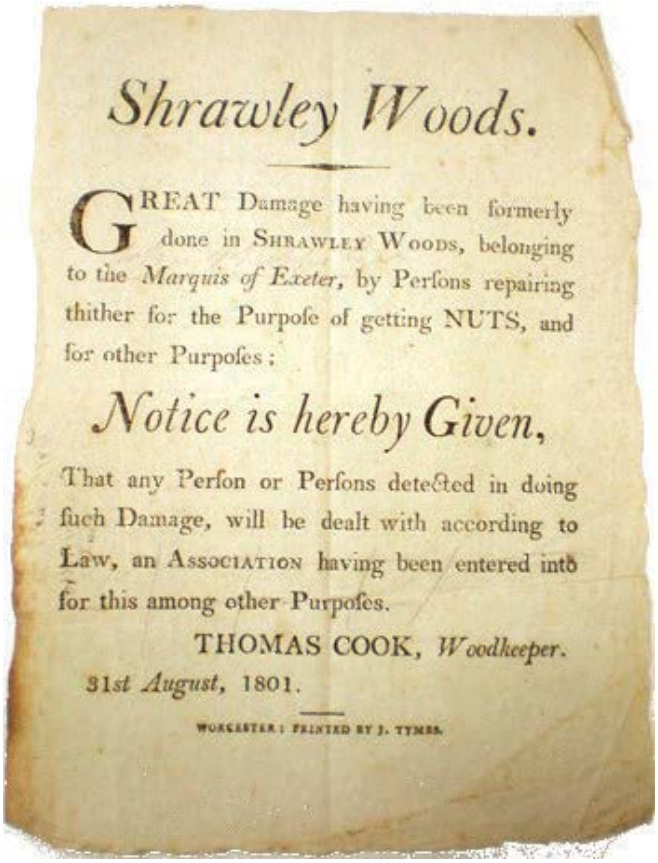
19. Falling numbers of hop poles recorded in the Wood Books.

gamekeeper / woodward	from	to	
John Anthonies	1736	1779	died 1788 age 84
Thomas Cooke	1776	1812	died 1814 age 56
Thomas Cooke the younger	1814	1829	moved to Hartlebury
Robert Wormington	1830	1832	died 1832 age 59
John Wormington	1833	after 1860	died 1891 age 84
Samuel Powick	before 1875	1895	died 1895 age 62

20a. Gamekeeper / Woodward succession. See also (06b)

Gamekeepers and Woodwards

From 1736 when John Anthonies first had his gamekeeper licence through to 1895 when Samuel Powick died, the Vernons always had a Woodward-come-Gamekeeper (20a). From 1764 to 1775 the Wood Book accounts were signed off by John Anthonies[s], then in 1776 they are signed off by Thomas Cook pp. JA; Thomas Cook (steward – a different man based in Hanbury) then signs off the accounts 1779-1784 but Thomas Cook (gamekeeper) seems to have been involved in handling the cash. In 1780, the Rev Daniel Piercy, Rector, charged Thomas Cook for the tithe due from Jonson's Grove; this was probably the steward rather than the gamekeeper. The 1785 accounts are unsigned and 1786-1798 are missing. 1799 is signed off by Thomas Cook (gamekeeper). The 1801 warning notice (20) was in the name of Thomas Cook Woodkeeper and an 1812 advertisement for sale of coppice wood was handled by Thomas Cook, Woodward.[26] The first Thomas Cook, Gamekeeper and Woodkeeper died 1814 (21) and was immediately succeeded by his son, Thomas Cook, who had obtained his gamekeeper's licence in 1813. When Thomas Junior left Shrawley to move to Hartlebury in 1829, local management of the Wood Account was undertaken by Robert Wormington who was succeeded by his son John when he died after just two years in post. After 1800, nearly all the accounts lack signatures until Thomas Jones (head woodman) took over in 1846, when he signed off the accounts until 1850.



Shrawley Woods.

GREAT Damage having been formerly done in SHRAWLEY WOODS, belonging to the *Marquis of Exeter*, by Perſons repairing thither for the Purpoſe of getting NUTS, and for other Purpoſes;

Notice is hereby Given,

That any Perſon or Perſons detected in doing ſuch Damage, will be dealt with according to Law, an ASSOCIATION having been entered into for this among other Purpoſes.

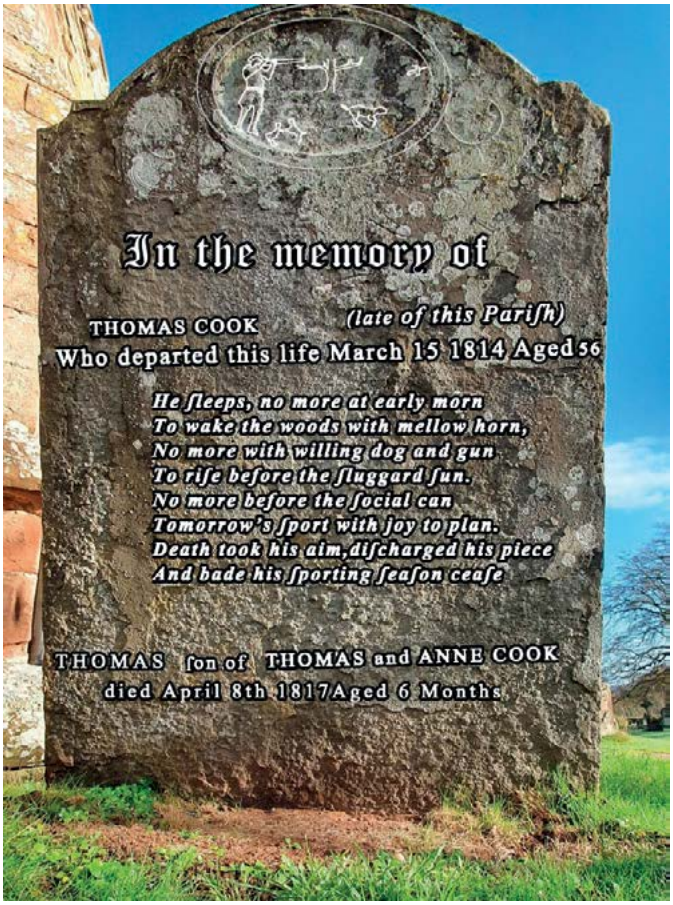
THOMAS COOK, *Woodkeeper.*

31st August, 1801.

WORCESTER: PRINTED BY J. TYMBS.

20. Warning notice, 1801.

s John Anthonies or Anthonis; baptised 18 Jan 1704, buried 21 June 1788



21. The gravestone of Thomas Cook (the elder) at St Mary's, Shrawley. The white text is taken from records of the stone before it became so severely weathered and is superimposed on the remaining traces of the text. His infant grandson Thomas was buried with him three years later. The oval bas-relief depicts a man shooting a rising bird, three dogs and a tree.

The gamekeeper also supplied game for the table at Hanbury and for the Vernon's associates (21a). (see also 1700-1763 p. 170)

	£	s	d
for 45 Breace of partridg	*1*	*10*	*0*
for two Snipes	*0*	*0*	*8*
for one quaile	*0*	*0*	*4*
for one Telle [Teal]	*0*	*0*	*6*
for 40 Cuppul of Kokes [Woodcock]	*1*	*6*	*8*
33 and a halef to Hanbury			
3 Cupel & a halef to Esquier Ligins			
3 Cupel to London for Doctor Lea and Mrs Martin			
and one Breace of hares			
payd the Caridg of that to London	*0*	*4*	*0*
hares 8 Breace & halef	*0*	*8*	*6*
for 26 gurnies [journeys] *to Hanbury*	*1*	*6*	*0*
and for 2 to Worcester with Game	*0*	*2*	*0*
pd for three horses for the Doggs	*0*	*15*	*0*
Pd for 2 Baggs of Barley	*0*	*13*	*0*
Total	*6*	*6*	*8*

21a. A Count of Game taken for the use of Thos. Vernon Esquire in the year 1752[27]. The three horses and barley were to feed the dogs; in 1758 ½ bushel of wheat was to feed the birds. Partridge were shot August to October, Woodcock November to March.

Hanbury Hall
In seven years from 1813 to 1838, the woodmen were paid for making over 20 dozen besom brooms which went to Hanbury for use in the stables. Other produce sent to Hanbury included timber, laths, hedging materials and faggots. Two enigmatic entries include 1809 "Pd. The Woodmen for Two Burdins of Beste to go to Hanbury: 2/-" and 1832, at the end of a list of underwood cutting, "for beaste to Hanbury: 2/-". This was probably best wood or faggots.

Shrawley Wood and Shotgrove produce

Many of the woodmen's terms we came across in the Wood Books were unfamiliar and some detective work was needed to reconstruct a local dictionary (see Glossary pp. 153-166). Some documents were particularly helpful, such as the 1708 and 1709 agreements between Richard Vernon and the Woodmen discussed in the chapter 1700-1763 pp. 167-9. Another useful document was a draft notice from 1779. This document[28] laid down the conditions for an auction of the whole of Kingshill Bind "*consisting chiefly of Hop Poles and Shade Wood*" to be held in Lower Arley, Worcestershire, on January 11th 1779. The handwriting is clear and the spelling of Shade Wood is consistent throughout this document. Presumably this is a variation on the spelling of what is called Shide Wood in the Wood Books. The terms of this auction give clues to the meaning of some of the terms used in the Wood Books.

There were five conditions:

1 The Whole of the Hop Poles to be cut close to the Stubs and the Shade Wood to be fairly Ax fallen – and the whole to be out of the wood by the usual roads before Midsummer next – and the whole of the Hop Poles and Shade Wood fallen before the first day of March next, except the oak poles which must be fallen before the first day of June next.

2 The Woodward John Anthonies to mark such Poles, & Shade Wood as are to be left Standing with Red Paint – which shall be no more and only of such size as have been usually reserved and left to stand in the constant Mode of falling.

3 The advance on each bidding £2 & the highest of two or more bidders to be the purchaser & if any disputes should arise about the biddings the same to be put up again and resolved,

4 The Purchaser to pay into the hands of Mr Slater a deposit of £5 per cent in part of Purchase money and enter into Articles and sign the Biddings for payment of remainder to Henry Cecil Esq at his order at Michaelmas next.

5 The Chats and Offal Wood which has usually been reserved to the Poor of the Parish of Shrawley is reserved out of this present Sale by the Vendor. [We think chats and offal wood were the small left-over fragments of wood].

The Wood Book for that year has payment for work and receipts for sales "for the use of Henry Cecil Esq" as for other years around that time, suggesting perhaps that this auction never led to a sale.

Stubwood
The Whole of the Hop Poles to be cut close to the Stubs. This instruction demands that when hop poles were cut from the coppice stool, the cut must be low. The account given by George Osbourne[29] makes the reason clear:

That's the difference, it was important. If you cut them off sweet right at ground level you get basal shoots and they replace the wood time and time again, they still keep coming because it was done correctly. Any shoots off a keg (the result of cutting higher up a stem) *and you're not replacing your wood.*
Look at what they grow on, the root system. Those old stumps they keep on but there's a life span attached to them and when that's finished that'll die.
That's what the whole object's for, you're growing new wood. Basal growth, right off the root stock. New roots, new shoots.

Stub wood was therefore the coppice stools. Falling the stubwood and cutting out the hop poles meant cutting the coppice stool growth of the last cycle at ground level and then trimming the stems to yield hop poles and faggot wood. When we tried this on stools with 17

years' growth, there was a quantity of stem bases too thick for hop poles that could have made cord wood or shide wood (see below) – but for what? It was no use for charcoal. Of course, what we found in this exercise may have been the consequence of recent irregular coppicing and poor practice resulting in very uneven growth in the stubwood.

In 1839 the woodmen were employed *stocking stubs for roads*. In this context stocking is grubbing out the coppice stools. The amount of time spent on this activity is not explicitly stated, but the total pay for it was £2 10s, and at 2s per day, this is 25 man-days work. Working in pairs, at best four stubs per hour, say 30 per day, thus could clear 375 stools. Being pessimistic, say 200 stools, and at 400 stools per hectare (see chapter Regrowth & Regeneration p. 296), this would have cleared 0.5 ha, equivalent to 1.0 km of road 5 metres wide. Then again in 1841 the men were paid £2 for *"stocking up a further part of the Ridin Roade"*, and in 1842 another £1 10s for *"stocking up a new road in the wood"*. Was this "Ridin road" a track along the edge of the wood beside the meadows called the Riddings, or was it a road for riding along? Together these clearances were probably sufficient to create the main straight ride through the Wood.

Cropwood, crapwood

The word *crap* (=crop) suggests cutting or harvesting (this was well before the days when crap came to mean poor quality or low value). The 1708 contract with the woodmen started with:

fall marke Binde faggott and Worke up All the underwood and what cropps and Tops of Trees shall be apointed to them to work up

We infer from this that the crop of a tree is the side branches removed to raise the canopy and the tops are the upper branches removed after felling timber. This interpretation seems to work with all the occurrences of *crop* and *crap* in the wood books. Crapwood sales are recorded from 1765-1815. Many sales were for "shidewood & crapwood". 1803-1805 many "loads of craps" were sold at 10/- the load, possibly as firewood.

Shidewood

Shidewood is defined in "*The Parliamentary survey of the lands and possessions of the dean and chapter of Worcester: made in or about the year 1649, in pursuance of an ordinance of Parliament for the abolishing of deans and chapters*"[30] :

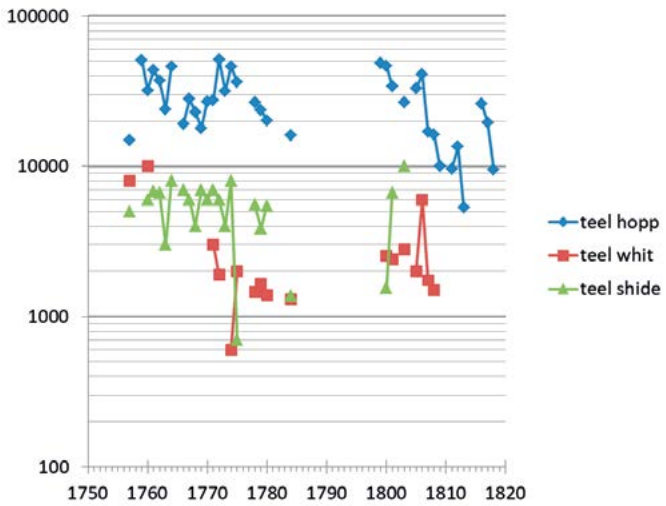
> Also the Lessee and Woodward and his assistant shall fall the Woods in due time, observing chiefly the Wind and the Moon, That is as near as may be none be fallen The Wind being in the E., N.E. or N., nor within 5 days before nor after the change of the Moon, And to shred and mark the bigger wood according to **Shide wood** truly and equally as near as he can, viz.. **Every Shide 7½ ft. long and 12 ins. about, and every 100 contain 1 Ton**, And that he make the woods into Kidds and faggotts, every Kidd and faggott being 4 ft. long at the least. So that every 100 Kidds or faggotts contain 1 Ton, and that he square the Timber trees. This is to be done yearly as near as may be before 10 June,

This account gives us an exact definition for shide in 1649 Worcestershire, but was this fixed through time or did it vary from place to place and drift in interpretation across the decades? No hop poles are mentioned in the Parliamentary Survey. It may be that hop growing had not by then become so popular that there was a local demand for poles and this change in demand might affect the requirement for shidewood. Brian Stephens writing for the Wyre Forest Research Group[31] discusses the difficulty reconstructing what was meant by shide wood and quotes various measurements including 1571: *The shedes to be maid of the said Hardwode to be in leinth a Yerde and in thikenes a Spanne*; 1677: *Cutting every shid of tall wood four foot long beside the kerf, and the billet three foot four inches*; and various references suggesting split wood.

The 1649 definition *7½ ft. long and 12 ins. about* gives a mass close to the target of a ton for a hundred shide with green wood such as lime and a common theme among the various definitions of a shide seem around 1/100 of a ton, short and fat or long and thin, whether they were destined for splitting or not.

Some years the Shrawley Woodmen were paid for "falling hoppoles, shidewood and faggotwood", other years for "falling the timber and shidewood" or "falling hoppoles & timber & shidwood", so these combinations are not helpful in deciding what their shidewood was. Shidewood and crapwood were often sold together; in other sales, shide poles went to hop growers with (or as an alternative to?) hop poles. Shide poles cost the same as non-shide poles, so for example most years from 1765 to 1785 Mr Hatton bought 1,000—2,000 hoppoles along with 100-500 oak poles or "long oak". In 1772 "270 shides of long oak" charged at 8/- per hundred were substituted for his usual long oak which had been charged at this same price in 1771. "Long oak" may have been 7ft 6in long as opposed to oak cordwood at four foot long and yard wood at three foot, the yard wood being what the charcoal burners preferred. In that case, shides of long oak and long oak would be the same thing. If shidewood was usable as hoppoles, then it must have been longer than 7ft 6ins; maybe these were just rather thick hop poles or maiden growth rather than stubwood?

Another clue might be found in the ratio of hop poles to shidewood. Every year (probably since the first contract between Woodmen and the Vernons in 1708) up until 1817 the Wood Books record the *teeling* of wood. In 1738 this was written *telling*. This was a report of the numbers processed during the year, the word *teeling* maybe derived from the tally sticks that were originally the method of recording the produce (chapter 1700-1763 p.168-9). Hop poles and shidewood were usually reported separately, whereas whitturnes were often counted together with faggots.



22. Numbers of hoppoles, whitturnes and shidewood recorded in teeling. All the whitturnes and most of the hop poles were lime, the difference being in their end use; much but not all of the shidewood may have been 17-year-old birch.

Shidewood is recorded in the teeling of last year's wood most years for which we have records from 1757 to 1805, along with hoppoles. Faggots are only recorded in the teeling until 1773 but not thereafter. Whitturnes are recorded inconsistently, sometimes lumped together with hard faggots. The ratio of hoppoles to shidewood is typically 4:1 (22); In 1805 teeling shidewood is replaced by teeling burch; this was the year that Mr Hill of Worcester bought "2300 shides of burch @ 6/- per hundred" – the same price he paid in other years for birch poles. A similar change in record occurs in "marking " the wood. Each year from 1770 to 1780 the men were paid for "marking the wood" then 1802 to 1805 "marking shidewood" then 1806 to 1811 "marking and measuring birch". Does this indicate that the wood they were marking throughout this time was birch shidewood? And why marking and measuring? Was this to check that it conformed to some standard before it went for sale? Birch poles were bought each year by Mr Coldrick of Bewdley and later by Mr

Hill of Worcester. They may have been builders who put in orders for birch poles of specific dimensions.

But Shidewood was not always birch. In 1807 Thomas Spragg, cooper from Hartlebury, bought 1100 ash poles @ 30/- per hundred and 450 shide ash @ 10/- per hundred (he normally bought ash poles at 10/- per hundred – the 30/- ones must have been bigger). This is the last mention of shide wood in the Wood Books.

Returning to the 1779 auction and its reference to *shade* wood: could shade wood and shide wood be the same? Phonetic rendition of shade in Worcestershire could well have been written as shide, and the inverse of this would not be impossible. The *shade wood* was to be fairly axe fallen. In this context and at this stage of cutting the fall, this suggests that the shade wood was the maiden growth since the last coupe that was to be removed to clear the way for felling any timber trees. The auction rules went on: *The Woodward John Anthonies to mark such Poles, & Shade Wood as are to be left Standing with Red Paint.* This again is consistent with the idea that the shade wood was the maiden growth and that some were to be reserved at least until the next cycle as *doublegrowers* or longer as timber trees.

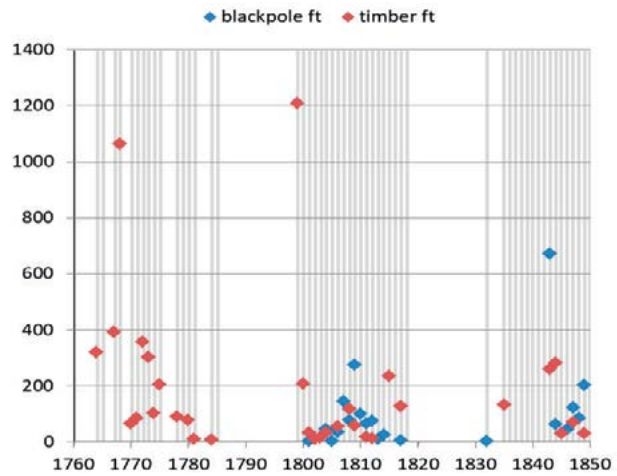
Pittwood
Pittwood, sold by the cord, was only recorded 1807-1809. Mr Degery of Dudley bought small quantities (1.5-2 cord) of it each of these years at 32/6 per cord, and Mules & Barnett of Stourport bought 2ft birch pittwood in 1807 at 38/- a cord. One might wonder whether these tiny quantities were used for mining.

Blockwood (Blookwood)
John Bunts was paid for cutting 20.5 cord of blookwood in 1811. Five and a half cord were sold to Owner Turner that year but the rest was trimmed for charcoal burning in 1812 (see Colliers, below). We do not know what blookwood / blockwood was, but if it needed trimming for charcoal burning it seems to have been longer than yd.wood (three foot) that the colliers used and probably oak or birch if it was used for coaling. The name suggests this was wood of greater diameter than poles or shidewood.

Oak timber and blackpoles
Blackpoles are coppice oak grown on through three or more cycles of coppicing; at this stage they may typically have two to four stems. There are few mentions of blackpoles in the payments section of the Wood Books: in total they comprise:

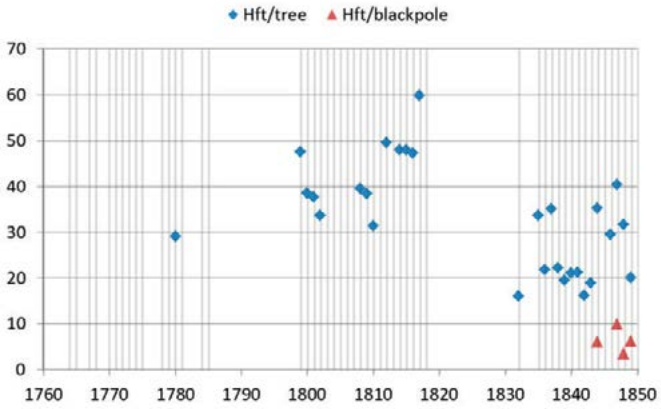
1800: John Cook for 8 days falling the stubwood & blackpoles, 16/-
1801: John Bunce for falling and peeling the Blackpoles and Stubb wood, £4-14-0d
3/6/1808: John Cooke & son for 24 days fallin timber blackpoles &c @ 4/6: £5-8-0d
1809: for halling to Severn for Mr Degery: 194 foot of Ash & Blackpole, £2-0-5d
1810: for hallin to Severn for Mr Degery144 ft blackpole tops &c @ 2.5d, £1-10-0d

Although John Cook felled the first blackpoles in 1800, the first sale, of just one blackpole for five shillings, was 1801 to Mr Still, who between 1799 and 1813 bought a variety of mixed underwood. The next sale was in 1804 to Mr Newcome, of nine blackpoles at five shillings each. So what happened to the other blackpoles that John Cook and John Bunce felled? Two discordant records (1804, 1805) have blackpoles priced per hundred at a similar price to hoppoles, suggesting these are something else. Another record from 1812 is for a cord of blackpoles at a very low price (11/- a cord). Mostly blackpoles are sold at 16 pence per Hoppus foot (Hft) from 1806 to 1849 with occasional outliers as low as 12d (1848) and as high as 30d (1812).



23. Recorded oak timber (including oak tops and oak board) and blackpoles sales, Hoppus ft. [t] If all the oak timber felled was sold, only a small fraction is recorded here.

Later blackpole sales are recorded in more detail (23), but are complicated by different methods of recording, as numbers, volumes or both, sometimes lumped together with other produce such as oak posts. The annual mean volume of blackpoles poles where this can be calculated (1844-1849) is less than half the smallest annual mean volume for oak timber logs (24). This may be compared with the timber in the 1945 felling log notebook[32] where the average oak log size was 39.7 Hoppus ft and even the smallest tree was 16Hft. The oak trees "Adam" and "Eve" sold to Thomas Spragg in 1835 had a combined volume of 132.7 Hft. The size of blackpoles is compatible with them being two and three cycles old (34 and 51 years), with the trees felled for oak timber being substantially older.



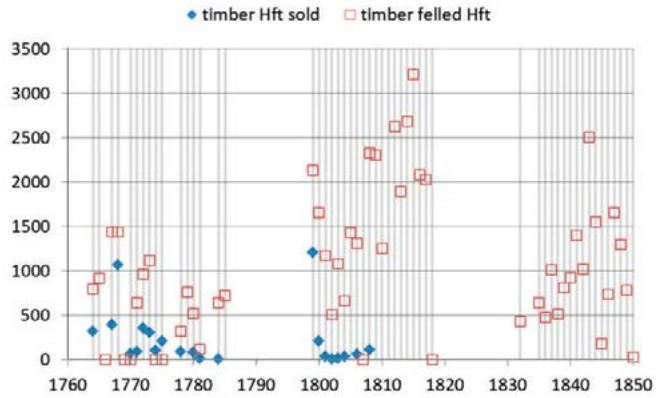
24. Average size of oak timber trees each year calculated from numbers felled and quantity of bark peeled at 14lb bark per Hoppus Foot. Blackpole size is derived from nine sales where both number and volume are recorded.

Adjacent records of "oak blackpoles" and "blackpoles" are slightly worrying, raising the possibility that not all blackpoles are oak. The other (more reassuring) possibility is that these reveal uncertainty which timber to classify as blackpoles and which as oak timber. Blackpole felling and blackpole sales start 1800; it seems possible that blackpole was not an endogenous local term for coppice oak before its first appearance in these records.

Nor is it easy to deduce the quantities of timber felled. In the earlier books this is nearly always lumped together with another activity such as "falling timber and shidewood" or "falling and peeling the poules". Then from 1799 onwards "buttin toppin and roundin" entries appear for timber trees, mostly oak. But there seems a tight relationship between the mass of bark peeled and volume of timber felled when these are both recorded, with between 13 and 15 pounds

t Hoppus foot is a measure giving an estimate of the usable timber in round logs. Hoppus Volume (h ft) = [circumference(ft)/4]^2 × length (ft).

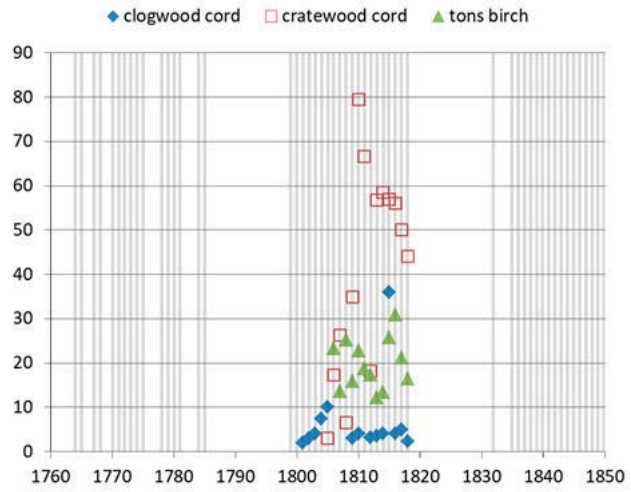
of bark for each Hoppus foot of timber. This allows the volume of timber to be calculated as 475 Hoppus feet per ton of bark, and (25) shows that most of the oak timber sales from which the bark came are not recorded in the Wood Books.



25. Comparison of timber felled (calculated from bark peeled) with timber recorded as sold (excluding oak tops and oak boards) in the Wood Book sales. It seems oak timber sales must have been recorded in a different ledger.

Clogwood and Clog-makers

In 1799 Mr Pemberton of Worcester bought 8.5 cords of clogwood. This is the first year clogwood is mentioned, and none was listed in the cutting work that year. For the next 18 years woodmen are paid for cutting clogwood but 1800 was the last year Mr Pemberton bought it. It was "Mr Diggory/Deggery of Dudley" who bought up all the rest until 1818, the last year clogwood is mentioned (26)



26. Mr Degery's purchases. Besides these, he bought many other items from Shrawley: oak, blackpole and ash timber, hazel, birch and ash poles and more. This would have amounted to several barge-loads each year.

Attempts to identify this Mr Diggory/Degery of Dudley unearthed Samuel Degrey and later John Degrey who were patten makers, according to the directories.[33] Pattens were similar to clogs, being overshoes with wooden soles. This would explain the interest in clogwood but it looks as though after buying wood for this business for three or four years, John Degrey took the opportunity for profit as a wood merchant while continuing to buy clogwood at much the same rate for his pattern manufacture. There are newspaper references to the theft of coal at Astley (presumably off the river?) from Samuel Degrey coal merchant of Dudley; coal merchants were commonly timber merchants and at the baptism of a daughter of a John Degrey, born in Stourport, he gave his occupation as a timber merchant.[34] It is not clear how many people are included in this account of John and Samuel Degrey, whether father and son had all these businesses or whether other family members with the same name were involved.



27. Jeremy Atkinson, traditional clogmaker

Although alder was commonly used for clogs elsewhere, in 19th century Shrawley clogwood was cut from double-grown birch. Birch is one of the preferred woods for clog-making in the Midlands.[35] However, an account of Shrawley Wood "within living memory" written[36] in 1982 tells us:

> The woods provided occupation for many foresters. Apart from the usual requirements of the carpenter. some wood catered for special needs. Lime wood was in demand for handles for enamel pans and as witton for chip baskets for the soft fruit producers around Evesham. Withy from the willows was in demand for basketry and oak bark for the tanneries in Worcester. The alder provided sales for clogs and each year clogmakers would camp in the woods and ply their craft "on site", using the waste wood and chippings for their fires.

The equipment used by the clogmakers in the wood would have been similar to the wrokbench and clogging knife used by Jeremy Atkinson (27).



28a. Bewdley Wood Colliers and their cabin, Wyre Forest, around 1900. Photo courtesy of Bewdley Museum.

year	paid	for	£	s	d
1780	Allowed the Collier	a Cabbin	0	1	5½
1781	Allowd the Collier	a Cabbin	0	5	0
1785	Allow'd the Collier	a Cabbin	0	5	0
1812	Pd. to Collier	3 Cabbins	0	15	0
1835	Joseph Cook	A Colliers Cabbin	0	2	6
1837	Joseph Cook	a Colliers Cabin	0	5	0
1840	[Chr./Mr.] Carradine	a colliers cabin	0	5	0
1842	Mr Cook of Bewdley	a Colliers Cabin	0	5	0
1844	paid	allowance for colliers cabin no bill	0	10	0
1845	Alloud J Knight & Co	3 colliers cabins no Bill	0	12	6
1846	alloud	Colliers Cabin	0	5	0
1848	alloud	a Coliers Cabin	0	5	0
1849	alloud	Colliers Cabbens - one for the Old Wood and one for New Cordwood	0	10	0

28b. Allowance given for colliers' cabins.

Charcoal and Colliers

Charcoal burners operated in Shrawley Wood from time to time. There was a family of wood colliers in Bewdley named Cook, one of whom became an innkeeper and established The Wood Collier's Arms in Bewdley.[37] Wood Colliers Arms continued to be run by George Cook (There was a publican there in 1831). We know of charcoal burning in Shrawley Wood from the allowances given for colliers' cabins (28) and from yard wood sales; wood for charring was mostly sold as *yd. wood* (we think yard wood was cordwood cut to three foot lengths instead of four foot). It was the cheapest cordwood, much cheaper than cratewood or clogwood. The species of cordwood is seldom specified, but in 1806, while he was running Astley Forge, Mr Shinton bought 15½ cord of oak cordwood at 13/- per cord, so the prices in (29) suggest yardwood may have been of oak (which forms good charcoal) rather than lime, which yields powdery charcoal which is unsuitable for most purposes.

Cookley Iron Works: Messrs John Knight & Co

"Mr Night"[u] bought cordwood in 1764 and later John Knight Esq bought yard wood from Shrawley Wood on several occasions; in most instances the purchase of wood corresponds to allowance for colliers' cabins, strongly suggesting the wood was purchased to make charcoal in the wood which was then ferried to the Cookley Ironworks. In 1764, John Knight was 24 and the first "Mr Night" may have been his father Edward. John Knight lived in Wolverly and his family owned (among a variety of other mills and forges) the water-powered Cookley Mill (29). A corn mill built in Elizabethan times, it was converted around 1639 to a slitting mill[38,] (for converting iron bar first to sheet iron then into rods for nail manufacture) and a forge was added in the 1670s. The Knight family acquired Cookley around 1703[39]. The present village of Cookley developed 1810 onwards around the forge to house the workers. The early sales (1764-1812) may have been for the forges at Mitton (Stourport), somewhat closer than Wolverley.

Cookley forge originally fined their iron with charcoal. From 1799 the Knight's forges began to use new methods with coke as fuel. From 1814 J Knight & Co reverted to charcoal iron manufacture, supplying the wire and tinplate industries.[40] These changes may in part explain the intermittent recording of yardwood purchase by John Knight Esq. (30).


JOHN KNIGHT & CO.,

COOKLEY IRON AND TIN PLATE WORKS, NEAR KIDDERMINSTER,

MANUFACTURERS OF

BARS, RODS, WIRE RODS, & SHEETS IN BEST, BEST BEST, & CHARCOAL IRON; & STEEL.

Charcoal, Steel, and Best Coke Tin and Terne Plates, Steel and Iron Tinned Sheets in all gauges and dimensions up to 96 in. by 48 in. Special qualities of Deep Stamping Sheets, Cold Rolled and Close Annealed Sheet Iron, &c.

Brands on Iron	KNIGHT'S CHARCOAL.	CSS CHARCOAL.	KNIGHT'S PLOUGH.	KNIGHT'S BEST BEST	KNIGHT'S ♔	KBC.
Brands on Tinplates, Terneplates, and Tinned Sheet Iron	COOKLEY K CHARCOAL.	CSS CHARCOAL.	KNIGHT P.	COOKLEY COKE.	CO COKE.	KCS, No. 1.

London Agent—ARTHUR BIRD, 81, GRACECHURCH STREET, E.C.

29. Advertisement for the John Knight & Co Cookley Iron & tinplate works from Grace's Guide to British Industrial History.

	Mr Knight
1764	28 cord 5ft (paid 1766)
	John Knight Esq.
1780	7 cord 1 ft Yard Wood = 5 cord 2¾ ft at 14/6 per cord
1781	102 cord 5 ft Yd Wood = 76 cord 7 ft at 14/6 per cord
1785	43 cord 6 ft Yd Wood = 32 cord 6½ ft at 12/6 per cord
1799	31 cord 3 ft statute measure cordwood at 13/- per cord
1812	58 cord 2 ft Yd Wood
	Messrs Knight & Co
1845	25 cord 7¾ ft statute measure 19 old & new Cordwood at 19/-
1846	9½ cord = 7 cord 1 ft statute measure [1 cord = 19/-]
1848	old cordwood = 12 cord 7½ ft statute measure at 19/- per cord
1849	14 cord 5 ft old CordW = 10 cord 7¾ ft statute measure at 18/-
"	13 cord 7 ft nesw cordW = 10 cord 3¼ ft statute measure at 18/-

30. Purchases by Messrs Knight. As "statute" cordwood was four foot long and yard wood three foot, a ¾ conversion of the volume was applied before calculating the price.

It seems clear from combining the dates of allowances for colliers' cabins (28) and Messers Knight's cordwood purchases (30) that charcoal burners made charcoal in Shrawley Wood on commission to John Knight & Co. The earliest record of this colliers' allowance and Mr Knight's purchase of cordwood is from 1763, found in the Woodman's notebook of 1758-1780 discussed in the chapter 1700-1763 p. 169. The company must have bought wood and/or charcoal from sources other than Shrawley to satisfy their needs: between 1829 and 1850, the forge's annual average output of charcoal iron was 2,039 tons. The father John Knight had died in 1795 and son John Knight died in 1850. The works prospered in the canal era with an arm of the Staffordshire and Worcestershire canal leading into the works but when rail transport became the norm, in 1886 the whole works moved north to Brockmoor near Brierley Hill.

William Phipson of Birmingham

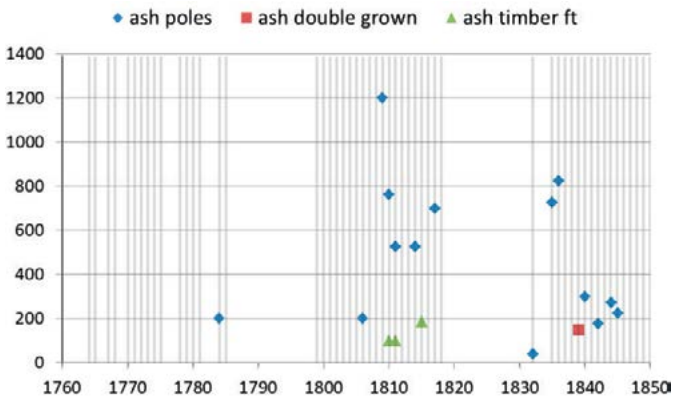
William Phipson 1770-1845 had a copper sheet rolling mill in Fazeley Street, Birmingham (and was a Master of the Assay 1792-1845). Only one purchase of 32½ cord of cordwood at 20/- a cord in statute measure is recorded for him in 1816. Mention of statute measure indicates this was yard wood for charcoal even though no mention of a colliers' cabin is made that year; maybe Phipson payed the collier directly. That year cratewood and clogwood were 60/- a cord and whitturnes 70/- a cord, so this was may have been oak or possibly lime cordwood. It is not clear why he would be buying wood or charcoal; his mill in Fazeley Street had two massive steam engines for rolling metal sheet[41] and was not a refinery for copper that might have needed green wood for poling. The Birmingham Proofing House was on the same site as his rolling mill.[42] Proofing here means testing gun barrels by loading them with a higher charge than would be used with routine firing. This Proofing House would have used quantities of gunpowder; it is conceivable that this was the destination for the charcoal from Shrawley.

Replanting ash and oak

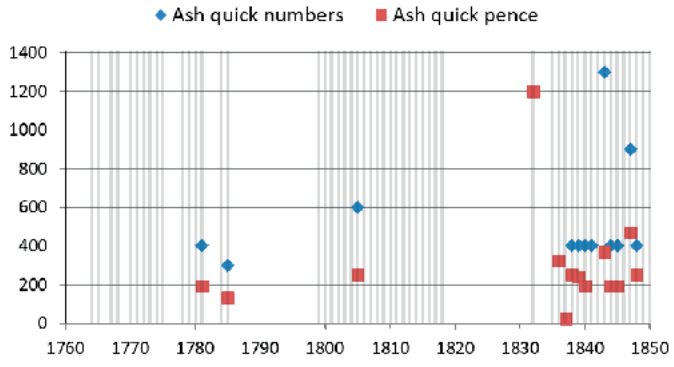
Ash Beds

As well as the binds of coppiced lime, the woodmen worked two ash beds: one "Ashbed by the Forge" (presumably the forge on Dick Brook because now there is an area there with a high density of ash trees), the other "The Pleck Ashbed" (presumably tithe 42, "Ash Bed") which was replanted with Black Cottonwood by the Forestry Commission but the adjacent area is still populated by ash trees – possibly seeded from the Pleck ash bed. These had a different cycle of cutting (31) and replanting with ash plants bought from Worcester market (32). Unfortunately it seems likely that essential data for determining the period of the ash cycle is buried in the missing books. These areas are covered in wild garlic in the spring, in contrast to the rest of the Wood where bluebells dominate. The garlic may be an indicator of higher pH, preferred by ash.

u This would have been Mr Edward Knight, father of John.



31. Sales of ash. Felled ash was counted as poles, double-grown poles or as timber measured in Hoppus feet.



32. Planting ash.
"Ash quick" is the term used for ash plants for planting: each plant cost around ½d (one halfpenny).

Replanting oak
The only records of replanting oak trees (33) are found between 1804 and 1817. It can be no coincidence that this coincides exactly with the period when John Phillips owned the Wood.

date	who	for what	days	£	s	d
1804	T Jones	plantin oke in the wood	12	0	18	0
1806	The Woodmen	for plantin Oke, Ash &c	25.5	2	11	0
1806	The Woodmen	diggen up grown plantes oke poplar &c	10.25	1	0	6
1811	James Atheridge	plantin young okes &c	3	0	6	0
1811	Edw Willitts	"	3	0	6	0
1811	John Layland	"	3	0	6	0
1811	James Atehridge	plantin oke & ash	3	0	6	0
1811	John Layland	"	3	0	6	0
1811		plantin Acorns	2	0	4	0
1811	Thos Jones	getting up quick & plantin	17.5	2	3	9
1811		plantin young Oke in Ash Bed	2	0	5	0
1812	Barkers Wife & son	Cleaning Quick	6	0	10	0
1814	John Priece	trimming oke poles; planting oke &c	16	2	0	0
1814	John Cooke	planting ash	3	0	7	6
1814		planting oke & willow	4	0	10	0
1815	James King	planting oke @ 2/6	5	1	2	6
1815		trimming & planting willows & ash @ 2/6	16	0	12	6
1815	Samuel Powick	planting Oke @ do.	1	0	15	0
1815	John Preece	planting Oke @ 2/6	5	0	12	6
1815	William Jones	planting and stakeing Okes	8	1	0	0
1815	Thomas Jones	planting & stakeing okes	7	0	17	6
1816	Ann Barker	Cleaning and weeding Quick @ 1/-	13	0	13	0
1816	John Preece	Replanting Oke &c	10.5	1	1	0
1816	Wm Jones	trimming Oke &c	7	0	14	0
1816		replanting oke &c	9	0	18	0
1816	Edwd Powick	replanting oke &c	12	1	4	0
1816	Saml Powick	replanting oke &c	12	1	4	0
1817	John Preece	brushing & cleaning quick	3	0	6	0
1817	Samuel Powick	planting oke &c	10	1	0	0
1817	John Preece	planting oke &c	12	1	4	0
1817	Thos Jones	planting oke	5	0	10	0
1818	Hannah Jane	cleaning quick @ 8d	8	0	5	4

33. Planting oak

We may note two things: unlike the ash plants that were bought from the market, the oaks were grown from acorns in the wood, with nursery beds tended by womenfolk ("cleaning quick" = weeding the nursery beds).

Protecting the Wood

Gates, hedges and fences
Keeping the unwanted out of Shrawley Wood, be they livestock, foragers (20) or poachers, seems to have been a major concern through the ages. Once a bind has been cut, the newly sprouting stems are vulnerable to grazing by any livestock and so it becomes essential to maintain the hedges and fences near the bind in this vulnerable interval. This has helped identify the time of cutting Shapgrove and has been one indicator helping to locate some of the old binds (see chapter: Coppices and Binds pp. 200-205).



34. A midlands pleached hedge (Photo courtesy of The National Hedge Laying Society)

The perimeter of Shrawley Wood (01) was 1317 perch (a little over four miles) and protected by a mixture of fencing and pleached hedge (34), which comprised a combination of hedging plants and vertical stakes with a woven header. For the most part, this wood hedge runs along the top of a bank that seems consistent with descriptions of medieval wood banks elsewhere in the country (see chapter LiDAR pp. 260-2). In places there is now a palisade of small-leaved lime stems along the line of this wood hedge (35).

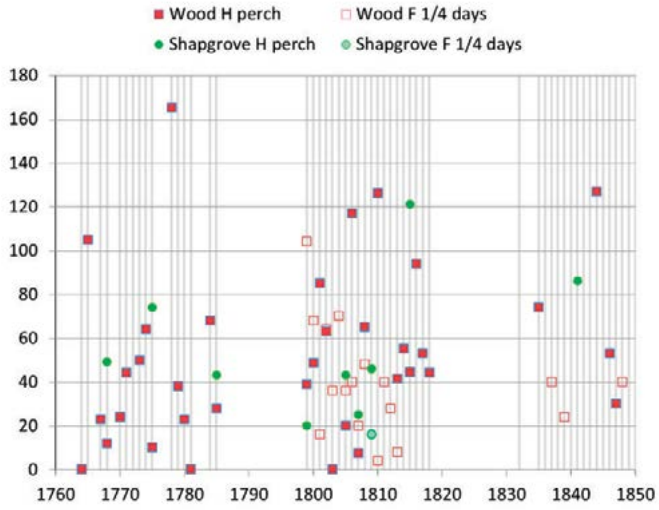


35. Line of the wood hedge on the wood bank near the northwest corner.

The stems of the hedging plants were split partway through and laid sideways along the hedge, woven with lops (lightweight vertical stakes every 18") and hetherings (a neatly twisted horizontal cord of long thin branches near the top of the lops) (34). Every year the woodmen and other hired labour spent many days glatting (repairing gaps) and pleaching the Wood Hedge. Lops were cut in the coppice and carried to the hedge along with the hetherings. A burden of lops was probably 12[v] (enough for one perch of hedge), and a thrave was 24 burdens (enough to last six days of hedging). Regionally,

v But Kendrick Watson wrote "A bundle of headrings, &c, is considered to be twenty-five, according to the size, &c."

hetherings were typically of hazel but round Shrawley Wood it is likely they were lime.

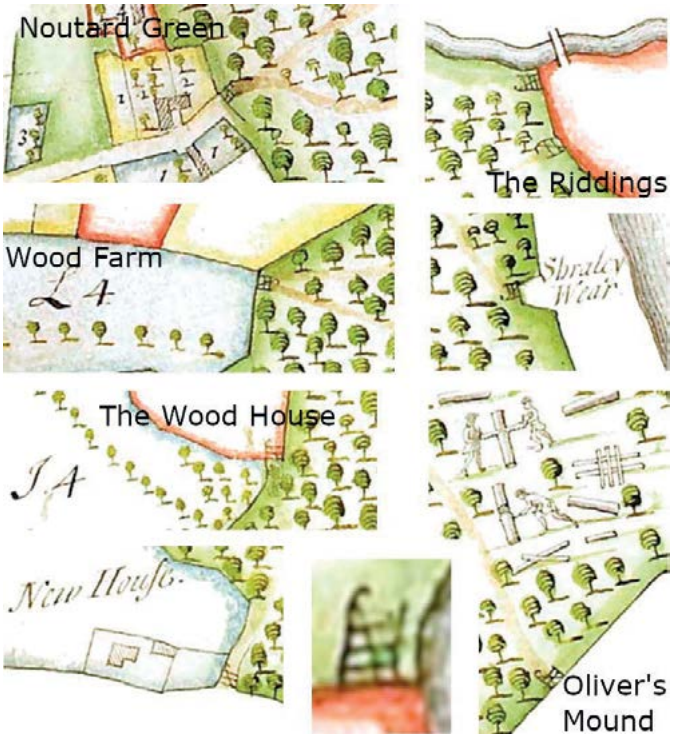


36. Lengths of hedging (H perch) and fencing (F perch).

From 1765 to 1809 this is recorded as pleaching; from 1810 to 1847 as making or repairing the hedge. Payment suggests that a day's work yielded three perch of hedge (15 metres). There was no mention of fencing in the Wood Books until 1799. Lengths of fencing are not recorded so the points on this plot are ¼ days calculated from the payment and rates of pay (36).

Taking the average number of perch of hedge pleached each year and the probable length of the perimeter with hedge, each section of hedge was re-pleached every 17 years or so, so this work may have been in phase with the coppicing adjacent to the hedge.

Dougharty's map surveyed 1731-2 shows a wood gate at the end of each track (37). It seems these gates were kept locked.

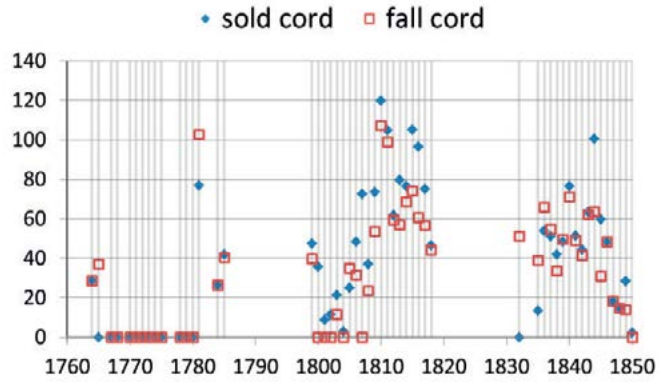


37. The eight Wood Gates seen on Dougharty's map of 1732 (see chapter Historic Maps p. 266-8). Each gate is drawn in as in the enlargement of one of the Riddings Gates bottom centre above.

Audit of the accounts

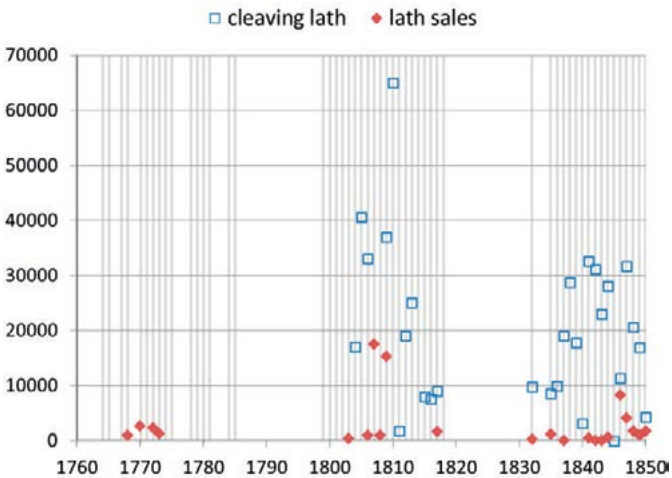
Cordwood: where did it all go?

In 1764 the men were paid £2.2.11½d for cutting 28 cord 5ft of wood; this exact amount was delivered to "Mr Night" [see Cookley Iron Works above]. In most subsequent years there is either a significant discrepancy between quantities of cordwood cut and sold, or no record at all (38).



38. Cords of cordwood felled and sold

In an effort to understand the amount of cordwood expected in each year's coppicing, five stems were sampled from an area of 18-year-old coppice. Two sites of this age were surveyed [see chapter: Regrowth and Regeneration pp. 294-301]; one had widely spaced stools (320/Ha) and vigorous regrowth, the other close-set stools (680/Ha) and relatively poor regrowth. The sampling was from the close-set site. Five different stools were selected and one stem cut from each, choosing the stem with the largest diameter at breast height (d.b.h) from one, 3rd quartile d.b.h from the next, then median then 1st quartile then smallest from the other. This yielded stems, branches and twigs that could have been used as faggots, thatching stuff, hedging materials (lops and hetherings) and poles suitable for hoppoles. There was sufficient wood of too great a diameter for any of these uses that could have been cut as cordwood amounting to 1/30 of a cord. Calculating from the number of stems per stool and number of stools per hectare, the conclusion is that coppicing inevitably leads each year to 40-120 cords of lime wood too large diameter for hop poles, lops, hetherings, thatching stuff and so on. The Wood Books seldom recorded a realistic quantity (38) and when they did, it largely went for charcoal and was most probably oak, not lime. What happened to all the lime cordwood? Is it possible that with regular coppicing, with the stems clean-cut by axe close to the ground as required in the 1779 auction specification, the stems at 17 years were more uniform, and the number of stems greater than resulted from coppicing the long-overstood stools, chain-sawed several inches above ground level that we examined in our study (chapter Regrowth and Regeneration pp. 294-301), thus making all stems suitable for use as hop poles?



39. Numbers of laths recorded as cleaved and those sold.

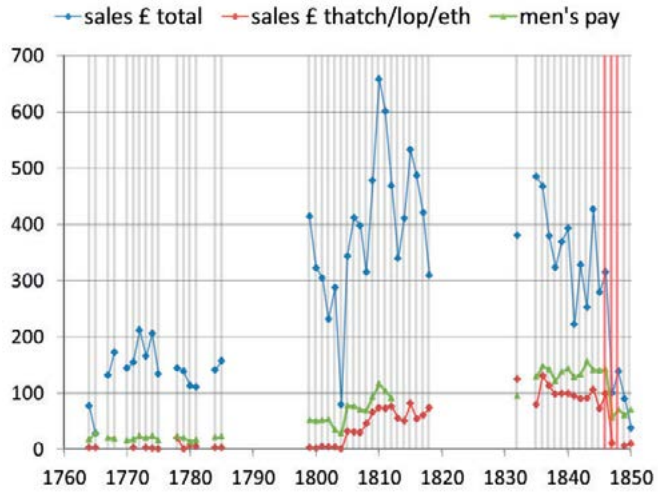
Lath cleaving and lath sales
The Wood Books record receipts from lath sales and, after 1800, payments to lath cleavers (39). Far more laths are being cleaved than sold. Who is getting all these laths free of charge? There are records of loads of laths going to Hanbury.

Timber
Peter King explains in the Introduction why the costs of felling oak timber were recorded each year (18,19) but the major part of timber sales were not mentioned apart from an occasional record of trees and a few more of oak tops. A notable sale that was recorded was the sale of two oaks named Adam and Eve to cooper Thomas Spragg. Sales of blackpoles were recorded. Ash timber sales were occasionally recorded (27). When timber was sold, these sales were presumably recorded in a different ledger, handled by the Estate Steward or equivalent. We have not found these records.

Taxes
From 1805 onwards taxes and/or repairs associated with several of the cottages were recorded as expenses in the Wood accounts. Why? 1805-1818 "the audit" seems to have been undertaken by Mr Coningsby Norbury, a Droitwich Lawyer and Magistrate. Financial sums have been checked and ticked or signed CN or CN^{y}. Minor overcharge and undercharge were occasionally detected and corrected, but nothing recorded in the audit about the glaring absence of timber or the missing cordwood disposal: presumably these were recorded in a different ledger? Large cash payments out of the wood account of £100-200 were recorded each year to Mr Norbury: presumably Mr Norbury was managing the profits from wood sales for the Estate.

Bark peeling: why were sales excluded from the accounts 1806-1818
From 1830 onwards the quantities of bark peeled and sold agree exactly (15). Before 1800, no payments for peeling are recorded: it is possible that this charge was dealt with by the tanner rather than the estate. In 1806-1818 payments for peeling but no receipts for sales are recorded: why were these kept in a separate ledger during Mr Norbury's stewardship?

Although it might have looked at first sight as though the Wood Books provided a complete picture of the Vernons' business in the woods, it is clear that this is far from the case.



40. Pay and sales: three years let to Wormington marked by red vertical lines. "thatch/lop/eth" are thatching stuff, lops, hetherings and faggots, i.e. the produce thinner than hoppoles that were accounted for separately.

1851
The last extant Wood Book is for 1850. In the 1851 census, Thomas Jones (who had been head woodman in 1850) is now unemployed. Samuel Powick remarried in 1850 and is back farming at The Knowle. Hop pole sales have fallen to zero. One might suspect that the focus had shifted from productive forestry towards it being a recreational facility for the Vernons and their friends. Young Samuel Powick will become gamekeeper rather than Woodman. In 1846-1848 the fall of underwood had been let to Mr (John) Wormington (40). This letting did not continue in 1849 & 1850 but we have no information for 1851 onwards until advertisements[43] for sale of the timber and underwood organised by John Wormington in 1860-4. It seems that the management of the Wood underwent fundamental change after 1850.

Acknowledgements
I am most grateful to Francesca Llewellyn for help with researching the material on which this chapter is based. Thanks also to Hugh Milner for help with interpreting many of the archaic terms encountered in the material; to Peter King for advice about the iron industry and other historical matters; to Jenny Nicholson and Chris Dring of the Shrawley Local History Group for their interpretation of the census material.

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The Coppices and Binds of Shrawley Wood

Richard Pumphrey

Definitions
A **Coppice** is woodland where an area of the underwood is cut every few years, leaving low stools to regrow until the next cut.
Underwood is all the new multi-stemmed growth and new growth from seed since the last cut.
In Shrawley the stools were called **Stubs** and the stems cut from them were called **Stubwood**.
Formerly there was an **overstorey** of timber trees (**poles**) forming a type of woodland called a **coppice-with-standards**. In Shrawley many of these poles were oak.

A named coppice may be subdivided into smaller named areas: in Shrawley the term for these was a **Bind** and the area cut each year was called the **Fall**. Generally the fall comprised one of the binds but in Shrawley 1760-1850 some years the bind is not named, and the relative positions in the cutting cycle of named binds either side of these years shifted, suggesting that the fall involved parts of different (adjacent?) binds.

In 1495 Shrawley Wood had within it ten coppices, eight containing two binds; one with one; one with three. Shrawley Woodmen included Shop Grove (now called Shotgrove) in the Fall once in each 17-year cycle but not always with the same named bind.

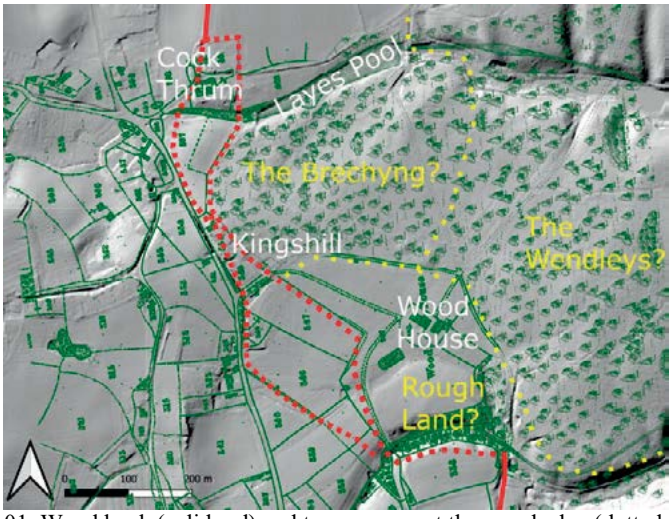
Foreword
While I was mapping the trees of Shrawley Wood I heard there were many documents naming parts of the Wood called binds but no maps of where they were. I thought this was an intriguing puzzle and so I studied the Wood Books for clues about where the binds might have been. I hoped that maybe what type of wood was cut in each year might help locate the bind it came from but was also looking for any other clues that might be hidden in the Books. This was an uphill task until I heard from Peter King about *A Survey of Shrawley Wood as rated by the tenants of the same*.[1] This survey, written around 1495, was the key to understanding the names of the binds and how big each was.

The areas given by the tenants for the ten coppices that made up Shrawley Wood seemed inconsistent with modern acres, so finding the conversion factor was the first step. I took the wood banks round both Shrawley Wood and Shopgrove (see chapter LiDAR p. 260) as a guide for their margins in medieval times, although these banks have been erased in places. The tithe map of 1839 helped in the reconstruction: its accuracy around the Wood has been established in chapter Historical Maps p. 270 by overlaying it on the LiDAR as shown in figure (01).

tithe #	tithe name	acres	ha	Survey	ratio
79	Shop Grove	11.18	4.53	4	**1.13**
404	Shrawley Wood	376.41	152.44		
402	The Lays	1.74	0.70		
403	Lower Pool	2.08	0.84		
405	Lower Hop Yard	3.40	1.38		
406	Middle Field	2.70	1.09		
407	Rye Grass Piece	2.22	0.90		
408	Piece above the Garden	1.75	0.71		
337	Field in front of Woodhouse	10.81	4.38		
338	Woodhouse Gardens Yards	2.69	1.09		
		403.79	163.54	157	**1.04**
476	Great Grove Coppice	5.69	2.30		
478	Upper Horse Leasow	2.18	0.88		
		411.66	166.72	157	**1.06**

Table 01. Tithes that were components of medieval Shrawley Wood

The tithe map gives tithe 79 (Shotgrove) an area of 11.2 acres (4.5ha) whereas the tenants' survey gives it as 4 "acres". This suggests a scale factor of just over 1.1ha per "acre".



01. Wood bank (solid red) and two guesses at the wood edge (dotted red) prior to the clearance for Wood House. Whether the eastern or western alternative is more likely for 1495 depends on when Cock Thrum was first built. Putative coppice boundaries are hinted at by yellow dotted line. Tithe map in green on LiDAR DTM.

Shrawley Wood mapped as tithe 404 had an area of 376.3 acres but the medieval wood included additional areas on the west of the wood that were later deforested: one for farming comprising tithes 402, 405, 406, 407, 408, 2 acres flooded to form Layes Pool (tithe 403); the other, parkland round Wood House (tithes 337 & 338) . The wood bank for medieval boundary of this last area has been obliterated by landscaping and had to be guessed at (01).

Another uncertainty comes from the tithes to the north of the Wood: 476 & 478. (02) Whether or not these were part of the medieval Wood is uncertain, but it would make little difference to the ratio of "acre" to hectare. (Table 01). Again, this gives a conversion factor of just over one hectare per "acre", a satisfyingly consistent result considering that the Woodmen's areas are given as whole numbers. So when drawing up a map of the medieval coppices we should aim at a little over a hectare for each "acre".



02. Tentative map of The Aley (yellow border), with wood bank (red) and tithe map (green). Tithes 476 *Great Grove Coppice* and 478 *Upper Horse Leasow* may or may not have been part of *The Aley*, causing uncertainty on the rest of its boundary.

Each coppice was cut over two years apart from *Tagleyheld* which was cut in a single year and *The Wendleys* which was cut over three years. The Tenants' survey also confirms that Shop Grove was worked with one of the other binds even that long ago.

By 1700, each bind was given a separate name based on that of its coppice, e.g. *First Elbow* and *Second Elbow* binds for the *Elbow Coppice*, but when portions of the west side of the Wood were deforested for farming the remaining areas were cut as binds with new names based on local features: (*Kingshill* and *Ladywell)*. The appendix Names of the Coppice Binds (pp. 206-8) traces the history of the name variations. What follows starts with the Tenants' coppices and seeks to map the binds that evolved from them.

Mapping the Coppices (→ Binds).

The Outwood (→ Great & LittleNutward/Outward)

The Tenants' Survey lists a coppice called *The Outwood*. There are many woods and hamlets around England called Outwood. The term may have had a specific meaning indicating the wood in question was common land rather than manorial. Because we know it was the name used in 1495, Outwood is the most probable origin of the name used in the Wood Books. Noutard Green[a] was also called Outward Green and this consolidates the supposition that this coppice was in the northwest corner of the Wood. *Noutard* is similar to *Nutward*, the name used by Cousin Richard for this bind in his letter to Thomas Vernon in 1699. Apart from oak and hazel, *Great Outward* was one of the three binds to yield Aspen. There is a solitary aspen left in the hedge bordering on the area cleared sometime between 1843 (the last cut to the Outward Binds in the Wood Books) and 1883 (the date of the first 25 inch Ordnance Survey).

The Aley (→ Alley)

In 1495 the survey told us this coppice was cut over two years but gave the area of this coppice as 1/13 of the whole Wood – rather less than the one tenth that would expect for two years' cutting on a twenty year cycle. By 1700 it was cut as a single bind, having been reduced in size, maybe by part being taken into Great Grove Coppice, part into the Horse Leasow and part taken into The Outwood. When coppiced in the Wood Books, The Alley bind yielded Aspen and Hazel. There is one area of the wood that has both these trees in abundance and is a deep alleyway from Noutard Green down to Dick Brook (02).

The Roche (→ Great & Little Rochpole)

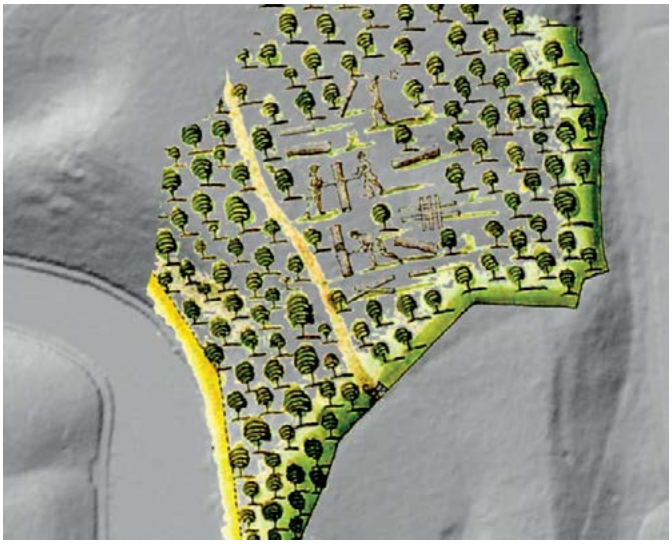
In the 1495 survey, one of the ten coppices was called *The Roche*; its area was given as one tenth of the Wood and it was cut as two binds. By 1700 these two binds had become the *Greate Rochpole* and *Little Rochpole* (Pole being the term for a timber tree). In a notebook of oak felling "September 18 1945" containing measurements of 718 oaks, nine ash and five chestnut trees, above OAK 99 is a note "FORGE PATCH Rachpole end". The Forge patch must surely be at the north edge of the wood (02), corresponding to "Ash bed by the forge", which would place the Rochpole/Ragepoul binds at the north end of the wood. One might guess that *The Roche*'s name referred to rocky outcrops on the steep northern slope of the Wood that were later quarried (see p.102).

Tagleyheld (→ Tadgley Hill)

The size given for this coppice was a little less than half that of the others and it was cut as a single bind. This remained the case in the Wood Books, when it was cut along with Shopgrove in more than one year. Following each time Tadgeley Hill bind was cut, work was carried out repairing the hedge of the Ridding meadows; this was important to keep the sheep that were grazing in the Riddings from coming into the Wood and browsing on the new coppice shoots. I have mapped Tagleyheld as the northern half of the eastern escarpment of the Wood, running along the length of the Riddings. *Held* in Middle English means slope/hillside, *Tag* usually meant an appendage;[b] *Lēah* can mean meadow. The Riddings may have been rid of trees after the castle was built, and maybe before this, a smaller pasture there was used for sheep. In Middle English, locally one meaning of *Tag* applied to sheep.



03. The Elbow?



03a. A fragment of Dougharty's map surveyed 1731-2 (see chapter Historical Maps p. 267) overlaid on the LiDAR showing the woodmen at work in the presumed Elbow coppice.

The Elbow (→ First & (Second Elbow → ?Ragnell))

The Tenants' Survey gives the area of this coppice as one tenth of the Wood and it was cut as two binds. By 1700 these were *The Elbow* and *Second Elbow*, which may later have been renamed *Ragnell* or *The Devil's Oak Bind*. The valley of the Middle Brook is bent at an angle of 60° somewhat east of its midpoint, forming an Elbow shape (03). It seems possible that the Elbow Coppice was in this part of the Wood. The Map by Dougharty surveyed in 1731/2 shows men working in this area of the wood (03a) and the bind sequence in (07) allows for this area to coincide with the Elbow Bind.

Ragnell has no obvious derivation from an original coppice name: it has been placed on the map in the tentative position of the Second Elbow Bind. *The Devels Oak bind* is only mentioned once, in 1815. Its place in the sequence is aligned with a Thrift bind, but not wholly incompatible with it being the same as Ragnell, as suggested in (The Names of Coppice Binds).

The Blackwych (→ First & Second or Hither & Far Black Witch)

This coppice was one tenth of the area of the Wood and was cut as two binds. Cousin Richard's letter has "First Blackwich" and "Second Blackwich"; the Wood Books have "One of the Black Wyches", "Far Black Witche" and "Ither Witch". We have no strong clue as to where The Blackwych was; the original reason for the name may have disappeared long ago. One thought was that it might refer to black soil in the gullies: examination of the soil in the

a Later renamed Noutard's Green by the Ordnance Survey: see p. 271

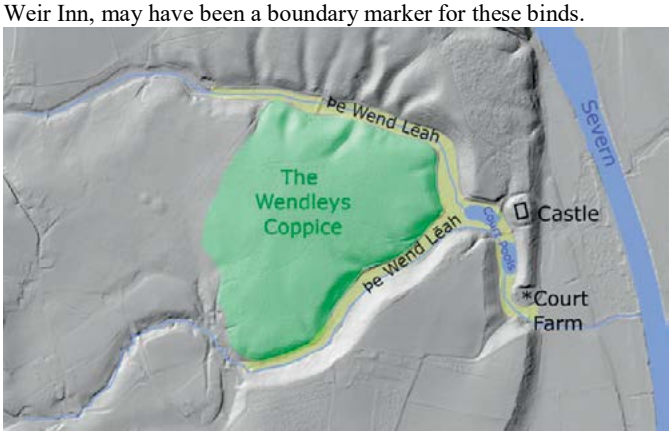
b For alternative meanings see Appendix Bind Names p. 206

northern gullies shows it is all red, as might be expected from sand washed down from crumbling Helsby sandstone. It struck me there was a possibility that Black Wych might refers to an ancient yew tree in this area; yew trees have long held a magical significance and there are two ancient yew trees in this area now, maybe descendants of the original Black Wych.

The Fryth (→ Hither & Further Thrift)

In Middle English *Fryth* means woodland, with in some instances an overtone of being a place for hunting game. This coppice was also one tenth of the area of the Wood and cut as two binds. In 1699 Richard Vernon called these these *First Frith* and *Second Frith*. In the Wood Books they had become *Hither Thrift* and *Further Thrift*. It yielded Aspen so it seems reasonable to suppose that the other aspen thicket identified by our survey of current trees in the wood is within the Thrift Binds.

The lack of strong evidence to map these last two coppices in any specific way leaves open two possible arrangements (05), (06). The main track across the Wood, later running from the New Inn to the Weir Inn, may have been a boundary marker for these binds.



04. Tentative map of Þe Wend Lēah. See also Shrawley Pools p. 107

The Wendleys (→Great, Second & Little Wenless/Winless)

In 1200, after the castle was established and its farm[c] had been built in the quarry at the foot of Oliver's Mound, the valley bottoms of the middle and southern brooks formed a long narrow C-shaped strip valley. Here I speculate that this might have been called *Þe Wend Lēah* – Middle English for the curved/wound-round meadow. If this is correct, it would pin down the Wendleys Coppice as the one *Þe Wend Lēah* wound around.

This Wend Lea would have been ideal pasture for cattle. The woodman's notebook covering 1758-1778 refers to "the Great Wenlis Milkin Way". The felling notebook of 1945 refers to "the Milking Bind" which may be another term for the Great Wenliss. By 1735 the path round the Wendleys Coppice could well have become known as the milking way, not just for Court Farm but all the other farms nearby whose cattle browsed in the Wood or grazed on the Wend Leys.

The Tenants' report indicates that The Wendleys Coppice was larger than the other nine coppices of Shrawley Wood, taking three years to coppice as opposed to two. When the binds were split, the Wendleys Coppice became three binds: Cousin Richard's letter has Great Winlesses, Second Winlesses, Little Winlesses. The Wood Books have "one of Wenliss", "Ye 1. Wenliss", "the Grate Wenless".

c Known as Court Farm in 1808.

Roughscentz) (→ Rough Land → Rowlane + ?Ladywell)

The Tenants' Report has Roughscentz paired with Shopgrove. In 1542 Rough Land was paired with Shopgrove. It seems only a short step from Rough Land to Rowlane. (see p. 407). Between them, Roughscentz and Shotgrove had an area of one tenth of the Wood and were cut as two binds: it seems possible that Rough Land Coppice lost some of its area to the Wood House Park, the remainder being split into *Rowlane* and *Ladywell* binds, the latter maybe gaining some area from one of the Wendleys.

Ladywell*:* The bridge over the brook in the southwest corner of the wood is still known as Ladywell Bridge (05); it seems reasonable to think that The Ladywell Bind is in this area. Early versions of this name have it as Ladywall: conceivably the quarry here may have been a source of stone for St Mary's Church, hence Lady Wall. This may be the bridge that was rebuilt 1769/70. The tithe map of 1839 shows the Wood extending into what is now the Wood House arboretum; one would guess this was included in the Ladywell bind.

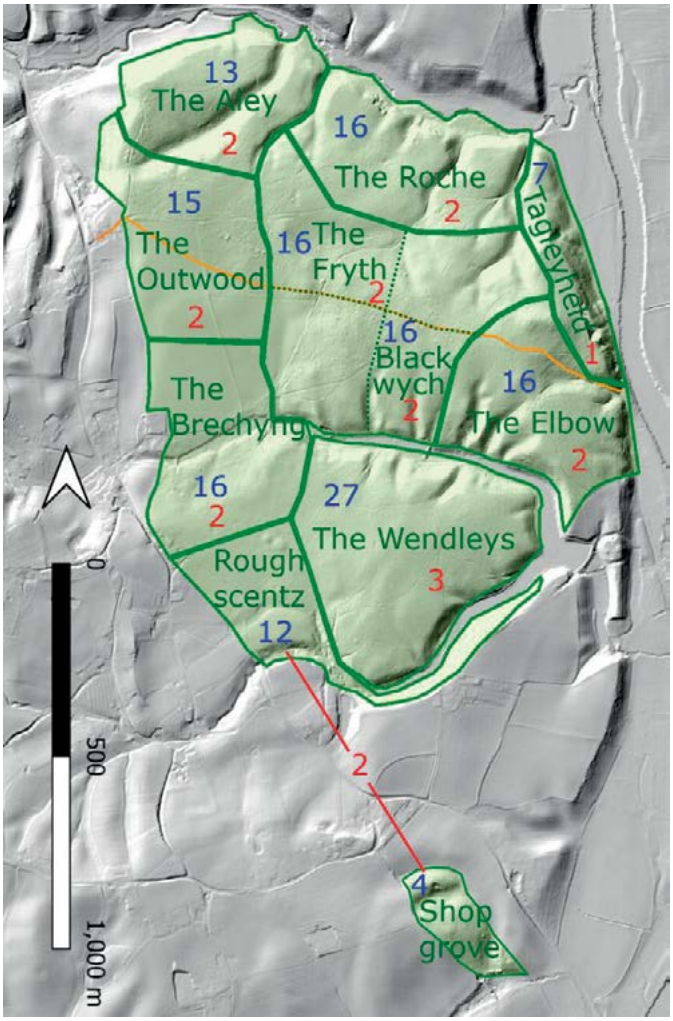


05. Ladywell Bridge 16th June 2021.

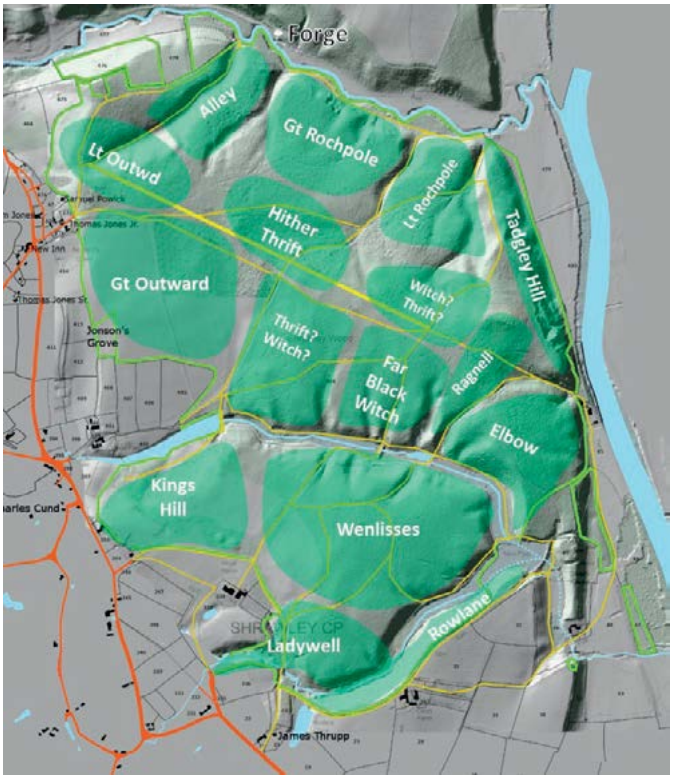
The Brechyng (part deforested, part → Kingshill)

We can only place The Brechyng Coppice by elimination. The best Middle English match might be to *brēch*, (= breach) suggesting a break in the boundary. Map (06) shows the west edge of the wood as deduced from the position of the wood bank (see chapter LiDAR p. 260) but map (05) shows the west edge as on both the tithe map of 1839 and Joseph Dougharty's map surveyed 1731-2; by then, a portion of the Wood had been deforested for farming. In 1705, soon after Thomas Vernon bought the Shrawley Estate, he drew up an indenture leasing Kingshill Bind and associated dwelling to Joseph Hopkins. It seems highly probable that this dwelling was on the same site as the house called now Kingshill, thus telling us where Kinghill Bind was. The area of this bind in 1705 was given as *15 acres more or less* but there is no guarantee these acres were the same as the current ones. We can have more confidence in the advertisement for a sale of wood in 1813 giving the size of King's Hill Bind as 21A, 1R, 39P (8.7 hectare), close to the nine hectares calculated as 1/17 of the area of Shrawley Wood 1730-1850. I conclude that following deforestation, the remnant of The Brechyng Coppice was renamed Kingshill.

We have wondered about the origin of the name Kings Hill because the area of the bind does not look particularly hilly. We think the highway through Shrawley used to be along what is now Rectory Lane (see chapter Access, Extraction and Dispatch p. 240), and at this time the track that later became the main road climbed over a short but steep hill with the Kingshill house at its top; years later a cutting through the sandstone smoothed out the gradient past Kingshill. Probably the Bind was named after the house when it was all that was left after much of the old Brechyng coppice was converted to arable land.



05 Shrawley Wood Coppices reconstructed from Review of the Coppices by Tenants of the same, c. 1495. "acres" in blue, bind count in red, main track across the Wood in orange.



06. Tentative guess at the bind locations 1750-1850. The Blackwich and Thrift split is as yet undecided.

The maps

By combining all the evidence listed above I have constructed tentative maps of the 1495 Coppices and the Wood Book Binds (05), (06). Of course, all of this is highly speculative and may be entirely wrong. On the other hand, it does help envisage a possible layout and perhaps help form a clearer mental image of the wood from the fifteenth to nineteenth century.

As well as named binds, general geographical descriptions are found such as men working in "The Grove": today this name is used for the tongue of woodland either side of the small lake west of Ladywell Bridge but earlier it may have denoted other parts of the wood because The Grove Pool Head was clearly the dam for what became The New Pool, and Jonson's Grove was an area of one acre hedged off from the rest of the wood at the west edge bordering on tithes 408, 412 and 413, while Great Grove Coppice was tithe 476 at the north of the wood and Shap Grove was a separate coppice south of the wood managed as one of the binds.

Another geographical description was "the Dingles" but it is hard to know where this was because the wood is full of dingles; a good bet might be the dingles north of the valley that became flooded for the north limb of New Pool.

"The Bottoms" in Shrawley Wood were the ground beside the three brooks that run from west to east, ending up in the River Severn: Dick Brook forms the northern border of Shrawley Wood; Middle Brook enters the Wood near the midpoint of its western edge *via* Layes Pool, and Lady Well Brook enters from the southwest corner. An advertisement for sale of wood in 1813 gave the area of Lady Well Bottom as 0A 3R 17 P (0.314 ha). The two southern brooks originally met just outside the southeast corner of the Wood, but since 1389 with the building of the fish pond, later Court Pool, and again in 1850 with the building of a dam below their confluence, they now run into the "New Pool". Pools were created along Layes Brook and Ladywell Brook at various times: the most recent being the New Pool. (see chapter Pools p.103) Above this on the middle Brook was the Middle Pool, and on the western border, Layes Pool. Reference to four days work by William and Phillip Jones "*riding the ditch at the Green Pool*" in 1816 (Ladywell Bind) may be the pool in the Grove by Wood House. The straight ride from Wood House to the centre of the Wood crossed the Middle Brook; currently this is blocked by the Middle Pool but there is no certainty that was the case when the ride was first cleared.

Robert Bourne bought Shrawley Court and adjoining lands 7th May 1783. Between 1801 and 1818[d] there are references to Mr Bourne's land such as *pleaching 30 pirch of hedge* by Mr Bournes, *falling and trimming large birches* on Mr Bournes Bank, *cutting three thraves of Lops for repairing the Wood Hedge* by Mr Bournes Batch, *falling and cutting cratewood* in the Bottom by Mr Bournes. Unfortunately, hedging activities seem not always related to the Bind where cutting took place that year, and some years felling took place in several different areas of the Wood, so these specific references are less helpful pinning down the Bind locations than might at first be thought.

The Rev. Mr Wharton lived for a while in The Wood House: 1806—1817 "by Mr Whartons" indicates this location.

Mr Houseman lived for a while in Wood Farm. From 1805 to 1815 there are references to "by Mr Houseman" and "Mr Housemans Bottom"; his bottom was flooded to form "the Lower Pool". Later this was called Layes Pool after "The Lays" – the field flooded by the dam. This pool has been empty since its dam was washed away in 2007.

d Robert Bourne was buried in Shrawley on 8 December 1817. His grandson Robert, son of William, lived near the New Inn and fell to his death into the quarry on his way home from the Weir Inn on 24 May 1845.

First Border and Second Border were on Cousin Richard's list as binds[e] but they never appear in the accounts as the object of "parting the fall". They are mentioned in 1800 as "in ye Borders" along with "in Shapgrove" and "in ye Wood" and "at Ladywell Bridge" as places Thomas Jones and Phillip Jones were falling[f]; in 1801 John Powick was falling on Tadgley Hill, in the Bottoms and in the Borders. In 1814 Thomas and William Jones were pleaching 35 perch of hedging "down by the borders and Outwards Fall". This suggests work near one of the Outwards Binds, most probably by Noutard Green, but there is no guarantee that his hedging in the borders was near this. In 1835, the Fall was in Tadgley Hill Bind when William Jones was falling "work down in the Borders & in the Bank. This could have been the bank below Tadgley Hill, but there had been frequent reference to "Mr Bourne's Bank" which ran all the way along the south border of the Wood as far as the New Pool dam. Cousin Richards account has no mention of the Lady Well bind: this is at the southwest corner of the Wood and may have been one of the Borders. The other may have been further east on the same bank… or by Noutard Green... or maybe by this time, Border simply meant the wood edge wherever.

Neighbouring tithes are also mentioned: "by the Riddings" [tithes 479, 480]; "down Wood Close" [confusingly tithes 41 & 397 were both called *Wood Close*: in 1807 the men were working all over the wood and references to "the Wood Close hedge" and "round Wood Close" that year are not helpful in pinning down their location].

The Bind Cycle

Each year the Woodmen took payment of five shillings in a tradition that started when Richard Vernon drew up the first contract with them[2] in 1708. He then gave them three days to "*divide the said binde amongst them to each a suteable* ***part*** *according to his time and ability"*– this was ***parting*** the bind[g]. (see chapter 1700-1763 p.166) and concluded "*and doth now give them in Earnest five shillings"* to seal the agreement for that year: it was five shillings from 1764 to 1813, doubled to ten shillings 1814 to 1846 and then 1846 to1850 purchase of paint was recorded instead of the bind parting allowance, the end of a long tradition.

The 1708 agreement laid out in detail the schedule of work to be used each year. Coppice stools were cut first to clear the way for felling the timber: "*falling and ridding the wood before other timb^r^ Fallen*" as written in the 1736 accounts[3]. The majority of coppice stools throughout the wood were lime but amongst them in the northwest was hazel; there were also two or three thickets of aspen and, along the brook margins, alders. Coppice oak bark was sold at a premium in 1768 (Tageley Hill and Shapgrove), 1780 from the Great Rochpole and 1781 from one of the Thrift Binds, so it seems likely that here at least there was some coppice oak. Elsewhere among the coppice stools were the oak timber trees and birch trees left to grow a second cycle. We know from a letter of 1699 to Thomas Vernon from his cousin Richard[4] that Shrawley Wood was at that time divided into 20 bind. It is clear from the Wood Books that these binds were cut on a roughly 17-year cycle and so there must have been some doubling-up of binds cut in some years to get through the cycle. It also seems likely that, contrary to the description by Andrew Yarrington[5], the areas of the binds were not all equal. Several of the Wood Books tell which bind was being cut that year – enough to be sure that the cycle was based on approximately 17 years but not enough to be certain of the sequence. Crucial information comes from a recently investigated Woodman's notebook[6], much worn, started around 1758 with additions up until 1780. One page has a most helpful list of binds coppiced each year from 1755 to 1776, sadly torn across the page at this point with the last few missing. There is a marginal note "*When Fall'd & the number of them and ye Names 1780"* with a line under the 16th line noting "*two this makes the 18 falls"* (this scribe often uses two instead of to); the eighth row had "*the Kingseel Bind and one of the Wenlis"* and the 14th had "*Tagleehill & Shapgrove"* to make up the eighteen: this establishes a 16-year cycle but preceeding and subsequent cycles point to a 17-year norm for the bind cycle. This is our most complete sequence of coppicing within Shrawley Wood and proved helpful in analysing the bind cycle (07). The missing bottom part of this page may have had another vital clue about the binds as the last half line ends: *"…ter not Thos. Vernones Landes".* Interestingly in 1780 the Woodmen took part in felling Jonson's Grove, a small hedged-off section of Shrawley Wood that belonged to an Astley resident, Mrs Winford (see Jonsons Grove p. 177-9).

The sequence of Falls 1700-1850 is plotted in (07).

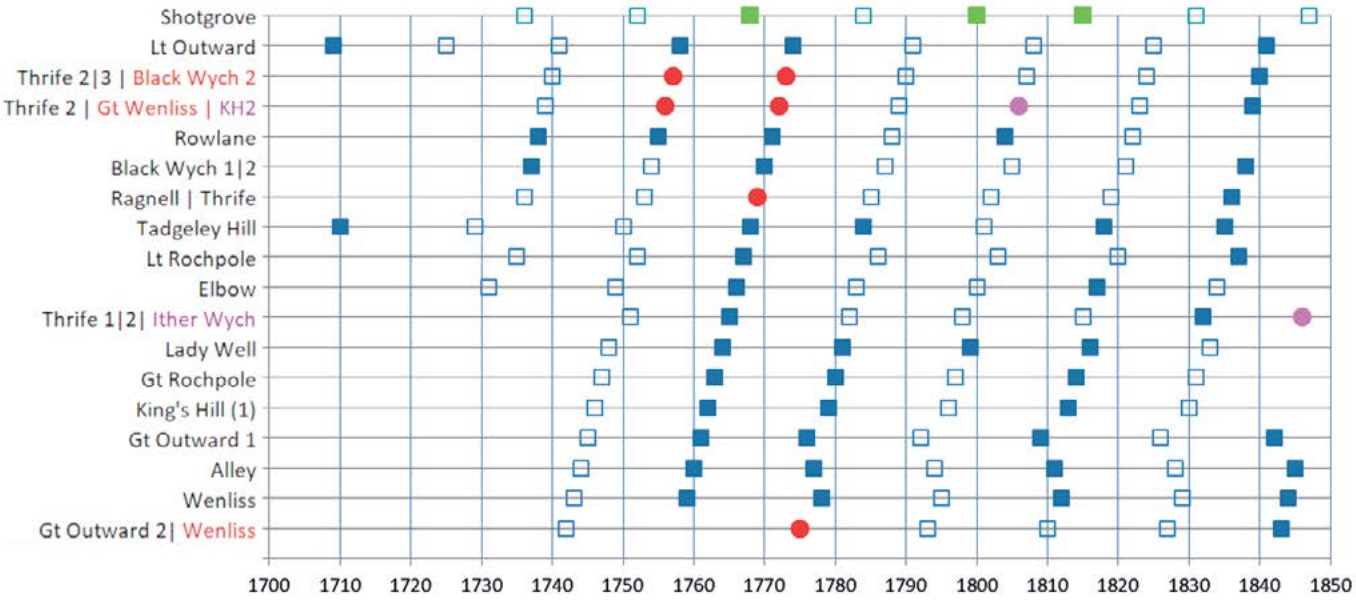
Oliver Rackham discussed cutting cycles and bind sizes.[7] A 20-year cutting cycle was longer than typical in medieval coppices but not uniquely so: the monks of Beaulieu Abbey drew up a schedule of various products to be expected from a wood of 20 year's growth – mostly destined to be burned in one way or another. Some woods that had been cut more frequently tended later towards longer cycles and smaller divisions. There may therefore be a possibility that the ten coppices of Shrawley Wood were originally cut with a ten year cycle, and the change to a longer cycle with smaller binds. If this was the case, then the change had apparently been completed before the fifteenth century.

The sequence changed over the years as adjustments were made in the fall boundaries, presumably to ensure cutting the optimal maturity of coppice stool for the products needed that year, with intervals between cuts of 15 to 19 years but with the great majority 17 years. Another factor disrupting a strict 17-year interval may have been coppicing the bind with suitable oaks for timber and bark required that year. However, it is also clear that the bind names changed over the years and it is probable that the bind margins varied when they were not defined by geographical features or the wood edge.

e We might have to consider the possibility that Coz Richard was mistaken to include the Borders in his list of binds, because he lists more binds that there were years in the cycle of cutting.

f Falling is the local term in the Wood Books for felling.

g In the Wood Books this was recorded as "parting the Fall".



07. The bind cycle. The filled squares or circles indicate the bind declared as "Parting the Bind Named…" The red and mauve circles indicate alternative declared binds. To clarify the sequence, putative binds (open squares) were inserted for the years where the bind was not declared, based on the most probable bind from the cycles before and after, but most probably these years the Fall did not match the Bind. Shapgrove was included in the Wood Books as a bind along with the others; its felling is marked by green squares. See the appendix Bind names for a full account of the history of these names (p. 206).

References

1 Peter King this monograph citing A *Survey of Shrawley Wood as rated by the tenants of the same*: TNA, E 315/83, f.56
2 Worcestershire Archive and Archaeology Service (WAAS) 705:7 BA7335/18/i/1-20 c.20 deeds relating to property in Shrawley. Vernon, Weaver, Severn and other families. 1701 - 1733. Vernons of Hanbury Hall. Document No. 11
3 WAAS 705:7 BA 7335/68/9-14 1736-69 Household and estate accounts. [No 13]
4 WAAS 705:7 BA 7335/109/iv/51 Coz Richard's particular & valuation of Shrawley:
5 WAAS 705:7 BA 7335/109/iv/44 Notes out of Mr Yarrangtons Survey or Eſtimates of Shrawley
6 WAAS b705:353 BA 3803/2 Estate Account Book 1758 - 1777
7 Rackham, Oliver 1990 *Trees and Woodland in the British Landscape. Chapter 4*: *Classical Woodland Management: the Middle Ages and after*. Weidenfeld & Nicolson, an imprint of The Orion Publishing Group Ltd. London 2020.

The Names of Coppice Binds (Coupes) within Shrawley Wood

Hugh Milner

The name of the area of coppice cut each year on rotation, varied throughout the country. Examples from other regions are Cant[1], Coupe, Cut, Drift, Fellet[1], Hag and Panel. In Shrawley Wood they were mainly termed a Bind but at varying times also a Fall, a Coppice, a Hold or a Ward. Much of local terminology is under threat from most traditional woodland operations dying out in the last hundred years. With the recent revival of underwood management for ecological reasons, the term used generally these days is Coupe.

Over the centuries, a Bind, as in to 'bind round', and pronounced 'beind' in Worcestershire, has been variously written as a Bayne (1423), a Bind(e) (1439), a Byn(e) (1469) or Bine, see the Glossary of Terms. It may have been last recorded in 1838, though it may well have continued to be used in speech by the Shrawley Woodsmen.

In about 1495 Shrawley wood comprised ten coppices let to tenants. The detached Shopgrove was included with one of these ten called Roughscentz. The tenants recorded an area of 157 acres (including Shotgrove) but each acre must have been around 1.1 hectares given that we think the combined area was 172ha (425 acres).
A further probably ambiguous reference mentions 1,040 acres but this may include other woodlands.

In the 1699 valuation by Richard Vernon, there were 11 Binds, following the year (of which seven were double, one was treble) each of 34 acres (13.76 hectares), which were said to be cut on a 17-year cycle. If every bind was 34 acres, the wood then totalled 374 acs (151.4 ha). The 1699 Yarrington report lists 18 binds, which would result in 646 acs (261.4 ha), most unlikely. Actually 20 are shown, though these include doubles, as mentioned above.

In 1742, it was said to be 365 acs (147.7 ha). This is much more likely. In 1813 it is believed its full extent was 421 acs (170.45 ha). This is most unlikely. 16 binds were paired in name, each one of the pair being c.17 acs. This list identifies 30 of those 32 half-binds, following the year. The contiguous Jonsons Grove, Great Grove Coppice and Hors Leasow Coppice are included though they were not part of the 11 binds of 1699 or the 32 half-binds of 1813.

By 1838 The Wood Books record that when the lime coppice was cut before the overstorey standards were felled, the cutting was described as 'ridding', though this was not meant in a disparaging way.
The 1838 tithe allocation gave the wood as 376 acres (152.2 ha) but surrounding tithes, probably part of the old wood, indicate a former extent of 412 acres or more (167ha). Between 1838 and 1883 the wood's extent was further reduced, mostly at the west (though some of this was replanted to larch) to 347.3 acs (140.55 ha). This remains its current size, 96ha with FC and 44.55ha with the Wood House Estate.

Where 'le' occurs below, it was in the original source, written in Medieval Latin because there is no definite article in Classical Latin.

Sources
1. James, NDG. 1991. *An Historical Dictionary of Forest and Woodland Terms*. Basil Blackwell Ltd, Oxford, OX4 1JF.
2. Halliwell, JO. 1850. *Dictionary of Archaic Words*. John Russell Smith, London. Republished 1989 by Bracken Books, London.
3. See acknowledgement below.

A Coz Richard's agreement 1708-9 Worcestershire Archive and Archaeology Service (WAAS) 705:7 BA 7335/18 i Nos. 11, 12
B Bailiff's report 1388-9 WAAS 705:66 BA 4221/7(ii)
C Childe v Childe litigation 1654 The National Archives (TNA) C6/41/116 and WAAS 705:7 BA 7335/20 No 1. 6
D Dougharty map 1733 WAAS 705:7 BA 7335/154/1
E Wood account book 1738-9 WAAS 705:7 BA 7335/68/No. 13.
F Felling notebook 1945. Wood House Private Collection
G Shrawley Game account 1875-1885 WAAS 705:7 BA 7335/25
H Minister's Report: TNA E101/149/7; SC 6/HenVIII/4004; SC 6/HenVIII/4008
J Jonson's Grove account 1780 WAAS 705:7 BA 7335/47 iv No. 19
K Court Rolls of the Manor of Shrawley WAAS 705:7 BA 7335/50/8 and 705:7 BA 7335/39/16
M Tithe map 1839 WAAS r760/545 BA 1572
N Estate Account Book 1758-1780 WAAS b705:353 BA 3803/2; 1736-69 Household and estate accounts
P Prattinton 2 Henry V
Q Prattinton 4 Henry IV
R Coz Richard's evaluation 1699 WAAS 705:7 BA 7335/109 iv No. 51
T Tenants report of c. 1495 TNA E 315/83/,f.56
W Wood Books 1764-1850 WAAS 705:7 BA 7335/47/iii Nos.1-2; BA 7335/132/ii Nos. 1-5; BA 7335/132/iii Nos. 1-5 & BA 7335/133/vii Nos 1-2

Acknowledgement
I am most grateful to Dr John Baker, Nottingham University, for his constructive comments.

1422-1495	1699 Coz Richard	Wood Books consensus	First	Source	Variants	Comments
			1410	P/K	Le Outewode	The original name of *The Outwood* may signify a difference in commons rights compared to *The In Wood* (*atten Outwood* > *atte Noutwood*)[3] c.f. name of the adjacent hamlet: Outward Green --> Noutard Green. Nutward may have crept in because of a high proportion of hazel in the underwood. Typical misspelling of this scribe; evidently the local pronunciation
			1443	P	Les Entwodes	
The Outwood			1472	T	The Outwood	
	Great Nutward		1699	R	Great Nutward	
	Little Nutward		1699	R	Little Nutward	
			1708	A	Second or Lesser Noutward binde	
		Little Outwards	1758	N	the Likel Outerdes	
		Great Outwards	1761	N	The Great Outerdes	
			1774	W	Little Outwards	
			1777	W	Great Outwards	
			1809	W	Grate Outwards	

		1425	Q	Le Aleye Bayne	The Alley Bind (adjacent to one or more of the
		1439	K	Le Aley Bind	gullies? See the chapter, *Shrawley The Word* p.118)
The Aley		1495	T	The Aley	
Alley Binde		1699	R	Alley Binde	
	The Alley Bind	1760	N	Alee Bind	misspelling typical of this scribe
		1760	N	The Alle Bind	
		1777	W	The Alle	
		1777	W	Halle bind	hyper-correction of Alley Bind
The Fryth		1469	K	Le Fryth Byne	
		1495	T	The Fryth	'The Wood' OE *fyrhth*
First Frith		1699	R	First Frith	
Second Frith		1699	R	Second Frith	
		1765	W	one of the thrifes	
		1769	W	one of the thrifes	
	Hither Thrift	1832	W	Hither Thrift Bind	
	Further Thrift	1839	W	Further Thrift	
The Roche		1495	T	The Roche	The Rock Bind; with rocky outcrops?
Great Rochpole		1699	R	Great Rochepole	Pole = tree
Little Rochpole		1699	R	Little Rochepole	
	Great Rochpole	1763	N	Great Rochpole Bind	
	Little Rochpole	1767	N	Lickel Powl Rock	Evidently the local pronunciation
		1814	W	The Great Rochpoles	
		1837	W	Little Ragepoles	
		1433	B	Blake/wych(e) Capicia	Black Wych Coppice ME *blak*,'black'[3]
Blachwych		1495	T	Blackwych	Black Wych, Elm, Ash or Rowan?
		1519	H	Blakewich Bind	
First Blackwich		1699	R	Blackwich, First	
Second Blackwich		1699	R	Blackwich, Second	
		1736	E	2nd Blackwich	
		1757	N	One of the Black wiches	
		1770	W	Ye Black which	
		1773	W	Black Wyches	
	Far Black Witch	1838	W	Far Black Witche	
	The (H)Ither Witch	1846	W	The Ither Witch	The Nearer Witch
		1425	P	Tagley Held	ME *Held* = Slope
		1447	P	Takeleysheld	Tag Wood-Pasture Hold (OE *tagge* Tag = Hog, a
Tagleyheld		1495	T	Tagleyheld	year-old sheep) (+leah)
Tadgeley Hill		1699	R	Tadgley Hill	
		1709	A	Tadgeleyhill	
	Tagley Hill	1768	W	Tagleehill	written as *the tagleehill & Shapgrove*
		1784	W	Ta(d)egley Hill Bind	
		1818	W	Tagely Hill Bind	
		1835	W	Tagleyhill Bind	
The Elbow		1495	T	The Elbow	We think this name reflects the shape of the
		1526	H	Elebow Coppice	border of the bind visible from the middle valley
First Elbow		1699	R	First Elbow Binde	
Second Elbow		1699	R	Second Elbow Binde	
	the Elbow Bind	1731	E	Elbo	typical misspelling of this scribe
		1817	W	Elbo Bind	
	? was 2nd Elbow	1815	W	Devels Oke Bind	Devil's Oak Bind
		1836	W	Ragnell Bind	Ragnell's Bind or Devil's Bind? (ME *ragnel*, devil)[3]
The Brechyng		1495	T	The Brechyng	OE *brēc*,'land broken in'[3]
		1508	M	Le Brechynge	Breach[2] Bind or Broken ground, ploughed. Recently grubbed? Thus, lost woodland
Kings Hill Binde		1699	R	Kings Hill Bind(e)	*Kings Hill* may have been named after the steep
Second Kings Hill Binde		1699	R	Kings Hill Binde, Second	hill on the road before the cutting was made.
		1761	N	King Sill Bind	Transpositioning of the S denotes local pronunciation
		1762	N	The Kingseal Bind	Evidently the local pronunciation

Roughscent[z?]		1495	T	Roughscentz	Rough meant a Coppice in Salop[2] (& also clearly in Worcs). Scentz is likely scent, a steep descent. Paired with Shopgrove in this document.
Rough Land		1542	M	Rough Land	Paired with Short Greve in this doument
Row Lane		1699	R	Row Lane Bind	
		1738	E	Rowlane, Ye	
	Rowlane	1755	N	Rowlene Bind	misspelling typical of this scribe
First Border		1699	R	First Border	On the wood edge
Second Border		1699	R	Second Border	
		1835	W	Borders, The	
		1835	W	Bank, The	Mr Bourne's Bank, the southern margin
	Ladywell	1764	W	Ledy Well Bind	Lady Wall [ref?] maybe refers to quarry by
		1799	W	Lady well Bind	Holders Pool, a possible source of stone for St
		1816	W	Ladywell Bind	Mary's Church. This is at the southern tip of wood
		1481	H	Long Wan(*le*)es	The transcription of the characters (*le*) is uncertain
The Wendleys		1495	T	The Wendleys	The Turned/Bent-Wood-Pasture (leah) or The
Great Winlesses		1699	R	Great Winlesses	Cross-Roads? (OE wegen-læt)[3]
second Winlesses		1699	R	Second Winlesses	
little Winlesses		1699	R	Little Winlesses	
		1762	N	One of Wenlisses	
	one of the Wenlisses	1775	W	one of the Wenliesis	
		1778	W	First Wenliss Bind	
		1778	N	Wenliss Fall One Bind	
	The Great Wenlis	1780	N	The Great Wenlis	'the milkin way' is suffixed to the Great Wenliss;
		1780	N	one of the Wenlis	did dairy cattle walk through for milking?
		1812	W	Ye 1st Wenliss	
		1844	W	The Grate Wenless	
		1780	W	The milkin way	Location unknown -- ? by the Great Wenless
		1945	F	The Milking Fall	
		1390	B	Shobbegrove	A personal name, OE Sceobba , then variously spelt: 'Sheba's Coppiced Wood' is the original and best meaning[2].
Shopgrove		1495	T	Shopgrove	Paired with Roughscentz
		1542	H	Shorte Greve	Transcription uncertain: paired with Rough Land
		1627	C	Shipgrove	
[not included]		1654	C	Shoppegrove	
	Shapgrove	1764	W	Shapgrove	
		1832	W	Shot Copse	
		1835	W	Shopgrove	
		1875	G	Shotgrove	Name adopted by the Ordnance Survey
The following were not part of the Shrawley Wood bind system but were in or adjacent to the Wood:					
		1838	M	Great Grove Coppice	Tithe 476 on the 1839 tithe map.
		1780	J	Jonson's Grove	'Johnson's Coppiced Wood'. Cut 1780 but still woodland in1838.
		1801	W	Ye Bottoms	The brook margins planted with osiers and withies

Shrawley Wood 1875-1897

Richard Pumphrey

This account is based on bills and receipts from the Vernon's Shrawley Estate game account 1875-1885[1], a complete set of worksheets from the Vernon's Shrawley Farm account from 18th September 1888 to 2nd September 1897[2] and an accounts notebook covering January 1893 to November 1895 written by Henry Thrupp, licenced victualler of The Lenchford Inn, farmer, coal merchant and cratewood merchant. These documents offer useful information about the history of Shrawley Wood together with a fascinating insight into the social history of Shrawley village.



01. Samuel Powick. Photo from "The lost world of Hanbury" by Bernard Poultney.

Game keeping

From 1875 to 1888 we have only receipts relating to the Shrawley game account. Samuel Powick (01) was gamekeeper throughout this period and his budget was managed by John Wormington.[a]

Each winter Sir Henry Foley Vernon hosted shoots in Shrawley Wood, Parsons Coppice and Shotgrove. He also paid Thomas Ashmore £10 for the right to shoot on "Glason Bridge Farm" in 1885, and was offered the same right for 1 September to 22 February 1886. His gamekeeper not only had to ensure the pheasants and other game were there for the Vernon's guests but also had to organise the beaters – up to fifteen men and six boys for the shoot, who were paid a day's wage (2/- for men, 1/- for boys) and given bread, cheese and cider for their trouble. He organised the dog licenses. There was an aviary with coops for the breeding pheasants and their numbers were supplemented by buying in new hens and eggs. The pheasants needed food[b], the coops needed repairs and the pheasants needed watching over by night to prevent poaching.[c] Samuel Powick's sons went on night watch in turn as they reached a suitable age, along with other village lads (paid one shilling a night) and occasionally an old hand such as Thomas Brown (paid 2s 6d a night). Men were paid for "nights out" in the Wood Books 1832-1845; presumably this was on the same mission when it was not specified as "nights out fishing". There were regular purchases for food for the birds. W Pheysey supplied the shot, black powder, wads and caps for the guns (the gun in the photo is a muzzle loading double barrelled shot gun that would have used this type of ammunition). Repairs to his gun in 1885 by Perrins & Son were an adjustment of the right cock and replacement nipples, confirming his gun was a muzzle loader although Perrins & Son made breech-loading shotguns and supplied cartridges. However, by 1897 bills appear for boxes of cartridges at eight shillings each rather than powder and shot, indicating replacement at last of the antique muzzle loaders by modern breach loaders.

W Pheysey also supplied snare wire and rabbit traps: rabbits must have been a major pest some years and most of the men took part in rabbiting at times. Ferrets were used: in 1876 John Brazener the carpenter spent two days making a ferret box and in W Pheysey supplies a ferret collar in 1876 and a ferret line in 1878. Rabbit wire was erected – presumably around the aviary. Rabbits must have been a regular meal for the men and some were even sent to Hanbury.

Moles were troublesome in some years and in 1893 the men spent days "spreading mole heaps in the park", and in 1894 James Clarke caught 102 moles and was paid two pence for each.

Samuel Powick's son Harry as a boy occasionally helped with planting trees and other work in the woods until July 1891, when at the age of 16 he became assistant gamekeeper and received regular pay of nine shillings per week. When his father died, he signed off the work sheet that fortnight and does not appear again in any later record. From that date, John Marks took over the Shrawley Estate Farm Labour management. Edward, one of Harry's elder brothers, had been working in the wood and continued after his father's death, becoming one of the main woodmen, felling trees and peeling bark from 1892 onwards. Edward's children in turn went on to be important in the running of the Vernon Estate: Sidney running the timber yard and sawing at Hanbury, Cyril living in Wood Farm and playing a central role in managing the estate in Shrawley, Denis acting as a carrier with the lorry for his coal business and Ruth being personal assistant to Sir George Vernon.

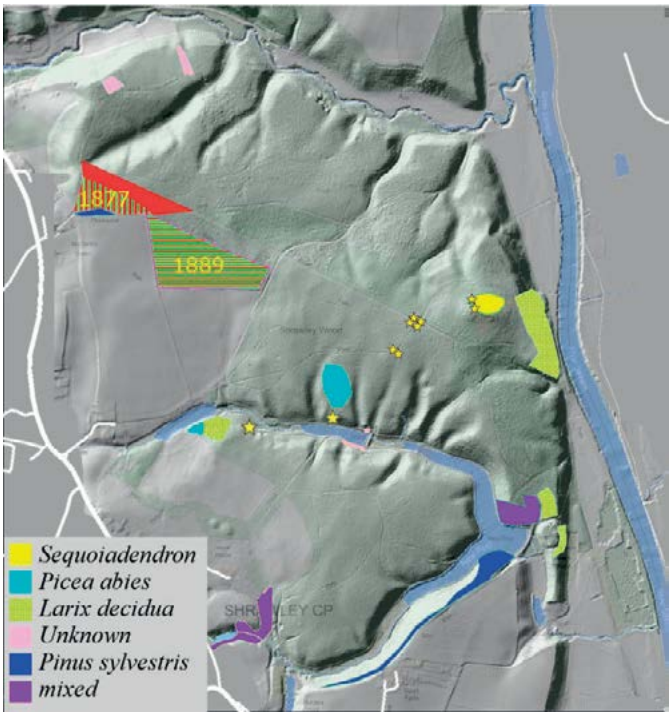
Tree planting

Ordnance Survey maps surveyed in 1883 and 1901 distinguish between deciduous and coniferous woodland (02); variations in the icons for coniferous trees may represent different species although this is not specified in the key. Old trees in the positions of these plantations may be remnants of the planting and where the trees are too young to be part of the original plantation, they may still be an indication of the species that was planted at each site.

[a] See appendix A for details of those paid from the Shrawley Game and Shrawley Farm accounts.

[b] see appendix B for suppliers to the Vernon Estate whose invoices are archived with the Shrawley Game and Farm accounts.

[c] Samuel Powick's account of the night of January 15 1859 graphically illustrates the relationship between gamekeepers and poachers: see appendix A.

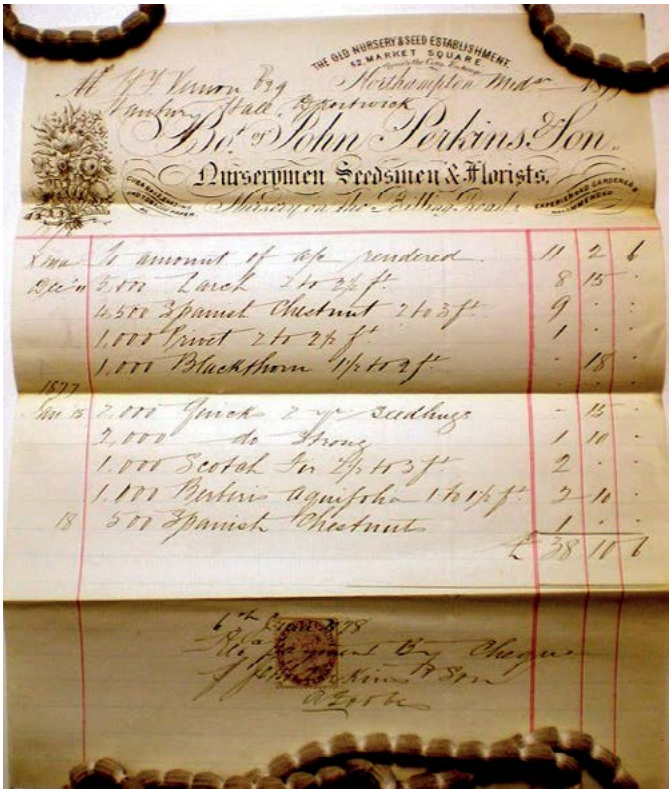


02. Position of conifers indicated on the Ordnance Survey map surveyed 1883, shown here on a LiDAR map of Shrawley Wood. The green/red striped area labelled 1877 is mapped as mixed coniferous and deciduous. The 1901 revision shows a new plantation (labelled 1889, green/red horizontal stripes). The 1926 revision has mixed deciduous and coniferous trees between the 1877 plantation and the main ride (red).
Two Wellingtonias (*Sequoiodendron giganteum,* yellow stars) by the middle pool are of an age suggesting they should have been mapped in 1883 but they are missing from the OS maps.

date	paid	for	£	s	d
10/3/1801	Mr Hammonds of Worcester	500 of beech plants	2	10	0
		50 Larch trees	0	6	0
		plantin the beech in the wood and the furs upon the waste land	2	10	0
c. 1828	no record of this purchase	Norway spruce	?	?	?
1838	John Tapp Nurseryman Worcester	1500 of larch for planting	2	15	0
13/3/1839	Tapp Nurseryman	200 Larch for planting	0	11	0
24/4/1846	Mr A Wood & Co	Larch Fur	2	10	0
21/3/1846	Mr Wood & Co	1000 Larch Fur	1	5	0

03. Previous tree planting

Larch planting before 1875
Previous purchases of larch *Laryx decidua* plants (fur) are recorded in the Wood Books[3] along with a single record of planting beech *Fagus sylvatica* (03). A few beech are left around the margins of the wood and by the New Pool dam; their age could be compatible with this planting. The 1801 planting of larch "upon the waste ground" raises a question about where this might have been: the OS map surveyed 1883 has conifers either side of the horse pasture at the north of the wood, in the main quarry in the east, around Oliver's mound by the southeast corner and at the wood edge south of Layes Pool: any or all of these might at that time have been called waste ground. A single remaining Norway spruce by Layes Pool fell in 2020 and a cut around 5 metres above the base had a ring count of approximately 188, suggesting a planting date during the interval 1819-1832 for which we have no Wood Books. In 1840 the Wood Book records a sale of 58 Spruce Firs 84ft at 9d [per ft] to Mr John Wright £3.3.0. These young spruce at 1.4 Hoppus feet each were probably thinnings from this planting.



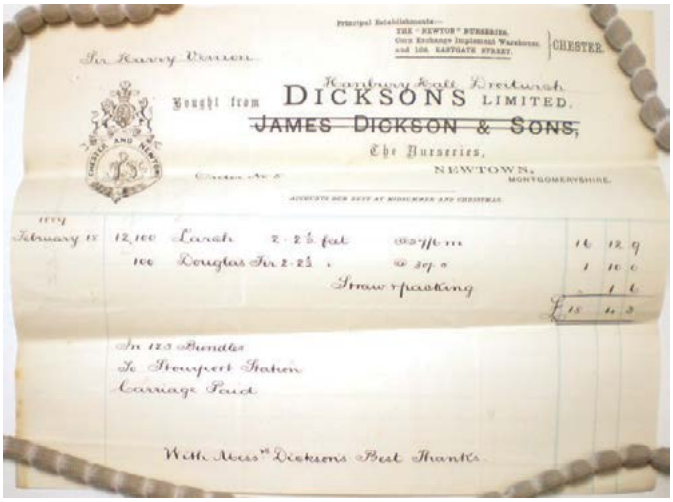
04a. Bill from John Perkins & Sons Northampton.

			£	s	d
Xmas	to amount of a/c rendered		11	2	6
1876 Dec 11	5000	larch 2-2 ½ ft	8	15	0
	4500	Spanish chestnut 2-3 ft	9	0	0
	1000	privet 2-2 ½ ft	1	0	0
	1000	Blackthorn 1 ½ - 2 ft		18	0
1877 Jan 15	2000	quick 2 yr seedlings		15	
	2000	do. Strong	1	10	
	1000	Scotch fir 2 ½-3 ft	2		
	1000	Berberis aquifolia 1-1 ½ ft	2	10	
18	500	Spanish chestnut	1		
			38	10	6

04b. Transcription of (04a).

Larch and Sweet Chestnut planting, 1877
The bill in (04) incorporates £11-2-6d from a previous unpaid order from 1876. Being addressed to "Mr H F Vernon Esq., Hanbury Hall, Droitwich" leaves open the possibility that these trees were destined for the Hanbury estate, but this bill has been filed with the Shrawley game account, suggesting the trees on this part of the account were for Shrawley; there is a plausible site for the planting on the OS map marked in red (02). Several of the items were hedging plants, but the larch, chestnut *Castanea sativa* and Scots pine *Pinus sylvestris* were enough for a plantation of 3ha or more although the brown area is only just over 1ha. The 1925 revision has mixed conifer and deciduous in this area extending as far as the main ride, an area of 2ha that may have been the full extent of the 1877 plantation, possibly misrepresented in 1883 because the larch trees were still so small.

In the worksheets for 1888, Edward Powick, Job Taylor and Allen Medlicott between them cut 485 Hft of larch timber and 500 larch poles; it seems likely that much of this came from older plantings of larch. Edward Powick and William Spragg cut 100 Scots pine for fencing rails on 20 August 1891; it seems likely these were thinnings from the 1877 planting. In 2019 no larch are left among the sweet chestnut, which has been coppiced and is now being managed on a 6-year cycle.



05a. Second bill from Dicksons of Newton.

			£	s	d
Despatched 1889 January 29					
12100	*selected seedling*	*Larch*	*2*	*11*	*6*
2000	*transplanted*	*Spruce Fir*	*1*	*-*	*-*
2000	*do.*	*Scotch "*	*1*	*-*	*-*
100	*do.*	*Abies Douglasii*	*-*	*10*	*-*
100	*do.*	*Spanish Chestnut*	*-*	*6*	*-*
100	*do.*	*Acacia*	*-*	*10*	*-*
2	*matted packages*		*-*	*4*	*-*
1889 February 18					
12100	*Larch 2-2½ ft*		*16*	*12*	*9*
100	*Douglas Fir 2-2½ ft*		*1*	*10*	*0*
	straw & packing		*-*	*1*	*6*
			18	***4***	***3***

05b. transcription of (05a)

The new larch plantation of 1889

Part of Shrawley Wood near Noutards Green had been cleared of trees some time before 1883. This area may have been the *Greater Outward* bind, last recorded as cut in 1842 and 1843. In the northeast corner of this clearance, the 1901 revision of the OS map shows trees were replanted sometime between 1883 and 1901 (02). The Shrawley Accounts pinpoint the time of this planting as February and March 1889. The men spent 77¼ man-days during the last two weeks of January marking out lines and digging approximately14,000 holes ready for the planting. A first order placed with Dicksons of Newtown was dispatched on January 29th and collected from Stourport station by Allen Medlicott on January 31st. It seems probable that something went wrong with the first planting of larch because a second order for larger plants was despatched by Dicksons on 18 February (05) and collected by Allen Medlicott from Stourport Station on 22 February. From 25 February until 23 March, 56¼ man days and 44 boy days were taken up with re-digging and planting. The area planted (4 ha) and number of plants suggests a regular six foot spacing. This plantation was harvested and then replanted by the Forestry Commission in 1965; a few Robinia[d] *Robinia pseudoacacea* remain, the oldest probably dating back to the 1889 planting.

1890 tree planting

Allen Medlicott went to Stourport Station to collect trees again on Friday 24 January 1890. The next day he and William Spragg, William Davis, Edward Powick, Thomas Powick, Henry Powick and two other boys started planting the trees. Over the next week they spent 30½ man days and 1½ boy days planting trees. Unfortunately we have no bill for these trees. One possibility is that they were orchard trees as the 1901 revision shows many new orchards had been planted on Vernon Estate farmland in Shrawley.

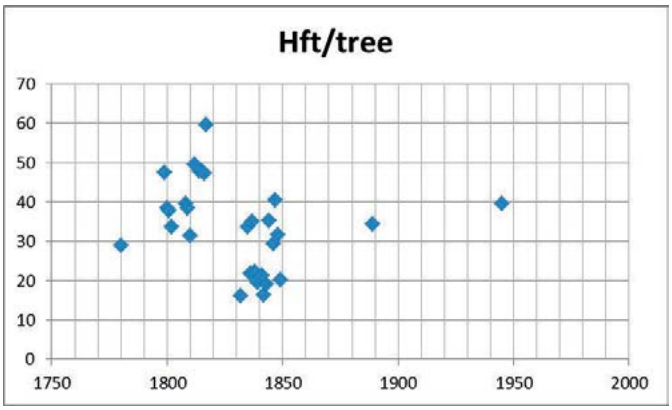
[d] Robinia were listed on the bill as Acacia.

Oak timber and bark

year	oak timber ft	bark tons	lb bark /ft oak	delivered to	waggons	paid
1889	2023	13.44	15	Worcester	6	Job Taylor
1890	0	0.00		-	0	-
1891	2153	14.59	15	Worcester	7	Job Taylor
1892	886	5.90	15	Worcester	3	Edward Powick
1893	420	2.75	15	Wick	1½	Edward Powick
1894	425	2.44	13	Worcester	1	Edward Powick
1895	434	2.60	13	Worcester	1	Edward Powick
1896	600	4.00	15	Worcester	2	Edward Powick
1897	2145	12.81	13	Worcester	5	Edward Powick

06. Bark yield.

Oak was cut each year apart from 1890 and bark was peeled every time the oak timber was felled. The yield of bark was consistently around 14 lbs bark for each Hoppus[e] foot of oak, the same as recorded for Jonson's Grove in 1780 (see chapter *Jonson's Grove* p.177). Each year it was taken by wagon to Worcester; a full load was just over two tons. In 1893 the second wagon had a part load of bark and part of poles, the latter presumably destined for the Vernon estate in Wick after the bark had been off-loaded at the tannery. There were two adjacent tanneries in Worcester: J Cock on Henwick Road and J Cock & son on Hylton Road. Both of these were right by the river Severn, but it seems it was less trouble to deliver the bark seven miles by road once the waggon had been loaded rather than transferring to a barge, because loading and unloading the waggon with two tons of bark was a significant amount of work. The men were paid 28 shillings per ton for peeling of bark – the same amount as in 1840 but we have no receipts to show how much the tannery paid for the bark. The size of the timber trees (07) is of interest too and can be compared to earlier and later felling. The early 1800s saw the biggest trees being felled on average, but some individual trees were massive, such as Adam and Eve in 1835, with their combined size of 132.7 Hft.



07. Average size of oak timber trees felled for each year that this can be estimated 1780-1945.

The bind names are not mentioned in any of these worksheets but in 1891 the bark and oak were taken from the park and in 1897 the oak was felled and bark peeled at Shotgrove, confirming that this coppice was still managed as part of Shrawley Wood.

Poles to Birmingham for copper refining

In 1913 Elwes reported[4] a conversation with Sir H. Vernon, of Hanbury Hall, near Droitwich, the owner of the wood, who "says that this underwood used to be cut every seventeen years, and sent to the Potteries for making crates, but that this demand having ceased, it is now difficult to get rid of. It is now allowed to grow into poles, which are sometimes sold for copper-smelting in the Black Country, at about six or seven pounds per acre for twenty to twenty-five years' growth. In Sir H. Vernon's opinion, it would now pay better to grub the lime and plant larch in its place." It seems Sir H Vernon had already followed this strategy in the Greater Outward bind.

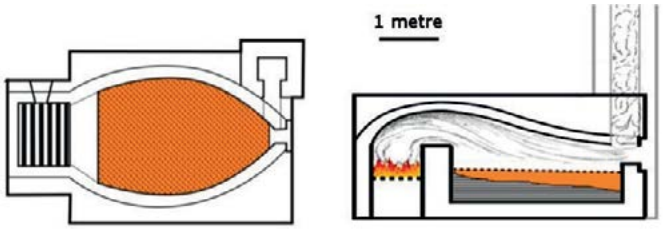
[e] Hoppus foot (Hft) was a measure of timber volume.

Two of the copper smelting firms who bought these poles were The Birmingham Battery Company and Ellis & Co., both of Selly Oak. Bills from 1897 allow the transport of two loads of poles to be traced, going from the wood to the wharf at the Lenchford Inn, thence down the Severn to Hawford lock, up the Droitwich Canal to the Worcester and Birmingham Canal, and so to the wharf at Selly Oak for delivery.

1. 27 September 1897: Severn Horse Towing Path Extension Co. Owner French; horses =1 from Stourport to Grimley
2. 29 September 1897: Toll to Severn Navigation Commission. 2/6d to J Dadge, receiver at Holt station: Owner French. 12 ton poles, 4 miles to Hawsford.
3. 29 September 1897: 14 ton poles to Birmingham Battery Co. 2 men @ 4/10, 2 horses @ 6s per day; price paid boatman £5-5-0 = 7/6d per ton. via Worcester & Birm. Canal Section; Droitwich Junction; Owner French. Battery Works.
4. 6 November: 11 ton 5cwt £ 3-13-3 (+ 1s 6d for the weighing); about 6/8d per ton for boatman) timber to Birmingham by canal from Lenchford by Mr Whitehouse.

And in the diary of Henry Thrupp, farmer, licenced victualler of the Lenchford Inn, coal merchant and cratewood merchant, we find:[5]
1895, 17 September: Sold Elliotts Metal Co 2 boat loads 50 tons poles @ 24/- .

The exact way in which these poles were used in Birmingham is not known, but descriptions of copper smelting elsewhere allow us to guess the process within narrow limits[6,7]. The ore used in Birmingham had earlier come from Parys Mountain in Anglesey or Cornish mines but at this time was increasingly coming from abroad. Extraction from the ore involved repeated cycles of calcination and fusion in reverberatory[f] furnaces of various proportions, eventually resulting in copper of around 95% purity known as blister copper due to the bubbles incorporated towards the end of the previous stage. The final process was performed in a reverberatory furnace of the type illustrated in (08). Before poling, the surface of the molten copper was covered with a layer of coke or charcoal. Because the exact method used in Birmingham is not recorded (it may have been regarded as an industrial secret), we can only guess how the green wood pole was pushed into the molten copper, probably moving it around to mix the melt. The melting point of copper is 1085C; the temperature in the furnace over the copper would have been well in excess of this, probably around 2000C, and the pole would surely have burst into flame during the poling, and the steam and reducing gasses produced will have sprayed molten copper around the inside of the furnace. It was acknowledged as a hazardous procedure.[6,7]



08. Plan and section of a reverberatory furnace of the type used for poling. Underneath the molten copper the floor is sand, arranged to slope towards the front opening, through which the copper is taken by ladle, both for sampling to monitor the progress of the changes induced by poling and at the end of the poling to take the copper out for casting into ingots.

If cut from 20-25 year-old lime coppice, the poles sent from Shrawley would have had a median diameter of around 10cm and length of up to 8-10m (see chapter "Small-leaved lime regrowth and regeneration" p. 295). According to Oudiz[7], poling used around 70 lbs of wood per ton of copper, with around six tons of copper in the melt. If this were true in Birmingham, each firing would need 190kg of lime poles; with a median mass of 20kg per pole this implies several poles being used for each batch.

[f] Reverberatory implies that the fire was separate from the ore and worked by radiant heat from the low ceiling of the chamber containing the melt.

Cratewood

Henry Thrupp bought cratewood from Shrawley for onward sale, making good profit. The cratewood had two components, flexible and rigid (chapter [1764-1850] (12) p. 188): the flexible rods were withies, the rigid were a wood called whitturne in the Wood Books. (Thomas Bunce spells it *Witton*; Samuel Powick spells it *Wittern*; Henry Thrupp spells it *Whittern*; John Marks spells it *Whitten*; Denis Powick[8] spells it *Witton, Witten, Wittan, Whitten, Whittern* and commonly with the last two letters illegible). Although *witan* and cognates have been used elsewhere to denote a variety of trees, we can be sure that in Shrawley it meant Small-leaved Lime:

a. Kendrick Watson's account of sales from Shrawley Wood does not mention lime, but does mention *witan* as one of the woods used for cheap hop poles.
b. Advertisements for sales of the harvest from of Shrawley Wood in 1860 (13 acres), 1863 (16 acres) and 1864 (13 acres)[9] all refer to the strong growing whittern underwood together with ash and oak timber. It was John Wormington organising these sales, maybe following on from his renting the fall in 1846-8. As far as we can tell, most of the underwood was lime in 1860.
c. In the deliveries notebook of Denis Powick covering the period 1933-1944, the quantities of oak, birch, witt_n/whit_n and alder poles suggest that his witt_n poles were lime.

Because cratewood had these two components and because of the way the work has been recorded, it is difficult to plot the quantities harvested in Shrawley each year; w[h]itt_n cratewood varied from none to 19 cords. Henry Thrupp's notebook shows he bought withy cratewood from other providers as well as Shrawley but his cratewood specified as whittern came from Shrawley.

Withies and osiers

Osiers are *Salix x. viminalis* and the name is also used for the thin branches of this tree used for basketry. Withies are thicker branches from *S. x. viminalis* or other willows including *S. x fragilis*. The brick pits that had been worked by John Hughes 1831-1852 had been disused for decades but had been planted with withies; the trees there now include a range of willow species and hybrids (see chapter Trees & shrubs p. 337). The withy harvest varied from none to 8.5 cords each year with a great deal of time fencing and hedging round the withy beds. It seems that the value of this crop was well recognised, and more withy sets were cut and planted in 1891 and 1897, both in the old brickyard and at Shotgrove (see chapter Shotgrove p. 308); in 1896 more withies were planted in the withy beds by Severn Bank House (presumably the site labelled tithe 73 "Shop Grove Sally Bed" on the tithe allocation map but simply "379" on the 1883 Ordnance Survey map).

Osiers were harvested by the bundle and delivered to Worcester; some were bought in 1893 by Stokes and Co. There was a John Samuel Stokes, basket maker in Worcester but it is not certain he was the one; Allen Medlicott carried loads of osiers to Worcester each year but we have no receipts for corresponding dates. Although Stokes & Co will have made hampers, the Vernon estate bought their hampers from the Woodbury Hill Reformatory for boys in Shelsley Beauchamp; some of these were filled with game for distribution by local carriers such as Job Taylor to the wealthy of Worcestershire. The Boys' Reformatory was a project of Lord Ward, Earl of Dudley.[10] It fell into disrepute because of the harsh conditions the boys were subjected to[11] and was closed following a riot by the boys in 1895.

Cordwood

Cordwood was cut every year and Allen Medlicott spent many days moving it around. Much of it may have been used locally as firewood.

Hedging
Hedging continued much as it had in 1764-1850. Laps and hetherings were cut every year and hedging undertaken at various sites around the estate. Other days were spent fencing, either with wire or with larch rails – small larch trees sawn in two lengthwise by the Bunces to give pairs of half-round rails. Iron fencing was bought and installed round the park surrounding Wood House. Notice boards were erected around the wood – presumably saying "KEEP OUT Trespassers will be prosecuted".

Sawyer work
Thomas Bunce and his son Thomas Jr. were the sawyers used by the Vernon estate. We have no evidence for any mechanical saws such as the steam-powered saws used in some yards at that time; in the last worksheet, October 1897, George Blunt spent four days felling poles, then four days digging a sawpit, indicating that these poles were to be sawn locally where they fell. The fall that year was in Shotgrove, so his saw pit may have been there. No trace of a pit is visible on the 2014 LiDAR digital terrain model of Shotgrove. There was most probably a permanent protected sawpit in the timber yard as well as ones dug by the fall. Later, after the First World War, there were circular saws at Hanbury and by Wood Farm in Shrawley, powered by belt and pulley from a tractor.[12]

Blacksmith work
The Shrawley blacksmith and farrier used by the Vernon estate was Joseph Thrupp, grandson of the James Thrupp who had been their blacksmith from 1809 to 1850. The bills for shoeing horses indicate that the estate had at least two horses in Shrawley that regularly worked in the wood and must have been the horsepower for Allen Medlicott's daily work. These were also hired out to local farmers when they needed the extra horsepower. Frequent repairs were needed to the ironwork of timber chains, timber wagon and tushing wheels as well as the ploughs and other equipment used on the farms.

Wheelwright work
In 1894 sawyer Thomas Bunce cut 32 of what he called *felleas* at 6d each and 64 at 4½d; felleas was Thomas Bunce's word for felloes; *fellies* seems to have been a local word for felloes in Worcestershire,[13] but the wheelwright David Knowles called them *fallows*. Felloes are the wooden segments of a wheel rim, which were for preference taken from oak with its grain running in the appropriate curve for the size of wheel.[14] Once David Knowles the wheelwright finished the woodwork of the wheel, Joseph Thrupp the blacksmith fitted the iron rim.

Carriers
In 1875-77 it was haulier Jerry (Jeremiah) Cound or his son Charlie who moved whatever was required for the game and shoots, with their bills submitted by Jeremiah's wife Elizabeth Cound; she earned a shilling a day from the Vernon estate on occasion by picking fruit.

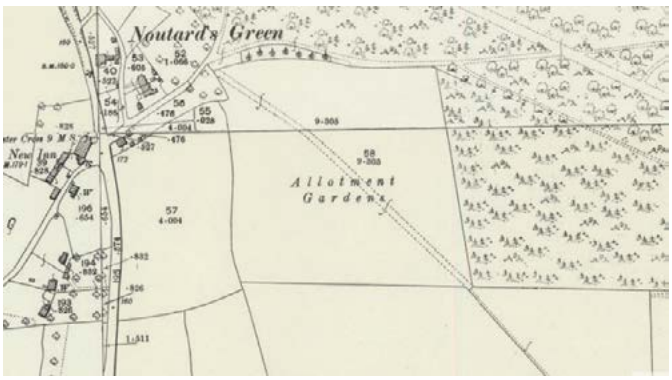
From 1888-1897 Allen Medlicott was employed virtually full time "drawing" or "lugging" everything from sand, bricks and lime, through hay, straw and manure, to poles, laps, hetherings and bark. He took these to and fro across the Shrawley Estate and thence to Hanbury or Wick. He gathered purchases that had been sent by train to Stourport Station. Much of the time this work involved two horses, whose shoes were maintained by the Thrupp smithy. He also planted trees, ploughed, harrowed, sowed seeds and many other agricultural chores. He was unmarried and spent days or weeks each year helping out at Wick and in Hanbury with similar tasks presumably with the horses. When he was working at Wick in the spring of 1894 he had to hire extra horses from Powick Mill.

Job Taylor (Samuel Powick's brother-in-law) also acted as carrier, mostly for smaller items or delivering hampers full of game to the wealthy of Worcester.

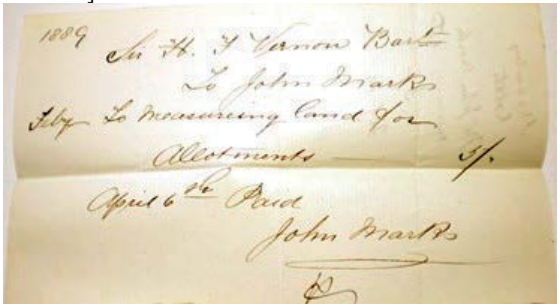
Farming
The worksheets are titled "Shrawley Farm Account" and much of the work recorded was ploughing, planting, mowing, haymaking, manure spreading and so on. In 1885, 90 tons of manure was purchased from the Worcester Urban Sanitary Authority for £5-5-0 and Allen Medlicott spent days each year carting manure around and spreading it.
There were pig cots made and sited by Shotgrove. The men and women gathered bushels full of acorns which may have been for pig food. Hen coops were made and installed – probably for hen pheasants to provide for the shoots.

Building work
Alan Medlicott spent many days going to Martley to collect lime and carting bricks, tiles, sand and "materials" to building sites around the village. Carpenters John Brazener, Rowland Williams and then Samuel Oakes spent many days building and roofing closets and sheds, repairing window frames, doors and floors as well as making and hanging an amazing number of gates. Wooden structures were painted with tar (probably gas tar – a forerunner of creosote). Allen Medlicott has to pay 4d to send an empty tar barrel back on one of his trips to Stourport on 13 May 1889.

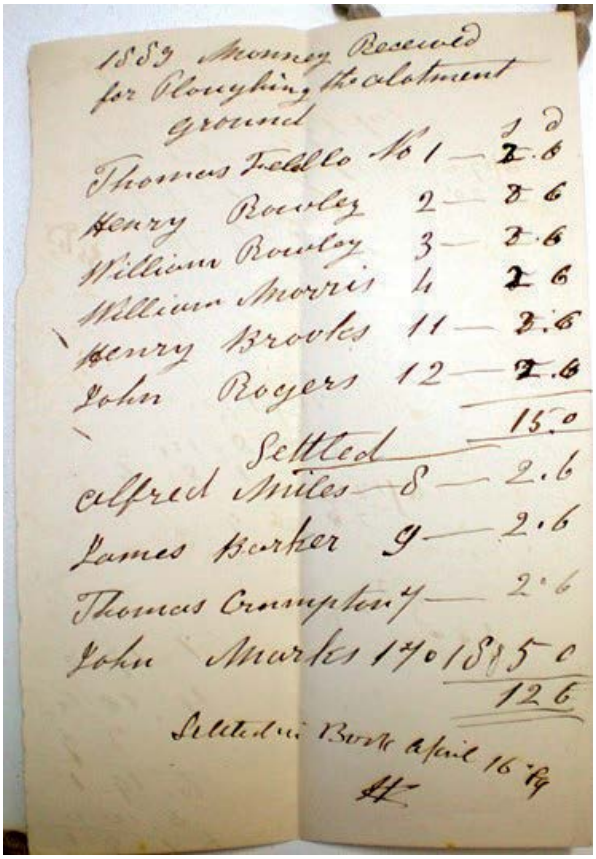
Village Life
Although not directly relevant to the history of Shrawley Wood, it is interesting to note in passing that John Marks was paid for measuring out the land for allotments near the land already earmarked for the new larch plantation. The area for the allotments indicated on the 1901 OS map is close to nine acres; the note (09b) suggests there were 18 allotments, each close to ½ an acre, and nine parishioners were charged 2/6 per allotment for this land to be ploughed, including John Marks who paid five shillings for a full acre. Maybe this move to create allotments was due to the Allotments act of 1887 which meant that if six or more villagers on the electoral role requested it, land should be made available for their use. John Marks lived in Wood Farm and may have thought of this as his land. The allotments are not shown on the 1926 revision of the OS map. The British Legion made an application to Shrawley Parish Council for 12 acres for allotments for WW I veterans. As none were given, the British Legion intended to approach the County Council for compulsory purchase, at which point George Vernon offered some land. This was thought unsuitable, but it seems the matter was not pursued any further.



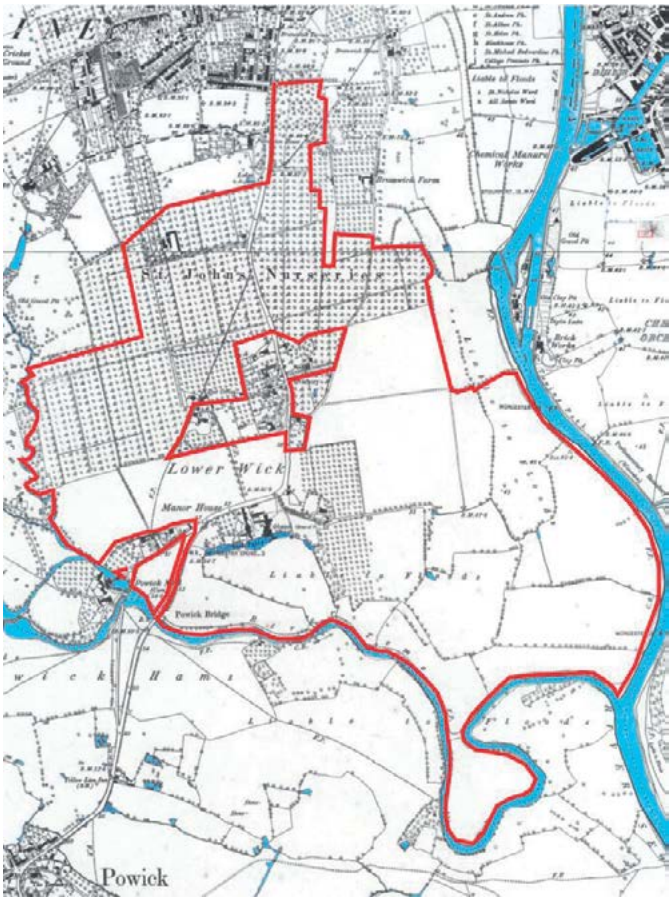
09a. Site of the allotments: [Copied by screen capture from the 1901 25 inch Ordnance Survey map of England and Wales available at https://maps/nls/uk >OS, reproduced under a Creative Commons Attribution-NonCommercial-ShareAlike 4.0 International (CC-BY-NC-SA) licence with the permission of the National Library of Scotland]



09b. John Marks' bill for measuring the land.



09b. The allotment users. We interpret the penultimate line as "*John Marks 17 & 18 [ ]5s 0d"* resulting in 12s 6d already settled.



10. Vernon estate in Lower Wick after 1883.[15] Copied by screen capture from the 6" OS map of 1883 available at https://maps/nls/uk >OS; the image was processed by removal of background colour, replacement of water by a uniform blue and addition of the red outline traced from the map associated with ref 16.

Hanbury

Roughly every three to four weeks, Alan Medlicott spent a day "meeting the Hanbury waggon" or "meeting the Hanbury Team" or "fetching horses from Hanbury", which involved paying the Holt Fleet Bridge toll of 1/6d. Once or twice he left Shrawley to spend some days at Hanbury. Sometimes he spent a day "loading Hanbury cart" or "loading the Hanbury Waggon" the day before he went there.

Lower Wick

The Vernons had acquired land in and around Lower Wick, southwest of Worcester c1743. Alan Medlicott spent days or weeks at a time in Wick with his horses, mostly in April, May and June but occasionally later in the year. His itemised pay there is not listed on the Shrawley work sheets. Other staff accompanied him there on occasion: May 1893 Thomas Spragg; May 1894 Edward Powick; June 1894 Thomas Barker and June 1895 Charles Spragg. Carpenter Samuel Oakey made three gates for Wick in 1895.

References

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2 WAAS Shrawley Farm worksheets: 705:7 BA 7335 Parcels 25, 26, 27, 59, 60, 61, 113, 114 Accounts and receipts relating to the Vernon Estates in Shrawley 1875 - 1897
3 WAAS 705:7 BA 7335/108, 109, 132 & 133. Account books entitled "Shrawley Wood book". With letters, receipts and accounts etc.
4 Elwes H.J. & Henry A. Trees of Great Britain and Ireland. 1913. Vol 7 p1659. Cambridge University Press
5 WAAS Thrupp H 1893-5. Account Book. 899:472 BA 9007 No 1 Account book of Henry Thrupp of Lenchford [in Shrawley] mainly concerning farm and estate matters 1893-5
6 Vivian JH An account of the process of smelting *copper as conducted at the Hafod Copper Works, near Swansea*. Annals of Philosophy 5 118-124.
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9 Advertisements for the sale of wood from Shrawley. Worcestershire Chronicle, 31 October 1860, 14 January 1863, 13 January 1864.
10 Melville, D 1857. *First Report of the Woodbury Hill Reformatory, July 1857*. London HMSO.
11 HANSARD 1803–2005 → 1890s → 1895 → February 1895 → 21 February 1895 → Commons Sitting → QUESTIONS.HC Deb 21 February 1895 vol 30 c1284
12 Personal communication from Bill Yarnold and Ann his wife, daughter of Denis Powick.
13 Salisbury Jessie 1894-6. *A glossary of words used in south-east Worcestershire*. London, for the English Dialect Society; Oxford University Press Warehouse.
14 Rose, Walter 1943. *The Village Carpenter*. Cambridge University Press. p 5-6.
15 WAAS 705:192 BA 5589/182 Hanbury Hall Estate O.S. Plans Scale 6 inch
O.S. 6" plans sheets 15SE, 15SW, 22SW, 22SE, 23SW, 29SE, 29NE, 30NW, 30SW, 30NE, 30SE, 33NE and 33SE representing portions of the Hanbury Hall and Wick estates embracing parts of Bentley Pauncefoot, Bromsgrove, Chaddesley Corbett, Crowle, Dodderhill, Dodford with Grafton, Dormston, Droitwich, Elmley Lovett, Elmbridge, Feckenham in Redditch, Grafton Flyford, Hanbury, Hampton Lovett, Hadzor, Himbleton, Huddington, Inkberrow, Kington, Kempsey, Oddingley, Powick, Norton juxta Kempsey, Rushock, Stoke Prior, Stock and Bradley, Westwood, Whittington, and Worcester City. 1883-5

Appendix A



A01. Map of dwellings occupied by Vernon Estate employees in Shrawley Parish 1875-1897

Dramatis personae

John Wormington managed the Shrawley Farm and Game Account until 1885 (age 76). John was baptised 28 March 1808; he married Elizabeth Little in St Peter's Church, Worcester 19 January 1830.
His parents were Robert and Mary; they lived in The Knapp and when Robert died in 1832, Mary continued there as head of household giving her occupation as farmer. In 1846-1848 the fall of underwood had been let to Mr Wormington and John Wormington was the contact person for sales of wood from the falls of 1860, 1863 and 1864.[9]
In the 1841 census he gave his occupation as Registrar and was living in Pow Pitt (now Bowpit Farm), with wife Elizabeth and children Henry age 10, Walter age 7, Harriot age1.
1851 his occupation is recorded as farmer of 40 acres employs 1; he was living in Bowpit with his wife Elizabeth. His mother Mary died 1851; she had been living in the family home The Knapp.
1861 he had moved back to The Knapp and was a farmer of 300 acres, living with Elizabeth who was now age 50 (on the census; actual age may have been a few years younger), and children Suzannah age 24, Elizabeth age 16, Charles age 8, Thomas age 2.
1871, age 63, he was a farmer of 13 acres
1881, age 72, he was a farmer of 33 acres living in The Knapp by himself.
1891 farmer age 82 living in The Knapp by himself. Later that year he died and was buried 14 November 1891 age 83.

Samuel Powick was the son of Samuel (1793-1881) who had been paid as woodman by the Vernons from 1819-1849. He was baptised 30 December 1832 at St Mary's church. He married Ann Taylor on 4 November 1852 and their first child John was baptised 17 April 1853. Ann was the younger sister of Job Taylor.

At the birth of his first two children he gave his occupation as labourer and at the third and fourth in 1856 and 1858 as woodman; for the next two (1860, 1862) it was labourer and not until the birth of Edward in 1869 did he give his occupation as gamekeeper. As a gamekeeper he worked under the management of John Wormington until sometime between 1885 and 1888. In 1890 he took over managing the Shrawley farm account as well as the gamekeeping account until his death in 1895.
At the age of 19, four weeks before he married Ann, Samuel came up before the magistrates in the Hundred House Petty Sessions on 6 October 1852 and was fined five shillings for poaching. With Job Taylor and Isaac Edwards he was convicted of killing a hare in a meadow owned by Lord Ward (in Holt parish) without license and without authority. (Job had been married to Samuel's sister Maria, who had just died in 1851)
In 1859 Samuel was shot by a poacher while on night watch for the Vernon Estate.
THE SUMMER ASSIZES: ATTEMPTED MURDER AT SHRAWLEY
John Bingley, 46, labourer and James Smith, 33, labourer, were indicted for having entered Shrawley Wood, the property of the late Thomas Bowater Vernon, Esq., for the purpose of destroying game. There were six separate counts in the indictment, the most serious of which was maliciously wounding a gamekeeper named Samuel Powick, with intent to murder him. Mr. Powell for the prosecution, the prisoners were undefended.
Samuel Powick said: I was employed to watch the game in Shrawley Wood, on Jan. 15 1859, with John Bond and Thomas Brown. I was stationed about three o'clock in the morning near Mr. Beech's [Bridge Farm by Glazenbrook Bridge]. I heard a shot in the direction of Redding Bridge which is a foot road near a ride in the woods. We advanced towards the bridge [along the broad track past the forge beside Dick Brook], and I stationed myself at a gate, and the others concealed themselves in the hedge. I heard two of the shots and a

pheasant cry. While there three men came down the ride and a dog came to the gate and returned to the men, when they went away, and I followed. I ran after them, and was closing upon them, when they turned round and the man I supposed to be Bingley fired at me without saying a word. He was ten to twelve yards off. Upon the man turning round, I saw him put the gun to his shoulder and point it at me. I instantly leaned upon my right side and received the charge in my left arm and breast. I cried out, "Oh, Lord, lads, I am shot; but come on, and we will have them now" I went on, and Massey turned round and struck at me with the gun-stock and we closed and fell to the ground. Their dog also got upon me. My butties then came up and struck Massey. The other two men were standing in the road a few yards off. When I got up they were shifted a few yards further. Brown said "Come on lads, and we'll have them now". Smith and Bingley then ran away. We then took Massey into custody. He was not the man who fired the shot. Bingley appeared to have a slop on; the other was dressed in dark clothes. It was a moonlight night, but was rather dark in the wood. I did not know who the men were. They were strangers to me. I was laid up five weeks from the effect of the injuries.
George Massey said, I was convicted in March 1859, for being out poaching in Shrawley Wood with two other men. They were the prisoners. I had been in their company in a public-house called the "Severn Trow" before. Bingley had on a check smock and a black billycock. The other had a blue jacket on the top of a white slop. There was one gun and a barrel of a gun amongst us. Bingley had the gun and I had the barrel. Smith had no weapon. It was about one o'clock when we went into the wood. We went to shoot pheasants. About three o'clock we were going down the ride when the gate opened and Powick came up. Bingley fired at him without a word passing on either side. I was afterwards knocked down and beaten by them as long as they thought proper, and then took into custody and tried for the offence, when I pleaded guilty.
By the prisoner Smith: Was there anything mentioned about any insult before. No
By the Judge: There was no agreement about fighting if we were stopped.
Bingley said he did not think that Massey's evidence ought to be taken as he had been three times convicted. Massey admitted having been convicted twice.
Joseph Higgins said: I am employed in the goods department of the West Midlands Railway. I kept the Severn Trow at Stourport. Massey and the two prisoners came to my house between eight and nine o'clock on the 15th January 1859. Bingley had a blue Guernsey frock on, and Smith wore a blue jacket.
Mr Warden, surgeon, Stourport, said that he examined Powick, and there were 28 shots in his head and arm, and 12 in his chest. He extracted 11 from the chest, but those in the arm were too deeply seated. Powick was laid up for five or six weeks afterwards. It was No 5 shot, such as is used for shooting partridges.
John Bond said: I was one of the watchers on the night in question. I saw the man that fired a gun using the ramrod as if he was re-loading and ramming the charge. The other man who was standing by his side said "Be sharp and load, and put a charge into that b--------"
By Smith: Massey had the powder and shot, but we did not know that at the time.
Smith, in his defence, admitted poaching, but denied that he had spoken the words imputed to him; in fact he was a distance away from Bingley at the time the shot was fired.
Bingley also said that Smith was a distance from him at the time, and did not use the words in question. He affirmed that the gun went off by accident, and denied having re-loaded it; also submitted that Massey's evidence ought not to be relied upon as he had been three times convicted. He was swearing their liberty away for the reward.
His lordship having very clearly summed up the case, said the question was, were the jury satisfied that the prisoners or either of them fired the gun with intent to murder the man, or whether it was not as likely that the shot was fired with the intent to prevent lawful apprehension. As to Smith, he did not fire the gun. It was said by Massey that there was no agreement between the prisoners as to fighting the gamekeepers. If the shooting was with a common purpose, Bingley's hand was Smith's hand; if not with a common purpose, or agreement, then Smith was not liable for Bingley's act. This chiefly depended upon whether they considered that Smith used the words imputed to him, namely, telling Bingley to "look sharp and put the charge into him." They would observe that only one person appeared to have heard the words, though there were several others near, and Bingley denied their use which was of importance as they did not affect himself.
The jury found the prisoner guilty of wounding, with intent to prevent lawful apprehension. Smith was sentenced to penal servitude for three years. The judge told Bingley that as his was the hand that fired the gun, if the jury found him guilty of the capital offence, he would have received a very heavy sentence, but, as it was, the sentence of the court would be five years' penal servitude.

Census information:
1841 age 8 living in Middle Cottage with his father;
1851 age 19 living in The Knowle, along with his elder sister, father and stepmother Sarah – no occupation given;
1861 age 29 living in Lower Fudges, with wife Anne and children John (8), Mary (6), Anne (5), Samuel (2), Sarah (8mo) – no occupation given;
1871 gamekeeper age 39 living in Curriers; same children + James (8) and Edward (1)
1881 age 49 gamekeeper, still living in Curriers, with wife and three children (James, Edward, George (5)
1891 age 59 Kings Hill, Gamekeeper with wife, Edward (agricultural labourer) and George (assistant gamekeeper).
Samuel died 1 April 1895 at King's Hill, Shrawley, aged 62

Edward Powick (1869-1941) was the seventh son of Samuel Powick, gamekeeper. He married Susannah Hill in July 1888. He mostly worked as a woodman, falling poles, peeling bark, gathering osiers and planting sets and trees. His sons included Sidney, Dennis and Cyril and his daughter Ruth became personal assistant to Sir George Vernon.
1871 age 1 living with his father in Curriers
1881 age 11 ditto
1891 age 21 living in Lower Fuggers with his wife Susannah age 22 and son Samuel age 1
1901 age 31 living in Vine Cottage with his wife Susannah age 32 and children Samuel, James, Sidney and Marjorie.

Harry Powick (baptised George Henry 20 June 1875) was the eighth son of Samuel. He became assistant gamekeeper when he was 16 but left immediately after his father's death. He married Anne Somers in Brecknock and became a police constable in Manchester, returning to Shrawley when he retired.

Job Taylor was a farmer living in Hayes Farm. He was born at Kings Hill, Shrawley and baptised 24 November 1823. He was Samuel Powick's brother-in-law twice-over because on 26 September 1848 he married Samuel Powick's elder sister Maria and Samuel married Job's sister Ann.
Maria died age 24 in 1851 leaving Job looking after baby Emma. He married again 15 October1857 to Ann Simmonds. Job was caught poaching with Samuel on Lord Ward's land just before Samuel's wedding. Job also worked as a woodman felling trees and peeling bark. He carried goods around for the Estate.
1861 age 38, farmer 3 acres living in Hayes Farm with his wife Ann and daughter Emma age 12. William Spragg (ag. Lab.) and family also lived in Hayes Farm
1871 age 48, Ag. Lab. living in Hayes Farm with wife and married daughter and son Samuel age 6.
1881 age 58, Ag. Lab. Hayes Farm
1891 age 68, widower, farmer, Hayes Farm with son Samuel age 25
1901 age 78, farmer, Hayes Farm with housekeeper Sarah Berry

John Marks was a farmer who took over the Vernon's Shrawley Farm account on the death of Samuel Powick in 1895.
He was baptised St Mary's Church 20 March 1856. Son of James (cooper, White House, Sankyns Green) and Ann.
1861 age 5 living in White House
1871 age 15 cooper's son in Bartlams (father James had moved his cooperage there)
1881 age 25 farmer, 16 acres, Bartlams.
1891 age 35 farmer, Wood Farm.
1901 age 45 farmer. Wood Farm;
1911 age 55 farmer, Green Farm.

Thomas Ashmore was a farmer living in Bridge Farm who leased the shooting on his land to H F Vernon.
1891 farmer age 69 living in Glazenbridge Farm with his wife Elizabeth age 65 and his son Henry age 34 (ag. lab. waggoner)
Thomas Bunce was the Shrawley sawyer used by the Vernons. He also was foreman for the farm labour and managed the account 1888-1890, until Samuel Powick took it over.
1861: age 24 sawyer living in Prospect Cottage [as lodger [I?]]; sawyer colleagues were Isiah Bunce age 20 and Edward Williams age 30
1881 age 43 he lived in Slade Hole with his wife Mary Jane age 36 and five children, oldest = Thomas age 13.
1991 age 54, living in Baxter's Green with his wife Jane age 46 and three sons (eldest son Thomas Jr. now moved out) and a daughter.
1901 age 64, still in Baxters Green with Mary; occupation now is farmer (small).

Thomas Brown may have been the Brown who had been with Samuel Powick when he was shot; he would then have been 32. Nights out watching 1875, 1877; tying faggots 1893, 1895
1871 woodman age 44, lodger in Catharine Preece's house Yew Tree Cottage with his wife Eliza age 54.

1881 general labourer age 54, living in Embutts (now Woodbine Cottage) with his wife Eliza.
1891 ag. lab (waggoner). living in (probably Embutts) with his wife Eliza.

Thomas Bunce Jr. sawyer age 23 in 1891, living in Carthouse No. 3 with wife Mary age 24 and daughter Mary age 1.

Henry Thrupp was the Licensed Victualler of the Lenchford Inn, coal and cratewood merchant, and farmer. Although it seems likely that Henry Thrupp had his own cart and horses, coal for Wood House was collected by Allen Medlicott from the yard. As well as his coal yard, the Lenchford had a timber yard for cratewood and a wharf for loading barges on the Severn. 300 yards downstream from the Lenchford was another coal wharf for the use of the Witley estate of Lord Ward. He negotiated sales of poles with the copper refining works in Birmingham.
He was son of Joseph Thrupp, blacksmith, who was the elder son of James Thrupp, blacksmith.; baptised 22 September 1846.
1845 May 27, his grandfather old James Thrupp the Blacksmith, was buried age 73.
1851 age 4, living in Bayliss Cross with father Joseph, blacksmith age 41 and mother Frances age 37, younger brother Joseph (2) and sister Mary (1). At this time Joseph's younger brother James was Licenced Victualler running The Lenchford with wife Ann and son James (3).
1855 James Thrupp was buried age 44.
1860 2 July Henry's father Joseph was buried age 52.
1861 census: Henry age 13; the smithy has been taken over by Henry's cousin, young Joseph Thrupp. Henry's widowed mother Frances has taken over The Lenchford from her brother-in-law James.
1863 22 October his mother Frances is buried
1871 age 24 Innkeeper and Coal merchant, living in the Lenchford.
At some point in time he took over Court Farm and became farmer as well as his previous occupations.
1881 age 34 Licenced victualler living in Lenchford with wife Lucy
1891 age 44 Licenced victualler & coal merchant, living in Lenchford with wife Lucy; Has taken on Albert Oakley age 18 as assistant.
1898, marries Eliza (28), daughter of John Wanklin, boat owner
1901 age 54, coal merchant living in Lenchford with new young wife Eliza age 31 and daughter Frances age 2.
1904, died 23 September age 58
1911 census: The Lenchford has been taken over by Thomas John Pitt age 27.

Joseph Thrupp was a blacksmith and farrier who had regular employment from the Vernon Estate Shrawley Farm 1888-1897. He took over the smithy sometime between 1861 and 1871
[1861 the blacksmith was Thomas Hill age 27, living in Bayliss Cross with his wife Mary and three small children; he must have taken over the forge when Joseph Thrupp, father of this Joseph Thrupp, died in 1860].
1871 age 22 blacksmith (one man) living in Bayliss Cross.
1881 age 32 blacksmith living in Bayliss Cross with his wife Sophia age 38 and three children.
1891 age 42 blacksmith living in Bayliss Cross with his wife and three children
1901 age 52 blacksmith living in Bayliss Cross with his wife and two children.

Allen Medlicott (born Allen Bellamy) was employed most days from 1888-1897, working with two horses and cart, wagon, tushing wheels, plough, scuffling irons, harrow and anything else that his horses could draw. He moved cut wood from the fall to the timber yard or the Lenchford, bricks, sand, lime and other materials to whichever of the Vernon Eastate cottages needed it. He helped planting trees, gathering fruit, hay, straw and anything else. He went with the horses to help neighbouring farms when they needed the extra horse power.
8 December 1850: Allen Bellamy baptised Ombersley. Mother Susannah Bellamy.
1861 as Allen Bellamy, scholar age 10, living in Big Nicholls with stepfather James Medlecote (Ag.Lab. age 34, died 1874), mother Susana Medlecote age 33 (née Bellamy, 1851 = house servant with Alexander Symonds age 60 farmer 5 acres as head of household in Ombersley) and sister Ann Medlicote age 5 (baptised 8 July 1855). Parish Register entry: *James Medlicott of Hartlebury labourer s. Edward Medlicott labourer m. Susanna Bellamy otp d. Thomas Bellamy labourer banns 18 Oct 1854 John Vernon rector wit. Samuel Harris & Mary Ann Medlicott.*
1871 as Allen Medlycott, age 20, living in Shelsley Kings as cowman to farmer John Leyland.
1881 as Allen Medlicott; general labourer age 28, living in Holders with his widowed mother Hannah and his brother James.
1891 as Allen Medlicott; ag.lab. age 38, living in Holders with his mother and sister Mary.
1896 banns 25 May 1896, married Charlotte Cheese, spinster otp, (d. of Anne, born Abberley, baptised 5/8/1846; had been house servant to Joseph Thomas in Shelsley Beauchamp 1871, 1881; staying with sister's family in Hove Sussex 1891).
1901 as Allen Bellamy, waggoner age 50, living in Lower Fuggers with wife Charlotte age 54.
1921 Allen Bellamy died age 70, Shrawley.

Rowland Williams, carpenter living in Little Nicholls, retired age 72 by 1891, then living on own means. Working for 3/4d per day 1890 putting rooves on WCs.

John Brazener, carpenter and joiner. His last bill 1890 was compiled and submitted posthumously by his wife and receipted "M Brazener" after his death that February. He charged 3/6d *per diem*.
1861 age 40, 1871 age 48 and 1881 age 60, living in Church Cottage with wife Mary age 30 in 1861, 36 in 1871, 48 in 1881, 2 children age 2,3 and apprentice Edwin Goodman age 20. 1881 census entered as Brasier. John Brazener was buried 26 Feb 1890; Mary Brazener in the 1891 census is a widow age 60 living on own means in "The Steps" [Woodend Cottage].

Samuel Oakey, carpenter who took over from John Brazener after his death (and from Rowland Williams after his retirement). He was employed by the Vernon estate many days of each year 1890 to 1897, earning 3/8d a day for building and repairing buildings, doors, window frames, making gates and so on.
1891 carpenter age 44, living in Church Cottage with his wife Sarah age 42, three sons and three daughters.

William Gegg, painter, plumber and glazier age 44 in 1991, living in Upper Fuggers with his wife Elizabeth and five daughters and 2 sons.

William Spragg had regular employment by the Vernon Estate, earning 2/4d a day throughout 1888-1897, partly as woodman and partly as agricultural labourer.
1991, age 65 living in Dirtymiddleton [now called Spring Cottage] with his wife Ann age 62, 2 sons and a grandson.

Charles Spragg, age 20 in 1891, son of William living with him.

Thomas Spragg age 31 in 1891, son of William living in Wood Farm Cottage

Henry Brooke, paid 1888-1897. ag. lab. but worked as a woodman at times.
1891 age 45, wife Jane age 46, 2 daughters, living in The Old Post Office.
1901 living near New Inn.

David Knowles was the Shrawley wheelwright used by the Vernon estate.
1881, he was age 38 and lived in 8 Sankyns Green with his wife Ann, six children and two apprentices, John Coccum age 20 and Albert Barton age 18. We have yet to identify which house in Sankyns Green was number 8.

Samuel Clarke labourer tidying up with cutting back, thatching rick, fixing aviary in the wood; painting Wood Farm Cottages.
1871 widower age 69 living in YewTree Cottage with his daughter and son-in-law
1881 age 74, widower carpenter living in Yew Tree Cottage with his son James

James Clarke ag.lab. catching moles 1894.
1881 age 52 living in Yew Tree Cottage with his father and wife Mary age 52
1891 age 65 living in Yew Tree Cottage with his wife Mary age 61
1911 age 84 living in Yew Tree Cottage with his wife Mary age 85

E Spragg labourer thatching rick and fixing aviary in wood along with S Clarke in 1876, 1877. Not present on the Shrawley census 1871 or 1881; no likely matches in the parish registers.

Other Shrawley residents giving their occupation as Woodman in the census 1851-1891:
1861 John Jones age 69 living in the Old Post Office with his wife Sarah age 73
1861 Thomas Bunce age 56 living in Wood Cottage with his wife Mary age 59, laundress
1891 John Rogers age 57 living in [site of Penrose] with his wife Susan age 60

Appendix B
Suppliers charged to the Game Account, 1875-1885

1875
HW Holtham & Co for biscuits
Pheysey for shot and powder
Anthony Waterer Knaphill Nursery Woking Surrey: seedlings *Rhododendron ponticum* and *Arundo conspicua*
Price & Co: 41lb grease
Arthur Thomkins & Co, Grocers: peck hemp and rice
Hannah Thomas bread
G Laight Cider
Wormington handling game account including four men beating Parsons Copice + bread, cheese, cider; S Powick £9-8-6 per quarter; Jeremiah Cound drawing the game in the Wood one horse 4/-; drawing [??] from the gravel pit to the [??]. Charlie Cound one horse ½ day hauling Buck wheat to shed; one ditto one day hauling buckwheat to rick. S Powick Jr. five nights watching pheasants. Thos Brown five nights watching. John Powick nights watching game &9 ½ days ploughing; Job Taylor 9 ½ days ploughing: For buckwheat for the game?

1876
Eggs for pheasants, 17 hens @ 3/- each, 8 hired hens.
Gospel Oak 8 x 400yd wire netting > S Clarke & James Johnson 12 days each repairing wire fence + one horse hauling materials.
Holtham for biscuits.
Pheysey for shot and powder & repairing Powicks gun. Price & Co for Grease.
Arthur Thomkins & Co, Grocers: peck hemp and rice.
J Brazener 2 days making ferret box.
Samuel Powick £9-8-6 per quarter + extras for taking care of nets.. three men beating Parsons Coppice, bread, cheese, cider. three dog licences. S Powick [Jr?] 9 nights watching. James Powick minding pheasants 33 days @ 1/- a day. Jeremiah Cound drawing rye (bill submitted by Elizabeth Cound).
December: three balls of string, 15 men beating, five boys, horse and cart, bread, cheese, 26 quarts cider. Similar bill for January.

1877
Pheysey for shot and powder.
Holtham for biscuits, barley
Josiah P Harvey for barley seed
Samuelson & Co for lawnmower repairs.
eggs for young pheasants; hens for sitting
John Perkins & Sons Northampton: 5000 larch 2-2 ½ ft. 4500 Spanish chestnut 2-3 ft. 1000 privet 2-2 ½ ft. 1000 Blackthorn 1 ½ - 2 ft. 2000 quick 2 yr seedlings; 2000 do. strong; 1000 Scotch fir 2 ½-3 ft; 1000 Berberis aquifolia 1-1 ½ ft; 500 Spanish chestnut
Samuel Clarke, James Johnson cutting shooting; S Clarke loading rye, thatching rick. E Spragg ditto (moved from 1876). E Spragg fixing aviary in wood; S Clarke do. Rowland Williams repairing pheasant coups. Thomas Brown watching pheasant seven nights x 2 + more; 2 men with W Vernon shooting; 4 men beating + cider + bread + cheese
Jeremiah Cound one horse ??

1878
Pheysey for shot, powder, snaring wire.
Dorrell [miller at Holt Mill] for maize.
Hollingshead Mill ditto.
Holtham for biscuits.
Iron fencing from Brierley Hill; £100 deposit.
removing old aviaries, new aviaries from timber yard to Curriers. Thos Brown, Thomas Taylor, Alfred Moor nights watching. John Brazener for aviaries.
S Powick £10-8-0 quarterly; one dog Aug 29 £2. Five men, five boys beating.

1879
Brierley Hill Iron works quote for 300 yards fencing at 2/4d per yard put into your boat at [staie] Worcs,

1880
Holtham for biscuits etc. Pheysey for shot & powder; Mr Dorrell of Holt Mill for maize;
John Warner Bell & Brass foundry for rotary ram bucket pump on oak frame £8-14-0
Wormington managing; three dog licenses. Ferret bags, collar;
Powick handling game account, £10-8-0 quarterly. Shoots: Parsons Coppice, Shotgrove; four men, four boys, bread, cheese, cider from John Marks.

1881
Phesey Ironmongers. powder, shot
H Thomas: bread, cheese; Job Taylor: cider
Holtham Seedsman: one sack of corn quarterly
Thos Pitt, Holt Mill: barley meal.
Wormington in charge and billing Vernon for the game account.
Other work: gathering barley and thatching rick. Beating in wood. Mending pheasant pens.

1882
Holthams, Pheyseys
Richard Smith & Co for Holly quick
Haywood for garden seeds
Richard Smith for 56 + 6 plum trees; 250 blackcurrant; 100 holly quick.
Wormington managing
S Powick £10-8-0 quarterly; 12 men beating
Thos Bunce sawing; and ? catching rabbits?

1883
Hundred House for two summons for trespass by Alfred Underwood.
Richard Smith 100 Holly, 6 Laurustinus alba, 6 hirtum
Seeds for pasture
Wormington managing
S Powick game account; £10-8-0 quarterly.
Thomas Bunce catching rabbits?
J Thrupp for horse shoes etc; at least 2-3 horses; plough repairs

1884
Holthams for biscuits etc; Pheysey for shot etc.
Thos Pitt Holt Mill for meal.
Thos Bunce for corn, hemp seed.
21 Mar, July 23, July 30 1884 42 hampers bought from Woodbury Hill Reformatory for boys, Shelsley Beauchamp.
Order of 11 trees for H Thrupp: 4 mahonia, 2 Portugese Laurel, 4 Rhododendrons, 3 hollies, 2 Lawsons Cypress, 1 macrocarpa. (For the Lenchford or Court Farm?)
Order for 6 lime trees for Oct 2 1884 to Mr J Wormington. He dealt with the bills for the Estate, but were these for his personal use at The Knapp?
Wormington handling receipts and Powick. Powick £10-8-0 quarterly for managing game account. Men beating, bread, cider, cheese, dog license, Job Taylor delivering. J Thrupp shoeing at least two horses, mending timber carriage x 3, timber chains, chaff machine, plough, cart, mowing machine.
Ringing 15 + 12 pigs.
John Brazener making dog kennel.
E Powick plashing many days and mending wire fences.

1885
Perrins & Son repairs to S Powicks gun.
Pheysey for shot and powder.
William Burgess for pheasant food.
Stallard for corn.
Francis Farmer making 2+3 hen coupes.
£10 to Glazenbridge Farm for allowing the shoot.
Strawberry runners & 900 apple trees £67-10-0 + plum trees from Richard Smith Nurserymen.
90 tons of manure from the Worcester Urban Sanitary Authority for £5-5-0.
Potatoes, clover seed.
J Thrupp 45 gallons bottled cider @ 1/- a gallon.
J Wormington handling game account. S Powick £10-8-0 quarterly. J Thrupp blacksmith work: shoeing horses, ringing pigs, repairs to timber chains, timber carriage, cart wheels, plough, waggon.
E Powick fixing rabbit wire with S Clarke. three dog licences.

Acknowledgements
I am most grateful to Francesca Llewellyn for help with researching of the material on which this chapter is based. Thanks also to Hugh Milner for help with interpreting some of the archaic terms encountered in the material.

Recent times

Hugh Milner



OAK TIMBER.

COTTON & CHAPPELL

WILL SELL BY AUCTION,

AT THE GRAND HOTEL, BIRMINGHAM,

ON MONDAY, MARCH 21, 1904,

At FIVE o'clock in the Evening,

704 OAK TREES

IN SHRAWLEY WOOD,

On the Banks of the Navigable Severn,

FOUR MILES BELOW STOURPORT,
EIGHT MILES ABOVE WORCESTER.

Lot 1.—140 Trees, numbered 1 to 140 inclusive, in White Paint.

Lot 3.—90 Trees, numbered 326 to 415 inclusive, in White Paint.

Lot 5.—163 Trees, numbered 569 to 731 inclusive, in White Paint.

Lot 6.—96 Trees, numbered 732 to 827 inclusive, in White Paint.

Lot 9.—215 Trees, numbered 181 to 395 inclusive, in Black Paint.

The Auctioneers have great pleasure in calling the attention of Timber Merchants and others to this Important Sale. The Trees are of a superior quality, big girth, and one of the finest lots that has ever been offered by Auction for years.

The Timber may be Viewed previous to the Sale by application to Mr. J. Marks, Wood Farm, Shrawley, Stourport.

Auction Offices—Bromsgrove and Birmingham.

Printed at the "Messenger" Office—Bromsgrove.

01.A 1904 advert for the Standing Sale of whole oak trees in Shrawley Wood. This may have been forced on the owner because of death duty liabilities, following the accidental death in South Africa in 1902 of Hubert Edward Vernon. But the wording hints that these may have been the best mature oak trees in the wood. Was this 'sustainable and appropriate' woodland management? It is the convention that such a sale includes all stem-wood, bark, branch-wood and 'Lop & Top', even if the timber merchant was really only interested in 'clean butts'.



02. Shrawley Wood: six oak standards have been felled. This is excessive for a normal thinning of the overstorey when coppicing in a joint operation, so perhaps this is the heavy felling of 1904, judging by the men's waistcoats. Less likely it may be 1945 or 1948. If so, then this is the 'devastated woodland' area in the north, sold in 1961 to the Forestry Commission.

A seventh tree has been laid-into by felling-axe, perhaps by one of the five men here. A heavy (hemp?) rope has been tied into its crown and secured at ground level, to aid/guarantee accurate 'directional felling' towards the photographer. The other four men at this tree will carry out the felling, using the large cross-cut saw to be seen, a pair at either end. The rope will be pulled, once the felling cut is almost complete but leaving a hinge to ensure control is maintained as the tree falls. Using ropes was not normal practice nationally except with leaning trees or near property but was perhaps a tradition at Shrawley, to ensure valuable 'veneer' butt-length logs did not split during felling. Climbing that tree was no mean feat!

The trees are in-leaf, which means the sap has risen, so this is likely to be June, the usual time for bark peeling, which is in progress here, to be dried and sold separately to leather tanneries. The Wood Books, (see Chapters *1764-1850* p. 189*, 1875-1897* p. 211), reveal that oak bark commanded as high a price as timber.

There are 17 men in this posed photograph. Note the oak and birch still standing in the background. The intrusive birch was a managed bonus. Nothing will be wasted. It is recorded that all the lop and top, twigs and chippings found a market. If this was a 'standing sale' to a contractor or timber merchant, all arisings would have been included in the sale.

Note how clear of branches the standards are, no doubt kept 'clean' by the small-leaved lime underwood on its 17-year cycle. Oak standards over small-leaved lime coppice, Peterken Stand Types 5A and 5B, were once more common in traditional English woodlands. The applied husbandry hints at why.

Recent times

We have shown in this monograph that management and production in Shrawley Wood have both been carried out in a thorough manner for at least 500 years and probably longer, perhaps continuously from prehistoric times, when the earlier management of wood-pasture is considered. Generally, woodland in British and Anglo-Saxon times was 'a vital resource'[1] and was essential for the Anglo-Saxon economy[2].

The growth and life of Shrawley Wood provided a livelihood for locals and for markets beyond, viewing the adjacent River Severn as an arterial route for produce. This harvesting of growth continued as an economic essential into mid-Victorian times. But after c.1850 the main focus in woodland veered from wood products towards game within a 'pleasure ground'. The woodland at this time was comprised mainly of oak standards with an understorey of birch and a Small-leaved lime-dominated coppice underwood.

We have studied in detail the available information and produced this report as a result. But what about the missing detail? How old are the quarries? We know that between 1730 and 1850 a great amount of stone was removed but we have not found any accounts. The quarry at the east of the wood is the largest in the area and perhaps supplied sandstone for the many walls in Shrawley village and beyond.

It was well-known that mineral extraction from the Forest of Dean in the 1960s, when four National Coal Board mines were extant and much limestone was quarried and worked, that the Forestry Commission earned more from these rights than from the sale of timber. Did the same apply to Shrawley Wood at some time?

There are hints of game management, fishing in 1812 and 'nights-out' in 1832 but we have no accounts until 1875.

These two activities strongly hint at a more diverse resource-base being exploited during the long Vernon tenure.

During the 203 years from 1760 to 1963 at least 6500 large oak were harvested, as recorded in *Oak Loss from and Replanting in Shrawley Wood*. This did not necessarily mean that the lime coppice was permanently losing all of its overstorey of oak. Seedlings would be recruited continuously, especially after each 'Bind', see *The Names of Coppice Binds (coupes) within Shrawley Wood*, was freshly coppiced, so that at any given time, there would be about 12 to 15 trees to the acre (32 to 40 per hectare) across the age range of 1 to perhaps 150 years but intentionally spaced out to 12-16m centres, so that sufficient light reached the lime underwood. Across the whole wood's 141 hectares, at any given time, there would have been about 5,000 oak standards, ranging from saplings to mature trees. Additionally, oak saplings were replanted early in the 19th century but perhaps not in the 20th, when financial viability became difficult for the Vernon ownership. As elsewhere, landed estate revenues were falling but this was exacerbated by death duties in 1904 and 1940, [see *Oak Loss* etc.].

The lime was grown on a 17-year cycle for various markets, fluctuating with time. Equally importantly though, this tall and close lime underwood shaded the oak trunks, keeping them straight and free of branches, so increasing the timber value by keeping it knot-free to break of crown, some 25 feet (7.6m) from the ground[3]. Shrawley Wood was renowned for its good quality oak standards. When both overstorey and underwood are jointly promoted in such a Coppice with Standards, a greater number of oak can grow above lime coppice than over hazel coppice because lime is more shade tolerant.

This very long period of traditional woodland management, would have involved promoting the most desirable tree species and retaining those oak with the best 'form'. This selection means that acorns came from the best shaped parents, so perpetuating high-quality timber. Good 'form' is straight, apical dominance with a deep crown for good growth.

Available markets will most often dictate promotion of certain species. Lime fell out of favour in mixed coppices elsewhere and would seem to have been actively discouraged from around 1700, in favour of other species offering better returns for woodland owners and their coppice workers. If the main reason to foster small leaved lime coppice was to produce cordage and ropes from its bast, other natural fibres such as hemp, grown in this country since Anglo-Saxon times, was far stronger (but required precious arable land on which to grow it!). For instance, the mixed coppices of Dorset and Hampshire were weeded-out to become monocultures of hazel, Hertfordshire and Essex to hornbeam and beech, whilst Sussex and Kent coppices were replanted to sweet chestnut[4]. Why did this great change in underwood management not happen in Shrawley Wood? Was it because the lime was needed? I believe so.

The traditional Coppice with Standards management is a compromise providing dual land-use and the opportunity of putting many more products to market from one parcel of woodland compared to growing oak only in a High Forest regime or coppice only with no overstorey.

A Time of Change

Big changes were afoot. The fashion for 'Landscaping' impacted upon the Shrawley Wood. North-west of Wood House (the mansion house) part of the woodland was converted to parkland between 1839 and 1883, although in the same period an area to the north of the parkland was lost completely to agriculture (see p. 273, image (01) Compartments 4 & 5). Around 1854 individual giant Sequoia and cedar of Lebanon were planted and an oak/lime avenue was created to beautify the woodland. Commercial management did not continue at the same level after 1850 and the various products found over hundreds of years for the extensive lime coppice and the birch understorey, began to dry up. This occurred nationally as other materials from the industrial revolution offered cheaper and longer-lasting alternatives. Metal hand tools and wire fences were two proliferating examples. However, I expect in an attempt to diversify the marketable products, two areas of commercial sweet chestnut were planted in 1876.



03. Strawberry punnet and chip baskets.
[Image © Museum of English Rural Life, University of Reading]

By the mid 1920s the coppicing cycle lapsed over large parts of the wood. Oak standards still provided some valuable sales of 'sawlogs' and the last coppice cutting of rods and poles in this era went for 'cratewood' to the Potteries and veneers for chip baskets to transport fruit (03). But the woodland was not managed so well. Benign neglect crept into the wood and unintentionally became the order of the times. Access rides became overgrown. Felled oak standards were not replaced. Nationally, the characteristic natural regeneration of oak seedlings below a woodland canopy changed for the worse. Previously relatively shade tolerant oak became a light demander[5]. The accidental introduction of Oak Mildew in 1908 into the UK from North America may be to blame. Oak saplings no longer thrived in shaded situations.

Sir George Vernon, in failing health, shot himself dead in 1940. Because he fell out with the established church over tithes and refused to have a 'snivelling parson say words over my grave' but also because he loved Shrawley Wood, he chose to be buried beside the Summer Cottage in the middle of the wood where he had spent happy days in his youth (04). Until 2015 the Church of England would not allow such deaths full burial rites or to be buried in consecrated ground. Sir George would have been well-aware of this. His coffin was borne by six Estate workmen[17], up into the wood on a handcart[18]. His tomb (04 & 05) is close to where the cottage door once stood. Sir George's assistant and later adopted daughter Ruth Vernon née Powick, later Mrs Ruth Vernon Horton inherited the Estate but seems to have been less able than Sir George in effective woodland management and the woodland deteriorated further.



04. The tomb of Sir George Vernon with the Summer house fireplace in the background.

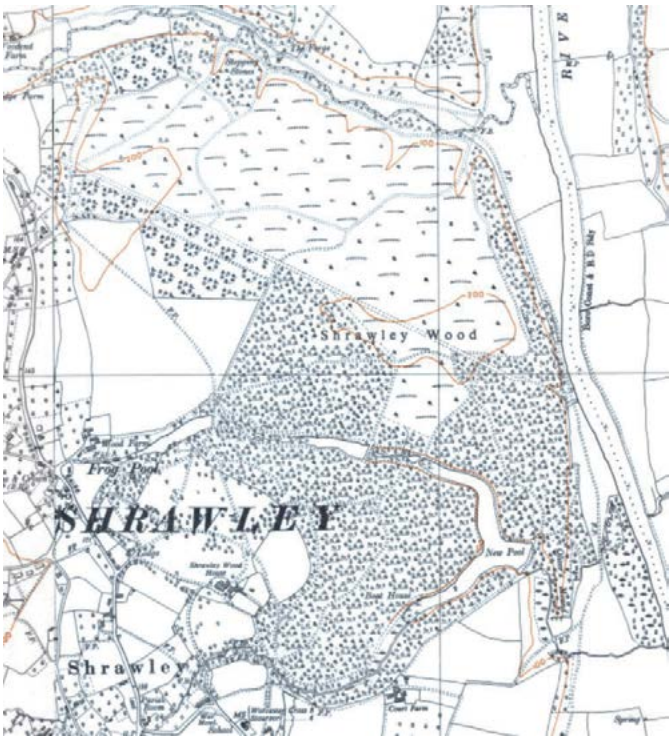


05. The Tomb. (see also the close-up photograph of the plaque p. 228).



06. Remains of the summer house or "Summer Cottage" beside the tomb. There is a rectangular foundation of the cottage in front.

Extensive felling of the northern part of the wood took place during the 1940s, no doubt for the war effort but also probably to meet death duties and as evidenced by the finding of many oak stumps. 726 oak standards were felled in 1945, 57 in 1946 and a further 57 in 1947 were blown over by the gale that followed the severe winter of that year. It is said that 'virtually all mature oak are removed' between 1947 and 1950, see *Oak Loss* etc.



07.Shrawley Wood 1954. Showing the area in the north of the wood, clear-felled in the 1940s. This was the main area of Devastated Woodland replanted to mainly Douglas fir by the Forestry Commission in the 1960s.

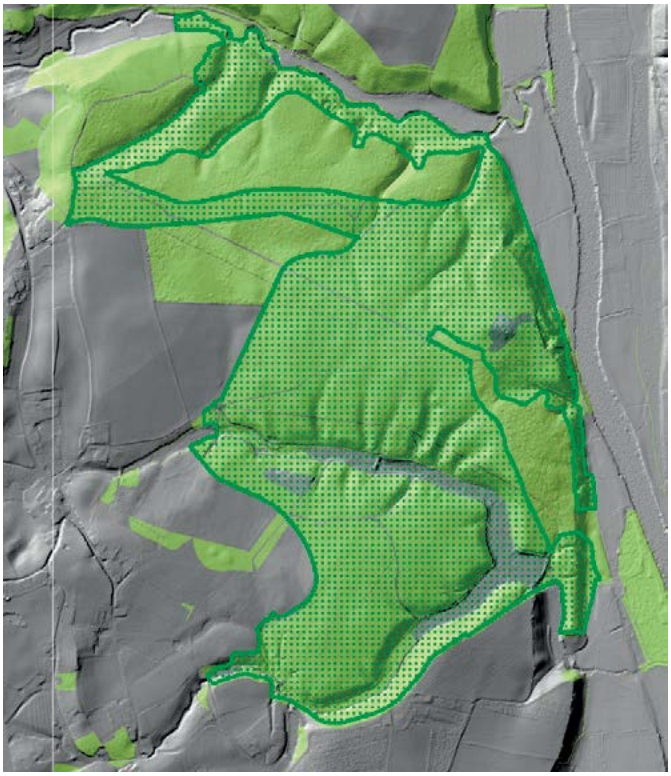
Along with oak sawlogs from other woods in Shropshire, Herefordshire and Staffordshire but mostly from Shrawley Wood, many more, perhaps in excess of 200 oak standards were felled in 1948, specifically to replace oak panelling damaged during the Second World War by Nazi incendiary bombing of the House of Commons in Westminster.



08. To be felled for repair of the House of Commons April 1948[6]. Note the height to the first big branch, the knot-free, high quality timber is in this first butt-length. The lime underwood will have created this over successive rotations. All this felling was clearly unsustainable, thus inappropriate but approved under Felling Licences by the Forestry Commission. Perhaps it was accepted, given the extraordinary circumstances during and after the Second World War and on the basis of a restocking condition ensuring the felled area remained woodland, albeit 'devastated'.

The views of an Old Forester

From 1953, protracted negotiations began with the Forestry Commission (FC), to sell the freehold of the northern two thirds of the wood, 96 hectares (ha) of the total 141 ha. The Estate was at a disadvantage because the large area of clear-felling in the 1940s had created a 'devastated woodland'. About half of the 96 ha was greatly reduced in value, since it had only a remnant standing crop, see fig. 07. It was perhaps no coincidence that the Nature Conservancy (NC) notified some 100 ha of the woodland as a Site of Special Scientific Interest (SSSI) in 1955 for its dominant small-leaved lime, breeding birds (and two rare slugs!). Nearly half of the woodland was shown to be Limewood, either coppice (26.5 ha) or High Forest (21.5 ha). This notification was updated in 1986 by NC successor English Nature, now Natural England (NE).

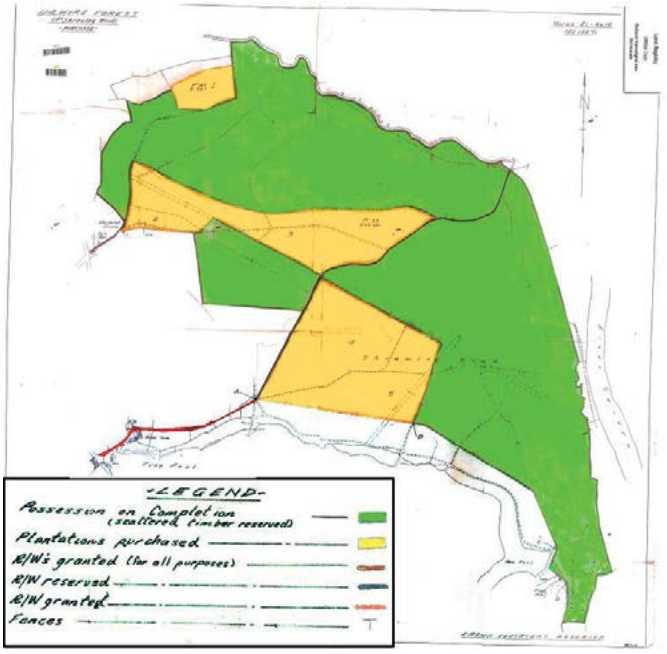


09.The SSSI area with a current NE assessment of Unfavourable Recovering. The two internal non-SSSI areas (no doubt not included after negotiations between NC and FC) were replanted from 1964 to mainly Douglas fir.

The FC finally produced an Acquisition Report in 1958 but the land sale was not actually completed until June 1961. The local valuation was £15 an acre but because of a permanent fencing commitment between the two parts of the woodland, FC paid £11 an acre (c.£27 per ha) for the woodland, stated to have a high productive potential. £11 then was worth c.£241 in 2018, an extremely low price but the Estate had retained timber rights, the green area on fig. 10, which no doubt was exercised, going some way in balancing the bargain, though these trees were said to be scattered.

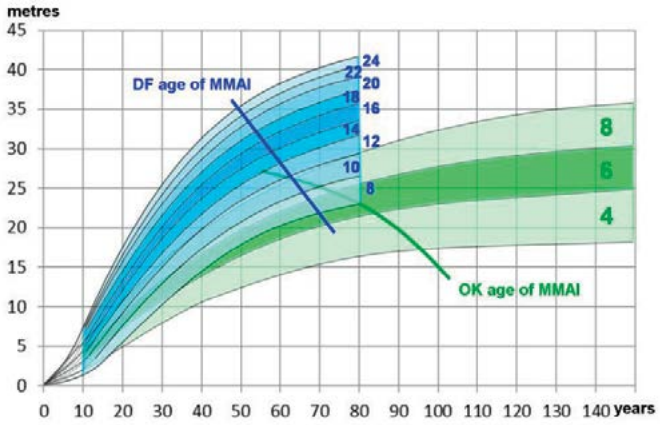
Economics were not considered at this time by FC. The comprehensive 1947 Census of Woodlands guided forest policy, Devastated Woodland should be brought back into production, 'Can we grow productive conifer here?' was paramount[16].

Although the woodland was now a SSSI, NC recognised then, somewhat surprisingly, that the 'Unreformed Forestry Commission' as Oliver Rackham penned them[5], had a sole objective of management to increase the nation's strategic reserve of timber. Thus, two areas (08) were not included in the SSSI area and FC replanted these to more productive conifers, notably Douglas Fir but mainly in the devastated woodland area. Only 57 ha of FC's 96 ha was SSSI.



10. FC Deed Map 1961 with legend enlarged. The green area: '*Possession on Completion (scattered timber reserved)*'; yellow areas: '*Plantations purchased*'.

The FC view in those days of many broadleaved woodlands was that they were 'worthless scrub' that could easily be converted to productive forest. FC had been measuring many species of trees since their inception in 1919 and knew conclusively for instance that oak would grow at a rate of some four to six cubic metres per hectare per annum but that Douglas fir on the same site could achieve 18 to 24 cubic metres per ha per annum[7]. With the single objective of timber production, it was obvious that a species that could grow four times faster, had to replace the 'poorer crop', see the graph below. Such low-grade broadleaves were felled and the stumps were treated with the chemical herbicide 2,4,5-T to eliminate regrowth.



11. This combined graph compares the yield class (YC) in m^3/ha/year of Douglas Fir (DF) and Oak (OK). DF generally reaches its age of Mean Maximum Annual Increment (MMAI) at about 60 years of age and OK at c. year 80.

The FC set to in 1963 and cleared 50 acres (c.20 ha) of Norway spruce, European Larch, Douglas Fir, Small-Leaved Lime, Silver Birch and a little Scots Pine, the yellow areas in map 10 above.

The last of the oak standards were felled, effectively converting the FC part of the wood from Peterken Stand Types 5A, pedunculate oak or 5B sessile oak over small-leaved lime coppice[8] to mostly pure lime coppice over large areas.

Between 1964 and 1983 the exotic species of Douglas Fir, *Pseudotsuga menziesii* and minor amounts of Japanese larch, *Larix kaempfarii*, western red cedar, *Thuja plicata* and the American poplar, western balsam, *Populus trichocarpa* were replanted across some 39 ha of the woodland (see the Chapter, *The Trees of Shrawley Wood* pp. 273-293).

About 1965 two areas of lime coppice were 'stored'. The stems on each stool were reduced to a single best stem, effectively creating High Forest. Another area was partly coppiced, partly stored, producing lime standards over lime coppice. Not only did these operations create a wider potential saleability of lime products, it also diversified the habitat from nearly pure lime coppice. Meanwhile nothing much was going on in the private southern third of the wood, which now contrasts greatly.

It was not until 1980 that Oliver Rackham introduced the concept that some woodlands were actually ancient, having always been wooded and were possibly a link to our primeval 'wildwood'[9], see the Chapter *Shrawley The Word* p. 118.

Only 2.3% of England has an Ancient and Semi-Natural Woodland (ASNW) status, semi-natural because man has interfered with all woods at some time. Shrawley Wood is one of these few, made even rarer at the national level, being dominated by the scarce small-leaved lime. Most surprisingly, this wood typifies a wood of 6,000 years ago, when such Lime was co-dominant with oak. We know now that Shrawley Wood is the largest Limewood in the UK.

It is clear from the surviving FC files[10] (all Forest Office files in the FC Mortimer Office were burnt by an arsonist) that this rare status gradually changed the management policy during the 1970s. Establishment of the new conifer crops had not been as easy as predicted. The birch, which at Shrawley, had traditionally been grown with the lime coppice, had been retained to afford dapple-shade, to protect the young replanted trees from hot summer suns. This was effective but lack of labour allowed progeny from the Birch to seed in from these parent trees, to thrive and then over-top the plantation crops and check its growth. Other areas were badly invaded by Bracken, which closed canopy over the young trees. The herbicide treatment of the lime stools was not fully effective. Many limes fought back and competed successfully with the conifers.

By 1979 the pendulum of policy change had swung away from the single policy of producing a fast-growing timber crop in this species-rich ancient woodland. Nature conservation values were also embraced thereafter, thanks to the efforts in the background of George Peterken and others. The Douglas fir and small-leaved lime were assessed in detail throughout the FC part of the wood. This resulted in 18,000 Douglas fir being removed to save 4,000 'viable' small-leaved lime stools. Additionally, coppicing of the lime was reintroduced. This has continued to the present, albeit sporadically due to the difficulty of finding markets for the lime wood[10].

The Survivor

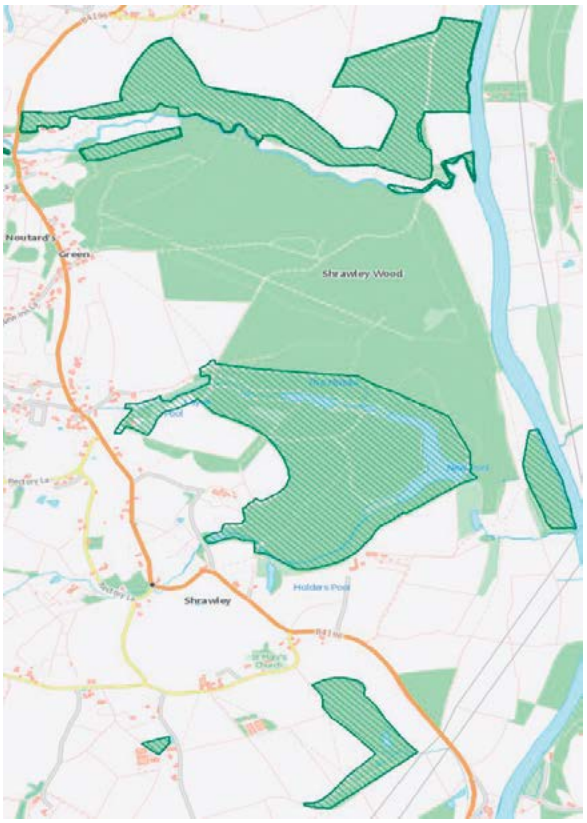
Shrawley Wood lies on agriculturally desirable soils and being beside the River Severn was easy to access in former times. Why then was it not all grubbed out for farming long ago, like so many woods, such as its northern neighbour Astley Wood? Good fortune comes into it but the answer is probably in parts. Initially, it must have been because it was needed. For hundreds of years, it was a valuable asset to its owner and meant 'life' to the local community from providing employment and as we have seen, producing many varied commodities. This continued following acquisition by the Vernon family in 1700 but it is evident that it was also much loved by them.

This takes us to 1961, a critical period for woodland loss when many of our ancient woods were grubbed to agriculture under a drive by the Ministry of Agriculture, Fisheries and Food (MAFF) to increase the productive capabilities of farms. So ignorant were MAFF of ancient woodland, which had never had any other land use, that this conversion was termed 'reversion to agriculture'! If MAFF officers identified such a potential increase, FC officers had to comply and allow such woodland to be cleared, even though there was a 'presumption against change of land use' under the Forestry Act. Of course, this was before rich sylvan habitats and ancient woodland

were appreciated officially[9]. The early recognition in 1955 by the Nature Conservancy of the wood's unique character and thus the placing of the SSSI status provided extra legal protection under the Countryside and Rights of way Act 1949, probably saved this wood. Perhaps not such a close shave, then. Should you wish to see how Shrawley Wood might look now if this 'reversion' had taken place, look no further than the 'arable desert' north of Dick Brook where the similarly extensive Astley Wood once stood (although the bulk of this was cleared to farmland and orchards after 1840 and before 1888).

Further good fortune is that the wood lies west of the River Severn. Natural regeneration of both plants and trees in most English woods has been seriously reduced or eliminated in the last 40 years by the swift, almost unchecked rise in deer populations. Browsing damage can vary from slight to complete. Luckily few wild deer are west of the Severn. Shrawley Wood exhibits little browsing or fraying damage. A watching brief on sufficient bramble presence and a lack of browse line, when looking through the wood, are excellent indicators of the level of an acceptable, sustainable deer population. But roe and Muntjac have increased in the last decade or so and must continue to be managed to allow natural regeneration to succeed[11].

The remaining private part of Shrawley Wood, the Wood House Estate has been managed in a gentler way since 1961. Ruth Annie Vernon married Frederick Horton in 1946 and the estate passed to him on her death in 1980, then on his death to Mrs Jacqueline Jeavons-Fellows in 1990 (see the Chapter, *Ownership Timeline* p.40). The Estate had a Forestry Commission Woodland Grant Scheme subsequently, carrying out amongst other things a felling and restocking and lime coppicing, especially for woodland birds.



12. The WGS in the private area of Shrawley Wood. Note other WGSs covered Astley Wood in the North and Shotgrove in the South.

Fortunate Future

By a remarkable happenstance Shrawley Wood has almost become an unsolicited mono-silviculture of small-leaved lime, across most of the woodland. But this has not created a barren woodland because lime is not a heavy shade-casting species. 'Biodiversity' has become the conservation 'buzzword' of the current era. Studies in this publication show just how diverse the wood is today. Botanically, there are 86 trees and woody shrub species present, 41 are native, of which five are Ancient Woodland Indicator Plants (AWVPs) and 35 are exotic, see pp. 337-339, before the ground flora and other organisms are considered. Astoundingly, the total number of herbaceous plants is 502. Significantly the first species recorded were 'lyne' (lime) and oak in 1538. The earliest recorded exotic species is larch (almost certainly European larch) in 1801.

Nationally, the FC is now committed to restoring Plantations on Ancient Woodland Sites (PAWS) thanks to work begun in the New Forest some years ago by Jonathan Spencer, former Planning and Environment Manager with Forestry England. At Shrawley the exotic conifers are now 37 to 56 years old and early removal is recommended for the sake of this unique woodland's ancient status and to enhance its biodiversity by ensuring restoration of its original stand types. The older conifer are ripe for felling anyway, having reached their Age of Maximum Mean Annual Increment (MMAI). Once all planted exotic trees have been harvested, natural regeneration of species native to the site should be the preferred option but supplementary planting of oak will no doubt be required. To achieve successful restocking, bracken and birch, the bane of FC's early years here will have to be managed, since, no doubt they will 'intrude' again. The long-term near-success in controlling Himalayan balsam still requires continual monitoring[13]. Sycamore and to a lesser extent False Acacia are invading the wood. Their retention or removal and control must be considered carefully in this unique woodland.

Gradual replacement of the 'lost' oak overstorey would be logical and has been agreed by local Forestry England and Natural England staff and has been met with enthusiasm by Mrs Jeavons-Fellows. This will re-create the original Peterken stand types of 5A (Pedunculate Oak) and 5B (Sessile Oak), as mentioned above. This will not happen naturally; no seed trees remain in the FC part (except some exceptional runts!). Experiments in Hampshire in the 1990s showed that replanting single trees at wide spacing (15m) to become new standards amongst old coppice stools delivered poor results. Loss of that single tree meant the site had to be revisited and the tree replaced. Planting five trees in a 'quincunx' avoided this 'beating-up' and the group collectively grew higher, producing better stems. These groups will self-thin or thinning can be aided from 20 years of age onwards. There are far more oak standards surviving in the private part of the wood but the owner is keen to establish a small tree nursery, an admirable desire, to raise stock from seed gathered in the wood, so maintaining genetic integrity. Oak can certainly be embraced in this endeavour. By agreement, site-native oak transplants can be distributed throughout the whole the woodland, most appropriate for this Site of Special Scientific Interest.

Continuation of thinning in the lime High Forest areas and of lime coppicing in the pure coppice and Coppice with Standards area would be most beneficial for habitat diversity on a 20 to 25-year cycle if markets can continue to be found. This longer rotation will promote more years of flowering (for insects) and seed production per cycle and would, at least, produce small diameter roundwood suitable for a bulk woodfuel (biomass) market, should no new niche markets emerge, such as eco-friendly rope-making! Increasing annual coppice 'bind' size to about two hectares or more will be better for wildlife, creating a mosaic of exceptional habitat.

It is important that older lime Standards are both recruited and retained throughout the wood to play the role of future seed trees. Sunlit recruited saplings will start flowering from 12 years old but in shade this will be delayed to 30 years old[3]

The rate of regrowth of small-leaved lime from established coppice stools is greater for instance than hornbeam or sessile oak, whether there is a shading overstorey or not[12].

Recruitment and retention of widely spaced birch at say 15m centres on the same 20 to 25-year cycle would mimic the known historical stand type in Shrawley Wood and increase a bulk market but will

require weeding to ensure it does not shade-out the emerging oak quincunxes.

FC Skilled Forest Workers, now termed Forest Craftsmen were once plentiful. In the 1950s most FC Forests had 100 men each, a legacy of Second World War combatants taking on a new career. But direct labour is now reduced to half a dozen staff covering a whole Forest District, carrying out only essential work. Most activities are driven by a commercial remit. So, in Shrawley Wood, environmentally desirable habitat enhancement, such as removal of self-set birch saplings from around planted oak, as above, control of Himalayan Balsam (now nearly achieved in the FC part after great effort[13]) or layering the lime 'sunshoots' to increase stool density is unlikely to ever be intensive. Local volunteers, with guidance, can be fostered to carry out such work. Currently lime stool average spacing is more than five metres (see the Chapter, *Small-leaved lime regrowth and regeneration in Shrawley Wood* p. 296). To produce straighter stems and improve yield for future potential markets, this average spacing can be brought to 3m by layering, without harming biodiversity. As a woodland stand-type, in-cycle coppice has the greatest holding capacity for wildlife in this country[14].

In eight of the last twelve years, there have been 'mast' crops when thousands of viable Small-leaved Lime, *Tilia cordata,* seedlings have germinated in the woodland floor (see chapter Regrowth & Regeneration. (17) p. 299).

Then they disappear as mysteriously as they came, leaving only a handful to become saplings in the last 20 years or so, across the whole 141ha. Why? Was it due to heavy shade or predation by slugs, (Shrawley Wood is home to a rare slug!) snails or herbivores? We determined to investigate this with mouse guards and in quantity, with mouse netting 'exclosures'. Unfortunately, this did not materialise in either 2014 or 2015, so this author moved the project to Bere Copse, Hants., which is a small, 1.5ha Limewood, fenced against rabbits and deer and where Roger Clooney had already found 22 seedlings under dense, overstood Small-leaved Lime and Wild service coppice.

A coppice coupe had been cut in 2014 and by 2016 there were 192 seedlings evident, mostly on the edge of this coupe. One third were protected with vole guards, one third with a copper tape attached to the vole guard, reputed to ward off slugs and snails and one third left unprotected as a control element. It is now reported (2022) that there is no appreciable difference between the three groups. Some 12 seedlings have disappeared but there are now over 300 seedlings and saplings, the tallest over a metre high. It is concluded that the exclusion of rabbits, hares and deer have had the most profoundly positive effect.

In suitably semi-open locations such as recently cut coppice coupes or ride edges, similar seeding scenarios can be embraced in Shrawley Wood and protected from mice, voles, rabbits, hares and deer by 6mm mesh guards at say 2m centres and recruited as new coppice stools, standards or to mixed-age High Forest (Continuous Cover). The use of open mesh guards is emphasized, not closed shelters which seem to have a deleterious effect upon natural regeneration. Such sexual regeneration will diversify the genotype, which does not take place with coppice regrowth, a concern of Donald Pigott.

Perhaps this reflects the wider issue of climate change. Lime may no longer retreat down its 6,000-year declevity (but see Suzi Richer's ground-breaking thoughts in this monograph! *Pollen from Shrawley Wood*). If summers continue to getter warmer, lime will produce increasing quantities of successful seedlings[3]. However, Donald Pigott has demonstrated that young Lime seedlings do not prosper when in competition with ground floral species[3]. 'TLC' from several selfless assistants surely beckons!

With continuing two or three zone ride management[15], adjacent coppice coupes up to 10m deep, perhaps in alternating scallops, managed on a shorter eight to ten-year cycle, would further enhance biodiversity. This would be all well and good if markets can be found for small diameter small-leaved lime poles and rods but may still be justified for enhanced habitat, even if these zones were flailed or cut to form habitat piles off-ride.

There is increasing natural regeneration of yew in the northern section, as identified in the Chapter, *The Trees of Shrawley Wood* p.279. It is very shade tolerant and may impact on the habitat. Although it is native to the wood, it should be monitored.

The recent underplanting of hornbeam by FC is odd. It is not native to the wood and will not thrive on these sandy soils, much preferring heavy clay sites. Its loss in the summer of 2020 is not a bad thing.

The reduced level of management in the private section of Shrawley Wood is allowing holly to invade the slopes north of the pools both by seeding and suckering. This is becoming locally dominant and impenetrable, shading out all ground flora. Early action is strongly recommended.

There is much Himalayan Balsam in the private part, particularly where felling took place recently and down in Middle Brook Bottom. Emulation soon of the long-term and successful efforts of mainly volunteers in the northern part would be admirable.

This is a sufficiently large woodland to allow promotion of different stand types in different areas: 1) lime High Forest (in the stored lime compartment) 2) lime Standards over lime coppice, 3) lime pure coppice, 4) sessile oak over lime, 5) pedunculate oak over lime, 6) oak High Forest, 7) oak coppice (which was fostered up to c. 1800) and 8) wooded parkland (near Wood House, mimicking the former wood-pasture). Within these stand types different cutting regimes will further diversify the habitat.

With agreement of the two owners, an over-arching Woodland Management Plan will ensure long-term objectives can be met to the benefit of the whole woodland. This should look 50 years ahead and prioritise sustainable and appropriate operations to restore and conserve the renowned character of this fortunate, rare, rich and remarkable woodland.



13. An overstood but vigorous small-leaved lime stool, *Tilia cordata* beside Dick Brook.

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13.H. Milner 2017.

The Summer House

Francesca Llewellyn



01. Sir Bowater George Vernon's tomb February 2018. The tomb is surrounded by a dozen grand oaks which have been left in peace while so many others were felled.

Before Sir Bowater George Vernon killed himself in 1940, he had left instructions that he was not to be buried in consecrated ground, by a "snivelling parson", but in Shrawley Wood near the summer house.[1]

One local newspaper described the burial place as a *"beautiful spot where Sir George had spent many happy hours as boy and man. A summer house formerly stood amid the trees, and during his youth, Sir George, with many friends, would live there during the holiday times for weeks on end. Later the glade remained a favourite spot for picnics."*[2] Another local paper reported that *"The coffin was lowered into a grave at a spot where roughly the door to the summerhouse, now in ruins, once stood."* [3]



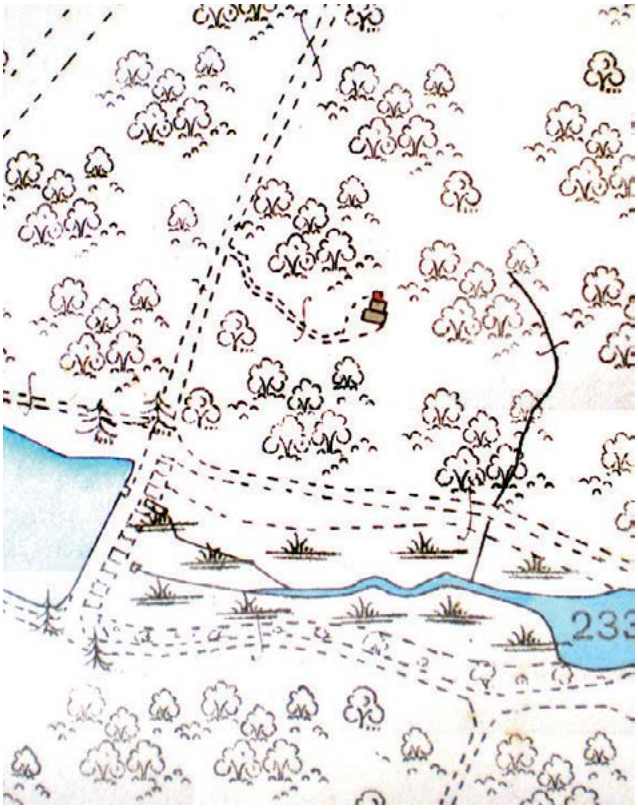
02. The memorial plaque.

All that is left of the summer house now are some overgrown foundations and the brick chimney located above Sir George's tomb in a glade surrounded by trees on a steep slope overlooking the Middle pool, but it is mapped on the 1884 Ordnance Survey[4].

Sir George was born in 1865, so if he had used the summer house as a child, it could have been built in the late 1860s or early 1870s. A detailed search through the Vernon archives located at The Hive, Worcester, has found very few references to the summer house. Unfortunately, no accounts relating to Shrawley Wood have been found for this period. There is nothing mentioned in the Shrawley Wood Books which stop in 1850[5] and the next detailed accounts start in 1875, continue through the 1880s and 1890s and finished in 1897.[6]

There are two references to the summer house in the 1870s - 13 December 1875 when "*One horse hauling fire wood to Summer House & buck wheat to sheds for ½ day cost 3/-*"[7] indicating that the summer house was being used during that winter. On 20 March 1878 1/- was spent on repairing the lock on the summer house.[8]

The four later references are from 1896 and 1897, but only show that work was being undertaken in the woods around the summer house, not at the summer house itself. Edward Powick spent one and half days in April 1896 working on the bridge near the summer house and in March and April 1897[9] G. Blunt spent two days planting trees near the house, one day cleaning the paths and 2 days putting up wire at the summer house. Perhaps it was being fenced off.[10]



03. OS map surveyed 1883 showing the Summer House and the path leading to it.



04. The Summer House Chimney February 2018

SOURCES

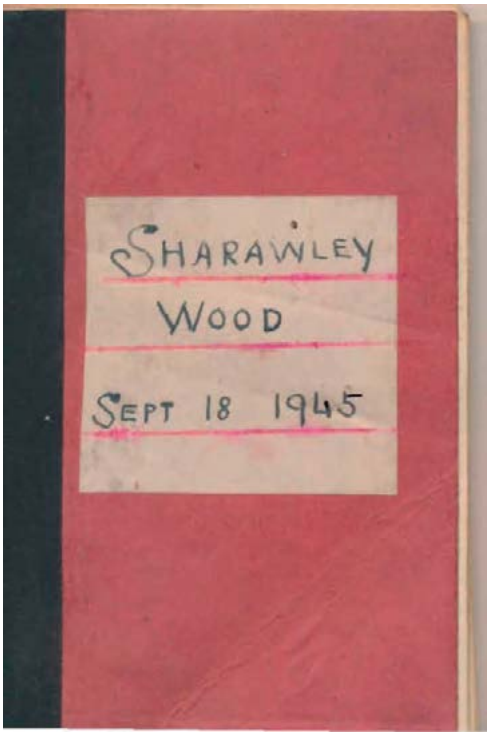
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7. Ibid 705:7 BA 7335/25 No 1253
8. Ibid 705:7 BA 7335/25 No 480
9. Ibid 705:7 BA 7335/114ii No 66
10. Ibid 705:7 BA 7335/114vii Nos 150 – 152

Analysis of a tree felling notebook dated 18 Sept 1945

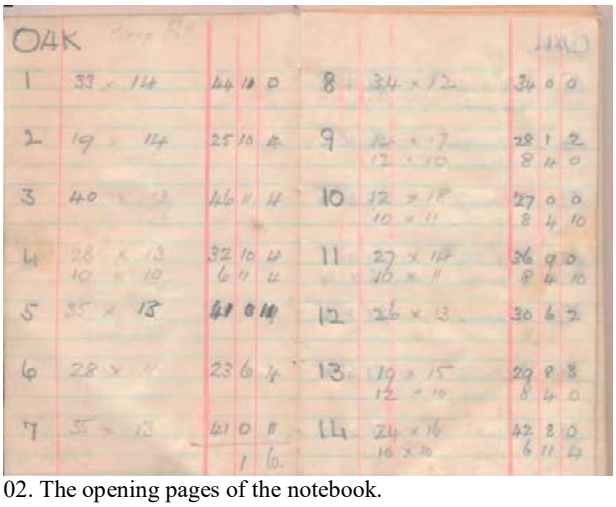
Hugh Milner

Most woodland owners in Britain supported the war effort during the Second World War. Extensive areas of clear-felling took place, the oak stumps are still there as clear evidence and Shrawley Wood is no exception. But the financial situation for the country, and many of these owners became precarious. This promoted further tree fellings after the war ended in 1945, to release the value held in the standing crops. To maintain a strategic reserve of timber, the government introduced Felling Licences.

We are most fortunate to have had kept on site in Wood House from those days, a notebook of trees felled and the resulting timber log measurements from 1945. This notebook was kindly loaned by Mrs Jeavons-Fellowes of Wood House, Shrawley. Also available were two Felling Licences from 1946 and 1947. These can be found after the following analysis.



01. The notebook



02. The opening pages of the notebook.

03. (opposite) One of the large oaks to be felled in April 1948 for repairs to the internal oak panelling in the House of Commons, London. This damage was caused by Nazi incendiary bombing during the Second World War.



Stewart Bale

A FOREST GIANT ON MRS. VERNON HORTON'S STOURPORT ESTATE



ENGLISH OAK FOR THE NEW HOUSE OF COMMONS: FELLING A TREE AT SHRAWLEY WOOD HALL, WORCS.

English oak to be used in the new House of Commons is now being felled on estates in Shropshire, Herefordshire, Worcestershire and Staffordshire by Messrs. John Ashworth and Company (Timber), Ltd., of Manchester. By using scientific methods to season the timber, the firm will be able to deliver it to the woodworkers in a matter of weeks.

04. The felling with a two-man cross-cut saw of an oak standard for repairs to the House of Commons, London.

	[h ft: see footnote [3]]	
Oak		
Trees with single logs[4]	390 (36.5%)	
Trees with two logs[6]	330 (61.8%)	
Trees with three logs	6 (1.7%)	
Trees total number	726	
Trees total volume	28,680.7 h ft	1034.06 m^3
Average Tree Size	39.5 h ft	1.42 m^3
Tree Size Range[5, 6] Smallest Tree No 330	16.7 h ft	0.60 m^3
Largest Tree No 226[15]	102.9 h ft	3.71 m^3
Average Timber Height[5]	35' 6"	10.82 m
Logs with a recorded volume	213[9]	
Logs with no recorded volume (of which four are marked 'A'[11])	855[10]	
Logs total number	1068	
Average number of logs per tree	1.47	
Average Log Size	26.9 h ft	0.97 m^3
Average Log Length	24' 1½"	7.35 m
Longest Logs No 185 & 531	50'	15.24 m
Shortest Log No 419	5'	1.52 m
Fattest Log No 229	25" qg[3]	80.85 cm diameter
Thinnest Log No 9	7" qg	22.64 cm diameter
'A' logs[11] Nos 182, 259, 637 & 657	246.3 h ft	8.88 m^3
Range 45 h ft (1.62m3) to 77.3 h ft (2.78m3) average 61.6 h ft (2.22m3)		
Ash		
Trees 16	382.1 h ft	13.78 m^3
Average Tree Size[14]	23.9 h ft	0.86 m^3
Tree Size Range[5, 6] Smallest Tree No 2	16.8 h ft	0.61 m^3
Largest Tree No 9	38.0 h ft	1.37 m^3
Average Timber Height	33.8 ft	10.31 m
Logs 17[12]		
Average Log Size	22.5 ft	0.81 m^3
Average Log Length	31.8 ft	9.70 m
Chestnut (Sweet)		
Trees 5[13]	373.6 h ft	13.47 m^3
Average Tree Size	74.7 h ft	2.69 m^3
Tree Size Range[5, 6] Smallest Tree No 3	46.4 h ft	1.67 m^3
Largest Tree No 5[15]	99.3 h ft	3.58 m^3
Average Timber Height	39.4 ft	12.01 m
Logs 9		
Average Log Size	41.5 h ft	1.50 m3
Average Log Length	21.9 ft	6.67 m
Total Species		
Trees 747	29,428.1 h ft	1061.00 m^3
Average Tree Size[14]	39.4 h ft	1.42 m^3
Average Timber Height	37.4 ft	11.41 m
Logs 1094		
Average Log Size[15]	26.9 h ft	0.97 m^3
Average Log Length	25.9 ft	7.91 m

Table footnotes:

1. In the table, trees numbered 1 to 98 came from 'Milking Fall' (see chapter Coppices and Binds p. 202). The 171 trees from 99 to 269 came from 'Forge Patch Rochpole Side'. Those 457 trees from 270 to 726 do not have their location shown. They follow the short lists for Ash and (Sweet) Chestnut.

2. At over 1,000 m^3 and with a large average tree size of 1.42 m^3, this constitutes a substantial felling by any standards. The Second World War ended in Europe on 8th May this year but planning for this felling could have started in 1944, so this great volume of timber may have been intended to support the war effort. If these 747 trees had been standards at the traditional spacing of 16m apart or 15 per acre (37/ha) they would have covered 49.8 acres (20.1 ha). Perhaps this unsustainable amount was agreed by the Forestry Commission with their required Felling Licence only because of the war but with hindsight, it should be viewed as another nail in the coffin of the oak overstorey for which this woodland has been renowned, see the Oak Loss record.

3. Hoppus tables were used in Great Britain and the British Colonies from the early eighteenth century for measuring the volume of round timber by taking its length in feet by its mid quarter girth (qg) in inches, ostensibly until 1971 when the timber trade and the Forestry Commission metricated at the same time the country decimalised its currency. However, in practice, many timber merchants and sawmillers still 'think' in Hoppus feet and convert figures to the equivalent metric volume!

4. Hardwood Logs for milling are normally derived from the stem-wood up to 'break of crown' to ensure knot-free timber but some of the second and third logs may have been won from the crown in apically dominant trees. Total height to the canopy top may have been a further 25 feet (6.7m) more or less.

5. Only the timber logs, i.e. the stem-wood has been measured and recorded. The height to which these extended is traditionally called Timber Height, beyond which there was no merchantable timber. The average Timber Height of 11.41m confirms that these were 'Capital' trees, just as their predecessors had been described when advertised for sale in the 19th century, as seen in the photograph of the oak being felled in the wood in April 1948 for the repairs to the House of Commons, (03), (04).

The considerable Lop & Top volume in a Standard broadleaved tree's crown has not been assessed. If these trees were sold standing, the convention is this volume was included in the agreed price for the sale. However, if these felled sawlogs were sold 'in-wood' or at ride or track-side, the Lop & Top would be sold separately. Traditionally this was converted into mining timber chocks and cordwood etc.

6. Many smaller and possibly distorted second logs, perhaps unsuitable for milling, have been measured, recorded and related to many first logs, thus giving also a log-to-tree record but they were not assessed for volume. Perhaps initially they remained unsold. This table establishes and includes that volume. The two-log trees may have been from tall trees where the first log is the 'butt-length' and the second log is from above it, either before or after break of crown or a second stem from overstood coppice or trees that forked above Breast Height, 4'3", 1.3m above ground.

7. Should the extensive felling have taken place from June when the sap was up, the logs (and the remainder of the trees) may have been debarked for the bark to be used for tanning leather. If so then the mid girth measurements are 'underbark', if not then they are more likely to be 'overbark', though an undeclared allowance for bark may have been deducted. A mature oak has bark varying from 12% to 16% of overbark volume but this was a valuable commodity when supplied to tanners. The earlier Wood Books reveal such bark could be more valuable than the timber.

8. Perhaps most of these trees came from that part of the wood out of sight of Wood House, shown as 'devastated Woodland on the 1954 Ordnance Survey map (05), most of which was sold to the Forestry Commission in 1961.

9. These 213 logs with a recorded volume were in a group from 10' to 40' long (3.048m – 12.192m) and mostly 12" quarter girth (38.8cm diameter). They appear to have been selected for a special reason, were they straighter and knot-free and thus most suitable for

a particular end-product? Were they cut to preferred sizes? The girth measurements seem to have been biased.

10. These 855 logs were in two distinct groups, 10’ to 15’ long (3.05m – 4.57m) and 10” to 11” quarter girth (32.3cm – 35.6cm diameter) or a wider range 18’ to 45’ long (5.49m – 13.72m) and 10” to 19” quarter girth (32.3cm – 61.5cm). Were they of poorer quality or of a size less saleable than those in note 9 above?

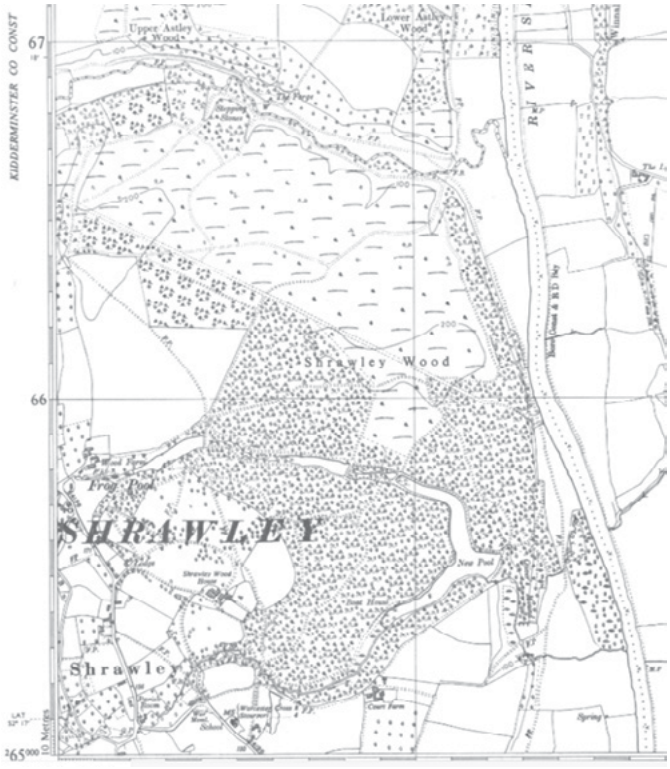
11. These four logs marked ’A’ in the notebook appear to have been selected for an extra special reason. They were all over 20’ long (6.1m) and over 18” quarter girth (58.2cm diameter). These were large logs but not the largest in this parcel. Was the ‘extra special’ nature because they were of veneer quality, the most valuable timber, worth over £1000 each on today’s market?

12. Only one ash log out of 17 had a recorded volume. This was the largest.

13. Only one sweet chestnut log out of 9 had a recorded volume. This was the smallest log by volume but was 12” qg so may have been included in the group mentioned in note 9 above.

14. The ash trees were much smaller (and younger?) than both the oak and sweet chestnut. The generally acidic soils lying beneath this woodland are less conducive to good growth and health of such a calcicole plant. The two areas of ‘Ash Beds’ are exceptions.

15. These two trees were considerably larger and thus most probably older than nearly all other trees in this parcel. They were certainly ‘notable’ and may have been ‘veterans’.



05. The OS map of 1954 depicting the felled, ‘Devastated Woodland’ in most of the northern part of Shrawley Wood. National Library of Scotland.

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Licences to fell [next page] 4 November 1946, 18 April 1947. These came after the licence relevant to the 1945 felling notebook: they are a later example of controls brought in to regulate the huge amount of felling during WWll. The license for April 1947 was to clear the windfalls following the dreadful gales of the night of 16th March; there may have been other damage from the heavy snow lodged on branches in the weeks before the gales.

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MINISTRY OF SUPPLY

AREA _____

APPLICATION FOR LICENCE TO SELL FOR FELLING AND/OR TO FELL GROWING TREES

(To be made in quadruplicate).

I, the Owner, hereby apply for a licence to sell for felling and/or fell, and I, the Purchaser, hereby apply for a licence to fell Growing Trees as set out in the Schedule hereunder.

Name and Address of ~~Owner~~ Purchaser. (Block capitals) John Ashworth & Co.(Timber)Ltd., Trafford Park, Manchester, 17.

Signature R.S. Ashworth Date 28th October, 1946.

Name and Address of ~~Purchaser~~ Owner. (Block Capitals) Miss Ruth Vernon, Shrawley Wood House, Shrawley, Worcester.

Signature Ruth Vernon. Date 28th October, 1946.

THE SCHEDULE.

I. SITUATION OF TREES.

Note.—Where Hedgerow Trees only are concerned, an adequate description of their location should be given. In all other cases (whether a clear fall or selection felling) a plan or tracing of the area concerned must be submitted.

1. County Worcestershire.
2. Parish Shrawley.
3. Estate Shrawley.
4. Name of Wood(s) Shot Grove & Shrawley Park.
5. Distance from (a) Nearest Station 4 miles. (b) Applicant's Mill 40 miles.

II. EXTENT OF OPERATIONS.

1. Area to be felled 11.534 Acres. and seven Park trees.
2. Whether felling to be clear or selected? Selected.
3. Proposed date of commencement of felling 30.11.46.
4. Estimated time to complete felling 5 weeks.
5. Utilisation (a) Resale as logs Nil %; (b) Conversion by Applicant's Mill 100 %

III DESCRIPTION OF STANDS OR TREES.

Notes :—(1) Where hedgerow trees only, strike out the words "STANDS OR" above.
(2) Particulars of each distinct stand should be entered separately.
(3) Give particulars of softwoods and hardwoods separately and state the chief species in each (i.e., any species which contributes 25% or more to the estimated cubic content of its group—see Column 2).
(4) If any of the trees are suitable for Telegraph Poles or other purposes than conversion to Sawn Timber or Round Mining Timber state the purpose and estimated quantity in Column 8.

	Chief Species. Name and percentage if 25 per cent. or more	Approx. Age in Years	Estimated No. of Trees	Estimated cubic content (Hoppus Measure T.U.B.)	Estimated Quantities (Hoppus Measure T.U.B.) suitable for		
					Saw Timber	Round Mining Timber	Other Purposes
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Softwoods	Larch 84%.	40	4	130	All	-	-
Hardwoods	Oak 70%.	50 & longer.	84	3333	All	-	-

FOR OFFICE USE ONLY.

Remarks :
Area Officer :

(8810) WT 14771/0000 20m 9/46 C & Co. 7466(4)

LICENCE TO SELL FOR FELLING AND/OR TO FELL GROWING TREES

Miss R. Vernon. of Shrawley, Worcester. ~~Messrs J. Ashworth & Co.~~ of Trafford Park. 9/46 17 is/are hereby licensed to sell for felling to the growing trees described in the Schedule, subject to conditions 1, 2, 3, 4, 5, 6 (a) and 7 (below).

4. (Area Officer). BOARD OF TRADE, TIMBER CONTROL, Area No. 9 [illegible] EXCHANGE BUILDINGS, LIVER... 2

For the ~~Minister~~ Board of Trade of Supply,

Timber Control Department.

Date 28.11.46

_____ of _____ is/are hereby licensed to fell the trees described in the Schedule, subject to conditions 1, 2, 3, 4, 5, 6 (b) and 8 (below).

...fficer).

For the Minister of Supply,

Timber Control Department.

Date _____

CONDITIONS:—

1. This licence shall (be valid for Three months from the date hereof).
   (expire on the 4th day of February) 1947
2. The licensee(s) shall not assign or otherwise seek to transfer it or any of his/their rights or obligations thereunder.
3. If the licensee(s) shall at any time neglect or fail to perform or observe or comply with any of these conditions this licence shall forthwith determine and cease to have effect.
4. Without prejudice to any other powers of the Minister of Supply this licence may be revoked at any time by notice in writing to be given to the licensee(s) by the Area Officer Timber Control Department.
5. The Conditions of this licence or any of them may at any time and from time to time be varied in any particular by the Area Officer Timber Control Department, by notice in writing to the licensee(s) and thereupon this licence shall take effect subject to such variation.
6. This licence must be returned to the Area Officer immediately upon its expiry, revocation, determination or :
   (a) in the case of a licence to sell for felling, the earlier completion of the sale for felling of all the said growing trees.
   (b) in the case of a licence to fell, the earlier completion of the felling of all the said growing trees.
7. In the case of a licence to sell for felling, the prices at which the said growing trees shall be sold for felling shall not exceed the maximum prices for the time being prescribed or provided by the Growing Trees Orders in force at the time of the sale.
8. In the case of a licence to fell, the licensee(s) shall cause the trees to be felled expeditiously and in a workmanlike manner.

Note :—The timber comprised in this licence may not be disposed of except to a person holding a licence granted by the Minister of Supply and may not be treated used or consumed except under the authority of Article 14 of the Control of Timber (No. 32) (General Provisions) Order, 1944, or by authority of and in accordance with a licence granted by the Minister of Supply.

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BOARD OF TRADE

AREA 10

APPLICATION FOR LICENCE TO SELL FOR FELLING AND/OR TO FELL GROWING TREES

(To be made in quadruplicate).

I, the Owner, hereby apply for a licence to sell for felling and/or fell, and I, the Purchaser, hereby apply for a licence to fell Growing Trees as set out in the Schedule hereunder.

Name and Address of Owner (Block capitals): Mrs. Ruth Vernon Horton, Shrawley Wood House, NEAR WORCESTER.

Signature: Ruth Vernon Horton Date:

Name and Address of Purchaser (Block Capitals): John Ashworth & Co. (Timber) Limited, Trafford Park, Manchester. 17.

Signature: R.S Ashworth Date: 18th April, 1947.

THE SCHEDULE.

I. SITUATION OF TREES.

Note.—Where Hedgerow Trees only are concerned, an adequate description of their location should be given. In all other cases (whether a clear fall or selection felling) a plan or tracing of the area concerned must be submitted.

1. County: Worcestershire
2. Parish: Shrawley
3. Estate: Shrawley
4. Name of Wood(s): Shrawley
5. Distance from (a) Nearest Station: 6 Miles; (b) Applicant's Mill: 40 Miles

II. EXTENT OF OPERATIONS.

1. Area to be felled: Windfalls Acres
2. Whether felling to be clear or selected?: -
3. Proposed date of commencement of felling: 30/4/47
4. Estimated time to complete felling: 2 Weeks
5. Utilisation (a) Resale as logs: - %; (b) Conversion by Applicant's Mill: 100 %

III DESCRIPTION OF STANDS OR TREES.

Notes :—(1) Where hedgerow trees only, strike out the words "STANDS OR" above.
(2) Particulars of each distinct stand should be entered separately.
(3) Give particulars of softwoods and hardwoods separately and state the chief species in each (i.e., any species which contributes 25% or more to the estimated cubic content of its group—see Column 2).
(4) If any of the trees are suitable for Telegraph Poles or other purposes than conversion to Sawn Timber or Round Mining Timber state the purpose and estimated quantity in Column 8.

	Chief Species. Name and percentage if 25 per cent. or more	Approx. Age in Years	Estimated No. of Trees	Estimated cubic content (Hoppus Measure T.U.B.)	Estimated Quantities (Hoppus Measure T.U.B.) suitable for		
					Saw Timber	Round Mining Timber	Other Purposes
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Softwoods	Spruce 100%	50	63	1450	All	-	-
Hardwoods	Oak 58%	75	99	2100	All	-	-

FOR OFFICE USE ONLY.

Remarks :
Area Officer :

LICENCE TO SELL FOR FELLING AND/OR TO FELL GROWING TREES

Mrs Ruth Vernon Horton of Shrawley Wood House, is/are hereby licensed to sell for felling to John Ashworth & Co (Timber) Ltd., Trafford Park, the growing trees described in the Schedule, subject to conditions 1, 2, 3, 4, 5, 6 (a) and 7 (below).

For the Board of Trade,

(Area Officer). Timber Control.

Date 21 Apr 1947

of is/are hereby licensed to fell the growing trees described in the Schedule, subject to conditions 1, 2, 3, 4, 5, 6 (b) and 8 (below).

For the Board of Trade,

(Area Officer). Timber Control

Date

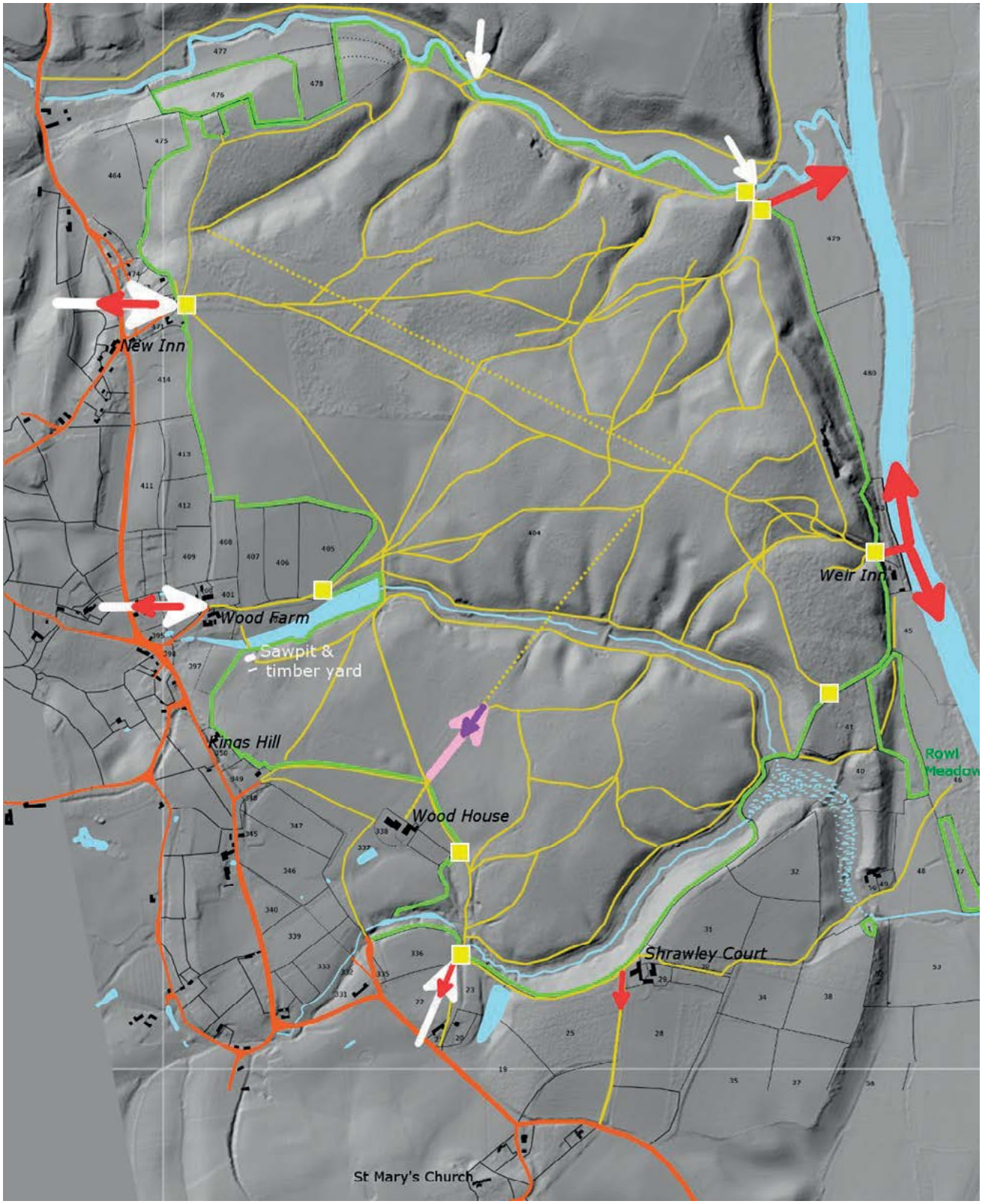
CONDITIONS:—

1. This licence shall (be valid for ... months from the date hereof).
   (expire on the 30th day of June, 1947)
2. The licensee(s) shall not assign or otherwise seek to transfer it or any of his/their rights or obligations thereunder.
3. If the licensee(s) shall at any time neglect or fail to perform or observe or comply with any of these conditions this licence shall forthwith determine and cease to have effect.
4. Without prejudice to any other powers of the Board of Trade this licence may be revoked at any time by notice in writing to be given to the licensee(s) by the Area Officer Timber Control.
5. The Conditions of this licence or any of them may at any time and from time to time be varied in any particular by the Area Officer Timber Control, by notice in writing to the licensee(s) and thereupon this licence shall take effect subject to such variation.
6. This licence must be returned to the Area Officer immediately upon its expiry, revocation, determination or :
   (a) in the case of a licence to sell for felling, the earlier completion of the sale for felling of all the said growing trees.
   (b) in the case of a licence to fell, the earlier completion of the felling of all the said growing trees.
7. In the case of a licence to sell for felling, the prices at which the said growing trees shall be sold for felling shall not exceed the maximum prices for the time being prescribed or provided by the Growing Trees Orders in force at the time of the sale.
8. In the case of a licence to fell, the licensee(s) shall cause the trees to be felled expeditiously and in a workmanlike manner.

Note :—The timber comprised in this licence may not be disposed of except to a person holding a licence granted by the Board of Trade and may not be treated used or consumed except under the authority of Article 14 of the Control of Timber (No. 32) (General Provisions) Order, 1944, or by authority of and in accordance with a licence granted by the Board of Trade.

Horse-drawn Shrawley Wood: Access, Extraction and Dispatch

Richard Pumphrey & Hugh Milner



01. The access points to Shrawley Wood shown on a hill-shading map based on 2018 LiDAR data.[1] The green line bordering the wood is the wood edge as shown on the tithe map of 1839. Joseph Dougharty's map surveyed 1732 had an identical border apart from the absence of Layes Pool and the groves in the northwest corner. Yellow squares denote gates in 1732.
Two main points of entry to the wood in use today are by a track from the main road (B4196) past Wood Farm and a track from Noutards Green, where all the Woodmen lived in the Census of 1841. A third exit route for wheeled vehicles was through a cutting in the southwest corner and up a holloway past the Holders Cottages to the main road; this was probably one of the routes used to move poles to the Lenchford in the third quarter of the 19th century. A lane along the southern edge of the wood may also have been used for wood drawn up the slope from the southern bank; this was certainly the case after the First World War when tractors with winches could pull timber up the steep slope.[2]
The purple arrows indicate the current private access to the private compartment.

Access

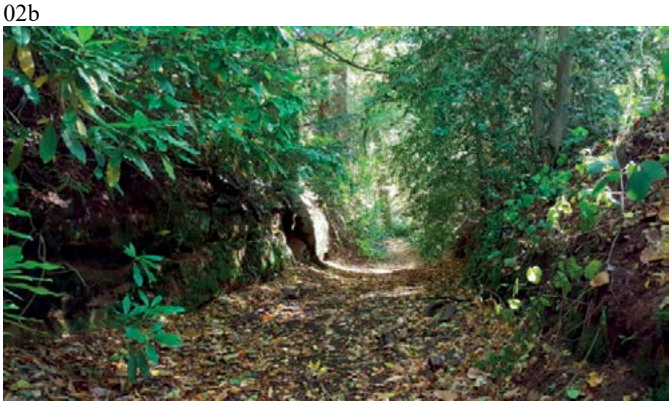
Throughout much of its history Shrawley Wood has been surrounded by a diligently maintained hedge, apart from along its northern border where Dick Brook was an effective barrier to livestock and maybe slightly less so for unauthorised entry. In medieval times the hedge was reinforced by an external ditch, resulting in the wood bank that runs round much of the wood (see chapter LiDAR p. 260). The hedge later became replaced in part by fences, first with oak posts and birch rails (see chapter 1764-1850 p. 196), later by iron railing round the Wood House Park and post and wire elsewhere. (See chapter 1875-1897 p. 212, 218). This barrier was pierced by a few gates (01) which needed repair by the estate carpenter and were kept locked with ironware from the estate blacksmith. Even before 1850 when the wood turned from productive forestry to a game reserve for the Vernon's shooting parties, men were employed by the estate for night watching against poachers. Harmless intrusions such as foraging for nuts were deplored by the estate as shown by (chapter 1764-1850 (20) p. 190).



02a



02b



02c

02. Old tracks through Shrawley Wood:
a, b Old holloways no longer used as paths.
c Cutting through the sandstone leading to the site of the Weir Inn and its landing stage. [Photos: Richard Pumphrey]

Extraction

Because Shrawley Wood has been a site of rural industry for centuries, there are many tracks carved into the ground by forestry operations such as extracting timber (02). An existing track often makes for easier transit so the tracks get deeper and deeper; they can be seen all over the wood on LiDAR images. Once abandoned, although they may soon become hidden by the ground flora, it takes many years for these tracks to disappear so completely that they are lost to the LiDAR image.

There seems a clear preference for tracks to be formed along the top of ridges or near the bottom of gullies; one could imagine that tree trunks or poles hauled by horses would be difficult to control if dragged across a slope and they would be likely to damage the bases of any trees they scraped against. Where they cross boggy areas, there are often parallel alternatives, perhaps reflecting diversion round quagmires produced by the traffic. The tracks all converge towards the seven key exit points from the wood, including Wood Farm, where there was a sawpit and timber store, and Noutards Green where all the woodmen lived at the time of the 1841 census. Access in the southeast corner is now via a track below the New Pool dam, but this area was most likely a marsh until after the New Pool dam was built in 1850.

Stamped on top of this pattern of tracks in the wood is a 1.13 kilometre long (0.7 miles) straight ride running from northwest to southeast. It crosses a straight sightline cleared from Wood House to the four Wellingtonias (*Sequoiadendron giganteum*) – a ride along some of its length but blocked near its midpoint by the Middle Pool; in 1963 Miles Hadfield reported

> "From the house runs an avenue of small-leaved limes across the park, continuing as a wide lime-lined ride in the wood. This rises to the highest point where stands a large leaning oak and some wellingtonias. From this point, when there was a seat, one could once look straight down the ride and with glasses and (so it is said) see within the windows of the house below."[3]

We do not know the date of construction of these rides for certain but they are shown on the Ordnance Survey map surveyed 1883 which also shows the Wellingtonias planted at the crossing of the rides. These trees were first introduced to England[4] in 1854, but for them to be shown as a feature on the OS map in 1883, they must have been planted before 1865 or so to allow for sufficient growth. Neither Dougharty's map surveyed 1731-2[5] [Historical maps (01)] nor the map by Colby published 1832[6] [Historical maps (06)] show the straight ride while both show a more tortuous track from the New Inn to the Weir Inn consistent with the route visible on the LiDAR around 50 metres south of the main ride. So it seems probable the rides were made after 1832 and before 1865. In 1839 the men were payed for "*stocking up stubs for roads*" – clearing coppice stools – then in 1841"*stocking up a further part of the Ridin Roade*", and in 1842 for "*stocking up a new road in the wood*". While "the Ridin Road" may have been a road by the fields known as the Riddings or a road across the Wood from Wood Farm to the Ridding Bridge, equally it might be the main *Ride* through the Wood. So the rides may have been formed 1839-1842; if not, then sometime after 1850 but before 1865.

In 1939 Cyril Powick had the sides of the main NW → SE ride drastically cleared for the vista;[3] trees that grew back restricting the width have more recently been cleared again.

More ancient than this ride is the cutting into the sandstone bedrock by the Weir Inn entrance to the wood (02c). Although we do not know the date of this cutting, the track was probably there back in the days of Shrawley Castle on Oliver's Mound – the late 12th century.

Mechanics of extraction

In mediaeval times oxen would have been used[7] to drag or haul produce from the woodland (04). The use of oxen dwindled in many areas from Tudor times, though not in the south-west of England or Wales until the late 19th century. However, by 1770 all but 3% of oxen in the West Midlands had been replaced by horses, probably by heavy Shires, Suffolk Punches or Clydesdales. Oxen were much cheaper to feed and had greater pulling power but horses were quicker and lived longer[7].



04a. Oxen with cart of hurdles. [Photo: Weald and Downland Living Museum].



04b. Pair of oxen dragging timber. [Photo: Devin Willett, dwlogging.com]

The Wood Books record many payments for "teem hallin", "teem drawin" and "teem work". (05) We have argued amongst ourselves whether any of these teams were human rather than equine. In 1736-1738 the carter was William Yates but Randal Seavern was paid in 1738 for hallin 400 Twernes; he was a farmer and may have had his own horse, or this may have been him carrying them. Often "hallin" seems likely to have been by hand, but "teem hallin" seems largely to be loads of poles, soil, lime, bricks, bark and other goods that most likely went by cart with a team of horses. It seems certain that references to payments from 1835 onwards to Mrs Sarah Powick for "Teem Drawin" or "Teem Hallin" were for the use of her horses and carts from Bonefields Farm. When her son James sold up the farm goods and stock in 1855 in preparation for his emigration to New Zealand, horses and carts were among the sale items (09). Later references to "lugging" by Allen Medlicott (probably written by Thomas Bunce as foreman completing the wages sheet) must from the context mean horse-and-cart work.

first	last	carter	paid for
1736	1738	William Yates	halling
1758	1759	Edward Smith	halling
1770	1771	George Tolley	halling
1808	1812	J Cook	halling
1811	1811	J Cook; Thos Cook	with teem, teem drawing
1816	1832	John Ford	halling, teem work
1835	1841	Mrs Sarah Powick	teem work
1841	1850	James Powick	teem work
1875	1877	Jerry Cound and son Charlie	
1887	1897	Allan Medlicott	drawing, lugging

05. Carters paid from the Vernon Shrawley Wood or Shrawley Farm accounts.

Much of the "teem hallin" was "hallin to Severn" but occasionally after 1805 to the sawpit, or after the Holt Fleet Bridge opened in 1828[8] to the turnpike with items for Hanbury – the residence of the Vernons: prior to 1828 these went to the Holt Fleet ferry. Later wood was drawn to Henry Thrupp at the Lenchford, where his wharf had become a major portal for goods exported from the Estate.

Although an area at the north of the wood was set aside as "Hors Pasture" [Dougharty map of 1732] or "Horse Leasow" [Tithe map of 1839], much of the later team hauling was contracted out to local businesses with horses and carts, such as Mrs Sarah Powick who lived in Bonefields Farm, not far from the Noutards Green entrance to the wood. No entries in the Wood Book have been found relating to hire or upkeep of horses, but there are references to the purchase in 1761 of "*4 threfes Boltin Stra*" and 1762 for "*4 & a halef threfes of boutin*" (probasbly baled-up pease haulms for fodder) and in 1771 of '*6 bushils of have*' which are oats. Later it seems the Estate used its own horses in the wood and as well as Allen Medlicott drawing poles hither and thither and "tushing out timber", income was recorded from local farmers using the Estate's horses [see chapter 1875-1897 p. 218].



06. Shrawley Wood recently cut bind. Taken in springtime, the lime coppice has been cut by axe, not saw. All large standards, at least 12, have been felled, leaving many young oak and birch to create dapple shade to promote the regrowth and become future produce. Note the road in the foreground and the hut in the rear centre on another road. Everything felled will be utilised, including the lop & top.

Light products, such as poles, bark, faggots and hetherings were carried out by hand from the recently cut 'bind' (06) and 'hand-balled' onto wooden carts or wagons (08) but heavy timber is more likely to have been 'tushed' or ground-skidded out of the wood (07a), although it is possible that wooden sledges may have been used (07b).



07a. A Horse ground skidding: The horse is Sultan, a Belgian Ardennes stallion. Item 52 in (09) "long gear" refers to the long reins as seen in this photo. [Photo: Simon Lenihan].



07b. Women's Land Army Forestry Corps extracting cordwood by sledge during WWI. [Photo: Imperial War Museum].

James Powick had been providing the team hauling for the wood. In preparation for his family's emigration to New Zealand in 1855 there was an auction of all his equipment and livestock (09). It seems likely he had had other shire horses and carts when he organised the team hauling, but this list gives some idea of the hauling equipment. Imagine a single horse being used to 'tush' Black Oak Poles and timber out of the 'Bind' with the Horseman chaining a pole, one at a time, to the horse's swingle-tree and setting it off out of the 'bind' to a 'landing' at the nearest track (07). The horse had learnt the extraction route, probably straight down any slope, so could be left to drag the pole by itself whilst the Horseman selected the next pole and fixed the choker-chain to it. When the horse with its pole arrived down at the landing, a boy, the horseman's son and apprentice, released the pole on the heap of other poles and the horse made its own way back into the coppiced bind. This was semi-automatic primary extraction, wonderful to observe.

Large, heavy timber may have been reduced 'at stump' by splitting it with wedges or rip-sawing it over a pit, whilst still green, to remove the waste slab-wood or make the resulting beams or boards much easier to extract and leaving the waste sawdust in the wood. Nationally, in the Middle Ages wooden Frame-saws were used on trestles or frames to convert timber in the wood (10). From the early 16th century, sawpits were dug in the wood near where the timber was being felled. They were generally 15 feet long, four feet wide and six feet deep. The seven-foot long pit-saw, cutting on the downward stroke, was worked by two men (11), a top-sawyer in charge and the bottom-sawyer standing in the pit. Over much of the wood the bedrock was too close to the surface to allow six feet deep pits to be dug but in 1897 George Blunt was paid for four days for digging a sawpit by the fall. There is a pit still visible in the wood and on the 1m LiDAR (see chapter LiDAR (12) p. 262) which may be the remains of just such a pit. Where the soil was too shallow for a pit, the use of frames or trestles in that year's bind may have continued until the 'model' Wood Yard with its sawpit was set up near Wood Farm. The Vernon estate seems not to have used mechanical saws until after the First World War, when a big circular saw was installed in the Wood Yard near Wood Farm, driven by a belt from a tractor.



08. Loading bark onto a horse drawn cart. Shrawley Wood 1911. The young boy is Cyril Powick and the lady beside him, his mother Susannah. It seems probable that one of the men was Edward, Cyril's father (see chapter 1875-1897 p. 216).
Photograph copied here by kind permission of Susannah Russell-Jones

HORSES (excellent workers)		Thos. Jones	1/-
49	A capital black cartmare "Snip" in foal to Mr Cooke's horse	Thos. Jones	£15.10s.0d
50	Valuable Bay Cart colt, rising 3 "Turpin"	Boughton	£25.0s.0d
51	Fine darkbrown cart filly, rising 2 "Poppet"	Daniel	£26.10s.0d
	GEARS & IMPLEMENTS OF HUSBANDRY		
52	Suit of long gears	Thos. Jones	14/-
53	ditto	Thos. Jones	11/-
54	Suit of thillers gears	Thos. Jones	£1.5s.0d
55	ditto	Thrupp	5/6
TOTAL PRICE FOR ABOVE 28 ITEMS LOTS NOS. 28 to 55: £75-17-6			
56	Gearing assorted	Jackson	1/-
57	3 leather head collars hemp reins	Thos. Jones	7/6
58	3 cart belly bands, stable shovel & pike	Thos. Jones	5/-
59	Stable bucket, 2 servers, box etc	Ford	3/9
60	Plough hammer, pin, shear drift & waggon jack, 1 timber chain	Thos. Jones	4/6
61	Plough bow, with traces, gampasses etc	Thos. Jones	10/-
62	Pair of driving reins etc	Thos. Jones	3/6
63	Saddle & bridle	Thos. Jones	£1.0.0.
64	Bag Pad	Thos. Jones	9/6
65	Nuttings Patent 2-knife chaff-engine	Thos. Jones	£4.5s.0d
66	A useful narrow wheel waggon, with thripples & dashboards	Thos. Jones	£7.0.0.
67	Board-wheel cart with dashboards	Thos. Jones	£5.0.0.
68	A good narrow-wheel cart iron arms	Thos. Jones	£3.0.0.
69	Barley roll	Thos. Jones	£2.0.0.
70	Slade with bridle	Thos. Jones	10/-
71	A stout 7-tine scuffle with wheels	Thos. Jones	£1.5s.0d
72	Valuable Iron wheel plough with flay etc	Thos. Jones	£2.0.0.
73	ditto	Thos. Jones	£2.0.0.
74	A set of 3 horse harrows equal to new	Thos. Jones	£2.0.0.
75	Set of 2 horse ditto	Thos. Jones	£1.10s.0d

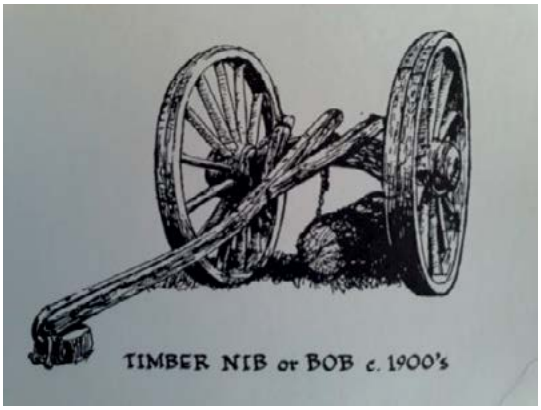
09. Extract of an account of the sale of Bonefields Farm.



10. enlargement from the map of 1732 by Dougharty. This may be his recollection of what he saw when surveying the map.



11. Sawpit [Weald & Downland Museum]



12a. Timber bob. [Rural Life Living Museum].



12b. Timber carriage, also known as a 'timber jill'. It consists of a central shaft and four wheels, and is made of wood with iron fittings and wheel rims. It is inscribed with 'Hunt Bros, Millwrights, Soham c. 1850. [The Museum of English Rural Life, University of Reading].



13. Timber carriage on the Hanbury Estate.

Once primary extraction had skidded the logs to the tracks, it is unlikely that large timber was dragged any further. Not only does this cause sometimes deep gauging in the ground, it also causes mud, grit and stones to become embedded in the wood, which quickly blunted the teeth of large circular saws. Sledges (08), Timber Bob (12a), Timber Carriage (12b; 13) or, for longer logs of say 30 feet or more, extendable Pole-Wagons (15) would have been used to extract such big logs along the trackways. The Timber Bob lifted the butt-end of the log from the ground by attaching it to the arched axle and swinging the drawbar from a vertical to horizontal position, prior to hitching up the horse. Just this method was certainly used in Shrawley Wood after 1844, when the village wheelwright Thomas Greaves was paid £2-7-0 for ‘meaking a pair of Wheels For Drawing Timber’ and the village blacksmith James Thrupp was paid £7-16-6 for ‘Iron Work for the new Wheels’. The term “tushing-wheel” first appears after this date but is listed in A Glossary of Words used in South East Worcestershire of 1894.[9]

Loading of the Timber Carriage or Pole-Wagon was done by unhitched pairs of horses pulling logs up a pair of poles to one side, using two long chains (14) or by using sheer-legs and a chain lift (15). The heavier the load the more horses were used (13).
All the smaller, lighter products would have been loaded for secondary extraction along the 'rodes', onto wagons (04a, 08). Narrow wooden wheels with metal rims caused deep rutting in the tracks in all but the hardest of ground. Every year the Wood Books reveal that much time and money was spent 'mendin rodes in y^{e} wood'. Stone was raised locally from the nearest quarry (see chapter LiDAR p. 258): for example, in 1849 Samuel Harris was paid 6d per yard for 40 yards of stone to mend the roads. Lops and faggots were also used for repairing roads: in 1844 James Meredith and others were paid for 27½ days "cutting down underwood for faggoting & mending roads &c" @ 1/10 per day.



14. Loading a timber carriage. [The Museum of English Rural Life, University of Reading].



15. Loading a pole wagon. [Photo: B&J Davies, Salop].

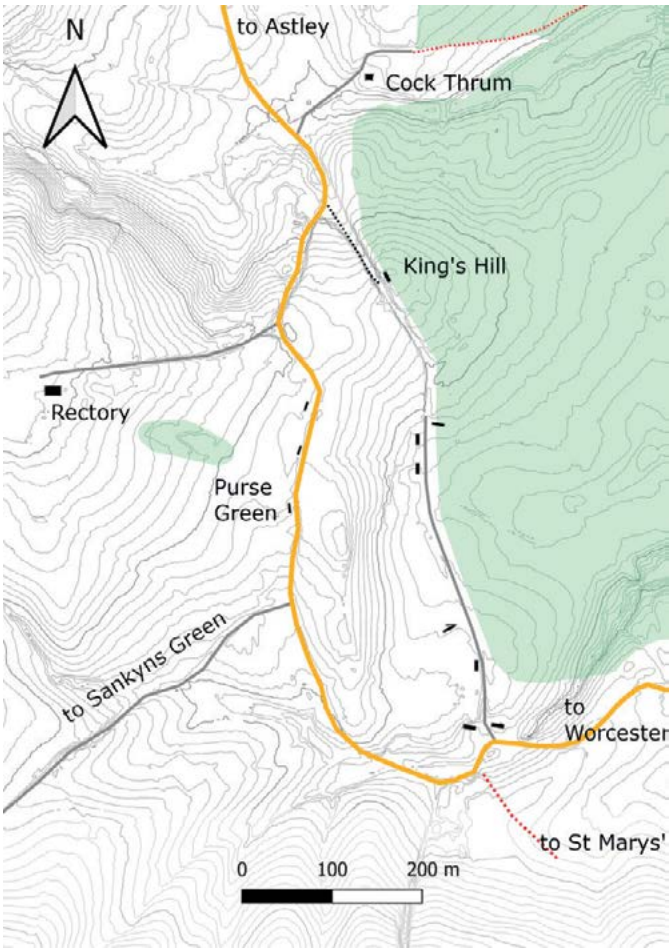
It appears that many or all of the several gullies (Dingles) were used for such extraction and the tracks along their bottoms became deepened by the traffic and winter rains. We suggest in 'Shrawley The Word' that these self-same gullies, a prominent feature of Shrawley Wood gave the wood its name in early Anglo-Saxon times. The extraction of produce described above was expensive, perhaps a third of the cost of harvesting that year's bind but of course was essential to get the wide range of products to market. These surprisingly numerous products are all referred to in the Products from Shrawley Wood p.249.

Dispatch

Dispatch routes varied according to the type of produce and changed from time to time. Some of both the underwood and timber was used locally and transported by road. Bark, cratewood, clogwood and many other types of produce such as bast ropes (until 1737), oak bark (after 1737), faggots, block wood, pit wood birch poles and timber were sent up and down river in trows or barges. Cargoes were typically loaded at the Weir Inn quay. The Inn closed in 1861 and sometime after that cargo loading moved south to the Lenchford quay. During his time as licenced victualler there, Henry Thrupp ran a thriving business as cratewood dealer as well as coal merchant and we have records of poles shipped from there to Birmingham (see chapter 1875-1897 p. 211).

The Weir Inn Quay may not have been the favoured route when binds in the north of the Wood were being cut. The steep eastern edge makes access to the Severn difficult anywhere else apart from a gulley in the northeast corner near Dick Brook Bridge. The field by this is the Upper Ridding, and the payment for repairing the "roads at the riding gate" referred to in the 1811 Wood Book[10] may have been the route across this to the river; there is no trace of this road today. From the mid-17th to early 19th centuries Dick Brook had been made navigable by two locks (see chapter Dick Brook Industry p. 100); it may have been possible for boats to load anywhere along this stretch if the mill operators permitted it.

Until the Staffordshire & Worcestershire Canal opened in 1771[11], these cargoes were for towns up and down the Severn; after that date, cratewood was sent to Brierley Hill, clogwood, cratewood and much else to Dudley, charcoal to Cookley Ironworks and lime poles to the copper smelters in Selly Oak. During summer the River Severn often became too shallow for laden vessels in many places between Worcester and Stourport. The changing pace of life during the Industrial Revolution meant that these delays had become unacceptable and a system of four locks and weirs at Lincomb, Holt, Bevere and Diglis were built 1843-5.[12] (see pp. 240-5.



16. Tentative map of road through Shrawley 1586.

The road through Shrawley may have changed since Elizabethan times (16). An indenture of 1586 indicates that what is now the back road (Rectory Lane) used then to be the highway to Worcester[13]. There used to be a road from Purse Green by this highway to Sankyns Green, which is now only visible as the trace of a holloway running through fields; this was possibly abandoned when the main road changed to the turnpike and a spring opening under the holloway turned the middle section into a stream.

There is an interesting note pasted into the Woodman's notebook[14] on a page for 1765:

> *Foot Roads through Shrawley Wood as Numberd*
> *From Outwards Green to Wire*
> *From Kings hill to Riding bridge*
> *From Kings hill to Wire*
> *No Bridle Road at All*

This was the year before the 1766 Act for extension of the Worcester Turnpike to include Shrawley was passed[15]. One might suspect that preparations for this had included a survey of what effects this would have on the connecting local roads. This note suggests firstly that a map with numbered routes had been circulated for comment and secondly that this respondent was pointing out there was no public access with horse and cart to the tracks through the Wood: any roads there were none of the business of the Turnpike Trust. The Wood Gate giving access to the two tracks listed as "*From Kings hill*" is drawn on Dougharty's map of 1732 (Historical Maps (01)). Access to this gate is now by the track past Cock Thrum (16) but in 1765 Layes Pool had not yet been dammed and there was most likely another access to the gate more directly from by Kings Hill.

It seems likely that by 1766 the main road had already switched preference to the route up and down Kings Hill and the widening of this section in 1810-1814 needed purchase of only 13 perch (232 sq. yd.) for a length of around 200 yards, suggesting that what had probably become something of a holloway over Kings Hill had been formalised into a cutting before 1814.

The turnpike through Shrawley connected with other turnpikes managed by the Droitwich, the Bewdley and the Hundred House Turnpike Trusts. The Wood Books record various payments in connection with the road through Shrawley. In 1810 there were payments to the Surveyor of the Highways and payments to the men for "cutting hedgewood for the highways" and a receipt for "stakewood, hedgewood etc" from the Surveyor of the Highways. There is a map[16] dated 1814 of the "Public Road through Shrawley as widened and improved" with an account of the land purchased.

Shrawley Wood produce was regularly dispatched to Hanbury and on occasion to the Vernon's estate in Wick, Southwest of Worcester. The turnpikes between Shrawley and Hanbury crossed the Severn at Holt Fleet. This was a ferry crossing until 1828, when the Telford-designed Bridge was opened.[17] The toll booths on either side of the bridge were on the right-hand side of the road. The law regularising driving on the left-hand side of the road came in in 1835; it seems uncertain which lane would have been used by traffic crossing the bridge in its early days.

Toll charges were inflicted on traffic by Turnpikes, canals, bridges and after 1845 even by the River Severn Navigation Commission. Examples of transport charges are given in chapter Remote Sales p. 244.

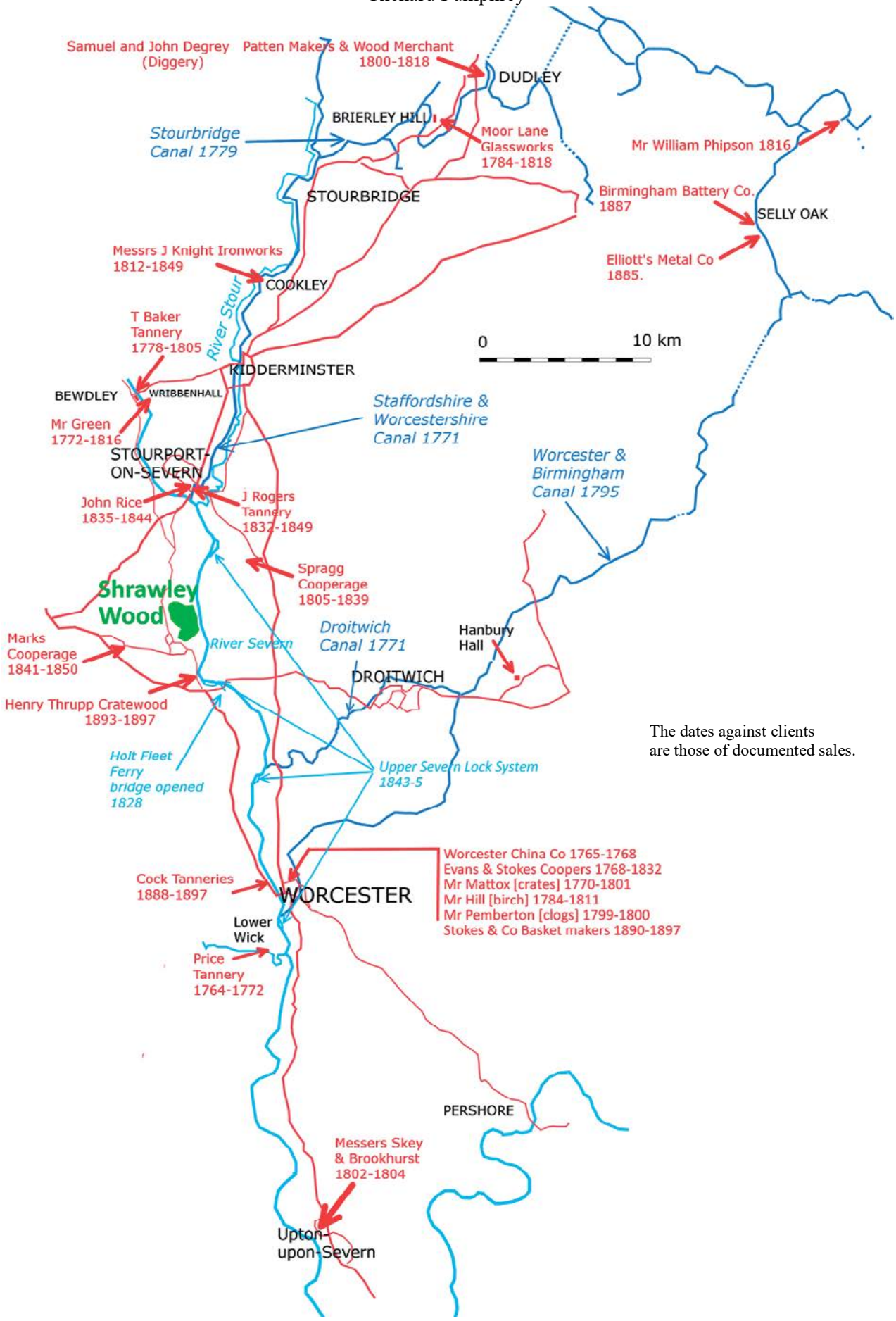
More recently dispatch from the part owned by the Forestry Commission has been by road from the Noutard's Green entrance.

References

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2 Mr J Powick, personal communication
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4 Musgrave T, Gardner C, Musgrave W. 1999 *The plant Hunters*. p 147-149. Seven Dials, Cassell and Co. London
5 WAAS 705:7 BA 7335/154/1 *A Book of Maps containing all the estates belonging to Bowater Vernon Esq. in Worcestershire, Warwickshire and Shropshire .. Drawn by John Dougharty of Worcester Surveyor* Survey'd and map'd by John Dougharty Jnr. : Worcester in 1731. 1732. Map 17 *A map of Shraley Wood with the Land and Cottages joyning to it. Mappt and Measur'd by Jos Dougharty of Worcester Surveyor;* Map the second
6 OS sheet LV NE; Leominster; Published at the Tower of London in Feb 1832 by Lieutnt. Colonel Colby; Royal Engineers; engraved by Benjamin Baker and Associates.
7 Collins EJT, The latter-day history of the draught ox in England 1770-1964 *Agric. History Review.* 58: p191-216
8 https://gracesguide.co.uk/Holt_Fleet_Bridge accessed 7/1/2019
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10 Pumphrey R S H 2019. Transcription of the Shrawley Wood Books onto MS Excel Spreadsheets, based on photographs provided by Llewellyn FM of the original documents: WAAS 705:7 BA 7335/47, 107, 108, 109, 132 & 133. Account books entitled "Shrawley Wood book". With letters, receipts and accounts etc.
11 https://historicengland.org.uk/images-books/publications/stourport-on-severn/stourport-on-severn/ accessed 1/1/2019
12 Williams, Edward Leader 1846, Account of the works lately recently constructed for improving the navigation of the River Severn with their effect in discharging the flood water. Excerpt minutes of proceedings of the Institution of Civil Engineers. London
13 Indenture between John Clerke alias Gylberts and Richard Stone, 17 April 28 Eliz 1 (1586). WAAS BA 7335/18 iii. Ref 705:7
14 WAAS B705:353 BA 3803 (2)
15 Act of Parliament extending Worcester Turnpike Trust to cover Shrawley Road.
16 Samuel Barnett 1814. *Map of the public road through Shrawley Parish as widened and improved also an account of land purchased.*
17 https://historicengland.org.uk/listing/the-list/list-entry/1301888 accessed 25/3/2021

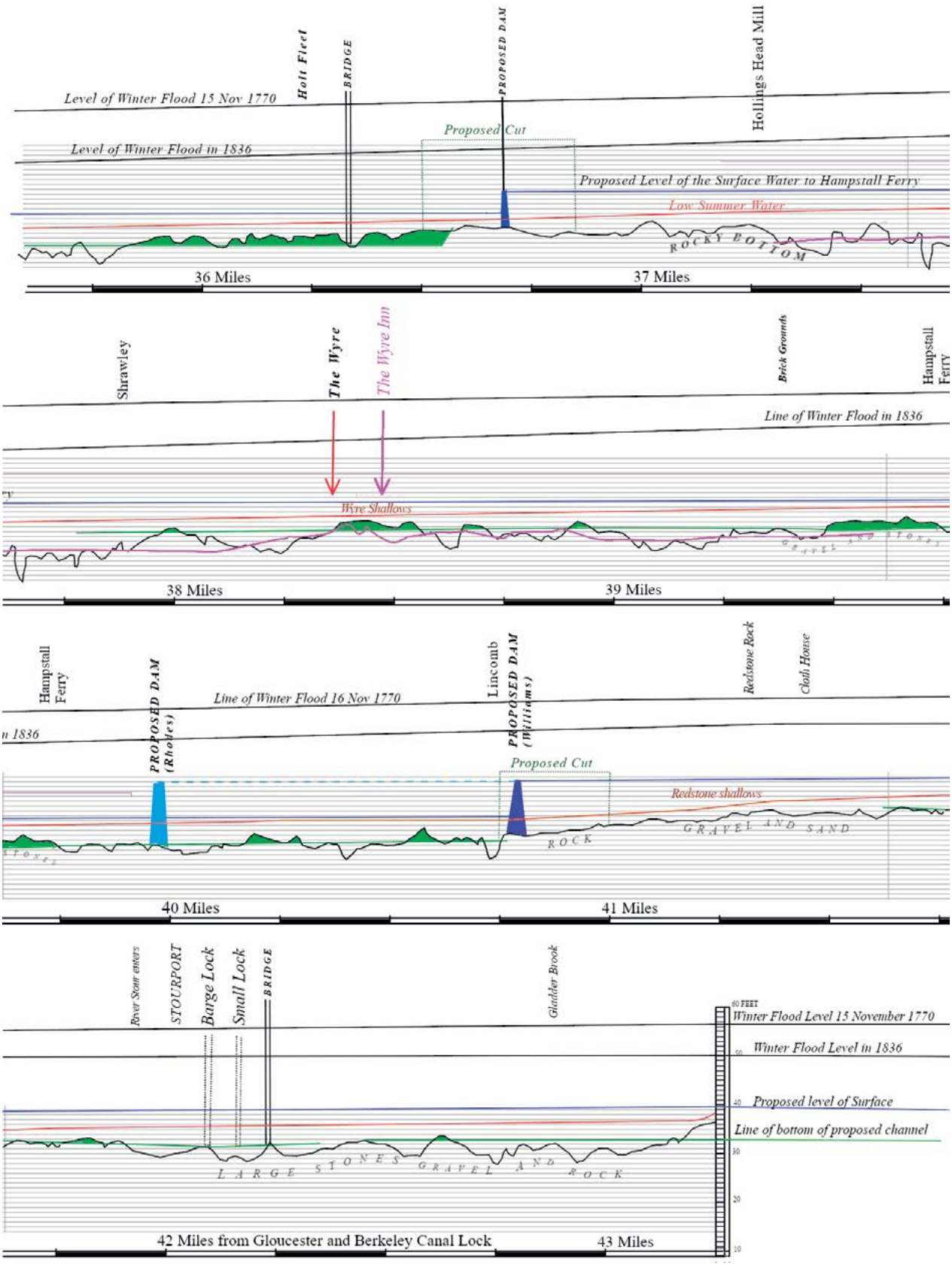
Remote clients and dispatch routes
for Shrawley Wood Produce, 1764-1897

Richard Pumphrey



The dates against clients are those of documented sales.

Engineering sections surveyed 1840 in preparation for the Upper Severn Lock System



01. Synthesis from the Rhodes and Williams Engineering Sections.

This has been redrawn in a simplified version to show the shallowness of the river before the upper River Severn Lock system was built (01). There were two competing schemes (Rhodes and Williams), differing only in the position of the lock by Lincomb: above this dam the water level was the same for each. Between Hampstall Ferry and the Lincomb Lock, the Williams proposal required additional dredging/cutting rock from the bottom of the River Severn.

The red line denotes the summer low level before the locks were built; the blue line the level expected after the locks were built; the green line denotes the line of the proposed bottom after the removal of the green shaded ridges. Dark green = extra dredging needed for the Williams proposal. The purple line was determined by soundings taken on 22 September 2020 by Mike Averill. These soundings suggest that the position of "The Wyre" indicated on the engineering section was 50-70 metres below the Weir Inn.

It was alleged that the Holt weir was built 1 foot 9 inches higher than in the plans and the Lincomb weir five feet higher, resulting in loss of head at Mitton Mill (yarn spinning) for many more days in the year than before the lock system was built[1].

The Weir Inn weir (Wyre in the Rhodes Section) was at the downstream end of a sandstone ridge that caused very shallow water in summer.

The depth soundings (02) are those for summer low levels shown on the Rhodes Section. We think the weir may have been similar in concept to the weirs higher up the Severn that survived into the nineteenth century[2] (03). The Weir fishery is described in more detail in chapter Tale of Two Rivers. The weir may have helped divert some of the flow into the barge gutter, which may have been on the Weir Inn side. Bowhauliers would therefore have been using the west bank at this point, the Inn providing welcome respite.

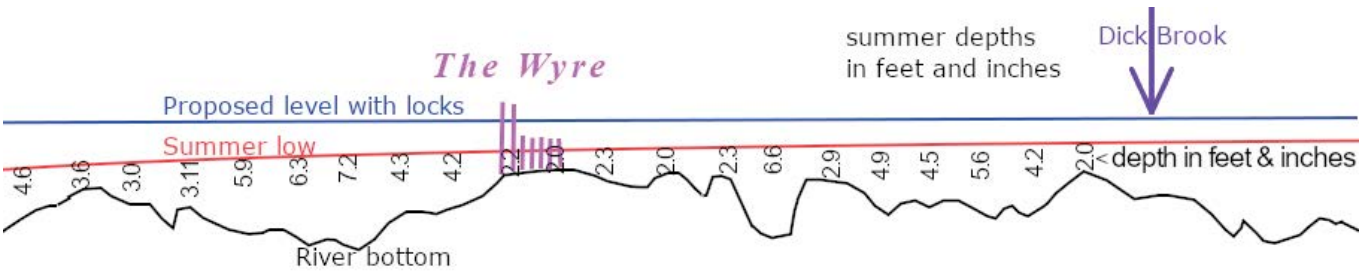
This Weir fishery has a history at least back to 1380, known then as Ffysshfe. Bailiff Robert Hyllhampton's Account of 1389 noted under *Customary Services*:
And for 14d for the fishery in the Severn called Ffysshfe let to JOHN FREWYN for the term of his life, this being the 9th year.[3]
The placing of this within the Bailiff's Account suggests it was the fishery by the Weir Inn.

Any remaining trace of the Weir was finally obliterated when the Upper Severn Lock System was constructed in 1843-5 (05).

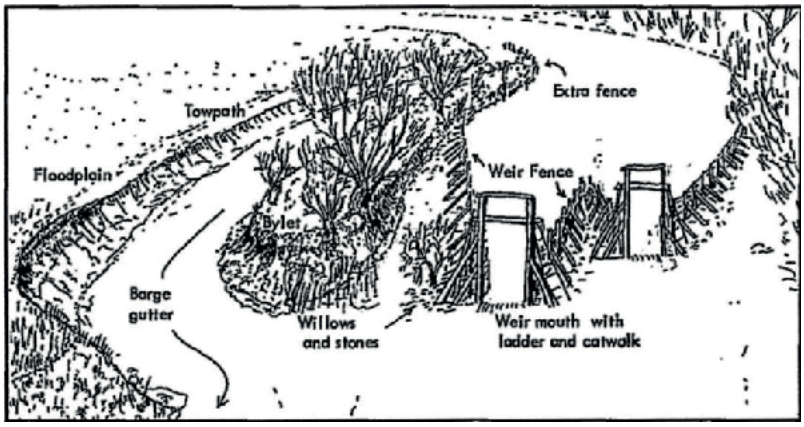
The 1838 Act proposed that the tolls collected shall be in the following proportions:
From Gloucester to Worcester 3d per ton
From Gloucester to Stourport 6d per ton
From Worcester to Stourport 3d per ton.
No tolls to be collected exceeding:
1s per ton from Gloucester to Stourport,
6d from Gloucester to Worcester
6d from Worcester to Stourport.

Tolls were collected from January 1847. (B Trinder Barges & Bargemen) – up to 1865 tolls were collected at Lincomb, Worcester, Diglis, Gloucester and Tewkesbury
in 1867 they were collected from Holt, Bevere, Worcester, Diglis, Tewkesbury, Upper Lode and Gloucester
in 1868 Lincomb was added.

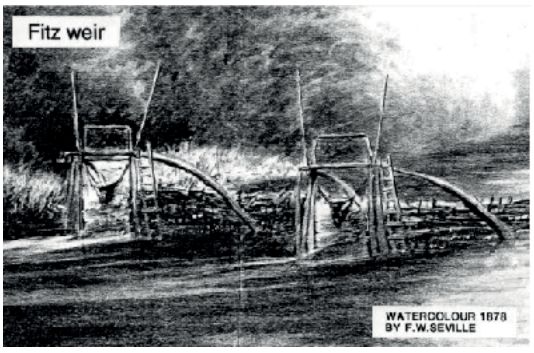
For a cargo of poles going from the Lenchford quay to Birmingham on 29 September 1897, the lock charge at Holt: Toll to Severn Navigation Commission. 2/6d to J Dadge, receiver at Holt station: Owner French. 12 ton poles, 4 miles to Hawsford (equals 2.5d per ton). See chapter 1875-1897
.



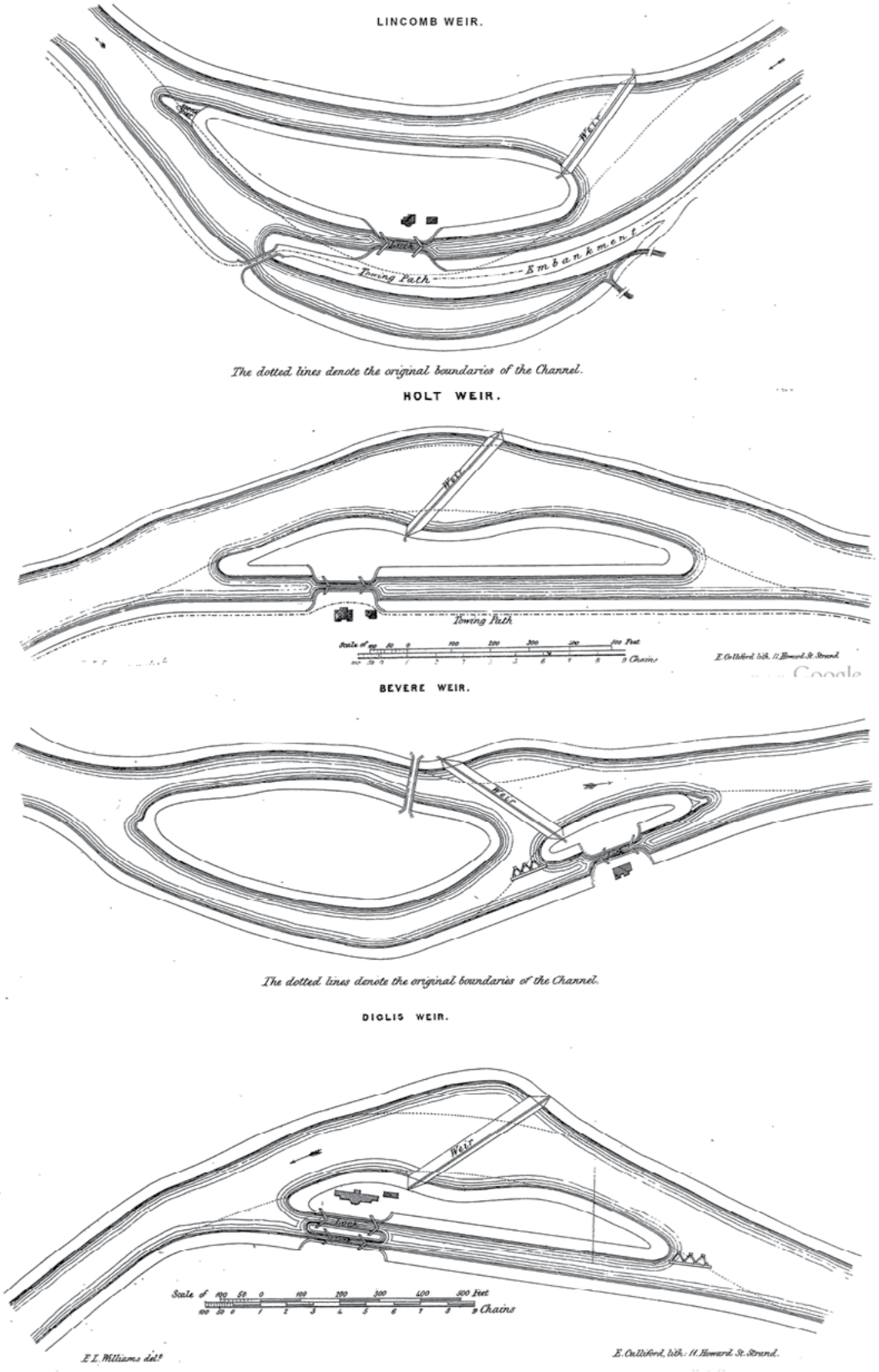
02. Depth soundings shown on the Rhodes Section of 1840.



03. Sketch of a typical fish weir from a description of the weirs of the Severn Loop near Bicton[2], reproduced here by kind permission of the author David J Pannett.



04. Watercolour of the Fitz Weir, (Fitz, Shropshire). Photo D J Pannett.



05. The four weirs and locks built on the Upper River Severn 1843-45.[4]

References

1 Berrows Worcester Journal 1845-1849, art. 88. March 18 1847 *Worcestershire Lent Assizes: The Severn Cause – Harris and another (SJ) versus Grissell and another.*

2 Panett D.J. (1987) Fish Weirs of the River Severn. Folk Life 26:1, 54-56.

3 WAAS) 705:66 BA 4221/7/ii Compotus roll of the Manor of Shrawley, [29 September], 13 Richard II - [29 September], 14 Richard II, [1389 - 1390]

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Oak Loss from and Replanting in Shrawley Wood

Hugh Milner

Oak Loss — Comments in this font

Year	No	Details	Source
1650s		*The whole woodland was clear felled during the Commonwealth period*. Most unlikely, may have been fully coppiced including oak Great/Black Poles during these years. Poor woodland management around this time resulted in a Chancery suit; woodland was being felled but not protected with fencing to ensure regrowth. Claims that the woodland had been wasted through excessive felling were perhaps unfounded.	3
1696-99	(160)	*Great poles above 36 years growth* were felled in these years, leaving '*9785 in the wood'*. This was oak coppice. Standards are not mentioned.	6
1760	604	Maiden oaks sold in April to timber merchants for £1660, an average of £2-14-11½ each, see 1904, 144 years later. Did a financial constraint cause this or were the oak standards being converted to coppice? The 'maidens' may have been 'stored' coppice.	2
1764		This is the year with the first surviving Wood Book	24
1772	3?	*3 tuns and 6 feet of Timber for to Hang the Bells* in Shrawley Parish Church	9
1774	383	*November ye 13 the number of the oak trees two fall Be 383 and 3 ash trees. Sould To M^r^. Chiles for £170 at the hoppoule in Worcester.* This was probably The Hop Pole Inn on the corner of Foregate & Shaw Sts	17 23
1778	250	Maiden oaks for sale. See the query note for 1760. *'Sould to M^r^. Edines*	17
1779	265	*Sould 265 oakes to M^r^. Chiles*	17
1780	19	Timber Lengths = 467 Hoppus Feet (15.6m^3 @ 0.82m^3) from Jonson's Grove. Woodland clearance?	7
1799	45	*Butting, topping and rounding timber trees*, probably oak	10
1800	43	Ditto	10
1801	31	Ditto	10
1802	15	Ditto	10
1803	?	*Mature Oaks felled*	4
1808	59	*Butting, topping and rounding timber trees*, probably oak	10
1809	60	Ditto	10
1810	40	Ditto	10
1811	36	Ditto	10
1812	53	Ditto	10
1813	?	11 tons of bark was produced, implying the felling of a number of oak trees	10
1814	56	*Butting, topping and rounding timber trees*, probably oak	14
1815	67	Ditto	10
1816	44	Ditto	10
1817	34	Ditto	9
1819-31		These Wood Books are no longer extant	24
1828	50	Sale of maiden oak	2
1829	40	Sale of maiden oaks	2
1830	30	Sale of Capital oak trees	2
1831	50	Sale of maiden oaks	2
1832	27	*Timber trees butted, topped and rounded*, perhaps 23 unsold from 50 were advertised, Sale of Capital oaks	2 & 16
1833-34		These Wood Books are no longer extant	24
1834	35	Sale of Capital oaks	2
1835	19	*Butting, topping and rounding oak trees*	16
1835	2	*M^r^* Thomas *Spragg* (of) *Hartlebury 2 Oak trees Addam & Eve 132^f^..9^I^*H Ft & Inches = 4.79 m^3 £ *26..11..0.*	16
		These significant trees were replaced afterwards by two more so named	
1836	22	*Butting, topping and rounding oak trees*	15
1837	29	Ditto *timber trees*	15
1838	23	Ditto	15
1839	42	Ditto	15
1840	44	Ditto	15
1841	66	Ditto	14
1842	63	*Butting, topping and rounding timber trees*	8
1843	132	*Butting, topping and rounding oak trees, of which 13 sold to Mr Hickman, 260 H.Ft* @ 2/9 = £35.15.0. This high number of felled trees coincide with a second cutting of the Greater Outward Bind, perhaps in preparation of its clearance to agriculture by 1883	13
1844	44	*Butting, topping and rounding timber trees*	12
1846	25	*Falling & Peeling, butting, topping & Rounding*	11
1847	41	*Butting, topping and rounding timber trees*	14
1848	41	*Butting, topping and rounding oak trees*	14
1849	39	Ditto *timber trees*	11
1850		The last extant Wood Book	24
1862	60	*Capital oak lying by the River Severn*	2
1863	(15)	1100 feet of oak timber sold	2
1864	40	Sale of oak trees	2
1868	390	Sale of *'Superior Oak Timber Trees…remarkably hearty, very straight and of first-class quality'*	2
1891	16 (14)	*1125^ft^ 4^in^*(1125.337 Hoppus feet, @ 70.3 h ft = 40.56 m^3 @ 2.54 m^3 average tree size) *1012^ft^ 10^in^ add oak trees fallen for M^r^ Groom of Hereford* (thus 1012.472 h ft @ 70.3 h ft ave = 14.4 trees)	18

1902	?	*Some of the larger oaks felled to help pay death duties* Unsubstantiated but see following	25
1903	1000	*29th January 'Sale of 1000 magnificent Oak Trees in Shrawley Wood, at the Grand Hotel, Birmingham'*	2
1904	704	March 21, Sale of oak trees, realised £2590, an average of £3-12-9½ each, see 1760, 144 years earlier	19
1945	726	Sept 18. Probably in the north, in what is now the FC part. See the separate analysis of this record, 'Tree Measurement Notebook'	20
1946	57	7 from Shrawley Park Formerly part of the wood. Probably all oak. 50 more were felled in Shotgrove	21
1947	57	Windfalls Probably as a result of the severe winter of 1947	22
1947-50		*Further felling for death duties, virtually all mature oak removed* Unsubstantiated but may refer to the large 1945 fellings or the following	25
1948	200?	'Hundreds' of Oaks felled for repairs to the House of Commons Article refers to different Counties in The Marches but most came from Shrawley Wood	5
1961	100	? Poor oak woodland cleared by FC in north of woods upon acquisition but the Estate had reserved rights on the remaining timber which was probably exercised.	1
Total	6510		

N.B., 1. Entries with source 2 are of mainly standing oak trees advertised for sale. It is likely that most or all were sold.
2. It is believed that prior to circa 1800, that there were as many oak coppice stools as there were oak Standards.
3. At least 6510 Standard trees were felled in 57 separate years (and probably many more in the 'missing years'), an average of 114 trees per year or 24.6 trees per year for the 265 years between 1696 and 1961. 6510 oak trees looks to be a high number but averages 46.2 trees per hectare (18.7 per acre) across the total 141 ha and 265 years. If these standards were ever at the traditional spacing of 37 per hectare (15 per acre) few would have remained. By 1961 only the southern private third of Shrawley Wood had any overstorey, in a woodland renowned for its quality oak trees. This does not indicate appropriate or sustainable silvicultural management perhaps during most of the 280 years of the Vernon family tenure or at the least when parcels of 100 trees or more were sold in the 12 separate years above. But surely conversely and partly because of the Vernon's long ownership this very special wood has survived to the present day?

Replanting

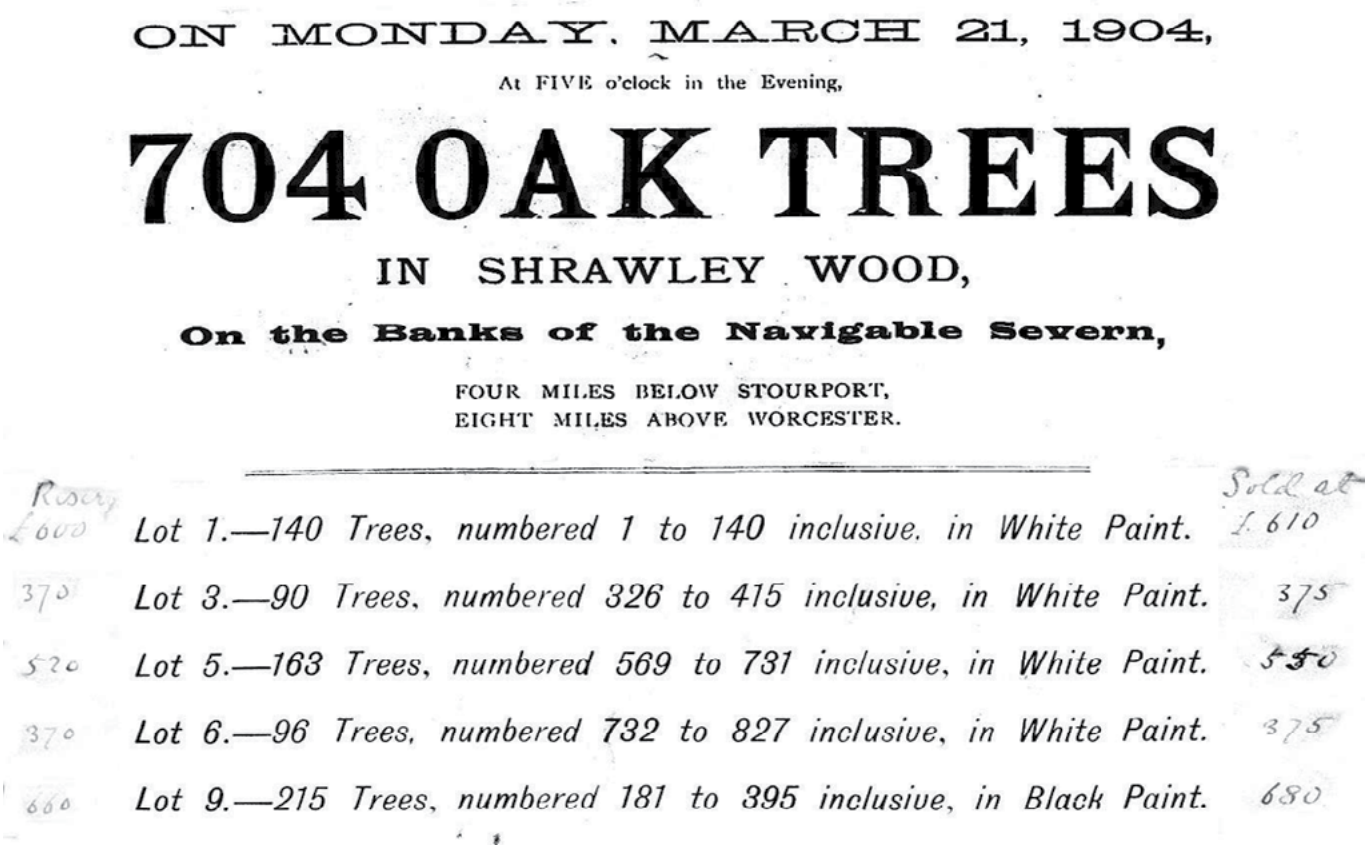
Year	Wood Book entry
1759	'*pd for Setin akkons 0 1 0* 'Paid for sowing acorns 1/-, probably in a nursery bed
1804	'*10th Sept To Plantin Oke in the Wood T.Jones 12 Days 0..18..0 Phillip Jones 14 Days 1..1..0 Thos Jones Junr 14 Days 1..1..0.'*
1806	'*Pd the woodmen Planting young Oakes* 13 days 1 5 6. *Pd. John Cook for 4 Days Getting up Oke Plantin &c 0..8..0 his Son 4 Days 0..6..0.Pd The Woodmen diggen up grown plantes oke* 5 days 0 10 3
1811	*'Pd the woodmen for plantin young oke. James Atheridge* 4½ days 0 9 0 *Edw Willetts 3 days 0 6 0 John Layland* 4½ days 0 9 0 *plantin Acorns 2 days 0 4 0 Thos Jones plantin young Oke in Ash Bed 2 days 0 5 0'*
1814	'*22nd Oct pd John Cooke 4 Days Planting Oke* (2 days 0 5 0) *Wm &Thos Jones for 4 Days Each Planting Oke Quick @ 2/6 1-0-0. John Priece planting oke etc.* 8 days 1 0 0 *'*
1815	*'plantin Oke @ 2/6* a hundred *James King 5 days 0 12 6 Samuel Powick 1 day 0 15 0 John Preece 5 days 0 12 6 planting and stakeing Okes William Jones 8 days 1 0 0 Thomas Jones7 days 0 17 6'*
1816	*'Replanting Oke &c Paid Thos Jones 9* (days) *0..18..0. John Preece 10½ days 1 1 0 William Jones 9 days 0 18 0 Edwd Powick 12 days 1 4 0 SamlPowick 12 days 1 4 0*'
1817	*'planting oke &c Samuel Powick 10 days 1 0 0 John Preece 12 days 1 4 0 Thos Jones 5 days 0 10 0'*

N.B.
1. It may be no coincidence that the replanting coincides with the Napoleonic Wars and the national drive of this era to replace oak trees for future naval timber. Intriguingly, Admiral Lord Nelson visited Worcester in 1803. He is known to have cast acorns in the Forest of Dean.

2. A nursery bed was established to produce young trees from seed gathered in the wood. This maintained the genetic integrity and well-known quality of the Shrawley oak.

3. It appears that all the replanting has been paid at piece work rate of 2/6 a hundred. They are likely to have achieved at least 250 trees per man/day, using two-year old trees, lifted on-site from the tree nursery. Some 145 man/days were spent on replanting oak, which gives an output of 36,500 trees. At 1.8m (6') spacing they would have covered 12ha (29.7 acres) but it is likely that they were replanted at wide spacing amongst the lime coppice stools as future Standards, so replenishing a much larger area of woodland. These may be the self-same trees, 125 years later that were some of the last oak in the wood felled in the 1940s.

The following advert is an example of one of the larger sales of timber from Shrawley wood. This was a Standing Sale.



ON MONDAY, MARCH 21, 1904,

At FIVE o'clock in the Evening,

704 OAK TREES

IN SHRAWLEY WOOD,

On the Banks of the Navigable Severn,

FOUR MILES BELOW STOURPORT,
EIGHT MILES ABOVE WORCESTER.

Rosery £600 — Lot 1.—140 Trees, numbered 1 to 140 inclusive, in White Paint. — Sold at £610

375 — Lot 3.—90 Trees, numbered 326 to 415 inclusive, in White Paint. — 375

520 — Lot 5.—163 Trees, numbered 569 to 731 inclusive, in White Paint. — 550

370 — Lot 6.—96 Trees, numbered 732 to 827 inclusive, in White Paint. — 375

660 — Lot 9.—215 Trees, numbered 181 to 395 inclusive, in Black Paint. — 680

Note the prices achieved on the right, handwritten by John Marks. Courtesy of Mrs Jeavons-Fellows. Photo' by Will Watson

Sources

1. Drewett, John & Roberts, John. 1994. *Midland Woods and Forests*. Quercus. Birmingham
2. Newspapers: The British Newspaper Archive. *Public Ledger* March 17 1760; *Berrow's Worcester Journal*, April 24, 1828; April 14, 1831; May 10, 1832; April 24, 1834; January 4, 1862. Accessed 2014-15. Worcester Herald: 7 February 1829; 3 April 1830. Accessed 14 December 2020. Bromsgrove & Droitwich Messenger 12 December 1868; 10 January 1903. Accessed 15 December 2020. Worcestershire Chronicle: 14 January 1863; 13 January 1864; Accessed 12 December 2020.
3. King, Peter *The History of Shrawley Wood* [Medieval Shrawley Wood & Early Modern Shrawley Wood]
4. Byfield, Pete *Some History of Shrawley Wood*
5. The Times Digital Archive. 2 April 1948 Accessed 18 March 2015
6. Worcestershire Archive and Archaeology Service (WAAS) 705:7 BA7335/109/iv/16-59 (No. 51 Coz: Richards particular & valuation of Shrawley) C.50 letters, accounts, abstracts of title, surveys and other papers mainly concerning the Vernon estate in Shrawley. 17th-19th cents
7. WAAS 705:7 BA7335/47/iii/1-45 (No. 22) C.45 letters, accounts, receipts, valuations and other papers mainly concerning the Vernon property in Shrawley. Late 18th-early 19th cents
8. WAAS 705:7 BA7335/107/iii/1-47 (No. 1) Account book of expenses [of the Vernon estate in Shrawley]. With c.35 receipts. 1841-2
9. WAAS 705:7 BA7335/108/i/1-49 (Nos. 7 & 14) c.15 account books entitled "Shrawley Wood book". With c.25 receipts and accounts 1764-1818
10. WAAS 705:7 BA7335/108/ii/1-232. (Nos 3, 4, 5, 6, 12, 13, 14, 15, 16, 17, 18 & 19) c.19 account books entitled "Shrawley Wood book".With c.150 receipts and accounts 1775-1816
11. WAAS 705:7 BA7335/108/iii/1-85 (Nos. 1 & 2) 2 account books entitled "Shrawley Wood book". With c.55 letters, accounts and receipts. 1846-50
12. WAAS 705:7 BA7335/108/iv/1-47 (No. 1) Account book entitled "Shrawley Wood book". With c.40 accounts and receipts. 1843-4
13. WAAS 705:7 BA7335/109/i/1-25 (No. 1) Account book entitled "Shrawley Wood book". With c.20 accounts and receipts. 1843
14. WAAS 705:7 BA7335/109/iii/1-187 (Nos. 1, 2, 4 & 5) 5 account books entitled "Shrawley Wood book". With c.100 letters, accounts and receipts. 1814-48
15. WAAS 705:7 BA7335/132/ii/1-5. 5 account books in respect of work carried out in Shrawley Wood in Shrawley. 1836-40
16. WAAS 705:7 BA7335/133/vii/1 & 2 Account books of expenses in respect of Shrawley Wood in Shrawley. 1831-2 & 1835
17. WAAS b705:353 BA 3803/2 Estate Account Book 1758 - 1777
18. WAAS 705:7 BA 7335/114/vii/1-182 (No. 40) C.150 Accounts and receipts, Vernon estate 1890-7
19. Sale notice in Wood House, Shrawley, courtesy of Mrs J F Jeavons-Fellows
20. Shrawley Wood Sept 1945 tree and log measurement book, courtesy of Mrs J F Jeavons- Fellows
21. Forestry Commission (FC) Felling Licence issued 4.11.1946, courtesy of Mrs J F Jeavons-Fellows
22. FC Felling Licence issued 21.4.1947, courtesy of Mrs J F Jeavons-Fellows
23. Hop Pole Inn, Foregate Street, Worcester from Blandford, Bob. 2013. Worcester Publications *Then and Now Vol II 1838-1873*
24. *Introduction to the Shrawley Wood Books* See that Chapter by F R Llewellyn
25. Anon. N.D. (After 1985) A Brief History of Shrawley Wood. N.B. Supplied by FC

Products from Shrawley Wood

Hugh Milner

This is a record of the various, mostly wood products (see fern, fish and stone, the exceptions) cut, prepared, extracted and sold from Shrawley Wood, together with the year they were first recorded. Finished products, commanding a higher price are marked thus *. Some items may also be the unit of measure and are shown thus ‘m’. A definition of all items can be found in the Glossary and Derivation of Terms pp. 153-166. Some 130 products are listed here, as shown in many records, mostly held at The Hive, Worcester, most particularly in the Wood Books from 1764 to 1850, a period of 86 years. In 2021, sale of different products from one woodland is unlikely to exceed six!

*Ballard Whitturnes	1806
Ballow	1700
*Bark(e)	1765
*Basten Ropes	1689
*Basten Ropes, Great	1700
Be(e)som Stuff	1839
Birches, whole trees	1843
Black Poles, oak	1807
*Bords (Boards)	1848
Bows (boughs)	1809
Bucket, wood to make	1841
m Bundles	1390
Bush, Oake	1845
Buts (Butts)	1772
Buttins, Oke	1800
*Cab(b)ins, Colliers	1837
Capital Oak	1830
*Chaise, Chais Whitturnes	1771
Chipwood, for Chip Baskets	1956
Clams, wooden collar for cows?	?1806
Cleft	1806
Cleving Lath, see Laths	1843
Clogwood	1802
Coling Wood, for charcoal	1845
m Cord	1803
Cordwood	1803
Crap(e)s, Crapwood	1767
Cratewood, see also Shidewood	1765
Cutts; Gubbins, see Gubbin..	1807
Dub(b)legroun, see Triple..	1814
*Etherin(e)(g)s, Eths	1801
*Faggots, Faggotwood	1700
*Faggots, Whitturne	1806
*Fence Posts, Sweet Chestnut	1964
Fencing Possis (Posts)	1810
Fern (Bracken)	1888
*Firewood	1564
*Fish from pools/brook	1840
*Furnace Sticks	1892
*Gate Rails	1836
Geatestuff (Gate Stuff)	1832
*Growed, Double,see Dublegroun	1834
Gubbin Cutts	1807
Gubbins	1816
*Hammer Steales, see Steales	1845
*Hard Faggots	1771
*Hart (Heart) Lath	1773
*Headrings, see Etherins ….	?1801
Hedgewood	1810
*Hethings, see Etherins	1845
*Hold (Old) Laps	1841
Hoop, Ash (for barrels?)	1839
Hoop, Hazle	1810
*Hoppoles (Hop Poles)	1801
*Hop-poles, Ash	1836
*Hoppoules, Hop Pols	1764
*Kidnybane (Sticks) see next	1845
*Kidneybane stix	1845
Kidbands, Kidbonds	1809
*Kids	1700
*Kill Rods	1799
Ladder Poles	1799
*Lap(p)s	1843
*Laths	1849
Leases	1841
m Loads	1645
Long Burche, Long Oke	1773
*Lops (and Logs?)	1806
Lot of Hazel, Lot of Oziers	1845
*Luggs	1776
Maiden Oak	1760
*New Cordwood, see Old	1849
Oke Buttins, see Buttins, Oke	1800
*Old Cordwood, see New	1849
*Pales	1805
*Peasticks	1845
*Peel Poules, see Poles, Peel	1765
*Peel(e)d Whitturnes	1765
*Pit(t) Wood	1806
*Poles, Ash	1884
*Poles, Birch	1884
*Poles, Drier	1848
*Poles, Hazel	1884
*Poses, see next	1832
*Pofsis, Possis, see next	1768
*Post(e)s, see Fencing	1423
*Poles, Scaffold	1802
Poles, Scotched	1949
*Post, Oake	1843
*Poules see Poles	1767
*Poules, Ash	1843
Poules, Peel,peeled/for peeling	1765
*Poules, Salley	1843
*Poules, Wittern	1770
*Poules, Yarn	1839
*Props, Mapul	1845
Pumpe Trees	1841
*Quarter, Quartering	1848
*Rafftons, Rafter Poules	1549
*Railes	1814
Rail Poules	1772
*Rakestales	1804
*Rids, Whittard	1699
*Rods	1390
*Rods, Whitturne	1810
Roule, Timber for a	1835
*Rownds	1832
*Sap(p)(h) Lath	1770
*Scaffold Poles, see Poles …	1802
*Scantling	1848
*Scotched Poles, see Poles …	1949
m Shidewood	1764
*Shovel Steales, see Steales	1845
Smallwood, Small Wood	1773
*Steales (Tool Handles)	1845
Stakewood	1807
*Steaks (Stakes)	1845
*Sticks, Furnace	1892
*Stiks	1836
*Stix	1839
*Stoakes (Stakes?)	1839
Stone (sandstone bedrock)	1700
Stub(b) Wood	1773
Stuff	1843
*Tenyearwood	1700
*Thatching Stuff/Twig(g)s	1809
*Thatchin Lug(g)s	1773
*Thathin (Thatching)	1849
*Threes, see next	1771
*Three Sticks	1780
Timber	1765
Timber Birch	1884
Top Timber	1768
Tops, Oke	1810
*Touchwood	1840
Triple Grown, see Black Poles	1840
Trunk	1805
Twernes	1737
*Twig(g)s	1809
Underwood	1415
Whattlin	1810
*Whittard, Whyttardes	1567
*Whittard Poles	1699
*Whittard Rids	1699
*Whit(t)(e)(u)(i)rn(e);	1770
Whittern Underwood	1860
*Windens, Windins	1565
Wood	1433
Yard Wood (wood a yard long)	1780
*Yarn Poles	1839

A Record of Poles Produced from Shrawley Wood

Hugh Milner

All references to coppice poles have been extracted from the Glossary particularly to understand the local trade in hop poles. Whitturnes were lime and Black Poles were oak but it is believed Whittards were oak. If the 17-year coppice rotation was maintained this will be the age of all the poles except oak Black Poles grown on a double coppice cycle of 34 years or a triple cycle of 51 years, which would yield timber. Alder (oler), ash, hazel, larch, wych elm (wicheasle) and willow (salley) poles are also recorded. The main market was as Hop Poles but small amounts went as Drier Poles, Ladder Poles, Scaffold Poles and Yarn poles.
Please refer to the Glossary pp, 153-166 to understand the many rare or obsolete words discovered in the Wood Books. All entries in italics are exact transcriptions from the original. All comments are in parentheses.

Date	Transaction	Product		£ - s - d
1567		*Whyttardes*	(are mentioned)	
1699		*Whittard Poles*		*16 - 0 - 0*
		Whittard Rids	(are mentioned)	
1700	*Each bind*	*5000 faggots & Whiterney @ ~~4s 4d~~*	(deleted)	*108 - 16 - 0*
January ye 20 1764	*In The Ledy Well Bind Payd Tho^{s} Jones for*	*24 dayes falling hoppoules + 'Shidwood' and faggotwood*		*1 - 4 - 0*
24/ 3/1770	*Payd the woodmen for*	*falling the faggot wood, hoppoules & Shidewood*		*6 - 17 - 6*
25/ 5/1770	*Payd the woodmen for*	*falling the Timber and the Saplins, the oake hoppoules and cutting craps & poules*		*1 - 10 - 0*
1770	*Rcd of Mr Wever for*	*700 hoppouls*		*2 - 9 - 0*
	Mr Croldual for	*poules and Shidewood*		*3 - 10 - 0*
	Mr Beach for	*300 poules*		*1 - 1 - 0*
	Mr Hatton for	*1000 poules of 7^{s}*		*3 - 10 - 0*
		100 poules of 5^{s}		*0 - 5 - 0*
	Mr Bandfor for	*200 & a halef* (250) *of Whiturnes*		*1 - 5 - 0*
		100 of oler	(poles?)	*0 - 7 - 0*
	Received of M^{r}. Matoxford	*300 and a half of Whiturens*		*1 - 15 - 0*
13/ 1/1773	*Pd Edw Smith and son John for*	*56 days fallin hoppoules, Shidewood and faggotwood*		*2 - 16 - 0*
		cutting out the poules		*0 - 9 - 0*
		falling and peellin 600 olar poules		*0 - 7 - 0*
1774	*Rec^{d}. of M^{r}. Jones for ...*	*100 of Whitturnes Rytters*	(Rytters are Ridders, which is lop & top, not poles)	*1 - 13 - 4*
1778	*Rec^{d}. of Rich^{d}. Lane for*	*100 & halfe of Ballards Whitturnes*	(Ballard is bald, thus peeled)	*0 - 13 - 0*
1779	*Rec^{d} of M^{r} Green for*	*900 Ballard Whitturnes,*		*4 - 0 - 0*
1780	*Delivered out of Jonsons Grove. Mr Leregoe*	*1100 of 8ſ poules 4 - 8 - 0 1000 6^{s}0^{d} 3 - 0 - 0*		(7 - 8 - 0)
1781	*M^{r}. Farmer, For*	*25 Whitturns, Poles at 2^{d}. per Pole*		*0 - 4 - 2*
	M^{r}. Green; of Wribenalle, For	*600 of Whitturnes* (at) *10s,*		*3 - 0 - 0*
		200 and a halfe D^{o}. at 8s		*1 - 0 - 0*
1781	*M^{r}. Roberts For*	*500 &a halfe of 5ſ poles*	(5s per 100)	*1 - 7 - 6*
	M^{r}. Beach For	*600 & halfe of 6ſ poles*	(6s per 100)	*1 - 19 - 0*
	M^{r}. Powick For	*100 of 7ſ* (poles)	(7s per 100)	*0 - 7 - 0*
	Richard Norrise Esq^{r}. For	*1500 Salley Poles at 8ſ*	(8s per 100)	*6 - 0 - 0*
25/ 6/1781	*P^{d}. the Wood Men for*	*Falling & Peeling the Whitturnes*		*0 - 15 - 0*
1799	*Rec^{d} of M^{r} Green for*	*900 Ballard Whitturnes*		*4 - 0 - 0*
	M^{r} Houseman for	*10. Whitturn poles*		*2 - 6*
1800	*Received from Mr Squires for*	*2225 Hoppoles from Shapgrove @ 6/-*		*6 - 13 - 6*
		900 Hoppoles @ 9/-		*4 - 1 - 0*
1801	*To the Tealing of last years wood To (Tealing is counting/checking)*	*46,700 of Hoppoules at 6^{d} per Thou^{d}.*		*1 - 3 - 3*
		2500 & $^{1}/_{2}$ of Whitturnes		*0 - 1 - 3*
		1500 & $^{1}/_{2}$ of Shidewood		*0 - 0 - 9*
	Paid for woodworke			*52 - 13 - 8*
	M^{r}. Green of Wribbenhall for	*2500 & $^{1}/_{2}$ of Whitturnes @10s p hd.*		*12 - 15 - 0*
1802	*Paid to fell & prepare*	*5500 Hoppoles @ 8d a H^{d}*		*1 - 16 - 8*
		4575 Hoppoles @ 7d a H^{d}		*1 - 6 - 8*
		4450 (hop) poles @ 7d a H^{d}		*1 - 5 -11$^{1}/_{2}$*
		1$^{1}/_{2}$ day cutting out Oke poles		*0 - 2 - 6*
		6 day felling Whitturnes & peelin etc.		*0 - 10 - 0*
	Pd Tho Jones for falling etc	*3675* (hop) *poles @ 7d a H^{d}*		*1 - 11 - 1$^{1}/_{2}$*
	In shares with Wm Holloway & Philip Jones	*7000* (hop) *poles @ 8d a H^{d}*		*2 - 6 - 8*
	Tho^{s} Smith for	*30 Scaffold poles @ 1ſ*		*1 -(1)0 - 0*
1806	*P^{d}. Phillip, Thos, W^{m} Jones & son for*	*Fallin and peelin Whitturnes*		*0 - 12 - 0*
	M^{r}. Shinton for	*a Lot of Whittrn Tops*		*0 - 7 - 6*
2/ 4/1807	*Paid to fell & prepare*	*2600 Hoppoles @ 6d a H^{d}*		*0 - 13 - 0*
		200 Hazlepoles		*(0 - 0 -)3*
		4800$^{3}/_{4}$ Hoppoles @ 6d a H^{d}		*1 - 4 - 4$^{1}/_{2}$*
		400$^{1}/_{4}$ Hazle poles @ 6d		*0 - 2 - 1½*
		2675 Hoppoles		*0 - 13 - 4$^{1}/_{2}$*
		100 Large poles	(Black Poles?)	*0 - 0 - 6*

		75 Hazle poles	*0 - 0 - 4½*
12/ 4/1807	*Paid to fell, prepare & extract to road*	*Hazle poles*	*0 - 16 - 0*
1807		*124. foot of black poles @ 2d per foot* (124Hft = 4.47m³)	*1 - 0 - 8*
	Received from Mrs Brazier for	*650 Oke poles @ 12/- a Hd*	*3 - 18 - 0*
	Mr Wm Bourne for	*500 Longe Oke @ 10/- a Hd* (Black Poles?)	*2 - 10 - 0*
		22 foot of Black poles @ 1/6 a foot	*1 - 13 - 0*
		3950 Hoppoles @ 7/- a Hd	*13 - 16 - 6*
		450 Hoppoles @ 11/- a Hd (King Poles?)	*2 - 9 - 6*
	Mr Degery, Dudley for	*1300 Hazle poles @ 10/6 a Hd*	*6 - 16 - 6*
		1500 Salley poles @ 22/- a Hd	*16 - 10 – 0*
		(Pricey because they will take root like setts?)	
8th Augs 1814	*To Halling*	*500 & ¾ of Ash poles @ 3 ∫ per hd*	*0 - 15 - 9*
7/ 4/1817	*7th. April Paid Jno.Thomas for Falling*	*24 Runnal Whitturns @ 1s 6p Tree*	*1 - 16 - 0*
1832		*2800 Wittern Faggits*	*9 - 16 - 0*
1832	*Wm Jones Acount of underwood falling cutting*	*600 Hoppouls at 8(d* per 100)	*0 - 4 - 0*
	Thos Jones Acount of underwood falling cutting	*625 Hoppouls at 8(d* per 100)	*0 - 4 - 2*
		925 Hoppouls at 8(d per 100)	*0 - 6 - 2*
		13 Ash pouls at 1sd (a miscalculation)	*0 - 0 - 1½*
	Wm Greaves	*4 Wittern pouls*	*0 - 4 - 0*
	Mr Cad Perry	*75 Ash pouls* (3.36d each, error?)	*1 - 1 - 0*
1835	*Wm Jones*	*1000 Hopstix*	
		5775 Hoppouls	
	Mrs Sarah Powick	*100 Hoppouls*	*0 - 10 - 0*
	Mr T Housman	*1500 of Hoppouls*	*7 - 10 - 0*
	Mr E Crean Astley*	*1200 Hoppouls*	*6 - 0 - 0*
	Mr T Crean Areley Kings	*600 Hoppouls*	*3 - 0 - 0*
	Mrs Rogers Rock	*300 Hoppouls*	*1 - 10 - 0*
	Mr J Bucksell	*300 Hoppouls*	*1 - 10 - 0*
	Mr E Perry Bewdley	*140 Whittern pouls*	*1 - 3 - 0*
	Mrs E Powick Holt	*1000 Hoppouls*	*5 - 0 - 0*
	Mr T Spragg Hartelbury	*882 Ash pouls*	*15 - 10 - 6*
	Mr T Cook Hartelbury	*2 Latherpoals* (ash ladder poles)	
	Mr T Tombs Holt	*2 Latherpols*	
	Mr H Cream Astley*	*2 Latherpols*	
	Mr T Watton Redston	*2 Latherpols*	
	Mr T Smith	*2 Latherpols*	
	Mr T Pickernell	*4 Latherpols*	
	for young Ground	*500 of Hoppouls*	*1 - 0 - 0*
1835	*Mr John Rice Stourport*	*52 Cords of Wittern Wood*	*208 - 0 - 0*
1836	*Mr H Crane* Astley*	*6 Ladderpouls*	*- 6 -*
	Mr Lett Shrawley	*2 Ladderpouls*	*- 2 -*
	Mr J Bucknell Shrawley	*25 Ash & Wicheasle poals* (wych elm)	*- 7 - 6*
	Mrs Spragg Hartelbury	*750 Ash pouls @ 3£ a 100* (Wrong, £22-10-0)	*11 - 5 - 0*
	John Wright Stourport	*100 of Yarn pouls* for Kidderminster carpet trade?)	*1 - 0 - 0*
1842	*Mr Wright*	*120 Wittern pouls*	*1 - 0 - 0*
	Mr John Houseman	*50 Hoppouls*	*- 5 - 0*
1840		Wittan (mentioned by Kenrick Watson)	
1844		*12 Blackpoles 59ft* (59Hft = 2.127m³ @ 0.18m³)	
1845	*Thos Wasband*	*1 Larch Pole* (first planted in 1801)	*3 - 6*
1848		*21 oake b(l)ackpoles* (113Hft = 4.074 m³ @ 0.23m³)	
		16 Whitturne poles	
1848	*Benm. Duggin*	*12 Blackpols 31feet @ 1s/4d*	*2 - 1 - 4*
	John Footeman	*1 Blackpol*	*0 - 2 - 1*
	Richard Jones	*2 Blackpols*	*0 - 11 - 0*
	Thos Wasband	*5 Blackpols 8feet @ 1s/*	*0 - 8 - 0*
		9 Oak pols	*0 - 4 - 0*
	Mr Humphris	*48 Linetree pols* (lime)	*2 - 0 - 0*
	Thos Greaves	*13 Ash pols*	*0 - 10 - 0*
		1 Blackpol 10feet at 20d a foot	*0 - 16 - 8*
	Mr Lewes	*3 Blackpols 9feet at 1s/4*	*0 - 12 - 0*
		1 Par Ladder pols	*0 - 4 - 0*
	Mr J Rogers Stourport	*50 Drier pols* (for Kidderminster carpet trade?)	*1 - 5 - 0*
	John Wormington and Mr Rogers	*12 Pols at 3d*	*0 - 3 - 0*
		3 pare Ladder pols	*0 - 3 - 0*
1863		*Whitturne Underwood* (is mentioned)	
1889		*Witton* (is mentioned)	
17/11/1892	*E Powick cutting Wittern Createwood*	*4 cord @ 6s*	*1 - 4 - 0*

Topography, Hydrology, Geology and Soils

Roger Clooney

Shrawley Wood is situated on the western bank of the River Severn; approximately five miles south of Stourport-on-Severn, in the county of Worcestershire. The wood lies on an outcrop of Helsby Sandstone which rises from 16m above mean sea level to a maximum elevation of 74 m as shown on Ordnance Survey (OS) 1:25,000 map sheet SO86.

The eastern boundary of the wood slopes abruptly from a plateau elevation of 50-60m to below 20m on the River Severn flood plain in a distance of around 80m. The national grid coordinates for the approximate center of the wood are SO809661. The meadows on its eastern margin are subject to flooding.

Dick Brook flows to the Severn along the north of the wood and Shrawley Brook to the south. Dick Brook originates from near Birch Hill, several miles to the northwest and Shrawley Brook flows over a mile to the south; neither influences the wood apart from collecting runoff.

Two small streams flow from the west into the wood ultimately reaching the New Pool; an artificial lake formed by damming a pair of valleys. Frogpool appears to originate on the geological fault running through SO801658. This fault "connects" the Helsby Sandstone to the Upper Mottled Mudstone. The Frogpool stream flows east through a valley and has been dammed at several locations over the years see chapter on Pools (pp. 104-8). The other stream flowing into the New Pool flows from the south. It rises at The Bartlands (SO800651); a system of springs and swamp appearing on the junction between the Helsby Sandstone and the Sidmouth Mudstone.

There appear to be several other artificial hollows in the wood which may be evidence of either watering holes or of pools for processing woodland products; lime bark retting has been suggested.

The LiDAR survey image shows many drainage valleys although not all of these are reflected in the 5m contour interval of the OS map and many of these were probably deepened when used for timber extraction.

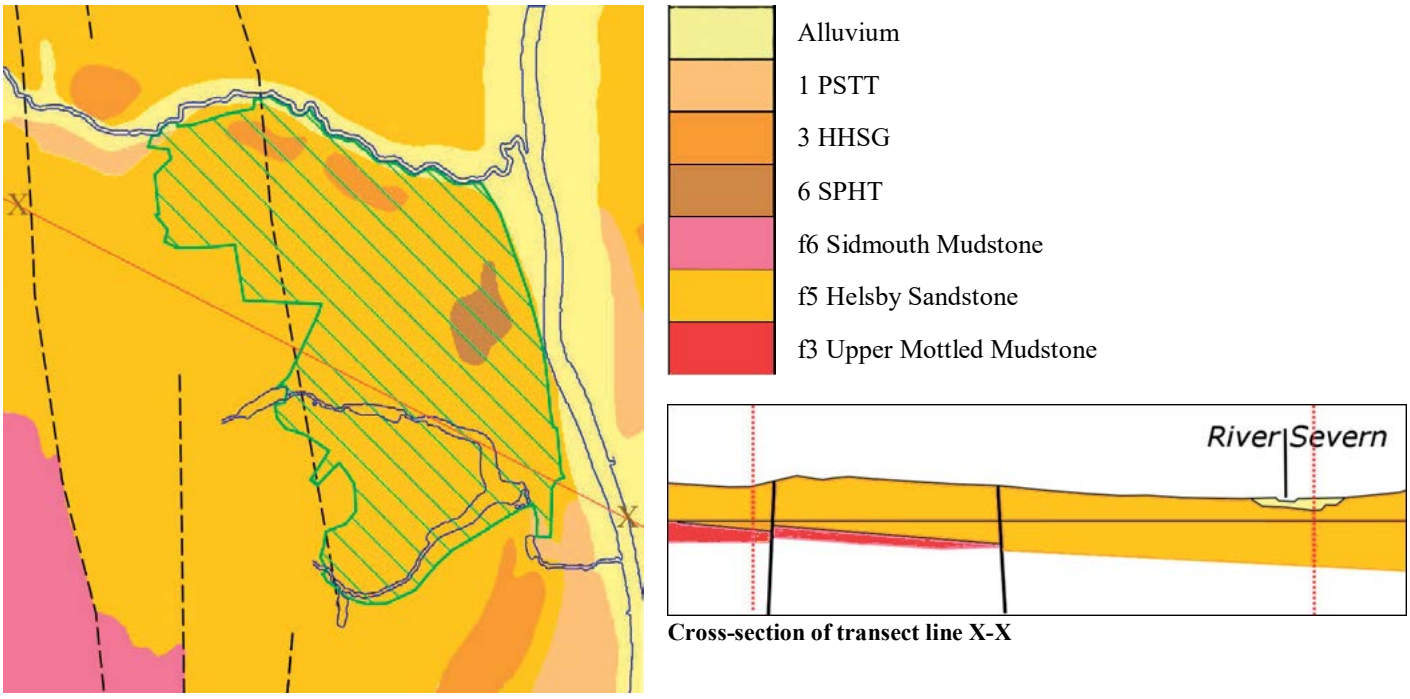
GEOLOGY

Until recently the Geology of the Shrawley area was defined by the British Geological Survey (BGS) map Sheet 182 (geological reference 1) and the accompanying monograph (geological reference 2). There have been some fundamental revisions to the Keuper "formations" and these are presented on the BGS website.

The wood sits on Helsby Sandstone with several areas of pleistocene glacial drift. The sandstone is covered by Alluvium in the river valleys. There are some changes to the south west with Sidmouth Mudstone being exposed but this does not directly influence the wood. The Helsby Sandstone and Sidmouth Mudstones were formed in the Triassic. The Helsby Sandstone is part of the Sherwood Sandstone group (geological reference 3) and the Sidmouth Mudstone part of the Mercia Mudstone group (geological reference 4).

The pleistocene glacial drift deposits are currently classified under the Severn Valley Formation. This consists of six terraces (Spring Hill, Bushley Green, Kidderminster Station, Holt Heath, Worcester and Power House). Three of these terraces occur in the Shrawley Wood area (shown as 1, 3 and 6 in the drift deposits on BGS map sheet 182). The data on the geological formations; presented on the BGS website, are shown in the tables.

The geology of the Shrawley area is outlined in 01. Gillespie (geological reference 5) gives a useful local view of the wood's geology although his geological classification is outdated. He makes one important observation that the Holt Heath drift deposits are more extensive in the extreme southeast corner of the wood than is indicated on the BGS map.



Cross-section of transect line X-X

01. Solid and Drift Geology of Shrawley Wood.

The position of Shrawley Wood is indicated by hatched green lines.

f3 Upper Mottled Mudstone

Status Code:	Pending Upgrade
Age range:	Wenlock Epoch (SW) — Wenlock Epoch (SW)
Lithological Description:	Calcareous siltstone, dark grey to black mudstone and irregular mottled mudstone. Shelly fauna. Massively bedded.
Definition of Lower Boundary:	Contrasts with the ribbon-banded silty mudstones of the Nantglyn Flags.
Definition of Upper Boundary:	Contrasts with the ribbon-banded silty mudstones of the Nantglyn Flags.
Thickness:	12 - 64m
Geographical Limits:	Not defined.
Parent Unit:	Nantglyn Flags Formation (NGF)
Previous Name(s):	Mottled Mudstones (-2294)

f5 Helsby Sandstone (Keuper Lower Sandstone) See geological reference 1 solid and drift geology map and key.

Age range:	Early Triassic Epoch (TE) - Anisian Age (TA)
Lithological Description:	Fine- to medium-grained, locally micaceous, cross-bedded and flat-bedded sandstones, weathering to sand near surface. Sandstones are of fluvial (sub-angular to sub-rounded grains) and aeolian (well-rounded grains) facies. Pebbles may be common, particularly near the base of the formation, and thin units of hard intraformational conglomerate occur in the south-west. Thin lenticular beds of reddish brown siltstone and mudstone occur and may be common in fining-upward sequences; calcretes and rhizocretions occur at some horizons in the south-west (Purvis and Wright, 1991; Hounslow and McIntosh, 2003; Newell, 2006).
Thickness:	It is locally absent in areas that were contemporary high ground such as Charnwood Forest, Breedon Hill and Mountsorrel, and possibly the Lickey Hills. The formation is thinnest in the Warwickshire, Derbyshire and north Staffordshire areas. The thickest known development (up to 500m) is in the Worcester Basin. It thins northwards to around 250m in the Cheshire - Lancashire area and is 90 to over 176m thick in Cumbria. The maximum known thickness there is 176.42m in the Sellafield 13B borehole where the top was not proved.
Geographical Limits:	The formation crops out almost continuously from the south Devon coast, northwards, to near Taunton, Somerset. There is one outcrop in north-west Gloucestershire around Newent, and extensive outcrops in north Worcestershire and in Staffordshire, up to near Stoke-on-Trent. There is continuous outcrop from Warwick to Nuneaton with outcrops elsewhere in Warwickshire and extensive but broken outcrops in south Derbyshire and north-west Leicestershire, including the north side of Charnwood Forest. Further fragmentary outcrops occur in Cheshire and south-west of Manchester, with more continuous outcrops around Merseyside and in southern Lancashire. The formation crops out very locally on the Cumbrian coast and more extensively in the Eden valley.
Parent Unit:	Sherwood Sandstone Group (SSG)
Previous Name(s)	Bromsgrove Sandstone Formation [Obsolete Name And Code: Use HEY] (BMS) Kirklinton Sandstone Formation [Obsolete Name And Code: Use HEY] (KIS) Bearstone Sandstones [Obsolete Name And Code: Use HEY] (BSS) Basement Beds (-3812) Building Stones (-5112) Bulkeley Hill Sandstone Formation [Obsolete Name And Code Use: HEY] (BHSF) Burcot Breccia (-5132) Grinshill Sandstone [Obsolete Name And Code Use: HEY] (GHSA) Keuper Sandstone Formation (-5133) Keuper Sandstone, Lower (-709) Otter Sandstone (-437) Otter Sandstones (-3599) Ruyton Sandstone (-5134) Upper Sandstone (-3792) Waterstones Group (-3089) Waterstones* (-5135) Helsby Sandstone Formation [Obsolete Code: Use HEY] (HBSF)
References	Purvis, K. and Wright, V P, 1991 Calcretes related to phreatophytic vegetation from the Middle Triassic Otter Sandstone of SW England, *Sedimentology*, Vol 38, 539-551.
	Hounslow. M W, and McIntosh. G. 2003, Magnetostratigraphy of Sherwood Sandstone Group; Lower and Middle Triassic, south Devon, UK; detailed correlation of the marine and nonmarine Anisian, *Palaeogeography, Palaeoclimatology, Palaeoecology*, Volume 193, 325-348.
	Newell. A J, 2006. Calcrete as a source of heterogeneity in Triassic fluvial sandstone aquifers; Otter Sandstone Formation, SW England, *Geological Society of London Special Publication*, No. 263, 119-127.

f6 Sidmouth Mudstone (Keuper Marl) See geological reference 1 solid and drift geology map and key.

Age range:	Olenekian Age (TO) — Carnian Age (TC)
Lithological Description:	Lithological Description: The formation consists of dominantly mudstone and siltstone, red-brown with common grey-green reduction patches and spots. The mudstones are mostly structureless, with a blocky weathering habit, but intervals up to 15m thick of interlaminated mudstone and siltstone occur within parts of the formation, notably in the Bollin and Byley Mudstone members of the Cheshire Basin (Wilson, 1993) and in the Radcliffe Member of the East Midlands (Charsley et al., 1990). Heterolithic units consisting of several thin beds of grey-green dolomitic siltstone and very fine-grained sandstone, interbedded with mudstone, occur at intervals throughout the formation. These units range from a few centimetres up to 4m thick, and locally form mappable cuesta features. Named examples include the Cotgrave Sandstone Member and Clarborough Member of the East Midlands (Charsley et al., 1990; Smith et al., 1973; Warrington et al., 1980) and the Weatheroak Sandstone Member of the Redditch area (Old et al., 1991). Units of halite up to 400m thick are present at several stratigraphical levels in the thicker basinal sequences of the East Irish Sea, Cheshire, Staffordshire, Cleveland, Worcestershire, Somerset and Dorset, though are most prevalent towards the top. Breccias produced by contemporaneous dissolution of salt are common throughout the formation. In Cheshire, more recent salt dissolution (some induced artificially by brine pumping activities) gives rise to dissolution hollows and collapse breccias associated with the halite members. Gypsum/anhydrite also occurs throughout the formation as nodules and veins.
Thickness:	165m at the type section (Gallois, 2001). Elsewhere, it ranges from 120-130m in the East Midlands, to 1600m in the Cheshire Basin.
Geographical Limits:	The surface outcrop extends from the South Devon coast east of Sidmouth northwards into Somerset, Avon, Worcestershire, Warwickshire, Leicestershire, Nottinghamshire and North Yorkshire; and westwards into Derbyshire, Staffordshire, Cheshire and Lancashire. The formation occurs in the subsurface below much of southern England, the south Midlands and eastern England. Equivalents occur below the southern North Sea and eastern Irish Sea.
Parent Unit:	Mercia Mudstone Group (MMG)
Previous Name(s):	Lower Keuper Marl (-1702) Mudstone I (-529) Lower Keuper Marl(s) (-1822) Eldersfield Mudstone Formation [Obsolete Name And Code: Use SIM] (ELM) Sub-Arden Keuper Marls (-3677)
References	Wilson, A A. 1993 The Mercia Mudstone Group; Trias, of the Cheshire Basin. *Proceedings of the Yorkshire Geological Society*, Volume 49, 171-188.
.	Charsley, T J, Rathbone, P A, and Lowe, D J. 1990 Nottingham: a geological background for planning and development. *British Geological Survey Technical Report*, WA/90/1
	Smith, E G, Rhys, G H, and Goossens, R F. 1973. Geology of the country around East Retford, Worksop and Gainsborough. *Memoir of the Geological Survey of Great Britain*, Sheet 101; England and Wales.
	Warrington, G, and Scrivener, R C. 1980. The Lyme Regis; 1901, Borehole succession and its relationship to the Triassic sequence of the east Devon coast. *Proceedings of the Ussher Society*, Volume 5, 24-32.
	Old, R A, Hamblin, R J O, Ambrose, K, and Warrington, G. 1991. Geology of the country around Redditch. *Memoir of the British Geological Survey*, Sheet 183; England and Wales
	Gallois, R W. 2001. The lithostratigraphy of the Mercia Mudstone Group; mid to late Triassic, of the south Devon coast, *Geoscience in south-west England*, Vol. 10, 195-204.

Glacial Drift

Sand and Gravel. Superficial Deposits formed up to two million years ago in the Quaternary Period when the local environment previously dominated by rivers.

Setting: rivers. These rocks were formed from rivers depositing mainly sand and gravel detritus material in channels to form river terrace deposits, with fine silt and clay from overbank floods forming floodplain alluvium, and some bogs depositing peat; includes estuarine and coastal plain deposits mapped as alluvium.

Map Ref 1 Power House Terrace Deposits (PSTT). See geological reference 1 solid and drift geology map and key.

Age range:	Holocene Epoch (QH) — Holocene Epoch (QH)
Lithological Description:	Normally soft to firm consolidated, compressible silty clay, but can contain layers of silt, sand, peat and basal gravel. A stronger, desiccated surface zone may be present.
Thickness:	none recorded or not applicable.
Geographical Limits:	none recorded or not applicable
Parent Unit:	Fluvial Deposits (FLUV)
Previous Name(s)	none recorded or not applicabl)

Map Ref 3 Holt Heath Sand and Gravel Member (HHSG). See geological reference 1 solid and drift geology map and key.

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Age range:	Wolstonian Stage (QO) — Wolstonian Stage (QO)
Lithological Description:	Gravel overlain by sand; a high proportion of the gravel includes exotic clasts from Scotland, Lake District and Malvern Hills; third terrace of the River Severn, also known as the 'Main Terrace'; part of the Severn Valley Formation.
Thickness:	none recorded or not applicable.
Geographical Limits:	none recorded or not applicable
Parent Unit:	Severn Valley Formation (SEVN)
Previous Name(s)	HOLT HEATH SAND AND GRAVEL (HOHE) HOLT HEATH MEMBER (HHTD)

Map Ref 6 Spring Hill Sand And Gravel Member (SPHT). See geological reference 1 solid and drift geology map and key.

Age range:	Anglian Stage (QA) — Anglian Stage (QA)
Lithological Description:	Predominantly cold phase sands and gravels that underlie the Severn Sixth Terrace of BGS Maps (Sheets 199, 216 and ?234). Dominated by clasts of "Bunter" quartz/quartzite lithologies with subordinate flint (c 20% below Avon confluence), with an argillaceous sandy matrix.
Thickness:	Up to 7m.
Geographical Limits:	Recognised from near Holt Heath (between Stourport and Worcester, Sheet 182) downstream. Currently mapped by BGS only on Sheets 182, 199 and 216. Possibly also present both farther downstream (Sheet 234) and farther upstream (Sheet 167) and also in the lowermost part of the Warwickshire Avon. (Sheet 200).
Parent Unit:	Severn Valley Formation (SEVN)
Previous Name(s)	Spring Hill terrace deposits (River Severn) (SPHT) Sixth terrace [deposits] Spring hill terrace Sixth terrace (River Severn) Bushley Green terrace (upper part). Spring Hill member Spring Hill terrace deposits (SPHT)

Geological references

1. British Geological Survey 50,000 map sheet 182; *Droitwich; Solid and Drift*; 1976.
2. Mitchell, G. H., Pocock, R. W., & Taylor, J. H. 1961 Geology of the Country around Droitwich, Abberly and Kidderminster; explanation of sheet 182, *Memoirs of the Geological Society* GB; HMSO.
3. Ambrose, K., Hough, E., Smith, N. J. P., & Warrington, G. 2014; Geology and Regional Geophysics Directorate Research Report; RR/14/01.
4. Howard, A. S., Warrington, G, Ambrose, K, & Rees, J. G. 2008; BGS Research Report; RR/08/04.
5. Gillespie, R. R. 2008; H&WEHT Report 100_3002; Olivers Mound Geology.

SOILS

The soils of the Shrawley area are defined by the Worcester Soils map (Soils reference 1)

The wood is located on soils of the Bromsgrove series with small intrusions of soils of the Newport and Quorndon series in the south east. The river valleys have deposits of the Clwyd series. The Bromsgrove series is replaced by soils of the Hodnet series to the south west; well outside the wood.

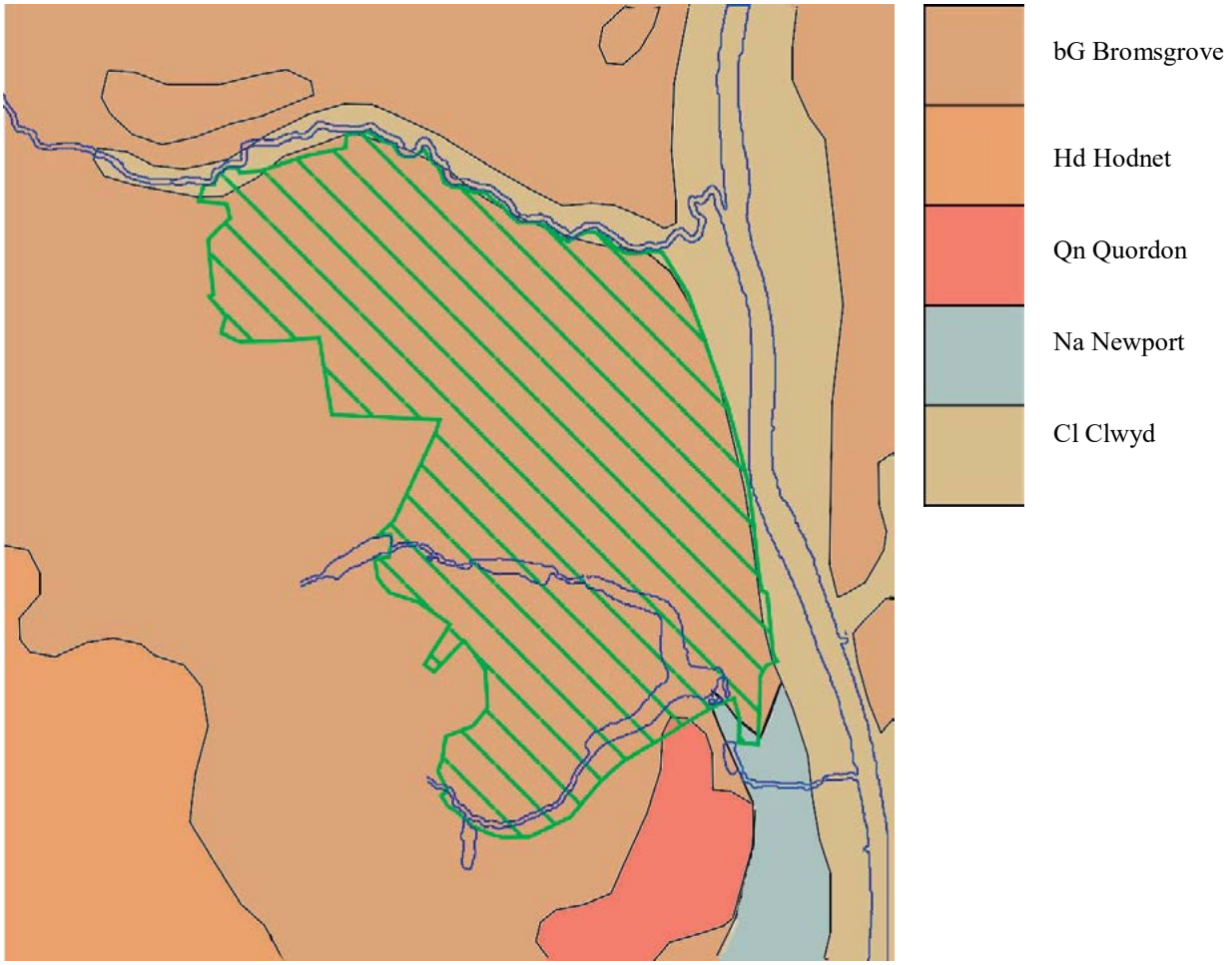
The Bromsgrove series are non-alluvial non calcareous loam.
The Newport series are non-calcareous brown sand.
The Clwyd series are non-calcareous loamy or clayey alluvium.
The Quordon series are non-alluvial loamy or clayey soils which can exhibit seasonal water-logging.

The data on these soils; presented on the Cranfield website (Soils reference 2), are shown in the following tables.

The distribution of the soils of the Shrawley area are presented in 02.

There are some useful observations on the Shrawley soils made by G E Simmons in Soils reference 3. He records the digging of several soil pits to a depth of between four and six feet. From these a pH range of between 4.5 and 8.5 was measured along with the identification of a calcarious layer at a depth of four feet.

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02. Soil map of Shrawley Wood

bG 0541 Bromsgrove. See 02 Soil map of Shrawley Wood.

Major soil group:	05 brown soils	With dominantly brownish or reddish subsoils and no prominent mottling or greyish colours (gleying) above 40 cm depth. They are developed mainly on permeable materials at elevations below about 300 m.0.D. Most are in agricultural use.
Soil Group:	4 brown earths	Non-alluvial, with non-calcareous loamy or clayey subsoils without significant clay enrichment.
Soil Subgroup:	1 typical brown earths	(unmottled)
Soil Series:		reddish light loamy material passing to sand or soft sandstone

Hd 0572 Hodnet. See 02 Soil map of Shrawley Wood.

Major soil group:	05 brown soils	With dominantly brownish or reddish subsoils and no prominent mottling or greyish colours (gleying) above 40 cm depth. They are developed mainly on permeable materials at elevations below about 300 m.0.D. Most are in agricultural use.
Soil Group:	7 argillic brown earths	Loamy or clayey with an ordinary clay-enriched subsoil.
Soil Subgroup:	2 stagnogleyic argillic brown earths	(faintly mottled with slowly permeable subsoil)
Soil Series:		reddish medium loamy material passing to soft siltstone and sandstone

Na 0551 Newport. See 02 Soil map of Shrawley Wood.

Major soil group:	05 brown soils	With dominantly brownish or reddish subsoils and no prominent mottling or greyish colours (gleying) above 40 cm depth. They are developed mainly on permeable materials at elevations below about 300 m.0.D. Most are in agricultural use.
Soil Group:	5 brown sands	Non-calcareous sandy or sandy gravelly.
Soil Subgroup:	1 typical brown sands	(unmottled with no clay-enriched subsoil)
Soil Series:		sandy drift with siliceous stones

Cl 0562 Clwyd. See 02 Soil map of Shrawley Wood.

Major soil group:	05 brown soils	With dominantly brownish or reddish subsoils and no prominent mottling or greyish colours (gleying) above 40 cm depth. They are developed mainly on permeable materials at elevations below about 300 m.0.D. Most are in agricultural use.
Soil Group:	6 brown alluvial soils	In non-calcareous loamy or clayey alluvium more than 30 cm thick.
Soil Subgroup:	2 gleyic brown alluvial soils	(faintly mottled with permeable subsoil)
Soil Series:		medium silty river alluvium

Qn 0831 Quordon. See 02 Soil map of Shrawley Wood.

Major soil group:	08 ground-water gley soils	Seasonally waterlogged soils affected by a shallow fluctuating groundwater-table. They are developed mainly within or over permeable material and have prominently mottled or greyish coloured horizons within 40 cm depth Most occupy low-lying or depressional sites
Soil Group:	3 cambic gley soils	Non-alluvial, loamy or clayey with a distinct topsoil and no clay-enriched subsoil.
Soil Subgroup:	1 typical cambic gley soils	(loamy with non-calcareous subsoil)
Soil Series:		light loamy drift with siliceous stones

Soils References

1. Beard, G R, Cope, D W, Jones, R J A, Palmer, R C, Whitfield, W A D. 1985. *Soils of the Worcester and the Malverns District*. Map 150.
2. Cranfield University. 2017. *The Soils Guide* –www.landis.org.uk. Cranfield University UK.
3. Simmons, G. E. 1970. The Changing Face of Shrawley Wood, Worcestershire. *Quarterly Journal of Forestry* 64:60-64.

LiDAR

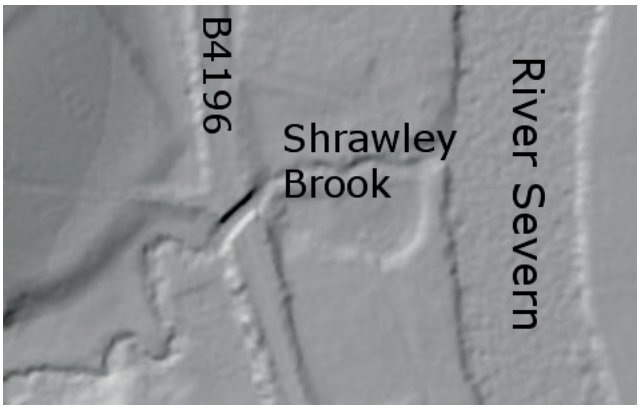
Richard Pumphrey

LiDAR (acronym for Light Detection and Ranging) provides accurate mapping and measurement of elevation both of the ground and structures above it. Applied to Shrawley Wood it maps the ground and measures the trees.

Technical summary

The data used in this chapter[1] were provided by the Environment Agency. They were obtained by flights over the wood on 12 December 2014 and 21 March 2020.

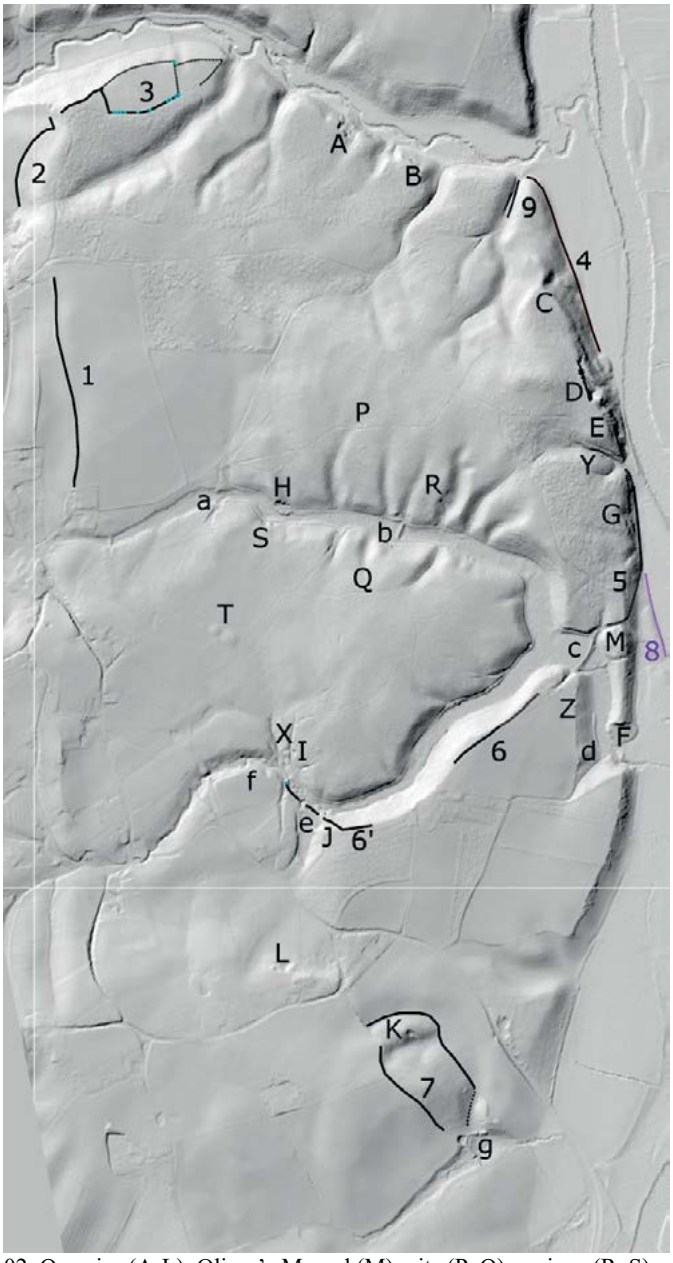
The method used involved measuring the distance from the LiDAR equipment to the ground by scanning the ground beneath the aircraft with pulses of infra-red laser beam and timing the arrival of reflected light back at the equipment. The raw data was first recorded as a "point cloud", a log of all the points "seen" by the laser beam, recorded as x- , y- and z- GPS coordinates and strength of signal. This vast set of information from the 2014 flight was simplified into one kilometre square tiles based on the Ordnance Survey grid, each tile having 1000x1000 measurements in a regular one metre grid.[a] Each measurement in this grid is the height above Ordnance Survey Datum in metres, said[2] to be accurate to within 15cm but recorded to the nearest centimetre. The Environment Agency provided two sets of heights for each tile: one, termed the digital terrain model (DTM), was computed from the lowest points in the point cloud closest to the grid point and the other, the digital surface model (DSM), from the highest points in the point cloud above the set threshold return signal strength. The algorithms used to derive the DTM and DSM matrix of heights from the point cloud have a great deal of work to do: points in the point cloud are scattered through space whereas the DTM and DSM are regular grids of measurements: in looking for the bare ground surface, the DTM removes signals from all the items it calculates are projections above ground level, such as trees and buildings. If it can't "see" the ground underneath them, it substitutes a surface where it reckons the ground level would be. This produces some unexpected effects, such as removing Doleham Bridge from the B4196 (01)



01. DTM has removed Doleham Bridge and substituted its guess at the surface of Shrawley Brook.

The DSM also may not show objects as one might hope. The sensitivity used for the cut-off in 2014 detected the tops of evergreen trees but not the mid-winter branches of the Small-leaved lime. The 2020 data included a "first return" DSM (frDSM) which was more sensitive to the deciduous winter canopy but nonetheless failed to see the thinnest twigs: thus attempts to measure the Small-leaved lime canopy height from the difference between frDSM and DTM heights yielded a consistently lower estimate of the canopy height than measurement by hypsometry (see p. 286 (A03)). The 2014 DSM is helpful in another way in that it shows where sub-canopy evergreen trees such as Holly, Yew and Laurel are and picks out those lime trees that have a dense growth of ivy. (See Trees Appendix (A02) p. 285)

These Digital Elevation Models (DEM, arrays of heights) can be imported into mapping applications such as QGIS allowing rendering of the DTM as contours or hill shading, or into MS Excel spreadsheets, allowing block sections of the terrain to be plotted.



02. Quarries (A-L), Oliver's Mound (M), pits (P, Q), springs (R, S), tumps (T), cuttings (X-Z), dams (a-g) and banks (1-9). For the pools resulting from these dams, see chapters Shrawley Pools p. 104 and Shotgrove p. 309.

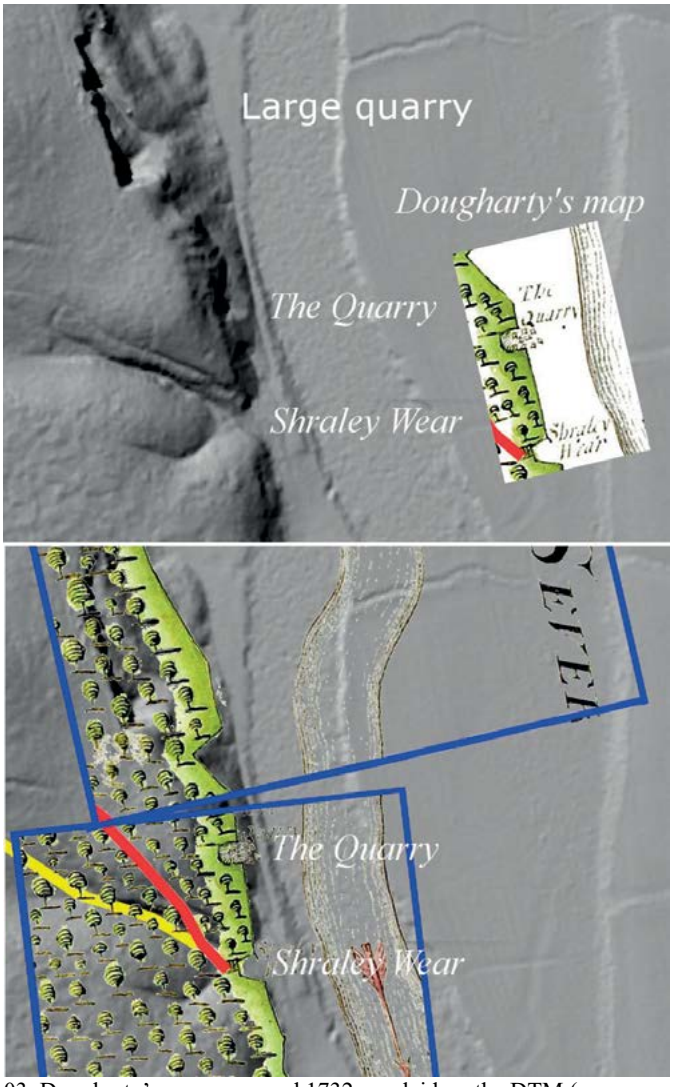
Quarries and excavations

Quarries of different ages are evident, mostly around the margins of the wood; the bedrock is Helsby sandstone[b] in all these quarries. Quarries (02:A) & (02:B) are on the northern escarpment above Dick Brook. The stone from these may have been used to make and repair the path along Dick Brook. (02:A) is close to Astley

a The 2020 data were processed in a similar way but packaged as GEOTIFF files representing 2000x2000 arrays.

b Previous reports on the Wood and Oliver's Mound used the term "Bromgrove Sandstone". The British Geological Society has replaced this term by "Helsby Sandstone": see chapter Geology p. 253.

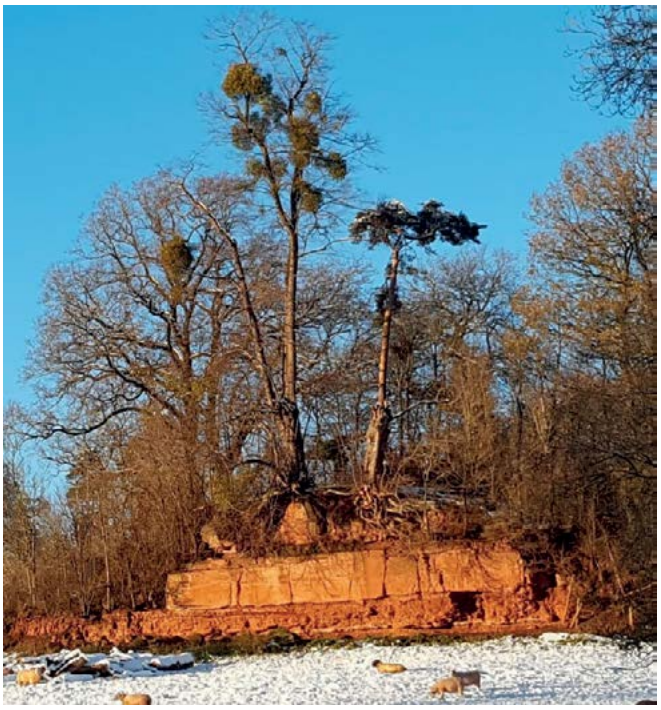
Forge/Mill and stone from there may have been used in building the Mill (although there is another quarry 300 metres to the northwest in Astley that equally may have been used for this); (02:B) is close to the lock on Dick Brook. Before they were quarried, there may have been prominent rock outcrops at these sites; in the 15th century one of the coppices comprising Shrawley Wood was called *The Roche* and I suggest it was centred around these rocks (See chapter Coppices & Binds p. 201). The feature at (02:C) is more likely a landslip than quarry because the volume of the spill is similar to the volume of the excavation, indicating little or no material has been taken off site. The biggest, (02:D), is described in more detail at the end of this chapter (p. 264); it was well placed for export of stone blocks up or down river. This is a relatively modern quarry, not shown on Dougharty's map surveyed 1732 but by 1883 it has already been abandoned and planted with trees. Sadly, we have not yet found any records of payments or sales relating to this quarry. Quarry (02:E) is older and shown on Dougharty's map (03).
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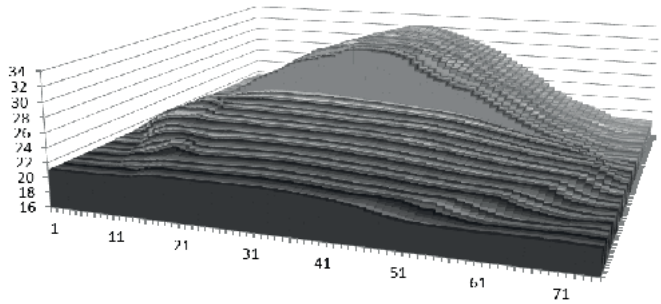


03. Dougharty's map surveyed 1732 overlaid on the DTM (see chapter Historical Maps p. 267). His quarry (02:E) is further south than and much smaller than (02:D)

The largest sandstone structure near this was Shrawley Castle, built on Oliver's Mound (02:M), but this predates (02:E) by more than five centuries. More probable sources for the castle were (02:G) or (02:F); the sandstone visible on the rock face (04a) suggests that this will have been a source of good building stone. The Block model of the DTM (04b) suggests that at least 50m^3 of stone could have been recovered for each of the last few metres cut from the face of (02:F); the flat ground in front of this suggests that the original sandstone ridge extended at least 30 metres beyond the current rock face. The volume extracted must therefore have been close to 1000m^3, at least sufficient for a large sandstone building such as is deduced from the excavations of the remains on Oliver's Mound (see chapter: Oliver's Mound p. 37). It is thought this castle was built in the late 12th Century. No sandstone blocks are left there now: presumably they were valuable as building materials and therefore harvested and recycled.

A farmhouse, barns and fold yard (tithes 49 & 50) were built on the floor of the quarry at the south end of Oliver's Mound (09), at one time home to John Bucknell and his family (see chapter 1764-1850 p. 259). The adjacent orchard was called *Curriers Orchard* and the surrounding area was called the Curriers Estate on a map of 1808. No information has been retrieved suggesting there was ever a connection with the leather industry here and seeing that the house and outbuildings were built in the quarry, the possibility that the name is a corruption of *Quarriers* might be considered. The farmhouse was safely raised from the surrounding flood plain; sandstone rubble and a few squared-off blocks were used to wall around this platform (04c), perhaps to clear the garden and consolidate the flood defences. This was interpreted by Deborah Overton as an outer bailey to the castle[3].


04a. Quarry (02:F) at the south end of Oliver's Mound. There are two tall European lime trees *Tilia x europea* with mistletoe *Viscum album* on top of the rockface (see chapter Trees of Shrawley Wood p. 278).



04b. Block DTM of the south end of Oliver's Mound (amended by removal of a DTM artefact that prevented the rock face being represented as a vertical surface). In this and all other block DTM in this chapter, the numbers are metres; vertical scale is above Ordnance Datum

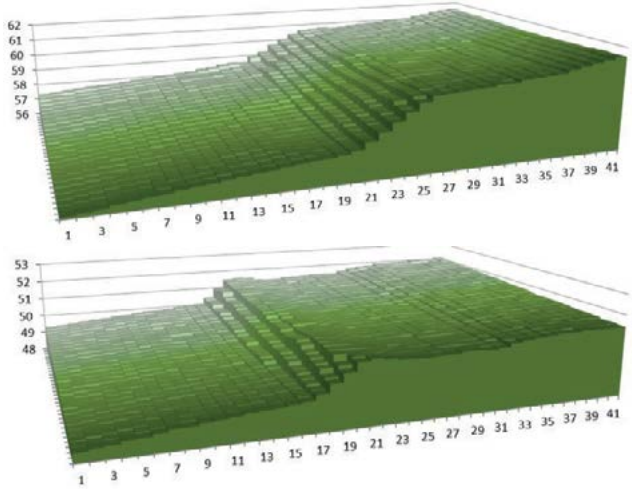


04c Sandstone blocks in *Curriers* garden wall. [Photo Deborah Overton]. Most of the rest of this wall is built of sandstone rubble.

Quarry (02:H) is not close to any known building and may have been used for stone to build the track around the Middle Pool, or maybe the "new bridge in the wood" built in 1770 that needed 32 tons of stone. We don't know the location of this 1770 bridge, but conceivably it may have later been converted to the dam for the Middle Pool. A more likely alternative is Ladywell Bridge, close to quarry (02:I): (02:J) may have supplied stone for the Holders Pool dam. St Mary's Church is built of sandstone; the nearest quarries are (02:J) and (02:K) and the largely obscured (02:L) . A visit to quarry (02:K) found only sandy soil; there was no exposed rock face, but there is a substantial squared-off sandstone building block lying on the ground not far from this quarry which may be a relic of the workings there.

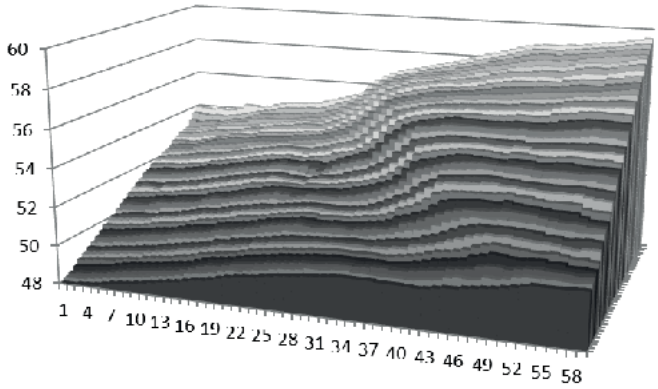
Looking for wood banks

Oliver Rackham said[4] "The visitor to an unknown wood should first walk the boundary. A typical medieval wood boundary has a strong bank with an external ditch, 20 to 40 feet in width, which follows all the sinuosities and zigzags". We know from maps surveyed 1739 and 1839 that the western wood boundary at that time ran along the ridge sectioned in (05). The fields both sides of this ridge (02:1) have been cultivated as arable land since some time before 1883. If there ever was a ditch on the outside of the wood, it had become filled in.



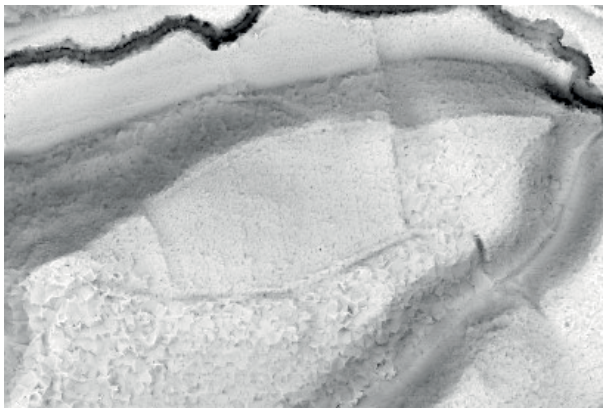
05a (north end)
05b (south end). Two block sections of (02:1) separated by 400m showing the consistent pattern of the bank.

The northwest corner of the wood has a bank (02:2) and its block section is shown in (05c). Although the slope of the hillside is steep, there appears to be a hint of a trough on the outside edge and a bank on the inside spanning 10-15 metres.

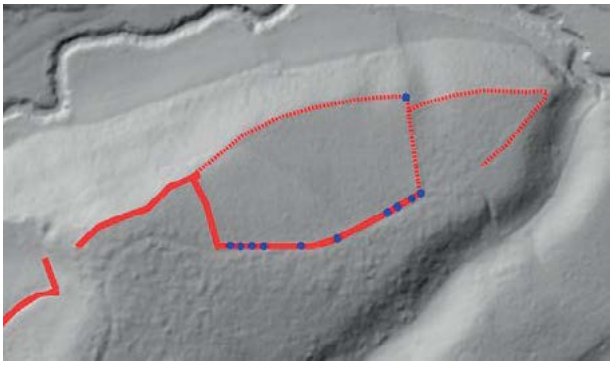


05c. Block DTM of the bank (02:2).

On the north border of the wood there has for centuries been a field which was at times a horse pasture (see chapter Trees p. 275). A bank (02:3) runs round the edges of the field (06).

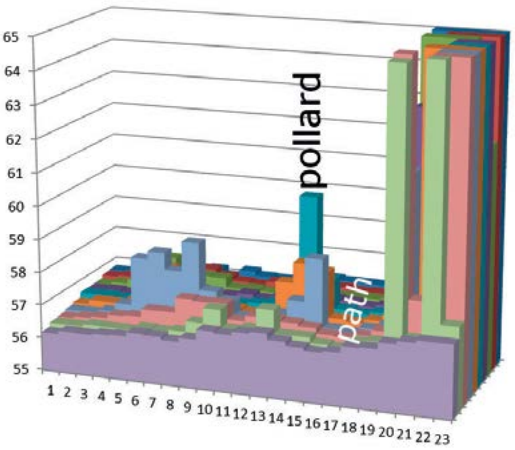


06a. Banks around the horse pasture at (02:3).

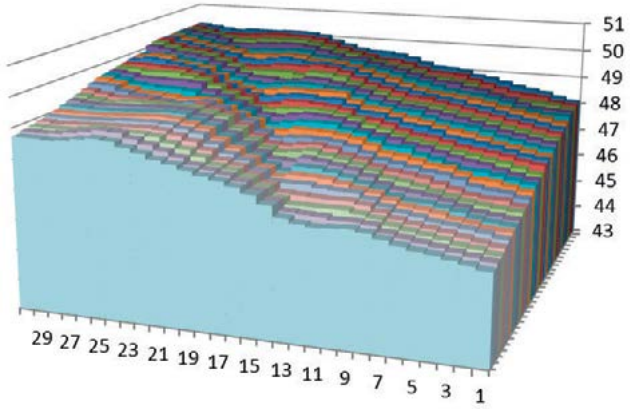


06b.The position of the surviving pollard lime trees (blue dots) on the bank

.



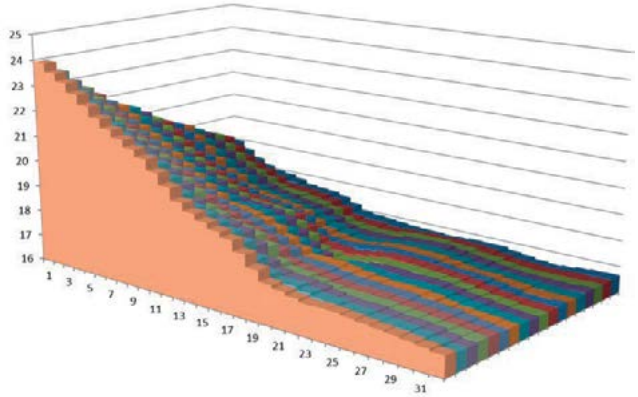
06c. Block DSM for the west end of the pollard row. All along the south side of the leasow the ridge is about 8m wide .



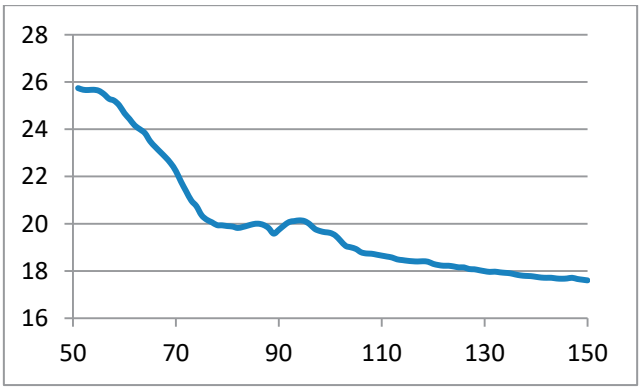
06d. Block section of the DTM of the east end of the bank (02:3)

A major track runs along the line of the bank illustrated in (06d) which might have been thought to account for the profile of the land here if it were not for the clear pattern of banks shown in (06a).

The east side of the wood has its boundary (02:4) at the foot of a steep escarpment where the wood hedge runs along the edge of the flood plain of the River Severn (02:4). There is what could possibly have been an old track running along the inside of the wood hedge and the ridge on the outer edge of this has several low pollards in what may be a remnant of the wood hedge. We (the joint authors of this monograph) have argued among ourselves whether these pollards are significant or simply a common occurrence when coppicing on steep slopes. There are scattered low pollards on steep slopes elsewhere in the wood that seem unconnected with any boundary.

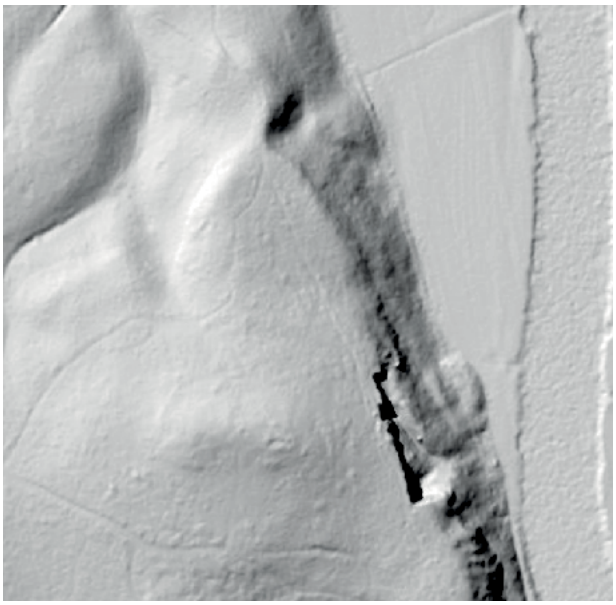


07a. The northern part of the eastern wood edge (02:4).



07b. East-west section of the landform on the eastern boundary of the wood: SO81126 66400-SO81170 66400. Both x- and y- axis are in metres.

The southern part of the eastern wood edge (02:5) has a bank that corresponds to the position of a track on the OS map surveyed in 1883 (08b). The possibilities are either the track was constructed along an existing wood bank or that there was no bank here until the track was made. The observation that the bank continues along the wood edge beyond this track may be an indication that the bank is the older of these two features. This track is ideally placed to run from Shrawley Castle on Oliver's Mound to the Weir crossing. The defence of the Castle likely needed the level ground to its north to be cleared of trees; the edge of Shrawley Wood in Dougharty's map and the tithe map (09) is consistent with this clearance.

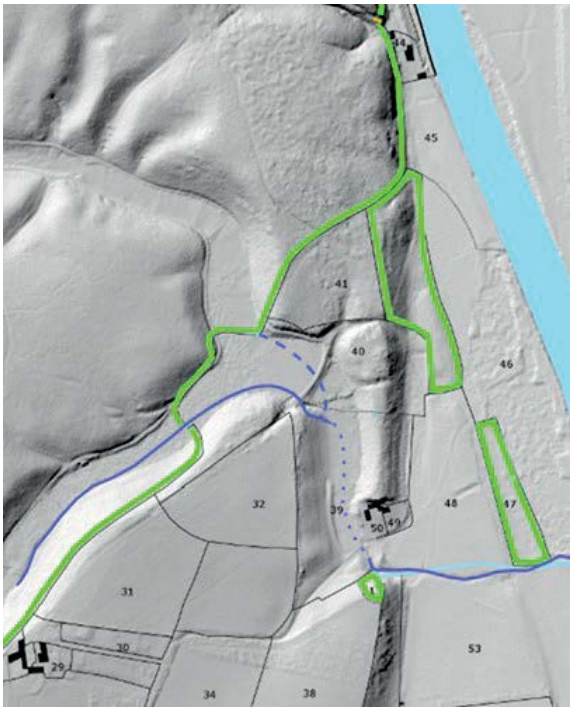


07c. The northern half of the eastern edge of Shrawley Wood (02:4); the bank along the foot of the escarpment runs over the spill from the ancient landslip but has been buried by spoil from the large quarry. Although (07) has the appearance of an external ditch and internal ridge that might be a medieval wood bank, an alternative possibility is that this may have arisen through centuries of maintenance work on a track for extraction of felled product running along the inside of the wood hedge.



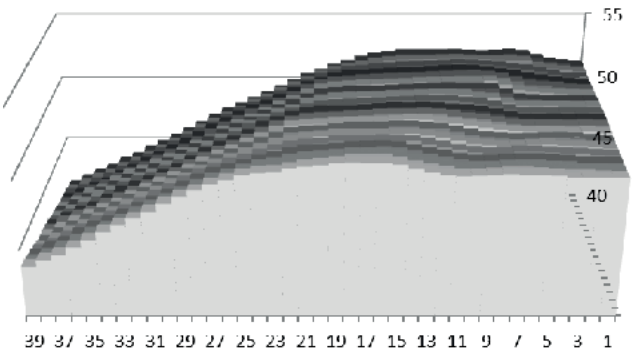
08. The bank (02:5) seen in the DTM corresponds to a track on the OS map surveyed 1883. [Screen capture image from the Ordnance Survey 6 inch map from the National Library of Scotland https://maps.nls.uk].

The ditch and bank (02:8) is most probably of modern origin. If there was ever a wood bank in the central section of the eastern border, it has been obscured by the spills from the more recent quarries and by works around the Weir Inn.



09. Tracing of the tithe map overlaid on the DTM to show the wood margin in 1839, before the New Pool dam was built. The dark blue lines indicate the brooks on *A Plan of Shrawley Court and Curriers Estate* (1808)[5]

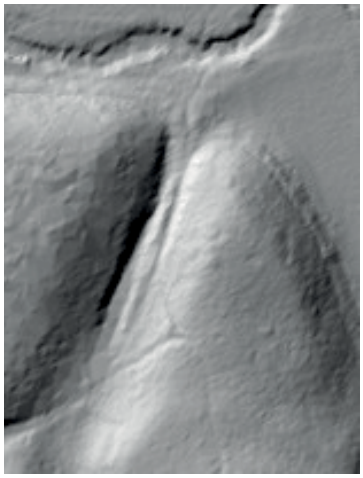
Although there is a curved linear depression visible in the DTM along the northern border of tithe 41, this looks more like a track than a wood bank (09). If there were further wood banks in this area, it is likely that they have been deleted by the earthworks for the dam or hidden under the water.



10. Block DTM of the wood edge at (02:6)

The south border of the wood has traces of what may have been a wood bank (10): the steep slope immediately behind the wood hedge and the much-used track along the outside of this hedge may be masking the original wood bank or may be creating the appearance of a wood bank because of traffic and maintenance of the hedge. The sections marked as (02:6) and (02:6') seem consistent with descriptions of wood banks.

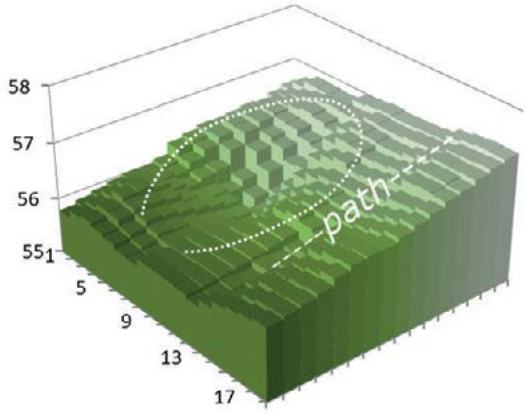
Some woods have internal wood banks as partitions between permanent binds. Although Shrawley Wood has named binds, it is not certain that the fall boundaries were always in the same place (see chapter Coppices & Binds p. 204). The most prominent DTM features within the wood are the holloways. The only prominent internal bank is (02:9), which could be explained as the effect of "making a new road out of the fall", a frequent task listed in the Wood Books; when the old road had been turned into a quagmire by the traffic, options were to mend the road or make a new one (11). If wood banks were produced by repeated hedging efforts to protect the new growth on recently coppiced stools, this is not the place one would have thought it would be needed, being protected by Dick Brook to the north and the external wood bank and hedge to the east.



11. Internal wood bank (2:09) or a replacement road avoiding the quagmire on the lower old road?

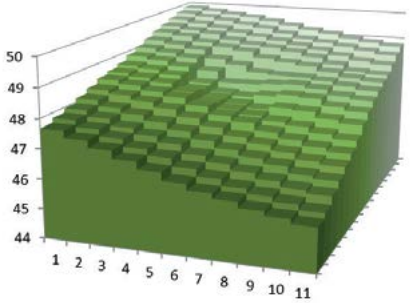
Looking for saw pits and charcoal burns

In October 1897, George Blunt spent four days felling poles, then four days digging a sawpit (see chapter 1875-1897 p. 213). Such a pit was probably nearly two metres deep, over a metre wide and a few metres long. This particular pit may have been in Shotgrove rather than Shrawley Wood because the fall was there in 1897, but no doubt pits were dug in Shrawley Wood too. Even after 120 years there might be some depression in the terrain to indicate the pit had been there but there is the possibility that the woodmen were instructed to fill in sawpits when the work was completed[6]. The DTM reveals a few such depressions, the clearest being at (02:P) and (02:Q).



12. The pit at (02:P) SO8073866036

While the pit at (02:P) could plausibly be attributed to a saw pit with margins that have collapsed and partially filled the pit in (12), the pit at (02:Q), although its appearance on the standard hill-shading DTM image is similar to that at (02:P), the block model (13) shows that it is smaller and shallower, and this pit could plausibly be explained as the hole left by a large root plate being displaced when a tree fell over.



13. The pit at (02:Q). It seems more likely that this pit was formed by the displacement of the root plate of a large fallen tree rather than by erosion of the edges of a saw pit.

Charcoal burns may leave a raised ring of soil from the turves that covered the burn and then were raked to the edges of the burn.[7] No such rings are evident on the DTM of Shrawley Wood. The resolution of the LiDAR used in the Forest of Dean report that documented LiDAR findings from charcoal burning was 0.25m, higher than the 1.0m resolution used in this report, which might compromise the chances of spotting likely sites.



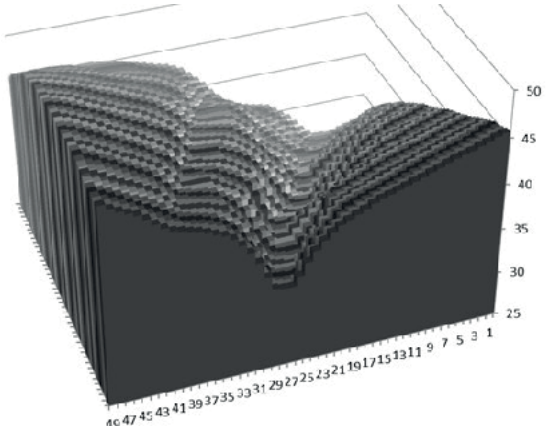
14a. The tumps



14b. Map of the tumps rendered with 0.1 metre contours.

The Tumps

There are two circular tumps at (02:T), (14). The larger has a diameter of around 40 metres, the smaller around 30 metres; both have a height of around 1.5 metres. The larger is estimated to have a volume of 1080 cubic metres, the smaller a little over half this. We have not been able to identify their origin: possibly they might be Bronze Age round barrows but alternatively the smaller could be waste from excavating the cellars of Wood House (181 square metres internally[8], so perhaps between 400 and 500 cubic metres excavated) and the larger from excavating the pond in the grounds in front of the house. At that time, the tumps were in the wood, just out of sight; a plausible dumping ground. In the absence of further documentary evidence, physical investigation of the tumps will be needed to choose between these possibilities.

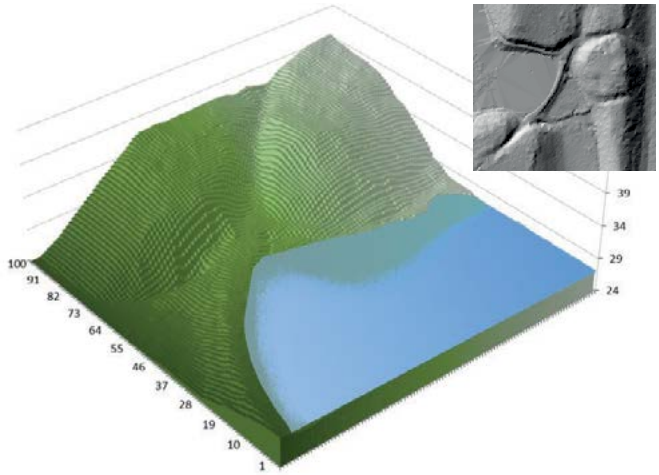


15. Block DTM of (02:Y), the cutting above the Weir Inn.

The cuttings

There are three cuttings, (02:X), (02:Y) and (02:Z); X and Y were needed to get wheeled vehicles in and out of the wood. In the case of (02:X) this was through a sandstone ridge, for (2:Y) it was to even out the gradient in a natural gulley leading down to the Severn. (15) is a block DTM of (02:Y), looking down towards the river, The parallel footpath with steps cut into the bedrock can be seen above the cutting. The need for two parallel paths that meet at top and bottom of the slope is not obvious; one possibility is that the steps were the older route, and before the cutting was made the route down that gulley ended in a vertical rock face,

The cutting (02:Z), (16) was formed during the construction of the dam for the New Pool and created a new road down across the dam as well as raising rock for the dam.



16. DTM around (02:c), the dam for the New Pool, completed 1850. The grey inset is the standard hill-shading DTM, lit from the NW; the green is a perspective view from the northeast, lit from the SE.

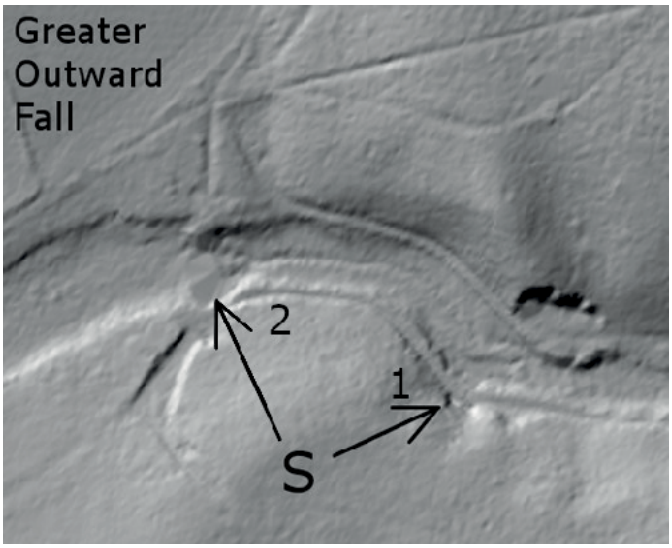
Springs

There are three springs in the wood, one at (02:R) and two at (02:S). The Wood Book for 1810 records:

"*20th March*

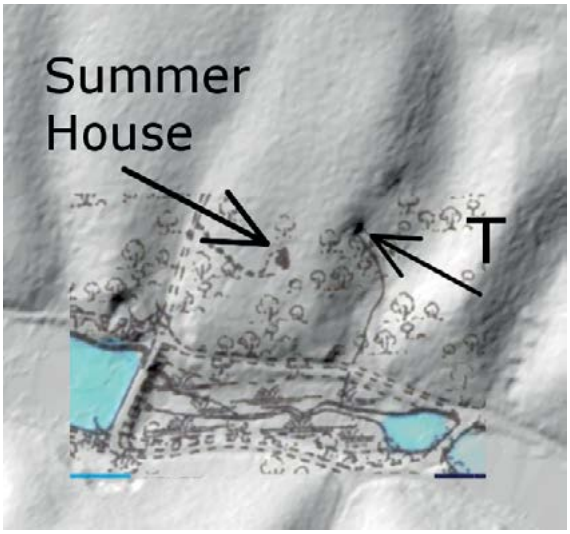
Pd. Wm. Bozard for makin a new road in fall		
down by Springway	*two Days*	*£0-5-0*
Wm. Tomkins	*Two Days*	*£0-5-0.*"

This may relate to (02:S) but the predicted fall that year was the second part of the Greater Outward bind (17). Just possibly the format of the record may suggest this was two roads or one that went from the fall to Springway.



17. (02:S), the putative location of the Greater Outward Fall indicating the possible site of "Springway".

The third spring is above the marshy ground between the New Pool and Middle Pool (18). Possibly this was useful for the Summer House.

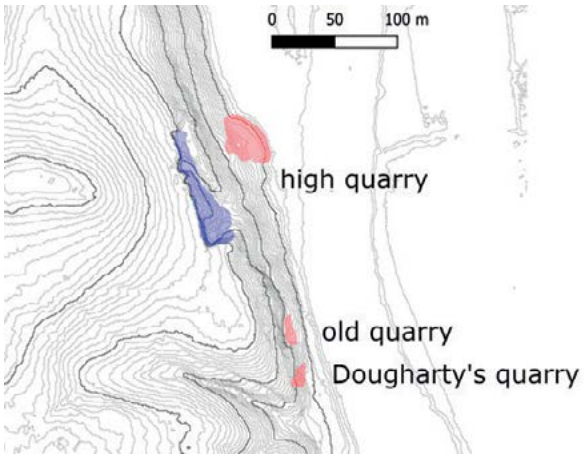


18. The spring at (02:T) with the site of the Summer House and the track leading to it.

Dams
For many of the dams, the DTM shows excavations either side that provided soil and stone for the dam. The most extensive excavation is that for the dam of the New Pool (02:c), (16) and smaller excavations are seen in (18). The dams in Shotgrove are discussed on pp. 309-311.

Reconstruction of the High Quarry (02:D)

The large quarry along with the lower quarry just south of it (20) are listed as an ancient monument WSM41349, called Shrawley High Quarry with a note: *19th century quarry recorded on 2nd Edition OS Map and Google Earth 2007*. The suggestion in the associated report[9] that the high quarry might have been the source of building stone for the castle on Oliver's Mound seems improbable given that the high quarry had not been started in 1732.



20. The quarries listed as ancient monuments WSM41349 include the high quarry, and a combination of the old quarry and Dougharty's quarry. Blue = removed, red = spill

The lower quarry *is* shown on Dougharty's map and may have been active or disused at that time. Because it was at the bottom of the escarpment, repeated rockfall (21) from above has largely filled this quarry. The survey by Dougharty in 1731-2 was sufficiently accurate and detailed to establish the high quarry was not there at the time of his survey (chapter Historical Maps p. 268). Rev Daniel Piercy recorded Thomas Smith, Mason and Joseph Smith, both at the Quarry in 1769. (chapter Rev. Daniel Piercy p. 174).



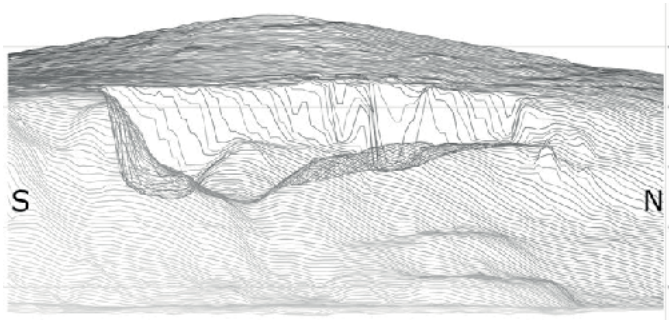
21. Rockfall between the high and low quarries 30th December 2019.

In 1800 the Woodmen bought 500 beech plants and 50 larch plants; they were paid for planting "*the furs upon the waste land and fencing in Ye same".* Furs were coniferous plants including larch; larches were planted in the big quarry around then, so it is possible the quarry was regarded as one of the areas of waste land at this time. By the time of the 1884 OS map the high quarry site is completely filled with trees including conifers. It is possible that work in the quarry had been finished around 1769 – the last time Daniel Piercy recorded tithes from quarry workers. The rock in the high quarry, like the rest of Shrawley Wood, is Helsby Sandstone (see chapter Geology p. 252). It seemed of interest to make an estimate of the volume of quarried stone that was taken off site and the fraction that remained in the spoil heap.

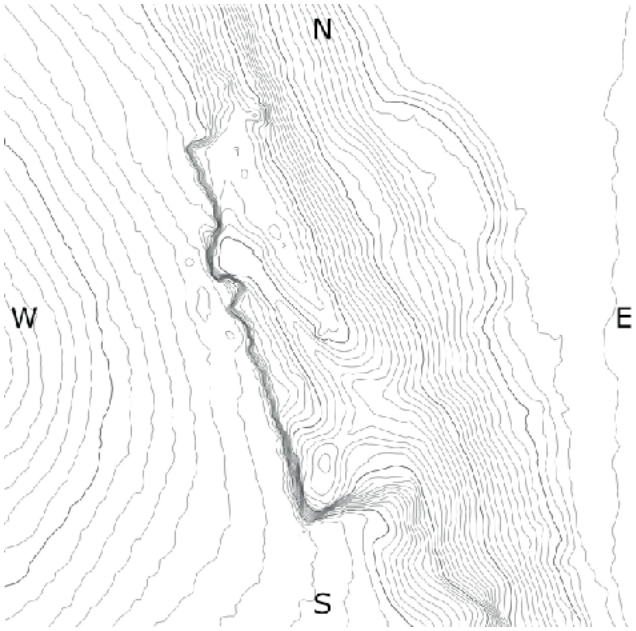
The data
The LiDAR DTM contains accurate dimensions of the quarry (20), (22) with the proviso that the algorithm used to calculate the DTM cannot cope with overhang or vertical surfaces, replacing these with a sloping surface close to vertical: thus the calculated volume removed will be underestimated by a few percent. The unknown parameter is the landform at this site before quarrying started. The east-west sections immediately to the north and to the south of the quarry are closely similar and these match parts of the hillside in between that were not affected by the quarrying. It is therefore reasonable to attempt reconstruction of a DTM of the original landform by cloning the DTM section from either end along the length of the quarry. Figure (22) graphically summarises the extent of the data available from the 2014 DTM. (23) plots the difference between DTM and the reconstructed pre-quarry DTM.



22a.High quarry east-west sections at 1m intervals

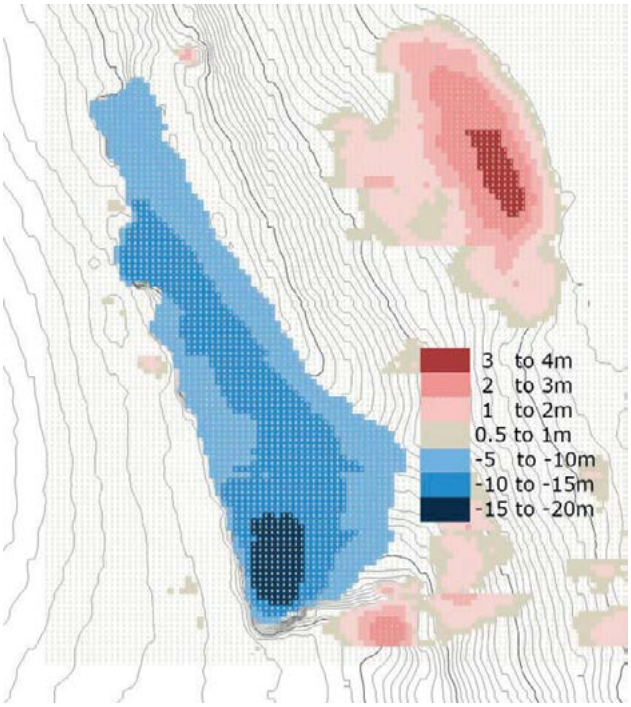


22b. High quarry north-south sections at 1m intervals



22c. High quarry contours 1m intervals

The minimum amount of stone quarried is estimated as 22,000 cubic metres, and the spoil heap as 2000 cubic metres, leaving 20,000 cubic metres removed from the site as building material. Although this might appear to imply 90% efficiency converting bedrock to building material, without digging trenches across the floor of the workings we cannot tell the quantity of spoil concealed within the excavated area. The volume quarried was probably a little greater than this due to the effect of LiDAR DTM artefact preventing the modelling of vertical surfaces or overhangs.



23. Difference between reconstructed DTM and 2014 DTM showing depth of quarrying and spoil heap. NB the scale on the depth of quarrying is five times that of the spill as shown on the key.

It would seem that the quarrymen wasted little stone when converting the sandstone bedrock to roughed out building blocks: the final tailoring to the required size would have been completed at the building site. If the quarrying activity lasted 22 years, this amounts to 1000 cubic metres each year, say 5 cubic metres a day given that quarrying was typically a seasonal activity. This volume would yield 50 good sized building blocks daily, ready for shipping up or down stream on the Severn. A team of at least five men seems probable though we only know the names of two.

The National LiDAR Programme 2020

Shortly before this monograph went to press the Environment Agency published data obtained from a flight over Shrawley Wood on 21 March 2020. As well as the 1m DTM, a first-return DSM dataset (frDSM, reflected from the canopy of trees) enabled a canopy height map to be drawn for the whole of the study area. The conclusions from these data have been added to the chapter Measuring and Mapping the Trees Appendix (03) p. 286, 293.

Conclusions

The LiDAR DTM allowed us to map archaeological remains and analyse their profiles. It gave a template for audit of historical maps and provided a sound basis for quantitative reconstructions of quarrying and industrial activity in the Dick Brook valley.

The 2014 DSM and 2020 fr-DSM provided different useful information about the trees of Shrawley Wood, as discussed in the chapter Measuring and Mapping the Trees Appendix pp 284-293.

A customised survey at higher resolution and a survey in summer to obtain an accurate profile of the canopy could provide further insight into the structure of the wood.

The rapid progress in computer applications capable of displaying detailed 3D models by a combination of LiDAR and photography means it will soon be possible to capture all of Shrawley Wood in a file for a virtual reality walkabout. No doubt it will only be a short while later that the model will be 4D, allowing the observer to travel through the seasons as well as through the Wood without ever leaving his room. Will that be a happy day or a sad one?

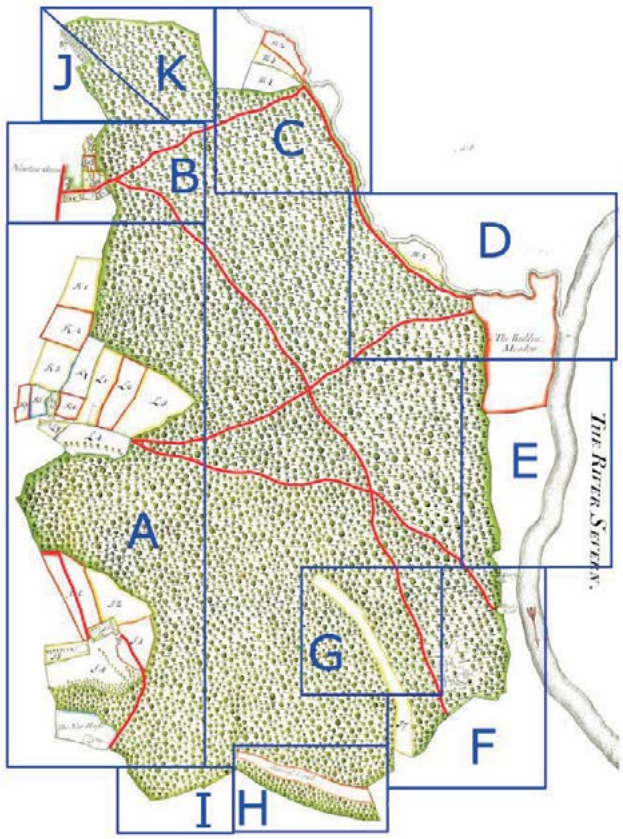
1 https://environment.data.gov.uk/DefraDataDownload/?Mode=survey
2 Environment Agency statement on vertical (height) accuracy: *"Our specifications require the absolute height error to be less than ±15cm. This is the root mean squared error or RMSE. It quantifies the error or difference between the Ground Truth Survey and the LIDAR data. We expect the relative height error (random error) to be no more than ±5cm":* https://environment.maps.arcgis.com/apps/MapJournal/index.html?appid=c6cef6cc642a48838d38e722ea8ccfee#
3 Overton Deborah. 2005. Field notes, sketch maps and photographs of Semi-Circular Platform. Worcestershire Historic Environment and Archaeology. HER Reference: WSM34375
4 Rackham, Oliver 1986. The history of the Countryside. JM Dent & Sons Ltd, London Melbourne. p98
5 Young and Charlton (Surveyors) 1808. *A Plan of Shrawley Court and Curriers Estate* WAAS r705:27 BA438/16 (vi)
6 Thomas Vernon Esq to Messrs Moore & Drew. *Counterpart Sale of Timber 1760 April 9* .WAAS 705:7 BA 7335/109 (iv) 4
7 Hoyle J 2008. *The Forest of Dean, Gloucestershire Lidar survey of selected areas of woodland and the Aggregates Resource Area Project Number 4798* MAIN Forest of Dean Archaeological Survey Stage 3A Project Report Volume 1: Methodology, Results, Discussion and Recommendations . Gloucestershire County Council Environment Department Archaeology Service November 2008
8 Sales brochure, 2021. Savills Country Department, London
9 Claire Cristiansen 2010 *Historic environment landscape survey at Worcestershire geological champions quarry sites.* Project CAA1197 Report 1783



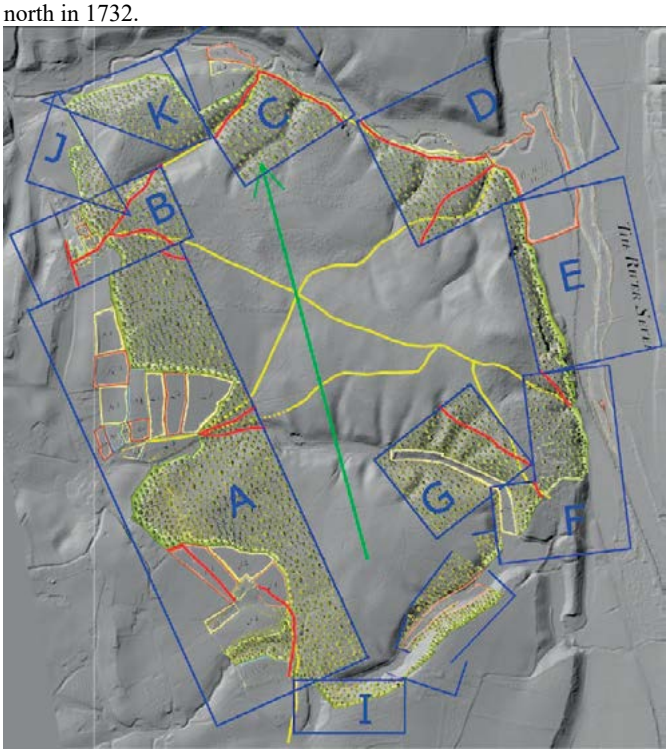
01. Map of Shrawley Wood by Joseph Dougharty, 1732.

Historical maps of Shrawley Wood

Richard Pumphrey



02. Joseph Dougharty's map of 1731-2.
above: cleaned derivation from his map of Shrawley Wood with paths enhanced in red.
below: fragments of this map overlaid on the 2014 LiDAR digital terrain model (DTM) of Shrawley Wood. All the wood margin lengths are correct and each section is accurate if rotated for best fit to the DTM apart from H, which needed further fragmentation. The solid yellow lines are paths evident in the DTM, dotted where there is a plausible alternative for 1732, for instance, one path in rectangle A became immersed in Layes Pool when that was created and so no trace remains on the DTM. The green arrow indicates magnetic north in 1732.



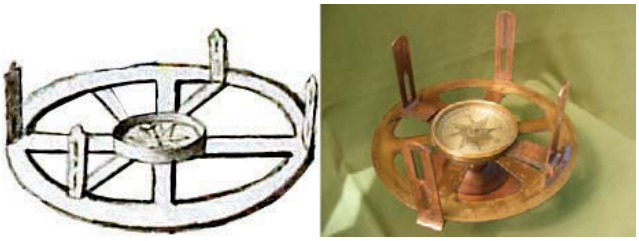
Introduction

This chapter is specifically about what the historical maps can tell us about the geography of the wood rather than about the maps as beautiful historical objects. Underlying the wood is the landform which for the most part has not changed over the centuries apart from excavations and constructions such as roads, dams and quarries. The best old maps can help us put limits on when these changes took place. We have now an exceptionally accurate knowledge of the landform in the LiDAR Digital Terrain Model (DTM) surveyed in December 2014 (see chapter LiDAR pp. 258-265). This DTM is claimed to have horizontal accuracy of one metre and vertical of 15 cm. Not only is it an accurate representation of the land form, but this land form contains traces of many old tracks and other earthworks that have been recorded in some of the old maps; it is therefore our best point of reference for accuracy. What we are looking for is differences between what is on this landform at various dates through history.

The Dougharty map of 1732

The earliest detailed map of the wood was surveyed by Joseph Dougharty in 1731-2 for a book of maps of the Vernon estates (01).[1, 2] His father John Dougharty Senior (1677—1755) had established a school of mathematics in Worcester around 1711.[3] His expertise in trigonometry must have helped him develop his cartographic skills; together with his sons Joseph (1699—1737) and John (1709—1773)[4] the family became famed for their maps and were employed by several of the large estates around Worcester, where the Doughartys lived.

Although Joseph's map of Shrawley Wood (01) is very pretty, its accuracy is fragmentary; when the sections indicated in (02) are scaled using his chains and links scale drawn on the map, and rotated for best fit to the DTM, most are seen to be remarkably accurate and we can be confident with what these tell us about the wood as it was in 1732. Other maps in the Vernon's Book of maps of their estate are more accurate and it is clear that North on the compass rose in each indicates magnetic north; in 1731-2 this is thought to have been 14º west of north as listed in detailed records of magnetic declination kept in London and Paris since 1550[5]. The consensus from others of Dougharty's maps prepared for the same book such as the map of Hanbury Hall or his *map the first* of Shrawley is around 15-16º west of true north. 15º west of true north is indicated by the green arrow in (02b).



02c. The Doughartys' circumferentor, shown on one of their maps and an early eighteenth century example made in London. The Vernier scale made it possible to record angles to within 5 minutes of arc. (Photograph by Michael Read).

So what happened round Shrawley Wood to perturb the usually accurate surveying by the Doughartys? The wood must have presented considerable problems to the surveyor: the trees obscured sightlines and it was not possible to see across it to triangulate for its width. The landform at its northwest and southeast corners also prevented distant triangulation. The orientation of each section either side of these points therefore depended on the compass bearing. Surveying the valleys within the wood presented similar difficulties with poor sightlines. Measuring distances however was no problem. Consequently each section was accurately surveyed

apart from one parameter – estimation of magnetic north. This suggests that the compass on their circumferentor (02c) was influenced by a local magnetic item, and that this was placed at a different bearing from the compass needle with each measurement. Perhaps a broken brass fitting had been replaced by an iron one deflecting the compass needle.

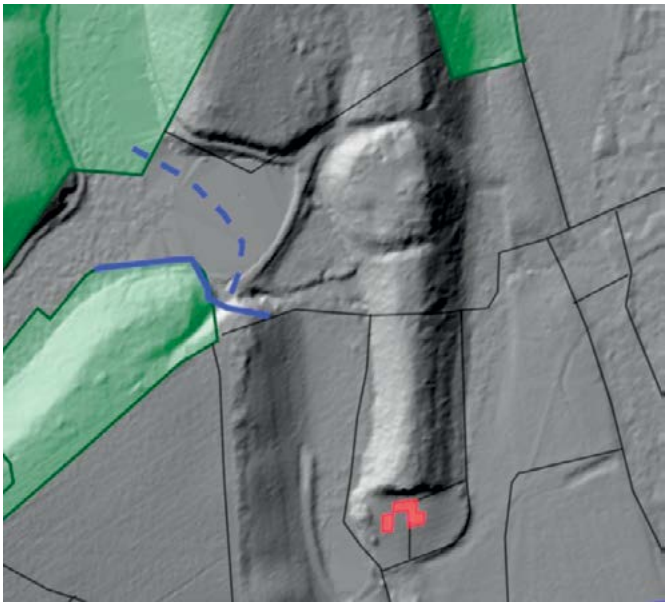
Further analysis of this map is included in other chapters: LiDAR, Access, Extraction and Dispatch, 1764-1850, and Shotgrove.



03. 1772 map by Isaac Taylor [Attribution-NonCommercial 2.5 Canada (CC BY-NC 2.5 CA)]

Other maps 1772-1839

Shrawley Wood is shown on a map of the County of Worcester by an unknown surveyor, engraved by Isaac Taylor (1730-1807) and dedicated to the Earl of Coventry in 1772. This map (03) is too small scale to give us useful information about the wood and by comparison with earlier and later maps, details that are shown around Shrawley are clearly wrong.


03a. A small section from a tracing of the 1808 map by Young and Charlton overlaid on the LiDAR DTM showing the junction of the two brooks before the New Pool dam was built. The dashed course of the Middle Brook may indicate that it is passing through marshy ground. Then after their junction, the brook disappears but reappears south of the quarry with the farm buildings (red). The tithe map labels this area as including Court Pool, which may have silted up to create a marsh, explaining why the course of the brook could not be shown. A recent dam has turned this marshy area into another pool.

A Plan of Shrawley Court and Curriers Estate of 1808 by Young and Charlton, Surveyors[6] shows the southern border of Shrawley Wood from Holders Pool round to the Weyre Inn. The details are similar to those on the tithe map of 1839 although a little less accurately placed but it shows one important detail that is inaccurately shown on the tithe map: the junction between the two brooks flowing through the southern half of the Wood (03a).

The *Plan of estates in the parishes of Astley, Abberley, Martley, Areley Kings [in Stourport: on Severn] and Shrawley, the property of D J J Cookes, clerk;* mapped in 1817 by Cotterell (Surveyor)[7] shows Dick Brook (the north border of Shrawley Wood) together with Astley Forge/Mill and its leat. This map is discussed further in appendix Dick Brook Industry reconstruction (p. 99).



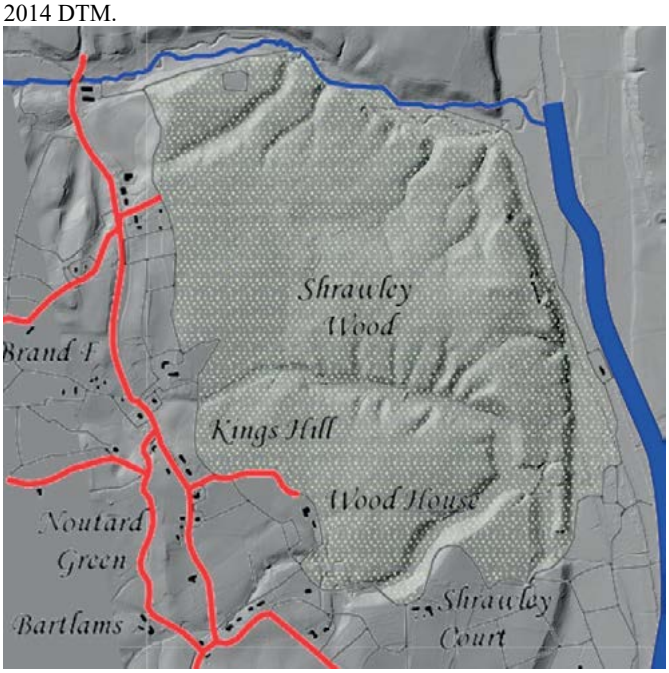
04. 1822 map by Christopher Greenwood. [8]

Christopher Greenwood (1786–1855) together with his brother John produced large-scale maps of England and Wales in the 1820s. Christopher's 1 inch to the mile map of Worcestershire shows Shrawley Wood (04): this map is too small scale to give us useful information about the wood and by comparison with earlier and later maps, details that are shown around Shrawley are clearly wrong. The fields between the wood and river are not shown although it is certain that they were there. Noutard Green is labelled as Frog Pool. The roads shown are a poor match for their true positions.

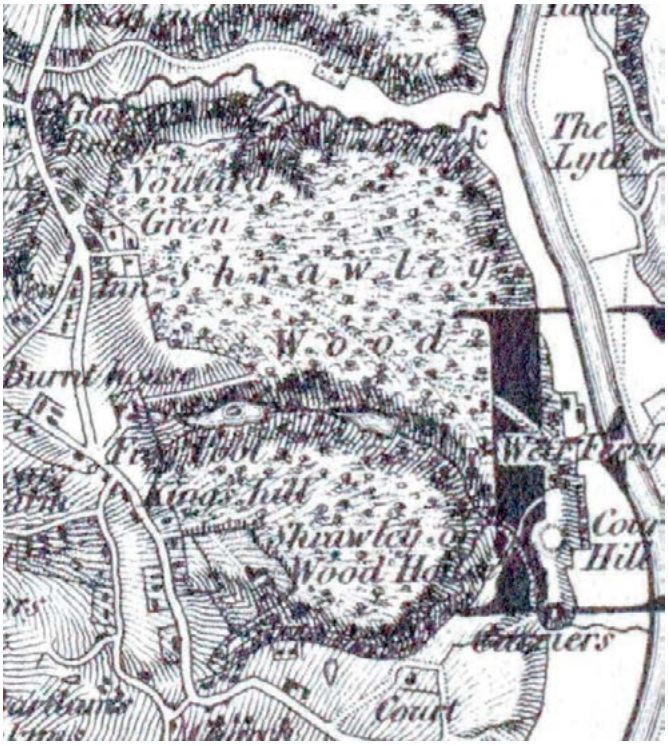
Robert Dawson was an English surveyor and cartographer and father of Captain Robert Kearsley Dawson (1798–1861), who in turn became famous for his surveying and cartography. Robert Dawson senior's 1813 map of north Worcestershire, prepared as drawings for the first Ordnance Survey, includes Shrawley on its northern border (05). The mapping was initiated by the military in 1795 on the south coast of England from concern that the French would invade, so accurate routes would be of strategic importance, less so features in between.



05. above: 1813 map by Richard Dawson
[https://creativecommons.org/ licenses/by-sa/3.0/04b]
below: tracing of this map scaled for best fit of the main road to the 2014 DTM.

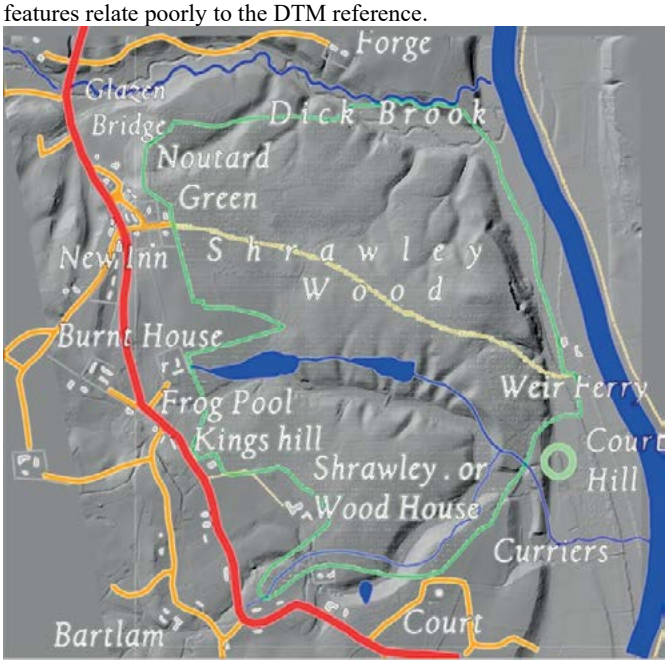


Most of the roads and many of the houses are correctly placed, but Wood House is placed too far east and the field boundaries by Frog Pool that were accurately mapped in the earlier Dougharty map and later Tithe map are shown as within the wood. Frog Pool is mislabelled as Noutard Green – the neighbouring hamlet 600m to the north. It is clear from this map that his interest was in the roads and houses; the field margins and minor waterways are sketched in with less regard for accuracy. It tells us little about Shrawley Wood that we can take as reliable.



06. above: the 1832 map by Lt. Colonel Colby.

below: this map scaled and rotated for best fit of the main road to the 1883 OS map: while the main road is reasonably accurate, other features relate poorly to the DTM reference.

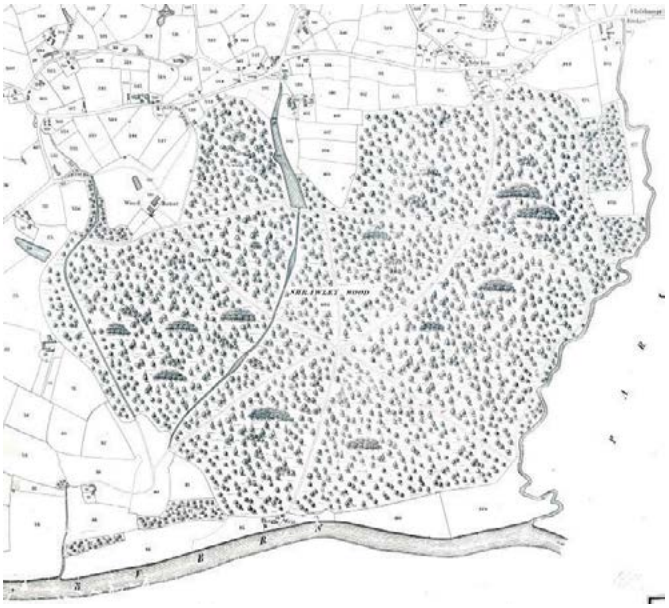


A later version of this map [OS sheet LV NE; Leominster; Published at the Tower of London in Feb 1832 by Lieutenant Colonel Colby; Royal Engineers; engraved by Benjamin Baker and Associates] is similar but has different errors when compared with the DTM (06). It does at least give an idea of the arrangement of the waterways through Shrawley Wood in that it shows only Layes Pool and the Middle Pool on the middle brook and no pools on the Ladywell Brook.

Tithe map of 1839
The next useful map (07) was prepared in 1839 for the Tithe Commissioners by an unidentified cartographer and printed by Standidge & Co., Lithographers of 77 Cornhill, London. The original had a compass rose pointing 6° west of true north. In 1839 the magnetic declination here was 24° west of north so the orientation of this compass rose remains unexplained. The border of each tithe allocation is accurate: when the map is scaled and rotated

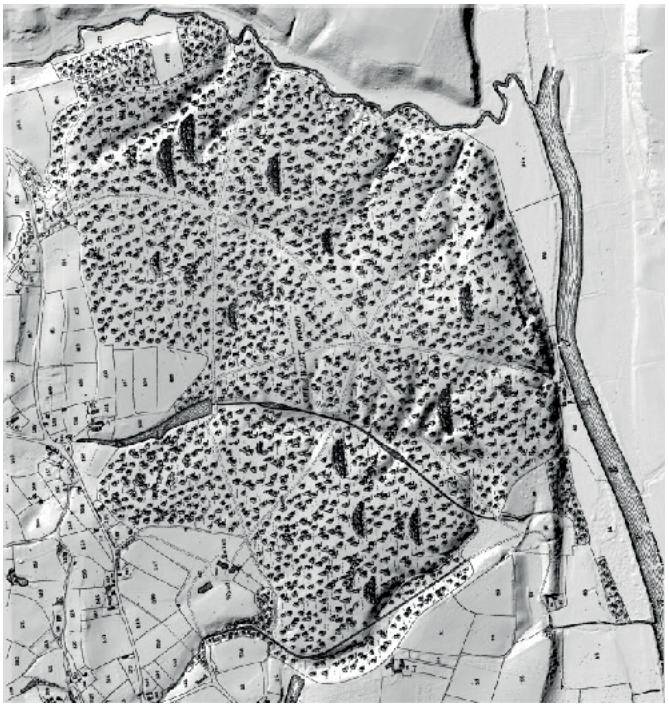
for best fit on Google Earth, the tithe borders fall neatly on the hedges between fields, paths, roads and water features with only minor inaccuracy towards the edges of the map.

In contrast, the mapping of detail within the area of the wood was clearly of no interest as it would not affect the tithe allocation: so although the points where paths and waterways cross the boundary of the wood are mapped correctly, within the wood these features have a style of mapping similar to that of the London Underground maps.

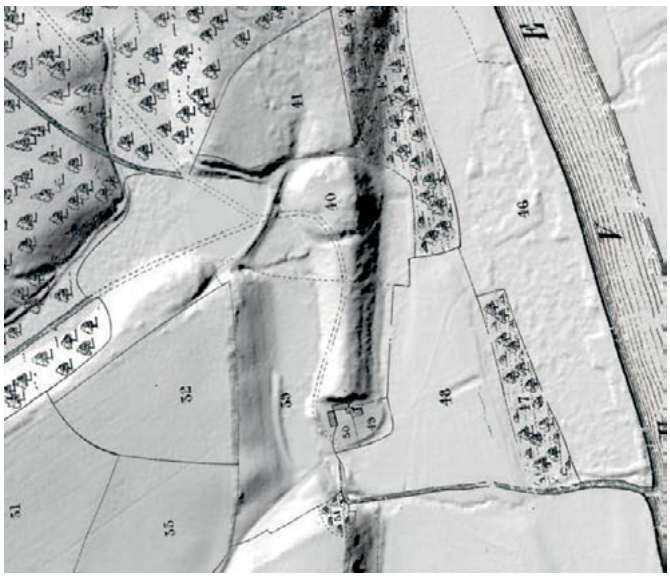


07. above: part of the 1839 tithe map for Shrawley showing Shrawley Wood.

below: this map rotated -96º and layered on the DTM. The tithe boundaries are highly accurate but structures within those borders are not mapped accurately.



Apart from the main road, tracks are curiously inaccurate and the waterways seem to turn into tracks near the junction of the middle brook and Ladywell Brook (08); whether this dashed double line represents a track or underground waterway, it climbs up and down the side of Oliver's Mound in an unlikely way and then turns back into a stream, flowing out into the River Severn. The junction of the brooks in Young and Charlton's map of 1808 (03a) confirms that this is most likely to represent the brooks.

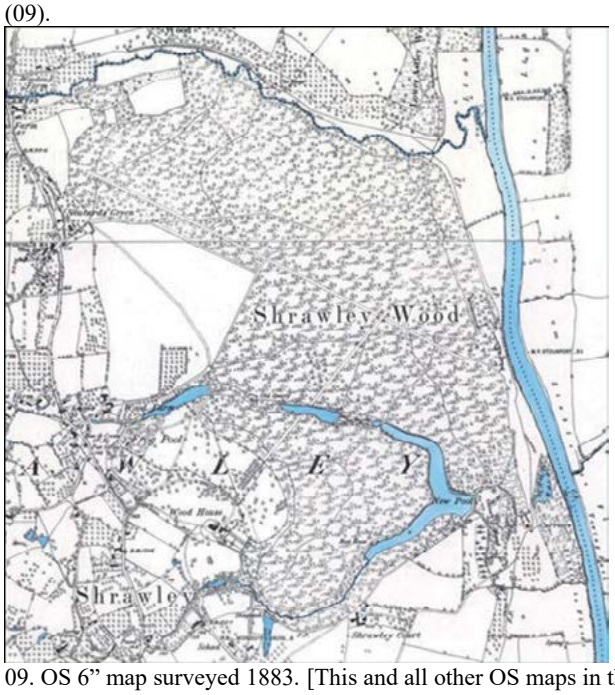


08. Track or underground waterway? a curious feature by Oliver's Mound.

The tithe map is referred to and enlargements illustrated in several other chapters including Access Extraction and Dispatch, 1764-1850, Coppices and Binds, Shotgrove.

Ordnance Survey maps surveyed 1883 onwards

Each of these earlier maps was produced for a specific purpose and omitted (or mapped incorrectly) details regarded irrelevant to that purpose. From 1884 onwards, the Ordnance Survey has provided maps that recorded greater detail with a high degree of accuracy (09).

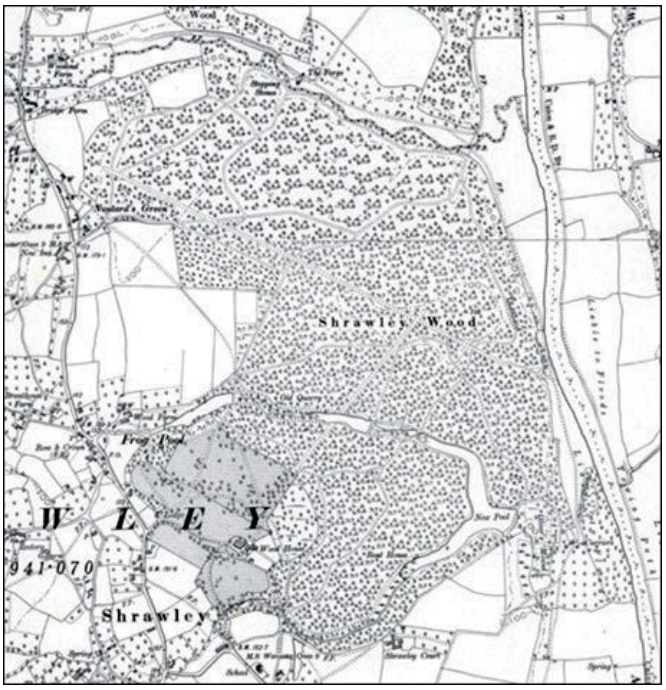


09. OS 6" map surveyed 1883. [This and all other OS maps in this chapter were obtained by screen capture, reproduced under a Creative Commons Attribution-NonCommercial-ShareAlike 4.0 International (CC-BY-NC-SA) licence with the permission of the National Library of Scotland].

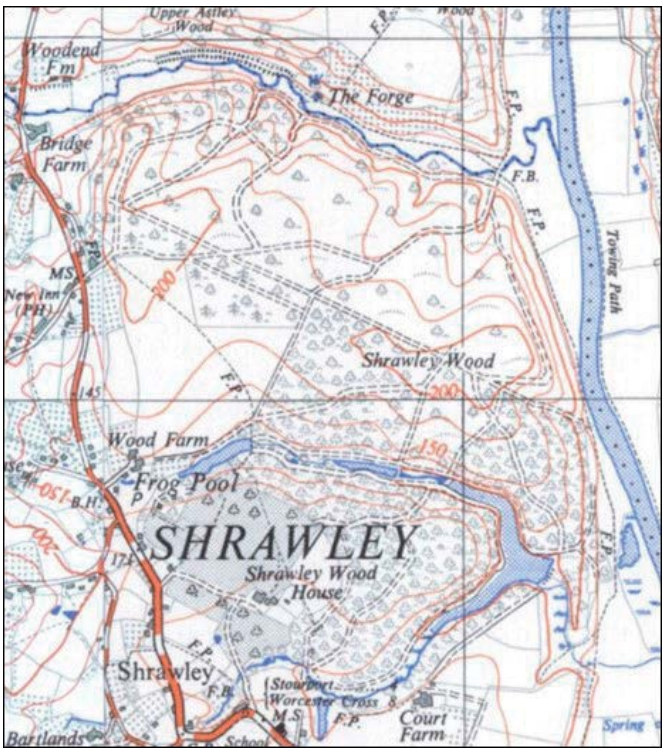
The first detailed survey of Shrawley Wood was undertaken in 1883; not only are the positions of the geographical features accurately placed, but the surveyors also questioned the local population to establish the most acceptable names and spellings of these features. This map was published in 1884 and shows major changes in the outline of Shrawley Wood since 1839: around 15 hectares of woodland have been cleared southeast of Noutard Green

(renamed Noutard's Green by the OS) and the trees in parkland round The Wood House have been thinned.

The next revision in 1901 shows new woodland planted in the area that had been cleared; we now know this happened in February 1889 (see chapter 1875-1897 p. 210). Further revisions followed surveys in 1925/6, 1937-45 and so on; in recent years revisions have been made frequently but selectively, the on-line maps being most up-to-date.



10. Ordnance Survey originally 6" to the mile: revision of 1901. A new triangle of mixed woodland has been planted on the mid-western edge of the wood.



11. Ordnance Survey revision of 1937-1945. The original was 1:25000.

At the end of the Second World War large areas of the northern part of the wood had been cleared of trees (11), including the steep eastern fringe.

These revisions have recorded changes in the layout of the wood over the last 135 years – not only in its outline but also with indications of where the trees were deciduous or coniferous. Icons for individual conifers in the positions where the Wellingtonia are now found suggest these trees have been large enough to map since 1883.

Origin of the name Noutard's Green

Originally this was probably Outwood Green, corresponding to the Outwood Coppice but the name changed over the years:

Outwood → Outward → Outwards
1495 Tenants — 1770 Wood Books

Nutward
1699 Richard Vernon

Noutard → Noutards → Noutard's
1772 Isaac Taylor — 1883 Ordnance Survey
1832 Colby

Nawters
1732 Dougharty

Over the years, the name morphed into Noutards Green, with the Ordnance survey adding an apostrophe as though Noutard was a person.

Google Earth "satellite images"


12. 1945 aerial photography [© 2018 The GeoInformation Group] The distribution of trees is worryingly incongruent with the 1945 OS map above.

Google Earth provides historical photography of the wood for 1945 (12), 1999, 2005, 2006, 2007, 2009, 2011, 2013 and 2018. "Satellite view" maps are stitched together from multiple photos with best fit to the position of features in the photographs. Occasionally there are small areas of significant distortion; in the Google Earth satellite view dated 2005 there is a patch of conifers shown in place of lime coppice on the northern border of the wood. Not all these maps are high quality; the best is from 2009, the worst recent image 2011. Nor is the alignment perfect for all these maps: footpaths may appear a few metres from their correct position and the 1945 image is displaced by 50m SE relative to the GPS framework of later maps. Other on-line maps provide alternative "satellite views" –

often as a background that can be faded in or out of another map: this is very helpful with the National Library of Scotland's on-line historical Ordnance Survey maps, where the "satellite" view provided by Bing Maps accessed February 2020 gave a beautiful glowing autumnal view of Shrawley Wood: undated but possibly from autumn 2016.

References

1 Worcestershire Archive and Archaeology Service (WAAS) 705:7 BA 7335/154/1 *A Book of Maps Containing all the Estates Belonging to Bowater Vernon Esq. In Worcestershire, Warwickshire and Shropshire ...* Drawn by John Dougharty of Worcester Surveyor Survey'd and map'd by John Dougharty Jur : Worcester in 1731. 1732. Map 17 *'A Map of Shraley Wood with the Land and Cottages Joyning to it belonging to Bowater Vernon Esq Mappt and Measur'd by Jos Dougharty of Worcestr Surveyor Map the Second*

2 Smith, Brian S 1967. *The Dougharty Family of Worcester, Estate Surveyors and Mapmakers, 1700-60*. In Miscellany II. Worcestershire Historical Society New Series 5, 139-180

3 Smith, Brian S 1996. *The Dougharty Family, Eighteenth Century Mapmakers.* Transactions of the Worcestershire Archaeological Society 15, 245-282

4 Smith, Brian S & Basford, Hazel 2006. *The last years of John Doharty of Worcester, Map-maker.* Transactions of the Worcestershire Archaeological Society 20, 151-156

5 Alexandrescu, Mioara; Courtillot, Vincent; Le Mouël, Jean-Louis 1997. *High-resolution secular variation of the geomagnetic field in western Europe over the last 4 centuries: Comparison and integration of historical data from Paris and London.* Journal of Geophysical Research Volume 102, Issue B9, Pages 20245–20258

6 WAAS r705:27 BA438/16 Plans (rolled) relating to estates 18th-19th cent. (vi) *A Plan of Shrawley Court and Curriers Estates in the County of Worcester*. Young and Charlton Surveyors. 1808..

7 WAAS s260.51 BA1565/1-5 1817-1927. *Plan of Estates in the parishes of Astley, Abberley, Martley, Areley Kings [in Stourport-on-Severn] and Shrawley, the property of D J J Cookes, clerk*, by H F Cotterell, surveyor. 1817.

8 Christopher Greenwood 1822. *Map of Worcestershire* WAAS s705:477 BA 4925/116



01. Shrawley Wood Compartments shown on a 2007 satellite view taken from Google Earth. [© Bluesky International Ltd].

1 [47 ha] and **2** [50 ha] were acquired by the Forestry Commission on 14 June 1961 [known to them as FC2701 & FC2702].

3 [42 ha] is the privately owned compartment of the wood.

4 (12.6 ha; private parkland) and **5** (15 ha to the dotted line) were part of the wood until they were cleared in the mid-19th century. Many of the trees on the private parkland now are remnants of that wood. The area of compartment 1 south of the dotted line [4Ha] was replanted with *Larix decidua* and smaller numbers of *Pseudotsuga menziesii*, *Pinus silvestris*, *Castanea sativa* and *Robinia pseudoacacia* in February 1889.

6 [1.6 ha] is a mixed plantation including *Pinus silvestris, Larix* spp., *Thuja plicata, Prunus avium, Quercus* spp., *Castanea sativa* and more, privately owned.

7 [3.9 ha] is an area worked as brick pits from 1841 for a bit over ten years and subsequently planted with withies and osiers.

8 [0.6 ha] is an area around the tomb of Sir George Vernon (1865-1940) retained by the Vernon estate at the time of the sale of the rest of the private compartment on 1 October 1990, now tended by the owners of Wood House.

9 [6.8 ha] is Shotgrove; 9a was worked by Shrawley Woodmen as if part of Shrawley Wood at least from around 1420 to 1897 (see chapter Shotgrove p. 305-313). 9b includes a recent mixed deciduous plantation.

Measuring and mapping the Trees of Shrawley Wood

Richard Pumphrey



02. The morning briefing

On 7th March 2017 a group of us gathered in Shrawley Wood to begin a survey of the trees (02). I joined this group as a novice, knowing nothing of forestry and somewhat hazy about how to tell a Small-leaved lime *Tilia cordata* from any other sort. We took instruction from Hugh Milner and set off in twos and threes to our allocated part of the wood to measure each tree we met when walking in a straight line. We had to record its species, the number of its stems, their diameter at breast height and for coppice stools the girth at ground level, and take GPS readings at the start and finish of each line. We measured the height of some trees by hypsometry and recorded everything on score sheets.

Our basic map of the Wood at that time was prepared by the Forestry Commission. It divided the Wood into three compartments (01). Within each compartment, subcompartments were defined by when the trees had last been planted or cut. Our transects passed through these subcompartments and it was hoped they would allow us to determine the content of each in terms of species and size. I rashly asked how we were going to analyse all this data, which ended up with me doing the analysis.

It seemed a disaster: the GPS readings made no sense, some being on the wrong side of the Severn, one halfway to Kidderminster. I had to try to work out where each transect had been located. Fortunately we had marked each tree as we measured it with a dot of green spray paint, so I hunted through the wood for marked trees and followed the line, reconstructing where the readings had been taken. It was apparent as I did this that I was not the only one a little vague about tree species identification. What saved the day were the excellent "satellite" views of the Wood available on Google Earth (01) which showed each individual tree and made it possible to pin down where we all had walked. After studying these for a while, I realised that each genus of tree was clearly recognisable if the views from different seasons of the year were compared (03).

Despite these reservations, we repeated the exercise several more times and ended up with data on over a thousand trees (A01).[a] This filled in the species where the satellite views only gave the genus. And we struggled on measuring heights by hypsometry of a fairly random selection of trees. Whatever else all this achieved, at the end of it I became more than a little familiar with parts of the Wood that are off the beaten track. But I puzzled over what I had seen – in particular the different appearance of the Small-leaved lime in the different parts of the Wood. How did the hundreds of little sprouting stems on the recently cut stools end up as the groups of tall trees I saw elsewhere in the Wood? Did these changes happen by themselves of did they need foresters to reduce the stem numbers? I have written an account of what I found in the chapter Regrowth and regeneration pp. 294-301.

Lime coppice stools can live many centuries or even millennia, rejuvenated each time they are cut down. They grow outwards at each cutting and after centuries may become transformed into a clonal ring of trees. We found rings of stools and Harry suggested we should try to find out whether they might have originated from a single ancient stool. He suggested digging around a ring to explore whether they were connected underground. We did this and some of the stools in the ring were clearly connected, but there was still uncertainty. So Harry contacted a laboratory where Hugh knew Kirsten Wolff who had an interest in *Tilia cordata* DNA and she agreed to help us. The wonderfully definitive results answered our question and also identified the species of some of the trees elsewhere in the Wood where we had doubt; the details are given in chapter on Lime DNA pp. 330-336.

During the group survey of the Wood, Harry Green organised for a drone pilot to take photographs of the wood. I mentioned this to my next door neighbour Rob Somer and he said he had a drone and would be interested in helping with the project. I am eternally grateful to Rob for the hundreds of hours he has spent collecting photographs for us of the 24 survey sites in the publicly owned part of the Wood. I have written this up in Shrawley Wood from a different point of view and the Drone Study of Phenology. It was satisfying to correlate these results with Kirsten's DNA findings.

I knew of LiDAR but not thought what it could do for us until Harry

a (A01) denotes figure (A01) in the Appendix to this chapter.

showed us a Digital Terrain Model (DTM) map of the Wood. I wondered if the survey that produced that map would include data about the canopy that could relieve us of having to measure trees by hypsometry. The LiDAR map I had seen was from a survey in 2014; this survey had some canopy data but this was hidden in the "point cloud" – a format that was too difficult for us to analyse at the time. But the 2014 Digital Surface Model (DSM) did show where the evergreen trees were hidden underneath the lime tree canopy. It was then possible to map the species by visiting them in the wood to see which were Yew *Taxus baccata*, Holly *Ilex aquifolium,* Rhododendron *Rhododendron ponticum* or Laurel *Prunus laurocerastus* (A02).

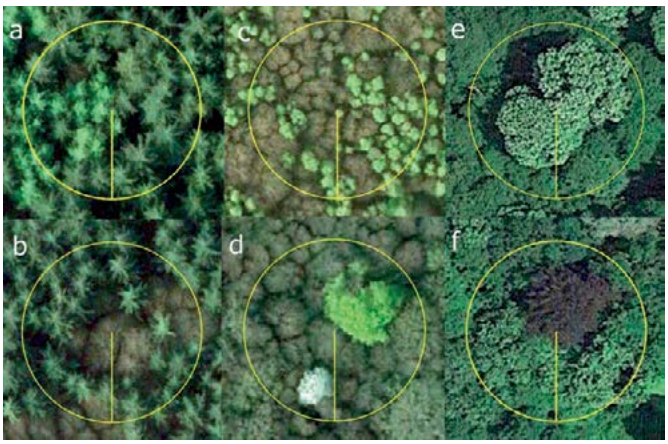
Then just a few weeks before our monograph went to press, the Environment Agency published a new survey with first-return DSM data. Now, using the free mapping software QGIS, it was at last possible to obtain a measure of the height of every tree in the wood without laborious hypsometry (A03). Software combining LiDAR point cloud data with photography already can give 3D models for Virtual Reality exploration of the Wood. This will surely be the future of recording the trees of Shrawley Wood rather than the small-print tables and sketchy maps in the appendix to this chapter.

Satellite views

Seen from far above, Shrawley Wood is a patchwork of different shades of green lying between Shrawley Village and the River Severn. (01). Zoom in close enough to one of the darker green patches on the satellite view and you can see individual conifers; these are mostly Douglas fir *Pseudotsuga menziesii* which keep their dark green colour throughout the year. A few larches *Larix* spp. stand out among them as pale green in spring and golden brown in autumn (03a). Amongst the Douglas fir are scattered small-leaved lime *Tilia cordata* (03b).

The large paler green patches in (01) are an almost continuous canopy of deciduous trees, with small-leaved lime by far the most abundant. In April their leafless branches have a distinctive pattern and among them other trees can be seen (03c): white puffs of blossom (mostly wild cherry *Prunus avium*), small yellow-green crowns of birches *Betula pendula* and *B.pubescens*, the broader pale green crowns of oak trees *Quercus spp*. (03d) and at this time of year often slightly darker green of sycamore *Acer pseudoplatanus*. By mid-summer, the deciduous areas are all mid-green with paler crowns where the mature limes or sweet chestnuts *Castanea sativa* are flowering (03e). Two large copper beeches *Fagus sylvatica* f. *purpurea* stand out among the trees of the private section (03f).

These helpful satellite images from different seasons allowed us to rescue the data collected by our transects and to combine satellite-mapped genus with species and size data obtained when we had been up close and seen the bark, leaves, flowers and fruit (A01). From this, together with Forestry Commission maps and aerial photographs, we have divided the wood into subcompartments based on the dominant tree species and the date of planting or last coppicing (Appendix Table 1 p. 288). We have to recognise that this type of recording will soon be side-lined by remote sensing and computer modelling. We can only hope that it may at least be useful as a historical database for future comparisons.



03a-d: satellite views zoomed in copied from Google Earth April 2007 [© Bluesky International Ltd]. The yellow circle is 0.10 ha (17.84m radius), the radius points south. Counting trees within the circle allows an estimate of the density.
a bright green larches within a Douglas fir plantation.
b surviving lime within the Douglas firs.
c bright green birch within a lime coppice.
d a white patch of wild cherry blossom and bright green dome of an old oak standard within small-leaved lime coppice.
03e, f copied from Google Earth July 2013:
e two massive old sweet chestnut trees within small-leaved lime coppice
f a large copper beech and sweet chestnut near the New Pool.

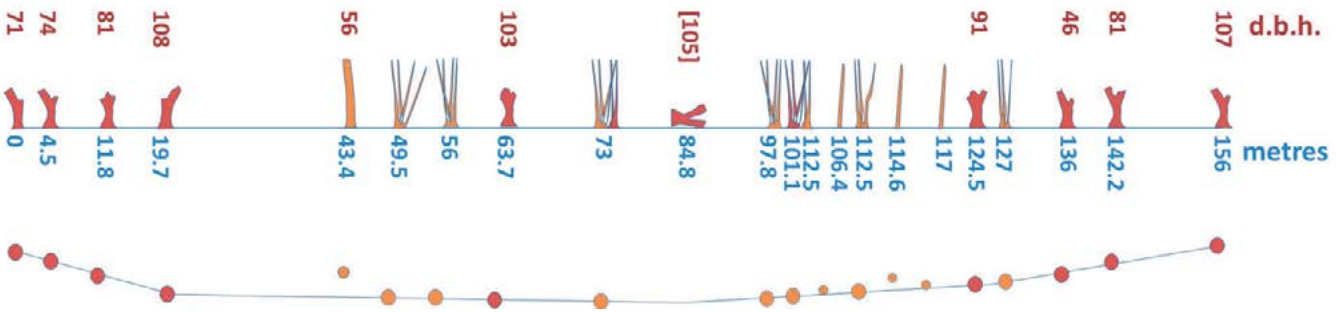
The trees

What we see now in the Wood is the product of its long history. We envisage that originally it was a mixed deciduous woodland of oak, small-leaved lime and birch with a smattering of other trees including rowan, hazel, wild cherry, aspen, alder and maybe many others.

Small-leaved lime

We believe this is a true aboriginal of the Wood. We know the whole Wood has been cut in portions every 15-20 years from the fifteenth to the twentieth century (see chapter Coppices & Binds pp. 200-205 for details). The stumps cut cleanly at ground level regrow so that by the time they are cut again there will on average be around ten stems, eight to twelve metres high, with diameters from 5-12 cms at breast height growing on each coppice stool. This regular cycle of cutting failed at the start of the twentieth century and some parts have not been cut since 1922.

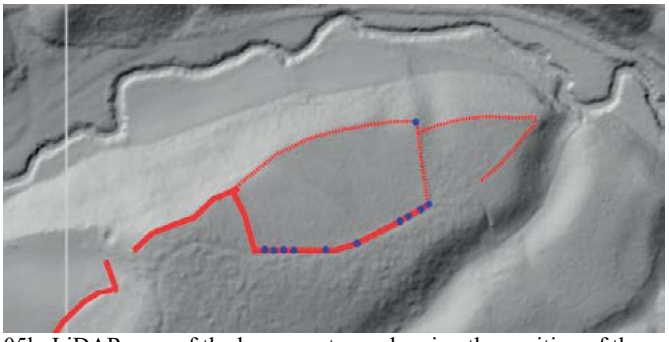
At the north of the wood is an ancient curved row of pollard small-leaved lime (04). The row is 156m long and was last cut in 2004. Since an earlier survey by North Worcestershire Archaeology Group (NWAG) in 2013, one of the trees was lost to old age in the winter of 2016 and another in 2017.



04a. The pollard row 2017: distances measured in metres from the west end along the open polygon indicated in the lower part of the diagram. Diameter at breast height (d.b.h.) measured in centimetres as girth/π at 1.3 metres above ground level.



05a. The pollard row.



05b. LiDAR map of the horse pastures showing the position of the wood banks which run along the borders of the Horse Leasow. It seems probable that there used to be other pollards filling in the gaps: There is a suggestion of this in the 1945 aerial photograph of the wood but the definition is too poor to be certain.

This pollard row marks the southern border of a field surrounded by a wood bank (05b). This field had become completely overgrown with birch trees *Betula pendula* and *B.pubescens* (A05c) and wild cherries *Prunus avium*. These were partly felled in 2018 but regrowth and regeneration has already begun. The northeast corner of this field was marked by another pollard that looks to be the same age but escaped the 2004 cut so its branches are much larger. The pollards are on the wood bank that runs around the field (see chapter LiDAR p. 260).



05c. Composite of Dougharty's map of 1732, the tithe map of 1839 and the current map of the pollard row. 475 = Upper Million, 476 = Great Grove Coppice, 477 = Hop Yard, 478 = Upper Horse Leasow. M2,3,4 are all designated "the Horse pastures" in the 1732 terrier for the Vernon Estate but are shown as part of the wood on the tithe map.

The tithe boundaries shown on a map from 1839 do not match the wood banks nor does the area designated as horse pasture match that on the Dougharty map of a century earlier; one must suppose that this area has been planted and felled in different portions over the centuries. It seems likely that much of the coppice in tithe 476 had been cleared to enlarge the pasture and then, when tractors replaced horses (see the chapter on Access, Extraction and Dispatch p. 238), the area was left unmanaged, allowing the natural repopulation with seeds from surrounding trees. Both species of birch and wild cherries have intruded on many of the subcompartments of the woods (07).

The pollard row may have started out as a hedge at the edge of the pasture which was allowed to grow then coppiced, with some trees later singled and pollarded. Sadly some of the remaining trees are in a poor state following the re-pollarding when they were too long overstood in 2004 and further loss seems inevitable. Low pollards are found in many places in the Wood (06).



06. One of several low pollards along the east edge of the Wood.

In 1985 Oliver Rackham visited Shrawley Wood and recorded a very tall lime tree in the Private compartment. His photographs allow us to identify exactly which tree this was. The frDSM derived height show it is now in excess of 35 metres tall (A08).

Oak

Shrawley Wood used to be famous for its oaks; in its heyday there were many more of these trees and their stumps are found all through the Wood. Despite the paucity of live oak trees, fungi associated with oak woods are still commonly found. The timeline tells of repeated sales of oaks but systematic replanting has been ignored for more than a century. A few areas still have something like the original density (A5b) – such as round the tomb of Sir George Vernon where a dozen large oaks stand close together, or near the perimeter of the private compartment a little north of the New Pool dam. There new wild cherry trees have been planted between large old oak trees.

Some of the oaks in Shrawley Wood are *Q. robur*, a few *Q. petraea* and the remainder most probably hybrid between these species; *Q. cerris* was found along the southern border of the Bridge Farm plantation. The high proportion of *robur x petrea* hybrids and scarcity of sessile oaks now may suggest that the sessile population was selectively removed in the past, perhaps because of its superior timber.



07. 8th May 2018: second year after coppicing. A dense patch of regenerating birch is growing where there had been a mature tree before coppicing. In the foreground is a Small-leaved lime stool has just come into leaf.

Birch

Birch is the next most common tree after lime; the pale green canopy stands out in aerial photographs taken in spring before the lime trees open their leaves. They grow readily from seed wherever there is space. Following recent coppicing, the density of birch has been greater than 100 per square metre in the first year or two near a previous mature birch tree (07), but competition between individuals and neighbouring re-growing lime stools soon reduces the density to less than one per square metre. Birch trees almost certainly formed part of the aboriginal population of the Wood, and are found in the same distribution in Shotgrove.

Hazel

Much of the hazel *Corylus avellana* is concentrated on a ridge in the northwest of the Wood (A05d). Here it comprises coppice stools of similar growth to the lime that it is mixed with.

Wild cherry

> *Loveliest of trees, the cherry now*
> *Is hung with bloom along the bough,*
> *And stands about the woodland ride*
> *Wearing white for Eastertide*[b]

And indeed at Eastertide the white cherry blossom stands out clearly in aerial photographs (03d), mapping the position of all the cherry trees (A04). There is a group of exceptionally tall wild cherry on the south bank of Dick Brook a short way upstream of the Forge Mill. We measured them by hypsometry and found the height of one of them to be 30.2 metres; the 2020 fr-DSM gave 26.5 metres (A07), though by comparison with the small-leaved lime values, the true value may be somewhat higher. The cherry plantation in Shotgrove has much the same height, with most of the trees showing over 24 metres by fr-DSM and some over 25 metres.

Rowan

Rowan trees *Sorbus aucuparia* are widely scattered around the Wood; their flowers stand out in aerial photographs in late May. A notable specimen was seen by survey site #06 with a palisade of stems arising by phoenix regeneration from a fallen stem (08).



08. Phoenix regeneration from a fallen rowan stem by survey site #06 in the north east of the Wood

Black cottonwood

Just north of Oliver's Mound is a 0.7 hectare block of a North American import, black cottonwood, also called Western balsam poplar *Populus trichocarpa* – indicated in purple in (A05e). These are all female trees, planted in 1969 by the Forestry Commission {2Be}, possibly as part of the Bryant & May initiative to grow knot-free timber for veneers to produce matches. Although this tree looks rather uninspiring here, on its home ground in California it can grow to become a massive tree, 40m high and 200cm diameter.[1]

Ash

The land the cottonwood plantation occupies is listed in the tithe awards of 1839 as an "ash bed" – a plantation of ash trees coppiced for poles and suchlike; ash trees still grow around the cottonwood plantation.

There is reference to another ash bed within Shrawley Wood described as "by the forge".[2] Thousands of ash trees were planted as saplings bought in Worcester Market at various times between 1779 and 1849. Ash growing today near these sites may well be their descendants.

[b] A E Houseman, *A Shropshire Lad 2*


09. A massive old sweet chestnut growing by the New Pool; this is the same tree as seen in (3e).

Sweet Chestnut
At the northwest corner of the Wood there is a 0.9 hectare sweet chestnut coppice: 5000 sweet chestnut trees were planted in the winter of 1876-7 (see chapter 1875-1897 p. 210). These two subcompartments have recently been coppiced alternately on a six year cycle. At this age the stems are suitable for splitting for chestnut palings and so on. There are sweet chestnut trees scattered through the rest of the wood (A05e), with a few massive old trees such as (09) (the same tree as seen in (03e)). There are also standards in the parkland by Wood House, presumably remnants of the wood when it was cleared to make the park. Previously coppiced sweet chestnut stools on the eastern scarp {2Bc} are now overstood with massive stems; these too may be from the 1876-7 planting.


10. Beech roots in the Ladywell cutting.

Beech
Beech *Fagus sylvatica* (10) is curiously infrequent in Shrawley Wood, limited to a dozen or so mature trees, mostly around the margins, and a few saplings. The mature trees may well be remnants of the Beech planting of 1801 (see chapter 1875-1850 p. 210).

Other trees
Walking through the woods one can see many species of tree, both native and foreign invaders. Much of the diversity is concentrated along the paths and round the margins of the woods, where there is more light and less competition from the cultivated trees. Here there are goat willow *Salix caprea*, rowan *Sorbus aucuparia*, elder *Sambucus nigra*, field maple *Acer campestre* and the occasional hawthorn *Crataegus monogyna* or groups of aspens *Populus tremula*


11. Developing elm seeds on the east edge of the Wood.

Along the brooks and in damp patches are **Alders** *Alnus glutinosa* and a variety of **Willow** species *Salix* spp. There are many references to planting sets for osiers *Salix viminalis* and withies *S. x fragilis* that may explain the origin of some of these willows along the brooks and in the brick pits.

On the northern border of the wood is a strip of woodland running all along the south bank of Dick Brook with a combination of wetland and marginal species and a high proportion of **Sycamore** *Acer pseudoplatanus* and small-leaved lime, some of which show signs of coppicing, possibly around 1930. A few small **Elms**, both wych *Ulmus glabra* and English *U. procera*, have managed to regrow from stumps of trees killed by Dutch Elm disease around the margins of the wood (11). Along the eastern border, at the bottom of the escarpment by the water meadows, there is more diversity

including a solitary old coppiced **Large-leaved lime** *Tilia platyphyllos*, and above the quarry is a single **Wild service tree** *Sorbus torminalis*, surrounded by germinating seedlings in 2017. Above the quarry rockface at the south end of Oliver's Mound were two **Common lime** trees *Tilia x europaea* laden with mistletoe *Viscum album* but one of these blew down in the spring of 2018. DNA testing has established these two are the *Hatfield* cultivar (chapter DNA p. 332) and therefore planted out from a commercial source. An order for six lime trees on Oct 2 1884 for Mr J Wormington[3] (chapter 1875-1897 appendix B 1884 p. 218) might perhaps be the source of these trees; at this time Samuel Powick, gamekeeper to the Vernon Estate, lived near there in a house called *Curriers*, vacated by brick workers after the brick pit closed. It seems conceivable that two of these six lime trees ended up at this conspicuous position near Samuel Powick's House. Two or three other limes suspected of being *T.x europaea* on the grounds that they had mistletoe which is rarely found on *T. cordata*; nevertheless, DNA from these established they were truly *T. cordata*.

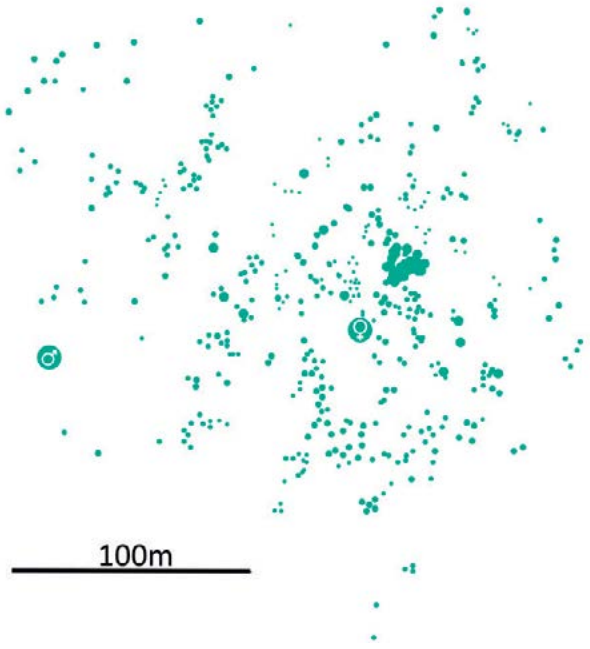
Acers
Field maple *Acer campestre* is frequent along the path leading from Noutard's Green to the Forge and along the northern and eastern edges of the Wood. These old trees seem particularly attractive to a range of lichen species (see chapter Drone Surveys p. 318). Sycamore *Acer pseudoplatanus* too is noticeably more common around the northern margins (A5e) and the range of sizes and ages gives the impression of an invasion proceeding from the northwest.

Aspen
There are two areas with multiple aspen trees *Populus tremula* regrowing since their last coppicing, one by the hazel and one more centrally (A03). All the stems in each area open their leaves synchronously but one area is a week behind the other.



12. Ancient female and male yews.
Female yew had minimum girth 3.65m at 40cm above ground level. Male (right);had minimum girth 3.77m at 20cm above ground level, indicating an age of 300-500 years.

Yews
Under the canopy of the lime tree coppice are trees and shrubs that can tolerate the lower light levels (A02): Laurel *Prunus laurocerasus* grows in a few places and rhododendron *Rhododendron ponticum* has invaded the woods near the gardens of Wood House. Holly *Ilex aquifolium* and yew *Taxus baccata* are common in the wood and in some areas have formed impenetrable thickets. Scattered through the wood are a few great ancient yews (A02), survivors of many cycles of coppicing of the lime around them. A dozen or so of these yews have girths of 3-4m despite growing surrounded by other trees, suggesting ages in the range of 300-500 years. There were almost equal numbers of actively reproductive male and female, with a similar number of yews showing no sign of inflorescence in 2018. Most of the old yews are around the steep edges of the wood, but the two most fecund females are more central, on level ground. Round these are discrete thickets of younger yews.



12. Distribution of yews around an old female as mapped by drone. The size of dots reflects the size of the yews. The location of this group is shown on (A02).

The positions and sizes of the yews around an old female were traced from a survey by drone flown in a grid pattern over the site at 60m height in March before other trees had leaves, yielding 42 x 12Mp slightly overlapping images (12). A continuous video taken over the same flight path gave a 3D view that allowed the yews under the canopy to be identified. The resulting pattern, with no other yews in the neighbouring area (13) strongly suggests that the young yews are the offspring of the central female yew, spread by birds who had fed on the fruit. It seems that all these offspring have grown since the last coupes, suggesting that only the oldest yews were spared.

The semi-regular line of yews on the steep southern bank of the Wood in the private compartment points to intentional planting; we have not yet found any documentary evidence to prove this.

Conifers
While it is possible that the primeval Shrawley had conifers such as larch or Scots pine, all conifers there now have been planted. Details of dates and location are given in the historical chapters.

Larch
There is a group of tall old larch trees can be seen behind the deer fence round the private compartment when walking along the path leading from the park towards Leyes Pool. A few still stand in and around the high quarry; one on Oliver's Mound fell a few years ago.

Between 1838[4] and 1883[5] around 20 hectares on the west side of the Wood were cleared of trees for agricultural use (01). In February and March 1889 (see chapter 1875-1897 p. 210) five hectares of this had been re-planted with mixed conifers (mostly larch) and deciduous trees. Among the trees planted at this time were 100 "Acacia", ***Robinia pseudoacacia*.** This is a North American tree from the Appalachians, introduced to Europe in 1601 by Jean Robin, tree specialist to King Henry IV of France[6]; its wood is prized for use outdoors but it is now an invasive pest over much of Europe.[7] Although most of this plantation has been cleared, replanted and now recently thinned again, at least one of these Robinia remains, now an old tree surrounded by several of its offspring in a clearing at the south end known locally as "The Glade". Another foreign import can be found at the southwest corner of this plantation where there are three **Japanese cedars** *Cryptomeria japonica;* new pests and diseases have caused a fresh review of this species in 2020 for

diversity & resilience.[8] The Forestry Commission had been experimenting with the suitability of this species for forestry around the time[8] that they replanted this subcompartment in 1964 and it seems likely that these were planted on the margin of the plot as part of that initiative.

Scots pine
These were planted in the Wood in 1877 and probably again since then. Anyone entering from Noutard's Green will have seen the stand along the main path. There are others near the southern edge of the private compartment.

Norway spruce
There are individual Norway spruce *Picea abies* scattered widely around the Wood and a few collections of them centrally in the private compartment (A04). One that was cut recently had annual rings suggesting an age close to 200 years. Thinnings from a planting from around 1828 were sold in 1840. 2000 "Spruce Fir" were bought for planting out in 1889, but these were probably planted in an area subsequently cleared and replanted.

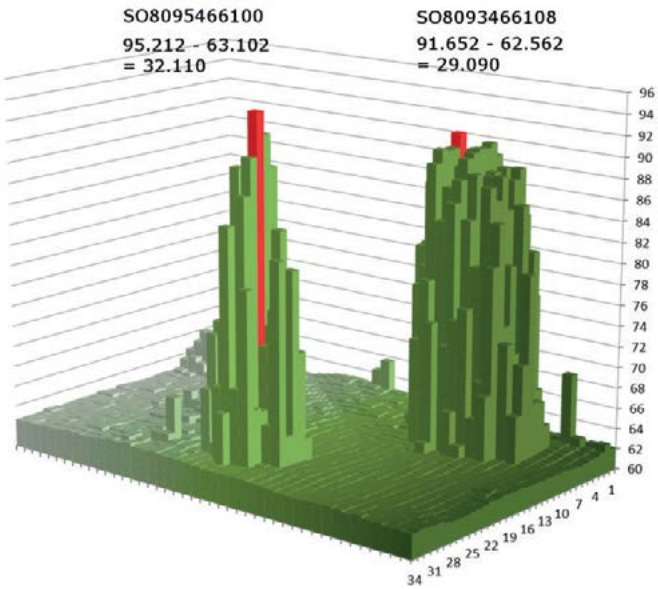
Douglas fir
Small-leaved lime is an aboriginal native and the coppice stands have been inherited from the ancient traditions of the Wood. In contrast, Douglas fir is a foreign import. It was first introduced to the UK by David Douglas, who came across many of these as huge old trees in his travels in North America in 1827: [9] he identified them as *Pinus taxifolia* but the accepted name now is *Pseudotsuga menziesii*. One of the first-planted seeds that he sent back survives in Scotland as "Dughall mor" and was for a while considered UK's tallest tree; it has now been outstripped by a later planting in Reelig Glen, near Inverness: this Douglas fir, measured at 66m in 2014, was then recorded as the tallest tree in Europe.[10] The trees in Shrawley Wood were planted by the Forestry Commission in blocks from 1964 to 1972 with additional trees planted until 1983. Their height is mapped in (A03) and (A06): our tallest was planted 1970 and at 50 years old had a first-return DSM height of 38.93 metres in 2020, already taller than the tallest Wellingtonia but dwarfed by the likes of Dughall mor.

These trees do not form a complete canopy, so (A05f) maps the percentage of the area visible on the satellite view occupied by *Pseudotsuga menziesii*. These crops are now being harvested so this map represents the position in August 2017: since then some of the conifers in the northern part of the Woods have been thinned and the small-leaved lime that has survived hidden amongst the Douglas fir is recovering, in some places as mature trees, in others as fresh coppice where the stools were cut.

The Wellingtonias
Standing proud above lime canopy are the giant redwoods *Sequoiodendron giganteum*, also called Wellingtonia (14). One of these magnificent trees has been the nesting site for ravens *Corvus corax* for the last few summers (photo p. 416); another had a hornet *Vespa crabro* nest in a crevice in the bark in 2017 (16) with blue-green banding from wood infected with the blue-green fungus *Chlorociboria*. This fungus is commonly found in the dead lime branches that litter the floor of the wood.

Seeds and young plants of Wellingtonia were first brought to England for Veitch Nurseries by William Lobb in 1853.[11] They rapidly became a horticultural craze and were soon acquired by many of the great estates. We do not know the exact date when the first of the Shrawley Wood Wellingtonias were planted, but they were mapped by the Ordnance Survey in 1883 and so must have been substantial trees by then, suggesting they may have come from the first tranche of Veitch's imports which were being sold in 1854 as seedlings at two guineas each[c] or twelve guineas a dozen. There are now eight of these mature Wellingtonias: four in the public section, four in the private but there were originally more. The diameter at chest height measured as girth/pi on five of these trees ranged from 141—222cm.


14. Wellingtonias *Sequoidendron giganteum* 13 April 2018.



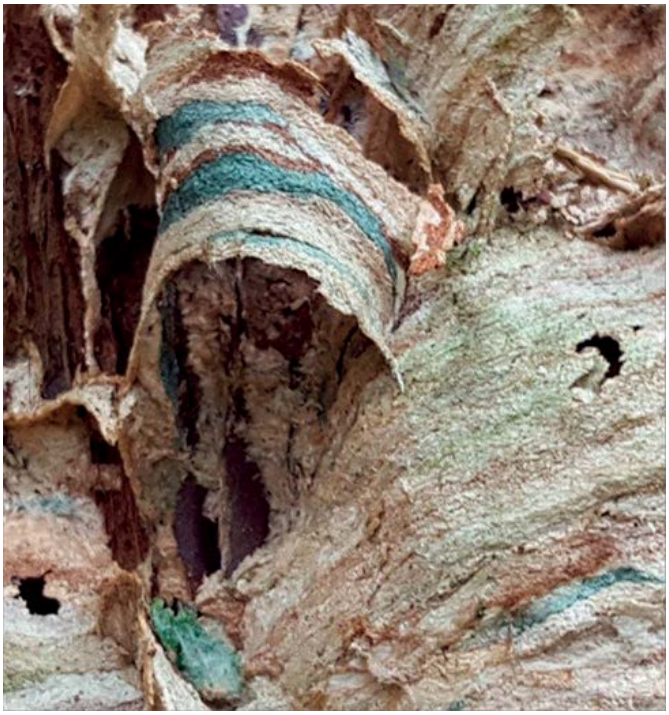
15. LiDAR 2014 Digital Surface Model (DSM) of the same two Wellingtonia by the cross-rides. Subtracting the Digital Terrain Model value from the DSM gives their heights on 12 December 2014 as 32.1m and 29.1m.

The 21 March 2020 LiDAR survey gave the heights of the three highest Wellingtonias in the private compartment as 37.33 metres, 37.6m and 31.13m: those in the public compartments 29.99m, 32.89m, 34.6m, and 32.9 metres.

The villagers of Shrawley wanted to commemorate the millennium by planting two more to replace some of the ones that had been lost but were prevented from doing so because these were not native trees; the planting of an alien species such as this within the SSSI would have been regarded as an "Operation Likely to Damage" by Natural England. Instead, they were allowed to plant two sessile oaks *Quercus petraea*. The acorns had been collected locally and germinated by John Westwood who lives in the village. These "Millennium Oaks" are growing on open ground {2Ba} near a high point of the Wood and have been named John and Mary – the commonest forenames in the village at that time. Later the Forestry Commission relented and in 2012 allowed the villagers to plant two more Wellingtonia opposite the two mature trees on the main ride,

[c] Equivalent to £220 in 2017 according to an online converter based on data from the Office of National Statistics.

the southern one as a memorial to Andrew Yarnold, a Shrawley man who died suddenly age 44 in 2011 after running the Droitwich marathon.



a



b

16a. Hornet *Vespa crabro* nest (photo RP). The blue bands derived from wood infected with the blue-green fungus *Chlorociboria* seen in 16b (photo Mandy Jones).

The Private Compartment

Management of the wood has been different in the private section since a change in ownership in 1990. A previous plantation of larch *Larix decidua* was harvested and replanted in 1996 with oak, beech, wild cherry and rowan. Another area was cleared around the same time and planted with oak, beech, wild cherry and yew. Wild cherry trees have been planted among the old oaks just north of the dam. Five swamp cypress *Taxodium distichum* were planted between the Middle Pool and New Pool in 2010, and a Japanese cedar *Cryptomeria japonica* on the high ground south of the northern branch of the New Pool. A variety of ornamental shrubs have been planted around the pools.

The Wood House Park

A map of the Vernon estates[12] [see Historical Maps] shows that the wood had been cleared from round the site of Wood House before 1731. By 1883[5] this park had been enlarged, leaving selected trees that remain as the grand old sweet chestnut and oak trees we see now. The trees lining the avenue from Wood House northward through the wood are not in a regular straight line and it seems probable they were trees left standing when the park was cleared rather than being specially planted. A recently felled horse chestnut *Aesculus hippocastanum* in the park by the Village Hall had growth rings indicating an age of around 140 years and so must have been planted around 1880.

Recent plantings of non-native trees in the private parkland by the Wood include two clumps of monkey puzzle *Araucaria araucana* with seeds from the garden of Ascot Place, Berkshire, collected and germinated by Bob Hayward who planted them out in 2000.

The College Plot

The Parish of Shrawley is well-provided with public footpaths: some of these run around and through the wood. If you enter the wood by Wood Farm and head a little north of east on a broad path, after 120 metres on the right there is a rowan tree.[d] Turn right here along a narrow path through the brambles and you are confronted by a wall of dark green trees: this is a crowded group of western red cedar *Thuja plicata*. On the far side of this is a gap of several yards until the path is blocked by the high weldmesh deer fence surrounding the private part of the wood. Between you and this fence are 20 or more small Norway spruce *Picea abies*, mostly dead or dying. In front of you, right by the western red cedar are two tall trunks and high above you are distant leaves looking intermediate between beech and sweet chestnut: these are raoul *Nothofagus alpine* (19). This curious constellation of trees is the remains of the College Plot, an area set aside for practical work by forestry students under the tutelage of G E Simmons from 1962 onwards for several years (18). An anonymous page of "Notes on Shrawley Wood" written sometime around 1964 states:

College plot: 1/10 acre of small-leaved lime with some silver birch is being cleared and replanted each year. Some of the cut lime and silver birch is being utilised at college in Rural Crafts. The species replanted are Douglas fir, Beech and European Larch up to 1964. Future plans are to ~~the~~ plant out blocks of different species of soft and hardwoods. Records are being kept of growth rates of the re-planted species together with mammal damage. A small area is being fenced off to find out the effect on vegetation when not grazed. The change in composition of the ground flora in the different areas is being recorded by random sampling, line and belt transect, also by permanent quadrats. This is combined with soil testing and analysis of litter (leaf) in the relevant areas, for soil invertebrates. The recolonisation of the bonfire plots is also being recorded. The whole area combines ecology and forestry practice and shows the inter-relation of the two subjects.

This looks like a handout for Simmons's students and matches the information in figure 83 in his book,[13] apart from reference to beech and not raoul: possibly the reference to "beech" includes southern beech – another name for raoul; this species is an import from Chile and Argentina. The Forestry Commission notes that these trees are not fully frost hardy[14] and that severe frosts have caused damage and loss to experimental plantations, so it seems we may be lucky to have these two trees left out of the eight shown in Simmons' planting plan. The approximate positions of the College 1/10 acre compartments are shown in red. Two surviving Raoul were found in compartment C3 and a group of Western red cedar *Thuja plicata* in C4 confirming that the plans to plant these went ahead. A few poorly growing Douglas fir were found in C1, C2 and outside this to the north, suggesting a possible C5. There were seven dead or dying Norway spruce *Picea abies* in C1 and a dozen or more in C3.[e] The site is now being invaded by sycamore *Acer pseudoplatanus* with a couple of trees and a dozen or so saplings of various sizes.

It was not possible to match the standard trees exactly with the positions shown in Simmons' plan but the surviving raoul *Nothofagus alpine ("Northofagus procera"* on his plan (18)), western red cedar and the Norway spruce seem to be where they should. The single common beech *Fagus sylvatica* in C2 seems too small to be a survivor of the College plot plantings, but if not, its presence is not easy to explain.

Due to parallax, the canopies visible in the drone image do not exactly match the position of the trees visible in the LiDAR DSM; the most extreme displacement is seen with the raoul: the purple dots mark the stem bases on the LiDAR and the purple circles, the presence of Raoul in the canopy. (20) shows the inclined trunks of the Raoul, explaining this displacement. The limes (SLI) were more prominent on the DSM because of a dense growth of ivy *Hedera helix*.

[d] Sadly this tree fell in 2019 and decay was advanced by 2021.
[e] These were the numbers in 2017: there were fewer in 2021.

Conclusion

Shrawley Wood is the product of its history. The intervention of Woodmen clearing, planting and coppicing was needed to produce the wood as we see it now; in its heyday it was largely small-leaved lime coppice under oak standards. Recent planting of exotic species and harvesting oak without replacement has left a modern derivative of the wood that many might consider impoverished. Left to its own devices, the wood will gradually change. Some lime trees have been known to live for thousands of years;[15] others grow old and fall over or die if they are not coppiced. This can already be seen in some parts of the wood such as along the steep eastern edge. Seedling limes are grazed by voles then by deer[16], preventing natural repopulation. Open ground is taken over by a few species such as silver and downy birch, goat willow, rowan and elder. Holly and yew intrude under the canopy and form thickets to the detriment of the lime. This would be the natural course of events. The associated flora and fauna would change. For better or for worse? This will depend on ones point of view. A successful future for the wood will depend on intelligent management: we live in hope.

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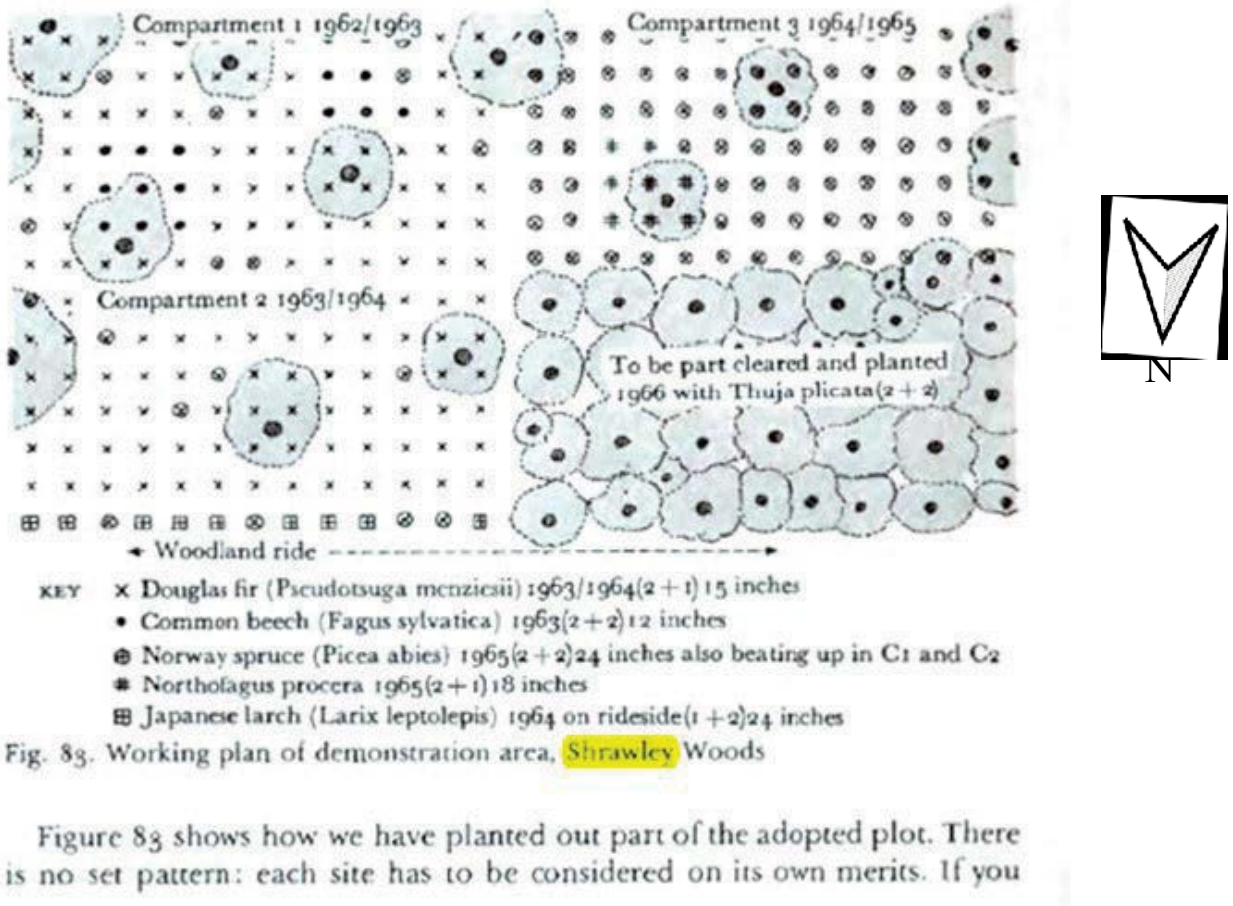
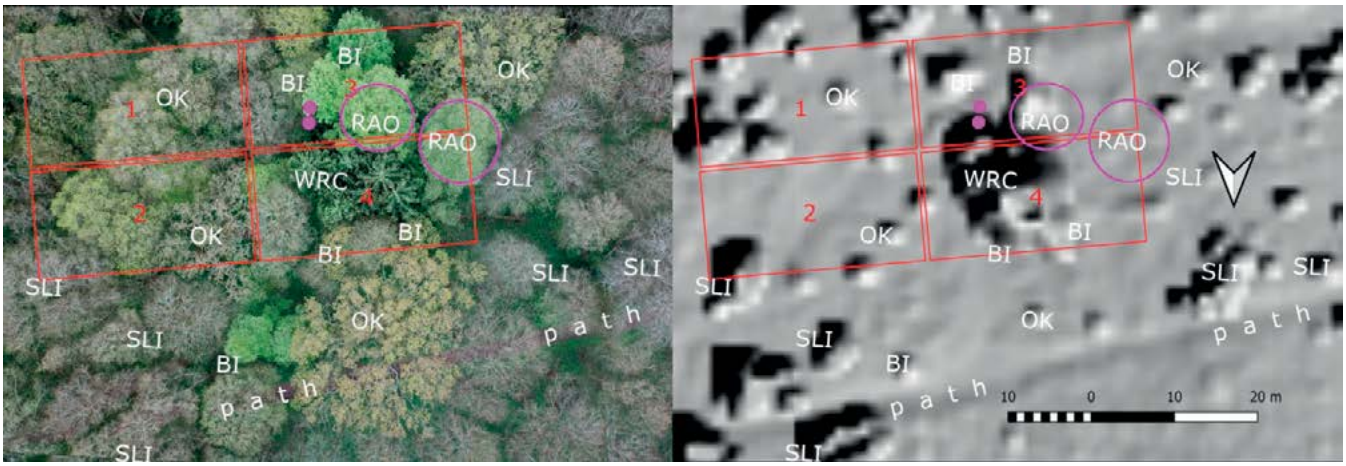


Fig. 83. Working plan of demonstration area, Shrawley Woods

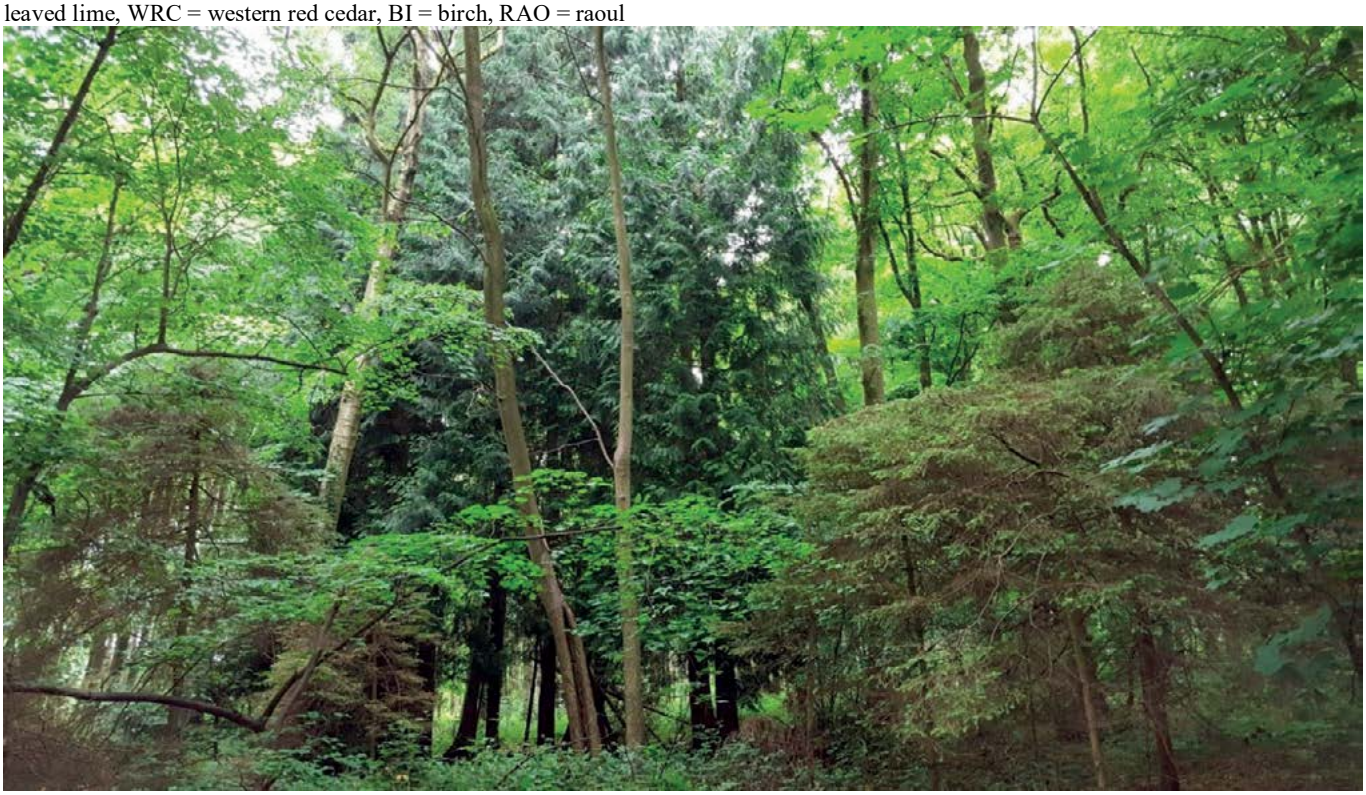
Figure 83 shows how we have planted out part of the adopted plot. There is no set pattern: each site has to be considered on its own merits. If you

18. Original Plan of the College Plot from Simmons book[10]. It seems that the big dots with shaded circle round them were standards left

when the plot was cleared.



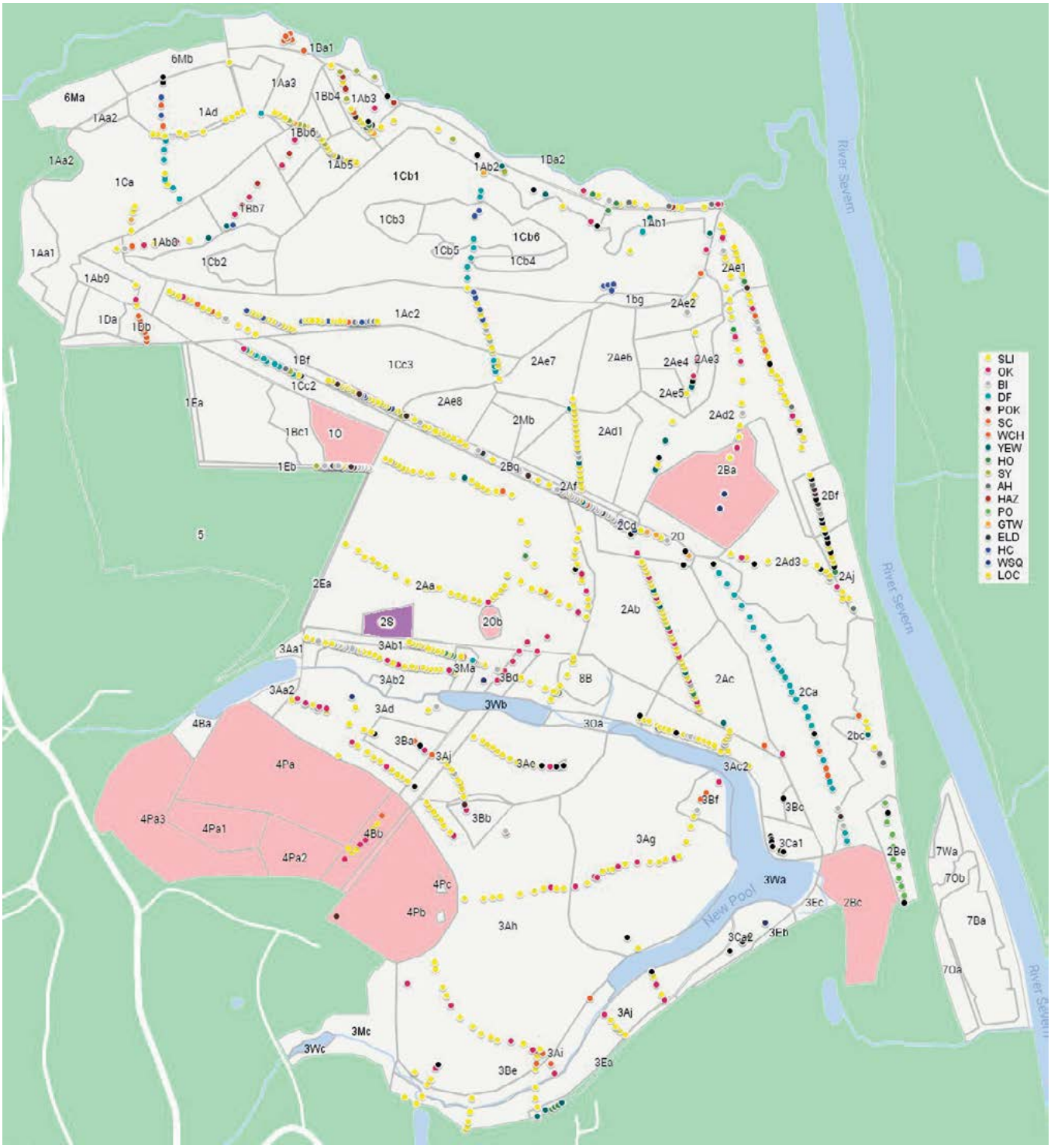
19. The college plot as it is now: left = drone photo of 29 April 2018, right = LiDAR DSM 12 December 2012. OK = oak, SLI = small-leaved lime, WRC = western red cedar, BI = birch, RAO = raoul



20. Photograph of the College Plot taken on 5th June 2017 from the deer fence, looking toward the Raoul and western red cedar, with Norway spruce in the foreground.

Measuring and Mapping the Trees of Shrawley Wood Appendix

Richard Pumphrey



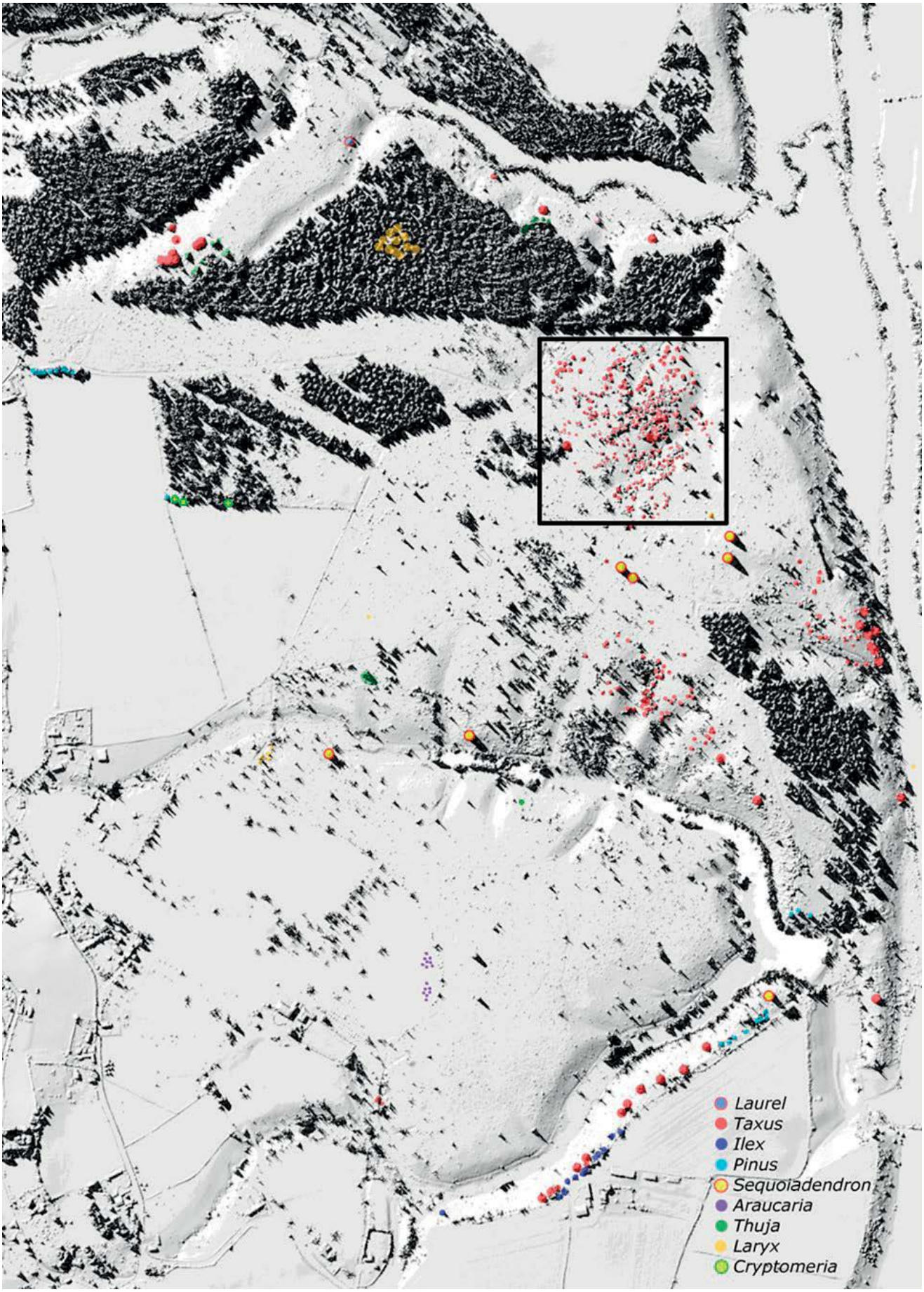
A01. Subcompartment Map.

Each dot on this map is the location of a stool, tree or oak stump surveyed by recording the species, counting the number of stems and measuring their diameter at breast height 1.3 metres and measuring the girth at ground level for stools and stumps. The pink areas were more open and surveyed by walking through the area and recording the species of each tree on an aerial photograph. Detailed surveys of specific areas included: parts of the purple area {2S}: see (18)-(20); the pollards around {1Ad}: see (4), (5); 36 circular areas up to 17.84 metres radius (0.1 ha) see chapter on Regrowth and Regeneration pp. 294-301.

The compartments in (01) are here divided into subcompartments: see Table 1 for details of each.

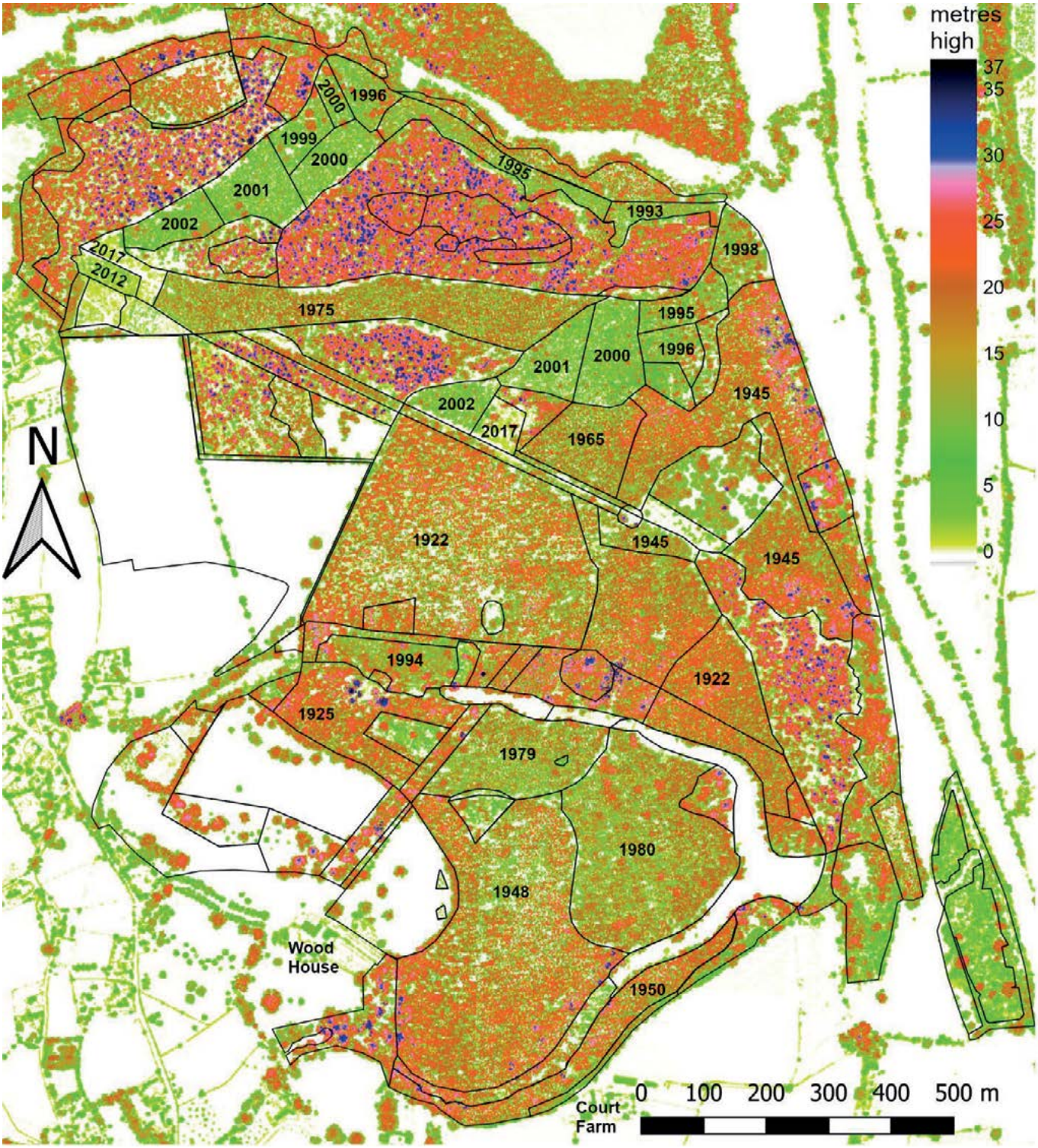
A= dominant *Tilia cordata*	B = dominant other broad leaved trees
C = dominant conifers	D = *Castanea sativa* coppice
E = peripheral hedges	M = mixed woodland
O = open ground	P = Parkland
W = water and wetland	S = College Plot

The lower case letter and number following the type code indicate subcompartments with different species mix and/or forestry histories as detailed in Table 1.

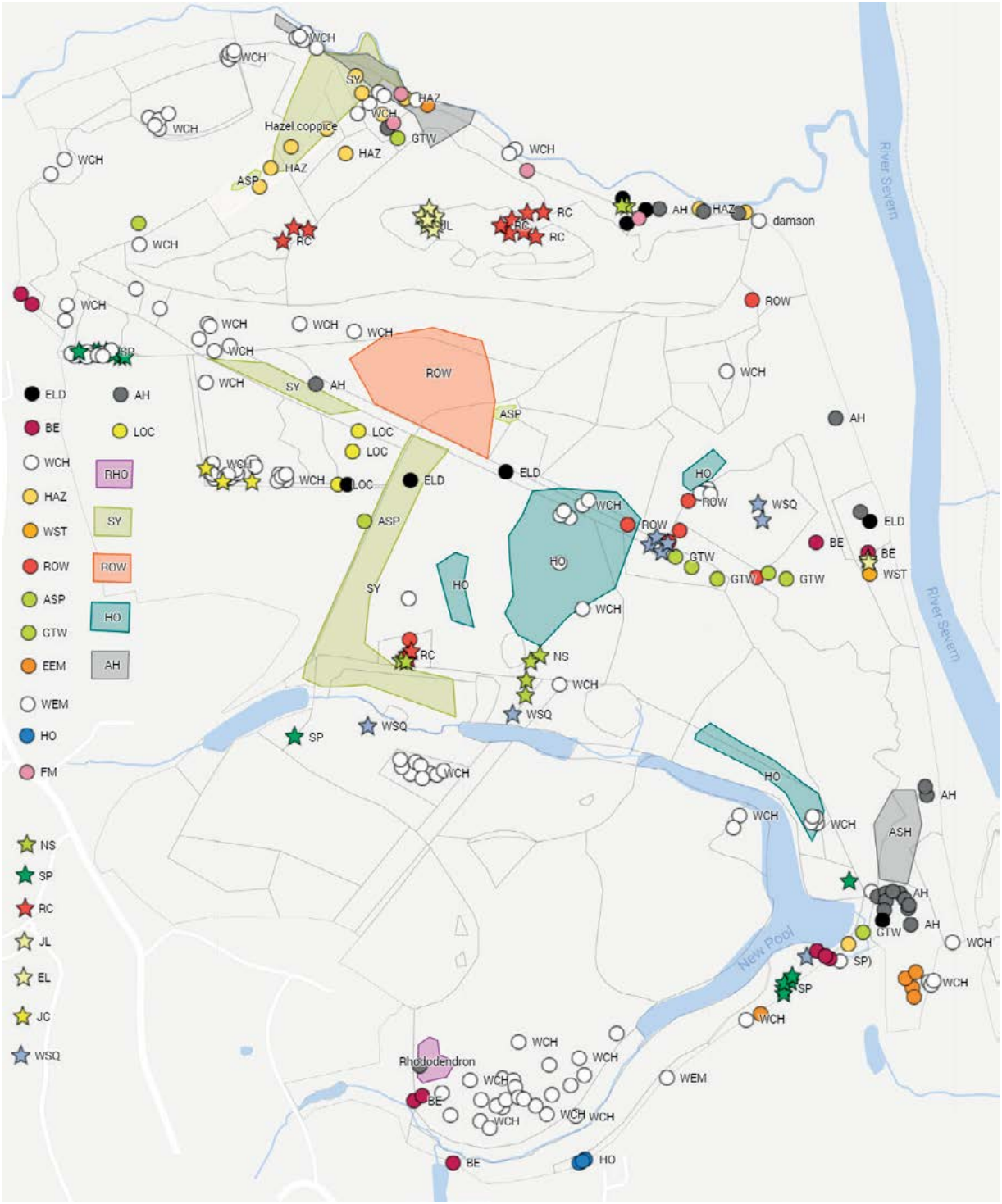


A02. 2014 LiDAR Digital Surface Model (DSM) of Shrawley Wood (see chapter LiDAR p. 258).

The LiDAR data was collected on 12 December 2014 and the sensitivity for compiling the Digital Surface Model was set too low to "see" the thin leafless branches of the small-leaved lime but the evergreen trees and ivy-laden deciduous trees were detected. Some of the genera of trees that stand out on the DSM have been indicated by colour as in the key. The semi-regular row of yews along the southern border suggests these may have been planted intentionally. The black square outlines the area shown in (12).



A03. Map of Shrawley Wood made by subtracting the 2020 DTM from the 2020 first-return DSM (see chapter LiDAR p. 258), giving the canopy height as seen by the first return. Buildings are also shown with a colour determined by the height of the roof. The date of last coppicing is shown for a selection of small-leaved lime binds. The regrowth of the lime coppice following the last coppicing is discussed in the chapter Regrowth and Regeneration pp. 294-301.



A04. Location of some other trees recorded during this study. (see A02) for yews.
Wild cherry [WCH] is scattered widely through the wood.
Rowan [ROW] is scattered widely through the wood but is particularly common in the area marked.
Holly [HO] is particularly common in the areas marked.
There are a few small English Elm [EEM] and Wych Elm [WEM], mostly at the edges of the wood, often with dead stumps nearby.
Goat willow [GTW] and other *Salix* spp. and hybrids are common on the path edges and in places in clusters among the limes.
Aspen [ASP] grows in two dense patches with occasional individual trees elsewhere.
Beech [BE] is rare in this wood with only a few individuals, mostly on the margins. 500 beech bought from Mr Hammonds of Worcester in 1801were planted in the wood; the age of some of the beech suggests they may date from this planting.
Robinia [LOC] was planted in 1889; the area around it has now been cleared ("The Glade" – {1O}) to prevent this invasive tree spreading further.
Sycamore [SY] is frequent in the north and east, with many young trees in the areas marked.
Ash [AH] seems limited to the more alkaline soil where wild garlic grows instead of bluebells, predominantly in or by the old ash beds.
Rhododendron [RHO] is limited to an area near the Wood House Gardens; a bill for the purchase of *Rhododendron ponticum* from Anthony Waterer Knaphill Nursery, Woking, Surrey is dated 1875.
The oldest of the Wellingtonias [WSQ] were planted probably around 1855-65.
There are of course many more trees than illustrated here, but the intention of this map is to give an idea of the diversity within Shrawley Wood.
The Forestry Commission codes for the other trees are listed in appendix Trees & Woody Shrubs pp. 337-9.

C	typ	sC	area name	FC sbcpt	area Ha	OG Ha	date	a	detail	%SLI	%DF	%BI	%OK	%SY	%SC	%WC	%CAF	%AH	%PO	other	%OG	Σ%	other=
1 .		all	FC north	FC2070	47.1	47.157																	
1	A	a1	W steep fringe	g iii	0.791	0	1965	c	SLI (part singled 2017)	87	0	5				2			0	6	0	100	
1	A	a2	NW steep fringe	g ii	0.412	0	1965	c	SLI	85	0	5				5	0		0	5	0	100	
1	A	a3	N steep fringe	b (7%)	0.927	0	1965	c	SLI	71	10	5		8	4				0	2	0	100	GTW
1	A	b1	N coppice 1	i	0.896	0.05	1993	c	SLI	81		7	2			2				5	5	102	FM, YEW, NS, RC
1	A	b10	Middle coppice 10	d (9%)	0.439	0.27	2017	c	SLI 2017 no standards	39											61	100	
1	A	b2	N coppice 2	e (part)	1.27	0.05	1995	c	SLI: s [OK SLI] 1975	63	3	15	5	5		2		1		3	3	100	HAZ, GTW, ELD, YEW
1	A	b5	N coppice 5	e (part)	0.979	0.02	2000	c	SLI: s [OK SLI] 1975	35		55	2			2		1		3	2	100	HAZ, GTW, ELD, SY
1	A	b8	N coppice 8	i (part)	0.946	0.02	2002	c	SLI: s [OK SLI] 1975	58		23	7	3						7	2	100	HAZ, YEW,RC
1	A	b9	W coppice 9	d (8%)	0.395	0.05	2013	c	SLI 2013 no standards	50		20							10	5	15	100	FM
1	A	c2	Middle coppice 11-20	d (83%)	5.07	0.2	1975	c	SLI: i BI (E>W)	73		23				1					3	100	
1	A	d	Pollard row	g i (5%)	0.087	0.04	2004	pol	SLI re-pollarded	55	0	0	0		0	0	0	0	0		45	100	
1	B	a1	Dick Brook fringe W	f part	0.899	0.03	1900	u	u since 1930?	31	0			41				5		20	3	100	HAZ, FM, HO, EEM, WEM
1	B	a2	Dick Brook fringe E	f part	1.34	0.01	1900	u	u since 1930?	55	0			35				5		30	0	127	HAZ, FM, HO
1	B	b3	N coppice 3	e (part)	0.711	0.02	1996	c	SLI/HAZ	35		15	5	3		3		2		35	2	100	**HAZ**, GTW, ELD, LAU
1	B	b4	N coppice 4	e (part)	0.334	0.01	1997	c	SLI: s [OK SLI] 1975	30		27	5	8		2		1		25	2	100	**HAZ**, GTW, ELD
1	B	b6	N coppice 6	e (part)	0.664	0.1	1999	c	SLI/HAZ: s [OK SLI] 1975	30		20	7							28	15	100	YEW,RC,**HAZ**
1	B	b7	N coppice 7	e+i (part)	1.37	0.1	2001	c	SLI: s [OK SLI] 1975	33		20	7							23	17	100	YEW,RC,**HAZ**
1	B	c1	BI by Robinia	h (approx.)	0.644	0.001	1965	c	i SBI, PBI	7		93									0	100	
1	B	c2	OG with old Robinia	c+h (9%)	0.834	0.664	2009	c	DF: u LOC, SC	2			3		8					8	79	100	LOC
1	B	d	BI by SLI pollards	g i	1.61	0.07	1965	c	i SBI, PBI	5	0	84			1	6	0	0	0	0	4	100	
1	B	e	By the SC	k (16%)	0.184	0.01	1940	u	u	55	0	8	5	13	2	5		2		5	5	100	SP
1	B	f	Ride margin NW	c (10%)	0.54	0.2	2016	c	c ride edge	50	0	3	5	3	0					2	37	100	GTW
1	B	g	DF c 2010	a (1%)	0.229	0.2	2010	c	DF(p 1970)	40										10	50	100	
1	C	a	DF northwest 1970	b (93%)	5.57	0.01	1970	p	p DF [c 1955]	6	92	0	1		0	0	0	0	0	1	0	100	GTW
1	C	b1	DF north central 1970	a (70%)	8.88	0.21	1970	p	p DF 1970 + SLI c 1960	6	92										2	100	
1	C	b2	DF north central replant RC1983	a (4%)	1.27	0	1983	p	p RC (SLI 1960)	5	85									10	0	100	RC
1	C	b3	DF north central replant JL 1982	a (3%)	0.45	0	1982	p	p JL	9	82										9	100	
1	C	b4	DF north central replant DF 82	a	0.346	0	1982	p	DF		80									20	0	100	JL
1	C	b5	DF north central replant DF 83	a	0.076	0	1983	p	DF		100										0	100	
1	C	b6	DF north central replant RC1983	a (4%)	1.27	0	1983	p	p RC (SLI 1960)	5	85									10	0	100	RC
1	C	b7	DF north central (W) replant	j (part)	0.532	0	1964	p	p DF	6	63	20		1	2	8					0	100	
1	C	c1	DF middle (W) 1965	c+h (24%)	2.16	0.04	1964	p	p DF	6	58	20	3	1	2	8				1	1	100	JC
1	C	c2	DF middle (central) 1964	c+h (10%)	0.985	0.04	1965	p	p DF	10	66	9	1	7		1		1		1	4	100	ROW
1	C	c3	DF middle (east) 1966	c+h (20%)	2.99	0.3	1966	p	p DF	15	72	2								1	10	100	ROW
1	D	a	Coppice SC b	k (44%)	0.445	0.002	2007	c	SC 6 yr cycle			10			90						0	100	
1	D	b	Coppice SC a	k (40%)	0.427	0.002	2013	c	SC 6 yr cycle						95					5	0	100	HO
1	E	a	OK hedge by DF mid(W)	c+h (2%)	0.167	0	1900	p	SOK, POK			10	50	5	20	10				5	0	100	JC
1	E	b	Hedge by Robinias	c (3%)	0.178	0	1900	u	u			60	25	5						10	0	100	ELD, LOC
1	E	c	SP-WCH		0.166	0	1925	p	SP, WCH, OK				5	5		45				45	0	100	SP
2 .		all	FC south	FC2071	49.6	50.144																	
2	A	a	Stcred SLI west	a	11.2	0.1	1965	s	c SLI 1925 s SLI 1965	95	0	1	1			0.5				2.5	0	100	NS
2	A	a9	2017 coup	g (part)	0.491	0.41	2017	c	DF + SLI	10	5									2	83	100	ROW
2	A	b	SLI mid	b (part)	3.59	0	1965	s	part s: c1945	85		7	0.5	5						2.5	0	100	HO
2	A	c	Stcred SLI southeast	b(ii) (part)	1.9	0	1965	s	c 1945 c/s 1955	90	0	4	1							5	0	100	HO, HAW, YEW
2	A	d1	S coppice	g	1.78	0.1	1965	c	SLI	81		9								5	5	100	YEW
2	A	d2	Stcred SLI north	b(i) (most of)	5.17	0.07	1965	c	SLI	52		14	8	5	8			2		10	1	100	WEM, ELD,
2	A	d3	CwS southeast	e	4.38	0.12	1945	c	SLI 1945 [SC 1885]	80		9		1	2			2		4	2	100	
2	A	e1	N CwS 1	c (14%)	0.893	0.1	1993	c	SLI 1996 s 1945/65	70		9	2	2						6	11	100	YEW, HO, GTW
2	A	e2	N CwS 2	c (13%)	0.791	0.1	1995	c	SLI 2000? s 1945?	75		8								5	12	100	YEW
2	A	e3	N CwS 3	c (6%)	0.423	0.05	1996	c	SLI 1996 s 1945/65	70		9	2	2						6	11	100	YEW, HO, GTW
2	A	e4	N CwS 4	c (9%)	0.63	0.1	1997	c	SLI 1996 s 1945/65	74		9	2	2						6	7	100	YEW, HO, GTW
2	A	e5	N CwS 5	c (6%)	0.399	0.02	2000	c	SLI 2000? s 1945?	72		18								5	5	100	YEW
2	A	e6	N CwS 6	c (22%)	1.45	0.05	2000	c	SLI 1996 s 1945/65	78		9	2	2						6	3	100	YEW, HO, GTW
2	A	e7	N CwS 7	c (18%)	1.18	0.15	2001	c	SLI 2000? s 1945?	75		8								5	12	100	YEW
2	A	e8	N CwS 8	c (12%)	0.776	0.02	2002	c	SLI 2000 s 1945?	78		15								5	2	100	ASP
2	A	f	Ride margin central (NE)	c,g,b SW edge	0.198	0.1	1978	c	c ride edge	44										6	50	100	ROW, GTW
2	A	j	Severn steep fringe	e part	1.03	0	1925	c	SLI 1925?	45	0	15	5	5	5			5		20	0	100	SC, WST, EL
2	B	a	Cleared 1929-45	f(i)	2.22	0.5	1945	c	u since 1945?	32		25	8		4					4	27	100	WSC, GTW, ROW
2	B	c	Oliver's Mound	f(ii)	1.72	0.33	1800	u	u since	9			5		4		4	25		34	19	100	WEM, EEM,FM, HAZ, GWL, HCH, YEW
2	B	d	Damp patch under dam		0.27	0.03	1999	x	dredgings dumped here	0	0		0		8		8	8		65	11	100	GTW, XWL, WEM, EEM, HAZ
2	B	e	Poplar	h	0.685	0	1969	p	p poplar hybrid	5							5		90		0	100	
2	B	f	Quarry	e part	0.67	0.1	1800	u		22	0	13	13	7			13			18	14	100	BE, spindle, ELD, HAZ, WEM

Table A1. Details of the subcompartments of Shrawley Wood.

See (01) for compartment numbers and (A01) for subcompartment map.
Headings: **C**= compartment number; **typ** = compartment type as in (A01); **sC** = subcompartment; **area OG** = area of open ground within the subcompartment; **date** = date of last significant activity in the subcompartment; **a** = type of activity: c = coppiced, p = planted, pol = pollarded, u = unmanaged; **details** = details of last activity. **%** = percentage of canopy occupied by each species.

C	typ	sC	area name	FC sbcpt	area Ha	OG Ha	date	a	detail	%SLI	%DF	%BI	%OK	%SY	%SC	%WC	%CAf	%AH	%PO	%othe	%OG	∑%	other=
2	B	g	Ride margin central (SW)	a NE edge	0.586	0.3	2016	c	c ride edge	24	0	12	5	2	0					6	51	100	
2	B	h	Scrub by crossroads	b (part)	0.679	0.05	1965	c	c scrub: Bl regrowth	30		48								15	7	100	GTW
2	C	a	DF south 1969	c	5.31	0.95	1969	p	p DF (edges cut 2010-13)	5	70	3	2		3						17	100	
2	C	b	DF by S coppice1965	g (part)	0.538	0	1965	p	p DF	45	30	25									0	100	
2	C	d	Crossroads by Sequoiadendron	a/b (1%)	0.074	0.06	1890	p	p Sequoiadendron											19	81	100	WSQ
2	C	d1	New sequoiadendron by crossroads	b/d (1%)	0.03	0.029	2010	p	p Sequoiadendron											4	96	100	WSQ
2	E	a	Hedge by stored SLI	a (W edge)	0.083	0	1900	u	u	5	0	43	5	38	0				5	4	0	100	ASP
2	M		Clearing by School plot	a (2%)	0.156	0.1	1900	u	u	0		3	21		7					5	64	100	GTW
2	O	b	Cleared DF 2008	c (north end)	0.466	0.46	2008	c	c DF 2008-2012?	0	0	0	0	0	0	-	-	-	-	2	98	100	WSQx1, ROW
2	S		School plot	a (4%)	0.376	0	1967	p	p NS, RC, RAO 1962-7	43	2	8	27							20	0	100	RC, SS, ROW
3	.	all	**Wood House wood**		**42.478**																		
3	A	a1	West outside (N)		0.128	0.03	1997	c	c SLI	56		15		2						4	23	100	BE
3	A	a2	West outside (S)		0.241	0.02	1998	c	c SLI	40		18			12					22	8	100	alder
3	A	b1	P_northwest coppice		0.842	0	1965	c	c SLI	90			9							1	0	100	WSQ
3	A	b2	P_NW recent coppice		1.33	0	1989	c	c SLI	88			7							5	0	100	CAR
3	A	c1	P_north central coppice		1.2	0	1948	c	c SLI	80			10							10	0	100	
3	A	c2	P_northeast coppice		1.38	0.1	1985	c	c SLI	76			7							10	7	100	YEW, HC,
3	A	d	CwS NW		1.28	0.1	1925	c	1925??	73		2	7		3					8	7	100	WSQ, BE
3	A	e	P_CwS 1979		2.82	0.1	1979	c	c SLI	71		18	8								3	100	
3	B	f	Old chestnuts		0.563	0.08	1900	u		30		10	16		30					0	14	100	
3	A	g	P_central CwS 1980		6.9	0.2	1980	c	c SLI sSLI OK 1730-1900	85			8		5					0	2	100	
3	A	h	south central		10.8	0.1	1948	c	c SLI sOK 1900	83	0.5	2	7		3	2				2	0	99.5	
3	A	i	south bank CwS		2.38	0	1950			84	0	3	5		2			1		5	0	100	YEW, BE, HCH
3	A	j	avenue in wood		0.513	0.1	1800			41			25		15						19	100	
3	A	k	P_coppice 1995		0.083	0.01	1995	c	c SLI	84										4	12	100	?
3	B	a	larch cleared: replanted 1995		0.635	0	1995	p	[c 1994 XL] p 1995 OK, WCH. ROW			10	37	3	5	30				15	0	100	BE
3	B	b	1996 planted OK+others		0.407	0.1	1996	p	p OK (BE, HAZ, WCH)				60		5					11	24	100	BE, HAZ
3	B	c	cherry 2007 + OK 1900		0.167	0	2007	p	pWCH. OK: s OK 1900	10			80		10					0	0	100	
3	B	d	old avenue (N)		0.251	0	1800			85			15								0	100	
3	B	e	South valley		1.04	0.5	1945			20			15			5	7	1		4	48	100	WL
3	B	t	Vernon tomb		0.52	0	1900	u	Oaks by 1540 tomb	5			85		10					0	0	100	HO
3	C	a1	conifer E		0.491	0.1	1970	p	p XL	5										75	20	100	
3	C	a2	conifer S		0.688	0.1	2000	p	p WSQ	25	0	10		10						55	14	114	SP, WSQ, EL, EEM, WEM
3	C	b	conifers 1995		0.021	0.006	1995	p	p mixed conifers											72	28	100	Cryptomeria, NS
3	E	a	south fringe		0.321	0	1900	u		20				20						60	0	100	HO, YEW, WEM, EEM
3	M	a	clearing		0.208	0.1	2007	p	p NS s OK	18			18							16	48	100	to do
3	O	a	between pools		2.78	2.77	2007	p	p swamp cypress	-	-	-	-	-	-	-	-	-	1	99	100	Taxodium distichum
3	W	a	New Pool		3	3	1850		dammed 1850 dredged 1999												100		
3	W	b	Middle Pool		0.489	0.489	?	d	dammed 1790-1830? Dredged 1999												100		
3	X	b	old quarry		0.064	0	1730	u	q 1730?	-	-	-	-	-	-	-	-	-	-		0	0	
4	.	all	**Wood House park**		**11.038**																		
4	B	a	NW park wood remnant		0.313		1800	c	regrown since saw pit abandoned?	to do			++				++				0	0	no data yet
4	B	b	avenue in park		0.671	0.02	1830	i	isolated from wood	43			49	1	3					2	2	100	LPL
4	B	b1	avenue in park new trees		0.15	0	1990	p	p OK HAW ...	0			50							50	0	100	HAW
4	M	c	Private arboretum		1.42	0.1	1900	p	mixed												7		no data yet
4	P	a	NW park		4.12	3.74	1800	c	most of trees removed				3		5						90	98	
4	P	a1	west central remnant		0.95	0.33	1800	c	most of trees removed				55		11						34	100	
4	P	a2	P_east central remnant		0.947	0.46	1800	c	some trees removed	25			25								48	98	
4	P	b	P_east park		2.41	2.44	1800	c	most of trees removed				3		3					0.5	101	108	
4	P	c	Araucaria 2000		0.057	0.047	2000	p	p Araucaria [seeds 1994]											18	82	100	Araucaria
5	.	all	**Old clearance 1839-1883**		**14.52**																		
5	X		North		11.6	11.6	<1883		cleared for arable 1839-1883												100	100	
5	Y		South		2.92	2.92	<1883		cleared as a park between 1839-1883												100	100	
6	C	all	**Private Bridge Farm**		1.7	0	1900	p	p EL, WRC, NS, WCH + others	5			2	3	5	5				80	0	100	WRC, NS, EL
7	.	All	**Brick Pits**		**3.86**																		
7	B	a	Brick pit margin		1.08	0.08	1857	u	unmanaged since brick pits abandoned	1		8	8				10	5	3	58	7	100	white willow pollard, poplar, [elm]
7	O	a	Old field by brick pits		0.487	0.3	1995	u	unmanaged since fenced off											39	61	100	blackthorn, poplar, grey willow
7	O	b	Glade in brick pits		0.246	0.2	1995	u	track kept clear otherwise unmanaged											19	81	100	willow
7	w	a	Brick pit wetland N		0.463	0.07	1897	w	withy bed since brick pits abandoned											85	15	100	alder, grey willow, crack willow
7	w	b	Brick pits wetland S		1.59	0.8	1897	w	withy bed since brick pits abandoned											50	50	100	alder, grey willow, crack willow

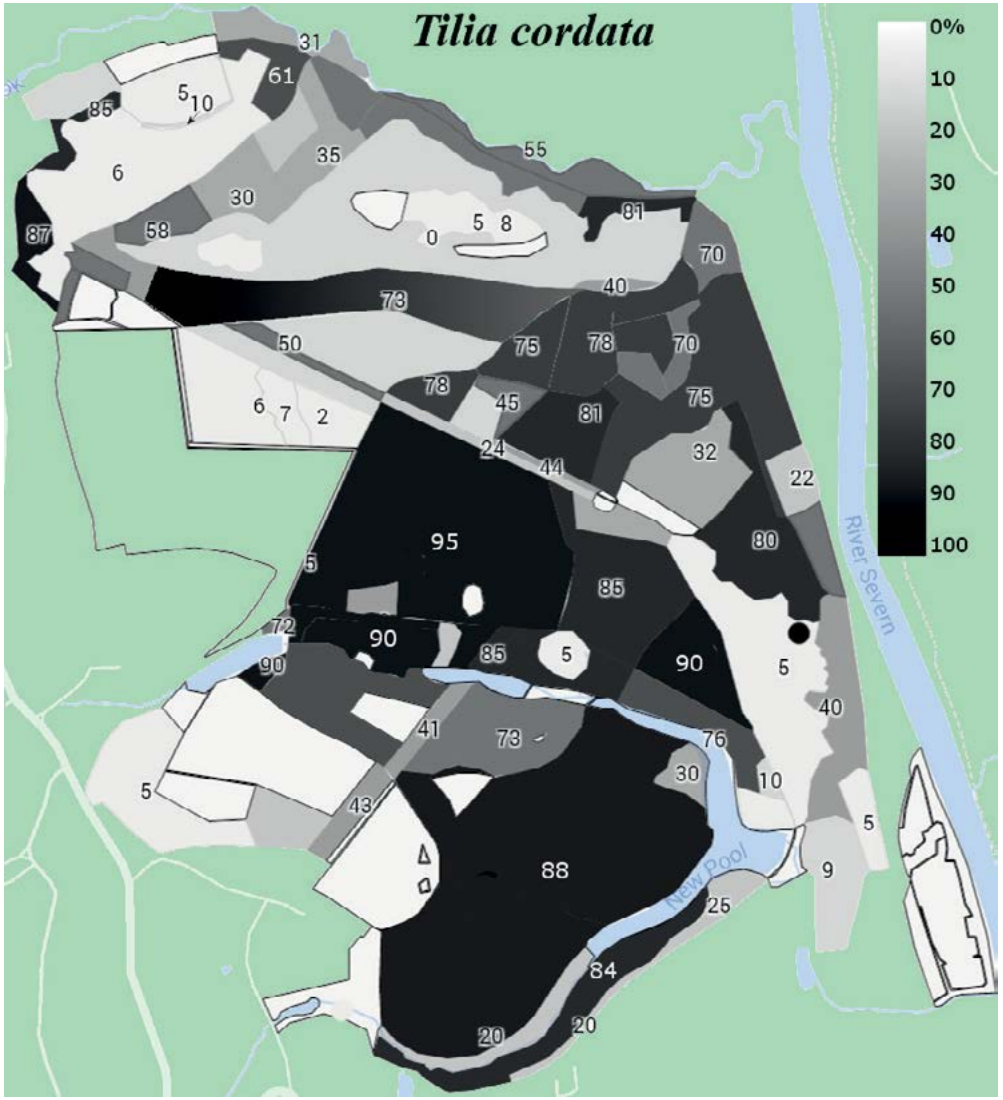
Table A1b. Details of the subcompartments of Shrawley Wood.
See (01) for compartment numbers, (A01) for subcompartment map and A05 for canopy occupancy maps.

Headings: **C**= compartment number; **typ** = compartment type as in (03); **sC** = subcompartment; **area OG** = area of open ground within the subcompartment; **date** = date of last significant activity in the subcompartment; **a** = type of activity: c = coppiced, p = planted, u = unmanaged, w = cut withies; **details** = details of last activity. **%** = percentage of canopy occupied by each species.
See Appendix Trees & Woody Shrubs for tree species abbreviations pp. 337-9.

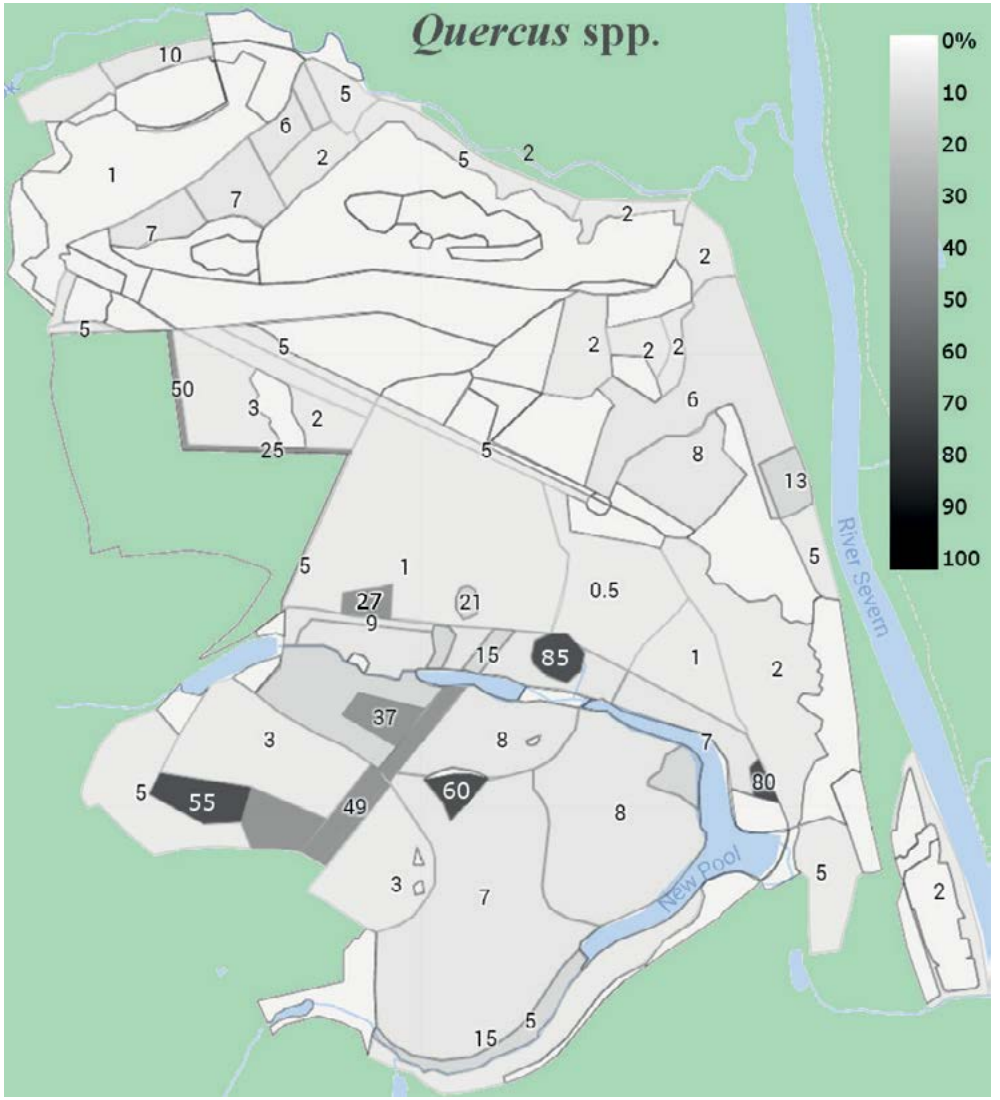
Canopy occupancy by the dominant trees of Shrawley Wood.

The percentages indicated in table (A01) and the following distribution maps were estimated by examination of aerial photography at various seasons of the year taking into account the *T. cordata* identified in (A01) the surveys described in the chapter on Regrowth and Regeneration p. 294.

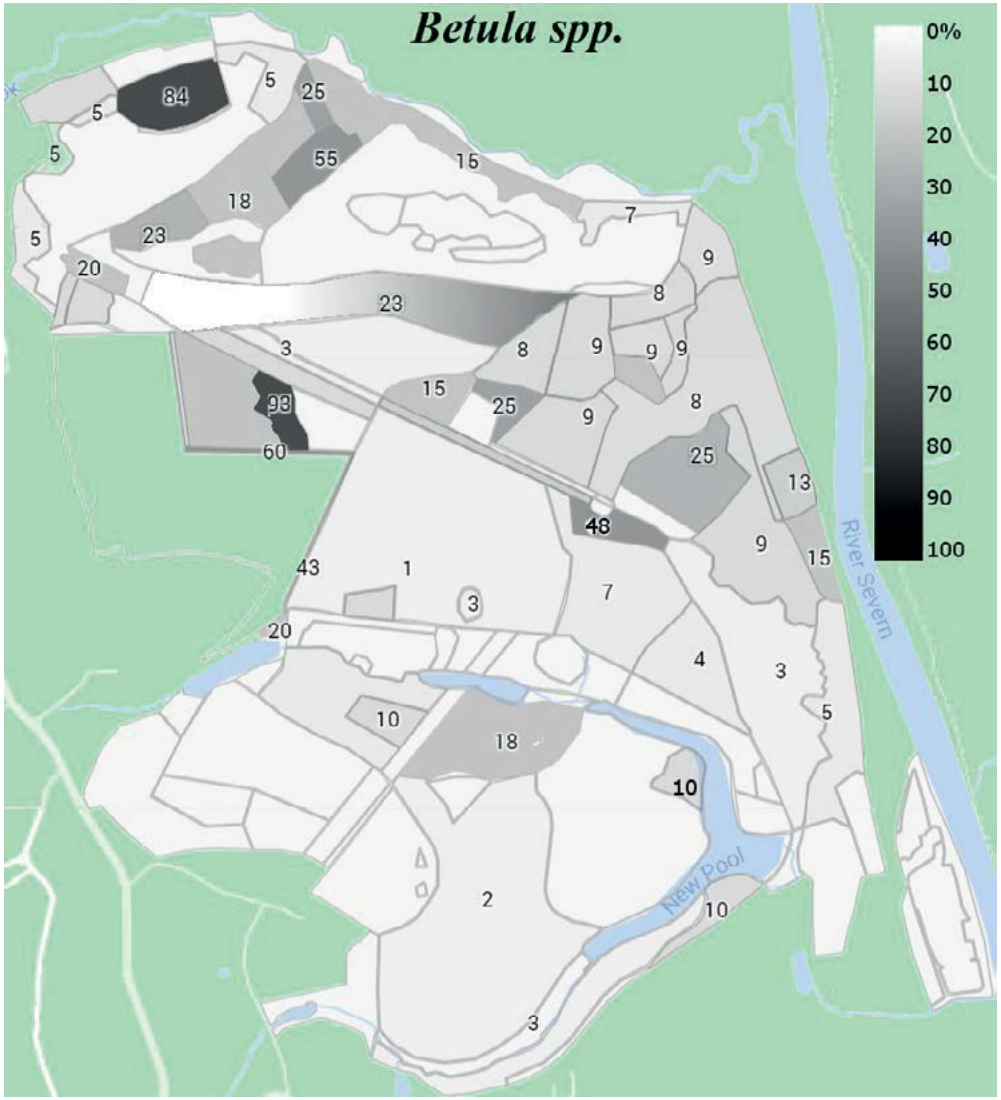
Calculating from the area and stool density there are around 25,000 lime trees in the Wood, of which around 6,000 have been singled (See chapter regrowth and regeneration p. 294). Irregular cutting of varying areas since 1922 have led to the patchwork of different heights seen in (A03).



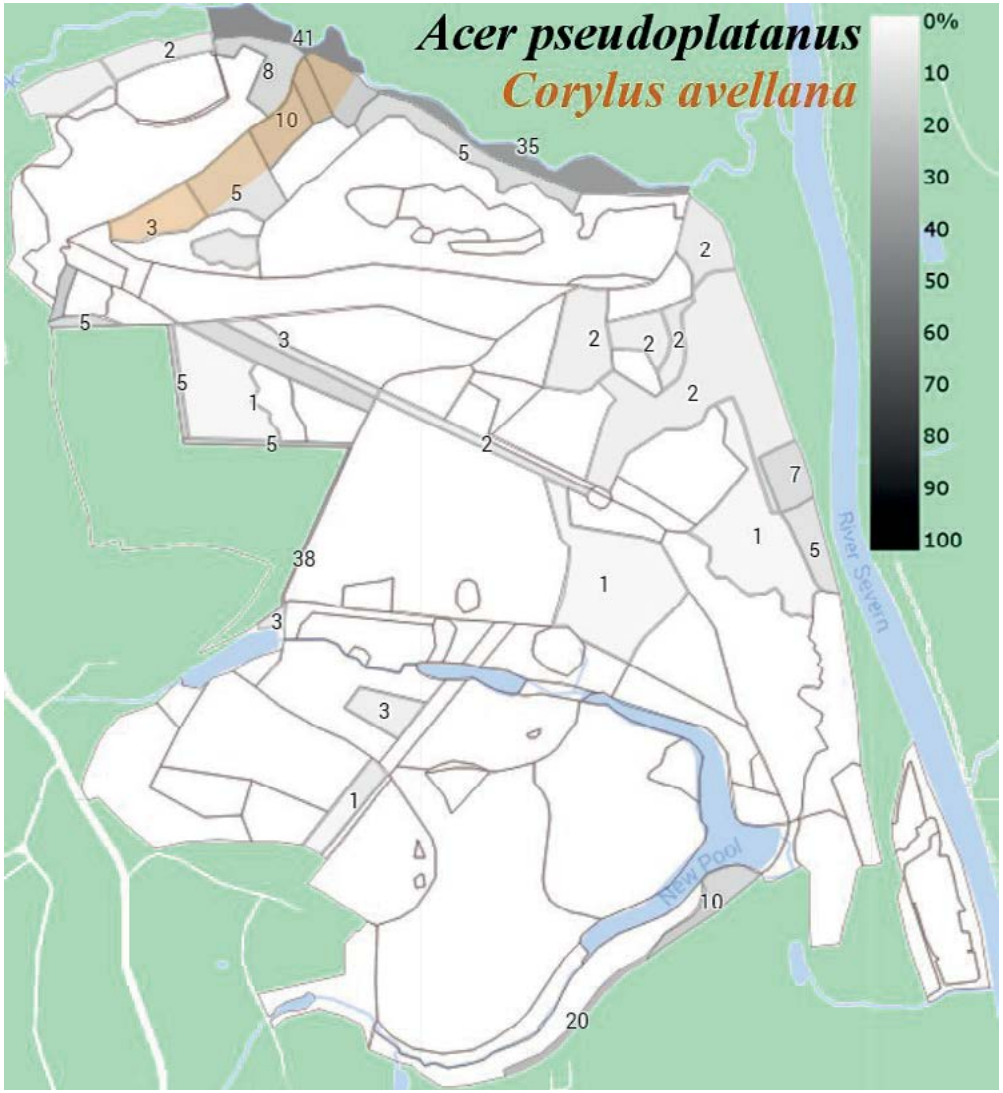
A05a



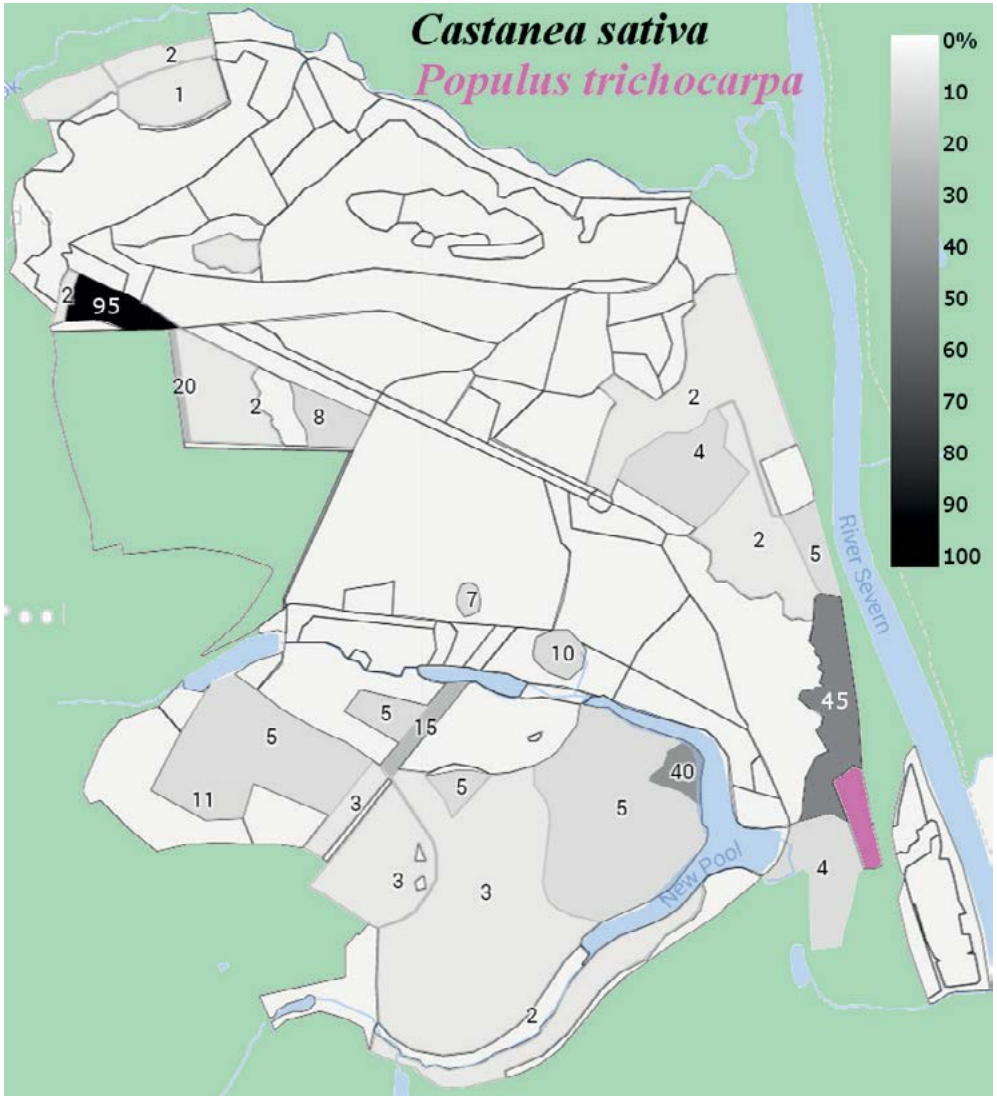
A05b



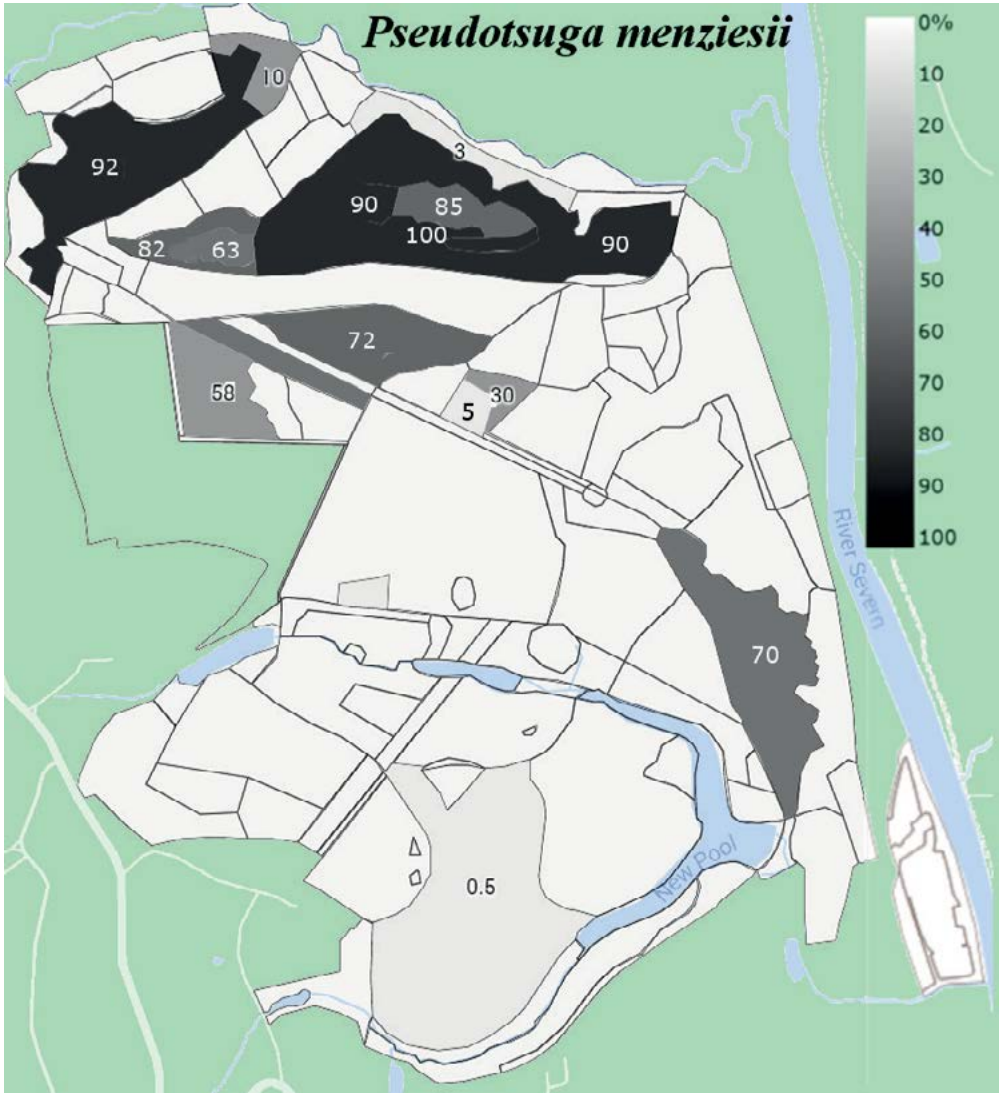
A05c



A05d. The brown colouration indicates the presence of *Corylus avellana.*

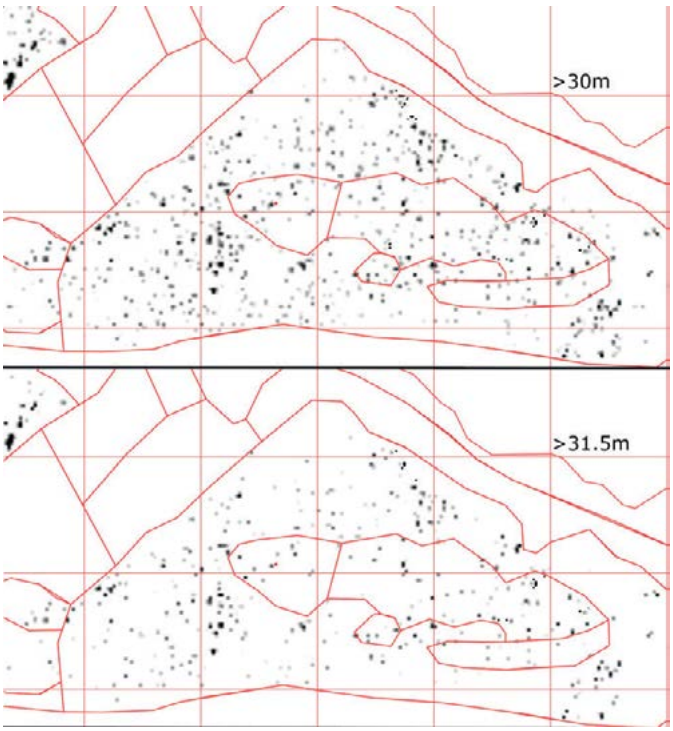


A05e. The purple indicates the presence of *Populus trichocarpa.*



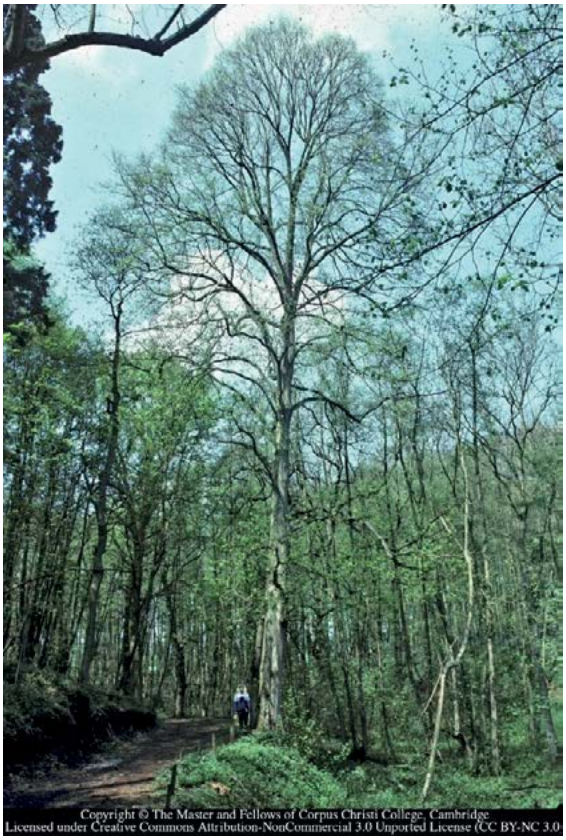
A05f. Douglas fir does not form a complete canopy, so the percentage estimated here is derived from the area occupied on the satellite view. Underneath this there is a canopy formed by the surviving Small-leaved lime.

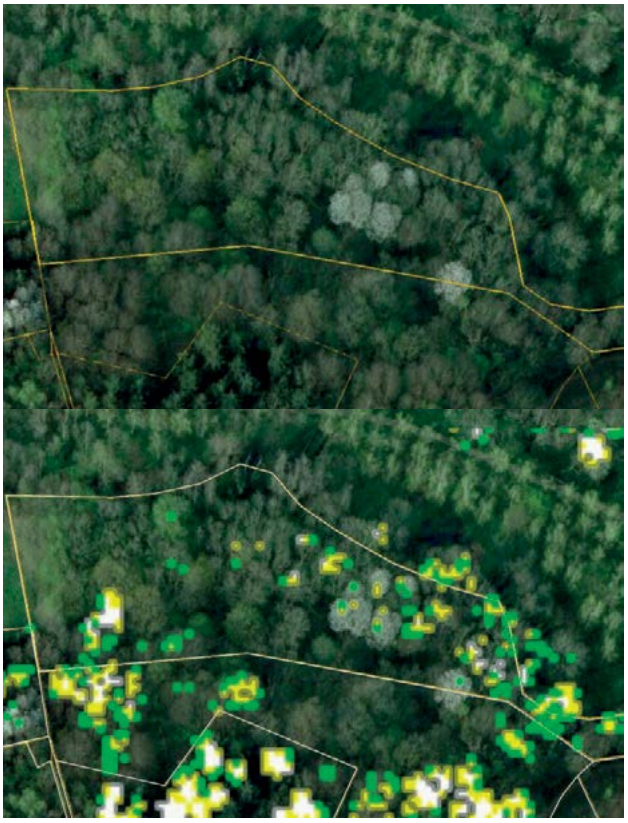
The frDSM gives accurate values for the height of evergreen trees such as Douglas fir.



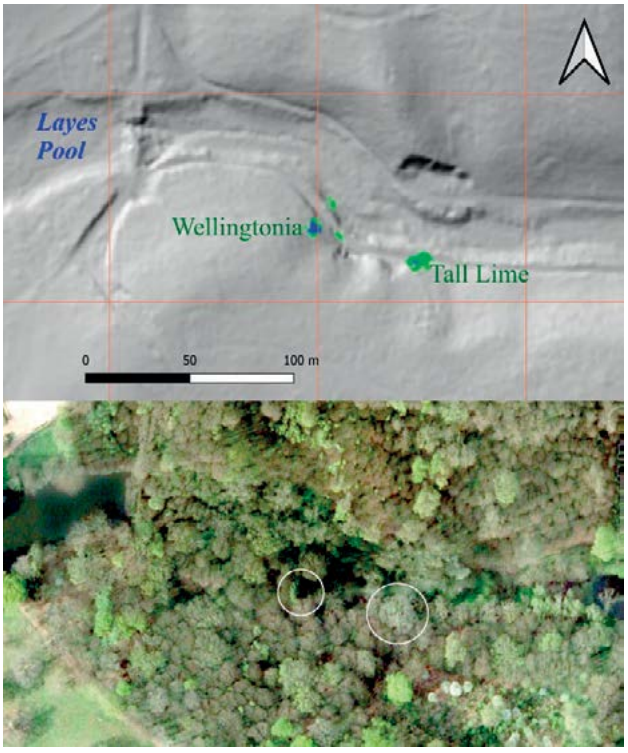
A06. Maps of the north-central Douglas fir subcompartment with a 100m grid.

There were around 100 trees per hectare above 30 metres high and 50/ha above 31.5m, indicating median height of 31.5m for the 100 tallest per hectare. Around 25/ha were above 32.5m, thus this height is the 3rd quartile. A few trees were over 35m high.
"Stand height" (average height of the 100 with greatest diameter in a hectare) gives a measure of yield for plantations. Statistics for height and distribution of the Douglas fir in Shrawley Wood can be derived by approaches such as illustrated in (A06).


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A07. The tall wild cherry trees.
These are growing among other tall trees making it imperative to confirm which trees are being measured on the LiDAR. The satellite image above shows which trees are cherries in blossom, the image below is overlaid with the LiDAR derived height map. The profile of the cherry trees gave a maximum height of 26.5 metres while other adjacent trees topped 31.5 metres. By analogy with the Small-leaved lime LiDAR heights, the true height may be up to 2 metres taller.



A08. Left: Tall Lime tree photographed by Oliver Rackham, May 1985. John Day is standing by the lime tree. The maps above show the exact position of the lime tree and Wellingtonia. The Lime tree is at SO80547 65819.

Small-leaved lime regrowth and regeneration in Shrawley Wood

Richard Pumphrey

Abstract: I measured 10 neighbouring stools in each of 36 sites within Shrawley Wood to investigate the patterns of regrowth of *Tilia cordata* 1-95 years following coppicing. The number of stools within a 0.1 ha circle at each site gave the local stool density. *T. cordata* seedlings grew densely throughout the wood but saplings and maiden trees were scarce. The results indicate that the density of stems is self-limiting through competition for light; that new stools arise by stool splitting and layering and that regeneration from seed is limited by the high loss of seedlings, saplings and young maiden trees.

Background

Shrawley Wood has been coppiced on a long (16-20 year) cycle at least since the fifteenth century[1]. We know for certain that this was lime coppice under oak standards since the seventeenth century but it seems likely that this was the pattern in previous centuries too. Then a hundred years ago, with the loss of markets for their produce, the coppices became neglected with some binds[a] not cut since 1922. Through this same time most of the oak standards were cut and not replaced.[2] In the privately owned southern third there has been infrequent intermittent coppicing over the last hundred years. Soon after the Second World War much of the northern third of the wood and patches elsewhere were cut over a short period.[3] Some areas were cut in 1955. After the Forestry Commission acquired the northern 2/3 of the Wood on 14 June 1961, limited and irregular coppicing restarted; central parts uncut since 1922 or 1945 were singled[b] in the late 1960s. Then in the late 1990s limited annual coppicing was restarted but there were intervals when cutting lapsed. So in Shrawley Wood there are areas of coppice that have been left standing uncut for varying lengths of time from 1 to 95 years[c], making it possible to study the patterns of regrowth over 95 years following coppicing.

Although in general the regrowth patterns following coppicing are well known,[4] there is little information about *T. cordata* coppice regrowth in the UK and none within ancient woodland[5]. This study provided the opportunity to gather detailed local data for native small-leaved lime and specifically data for the increase in stem height and diameter and decrease in stem number and stem and stool density with increasing time since coppicing.

Methods

I selected thirty-six survey sites (02), twelve in each compartment[d]. Some forestry records of the dates of last coppicing had been lost through a fire where they were stored[6] and there were conflicts between contemporaneous records and current ones. Historical satellite and aerial photographs showing recently coppiced areas resolved some of these conflicts and further help came from a previous study of bird populations that had recorded coppicing dates and tree densities in three subcompartments[7]; Shrawley residents recalled times of some of the coppicing: all these have helped construct a more accurate dating of each historical cut.

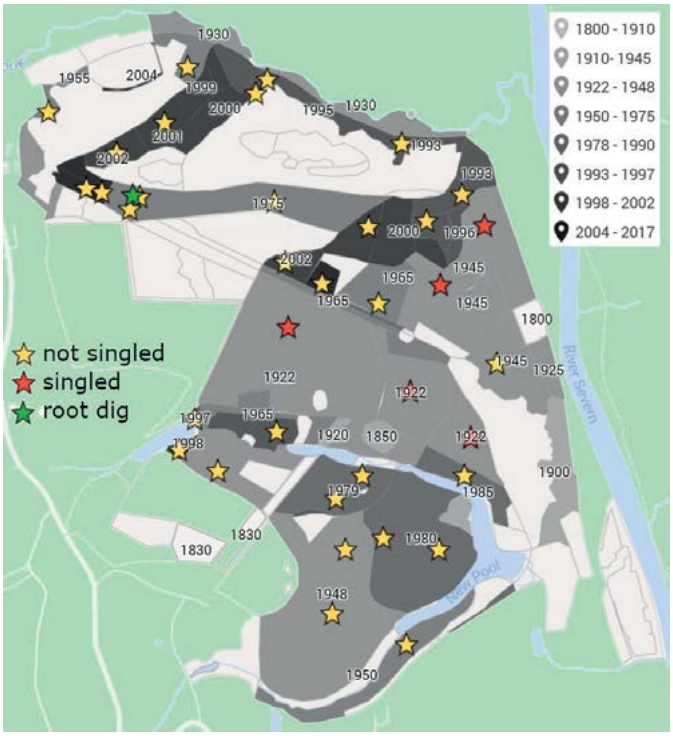
At each survey site I selected a stool away from the edge of the bind in an area that looked typical of the bind and placed a tripod-mounted charting table (01) over, within or beside the chosen stool, plotted the position of each of its nine nearest neighbouring *T. cordata* stools onto a polar coordinate chart and recorded:



01. Charting table.

a) Girth at ground level of each stool in metres by tape measure.
b) The height of the tallest stem of the central stool by tape measure up to 8m and by hypsometry above this.
c) Diameter of the largest stem at 1/5 of the height or 1.3m from the stem base, whichever was lower, in centimetres by girthing tape down to 4cms and by callipers below this.
d) Diameters of live and dead stems greater than 1/10 of the diameter of the largest: when there were high numbers of stems, for some sites only the maximum, median and minimum diameters were recorded.

When two or three stools were much closer than the local average and it looked reasonable to suppose they were a single stool in the not-too-distant past (e.g. foreground (12c)), I counted them as a single stool.

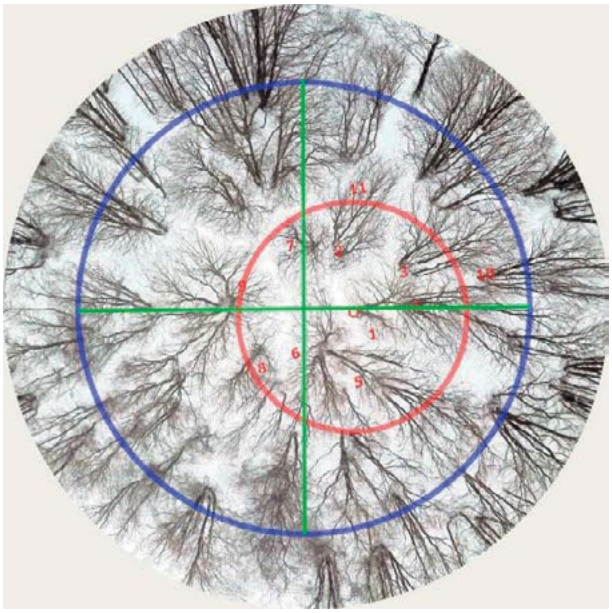


02. Map of the survey sites: years since last coppiced as in the key:

Stool density was estimated as the number of stools within a circle radius 17.8 metres from the central stool (0.1ha) and/or in a similar circle on drone photos (03) taken from 60 metres directly above the survey site when snow lying on the ground provided clear contrast for the dark stems. In eight of the sites the numbers of stools within circles of increasing radius were counted to assess the uniformity of their distribution.

[a] A bind is a circumscribed area of woodland coppiced in the same season.
[b] Singling involves cutting away all but one (usually the best form or biggest) of the stems growing from a coppiced stool.
[c] The data for this chapter was analysed in 2018.
[d] see p. 273 and appendix to The trees of Shrawley Wood (pp. 284-293) for explanation of compartments and subcompartments.

Canopy cover was measured by counting pixels of sky / not-sky in an approximately 10° cone photograph taken vertically upwards. Canopy closure was estimated from 180° fish-eye photographs taken vertically upwards.



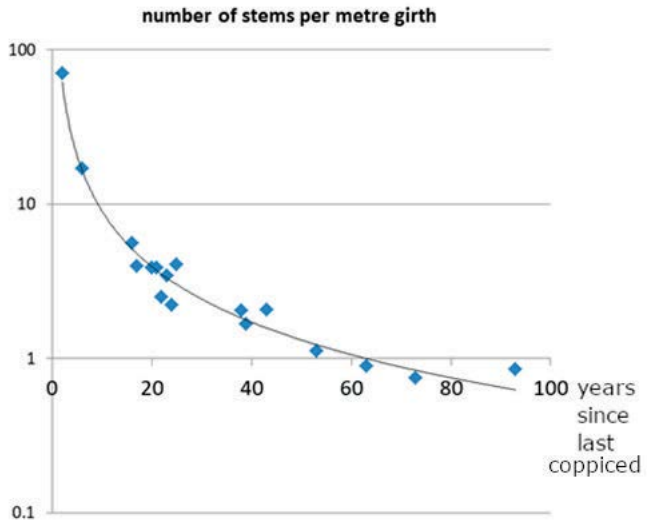
03. Drone photo 3/3/2018 with the survey site ringed in red and a 17.8m circle in blue.

Results and discussion

Location and date of last coppicing at each survey site is shown in (02); the dates are a best-fit reconciliation between the Forestry Commission records and the historical photographic information; minor errors in the older binds are unlikely to be significant in analysis of the measurements.

Regrowth characteristics

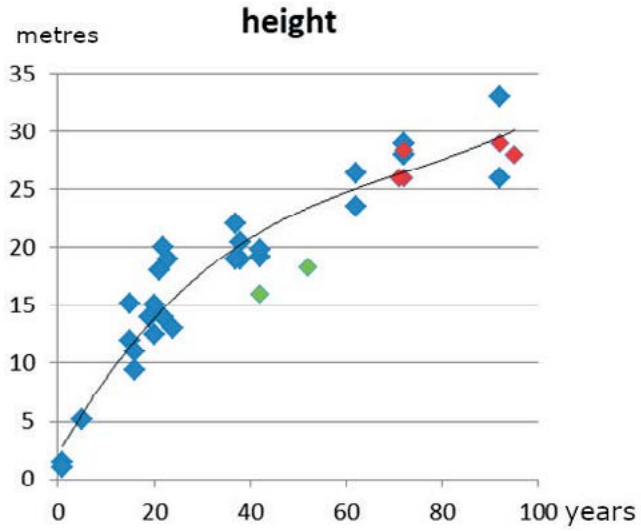
In the first year after cutting, sprouts burst from the bark below the cut with close to 100 sprouts for each metre of girth (04). Limes recently cut as high stools / low pollards had higher numbers of epicormic sprouts in the first year.



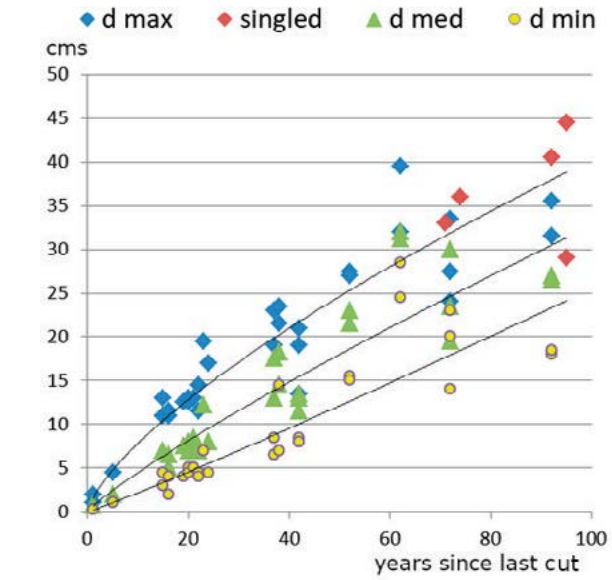
04. Number of stems per metre girth. Each point on this graph is the gradient of the best fit line for each of 36 scatter plots, one for each site, of the number of stems plotted against the girth for each stool.

The growth of these sprouts depended on the light falling on the stool. Stumps of lime trees felled during a Forestry Commission thinning operation that left them in the dense shade of surrounding tall trees sprouted new stems but these grew poorly with the majority dying in the second year. Away from shade, the growth was up to 1.5m in the first year and subsequently the height increased at 0.6—0.9m/year, slowing in later years, until a height of 26—33m was reached after 95 years (05). Some of the sites had birch trees amongst the lime stools; in the two sites with most birch, the height of the tallest lime stems fell below the trend curve (05 green points). Two of the sites, both 62 years since last cut, had low density of stools (08); their stem diameters were greater than the trend (06). The diameters of stems in the singled sites were mostly greater than sites that had not been singled. Perhaps surprisingly, survey sites on steep north-facing slopes seem to have grown just as fast as those of the same age on steep south-facing slopes, making reduced illuminance from this cause less likely as a cause for reduced growth.

Occasional stems were encountered that were bigger than expected, possibly because they had been left standing at the last cut so that the assumed cutting date is wrong. Then there are some stools much smaller than their neighbours: a few appeared to be new maidens; others may have been runt outliers from an old stool that had fragmented. Because of these minority outliers, the median values have been used for much of the analysis as more representative of each survey site.

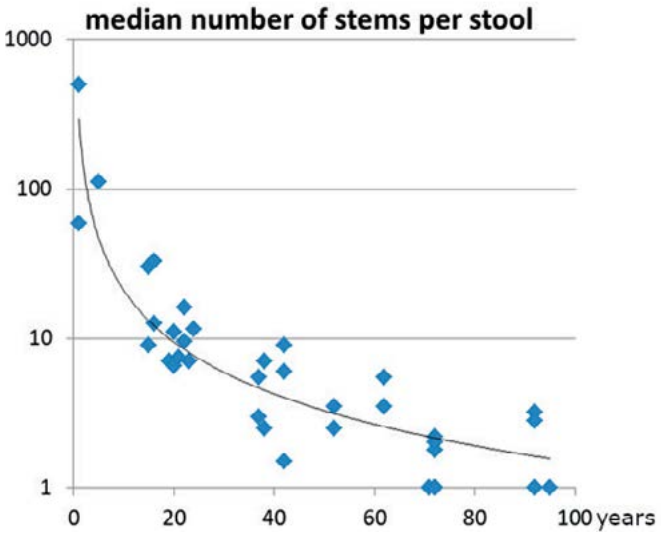


05. Growth in height of central stem in metres following coppicing: red points are from singled sites, green points were sites with high numbers of birch among the lime coppice.

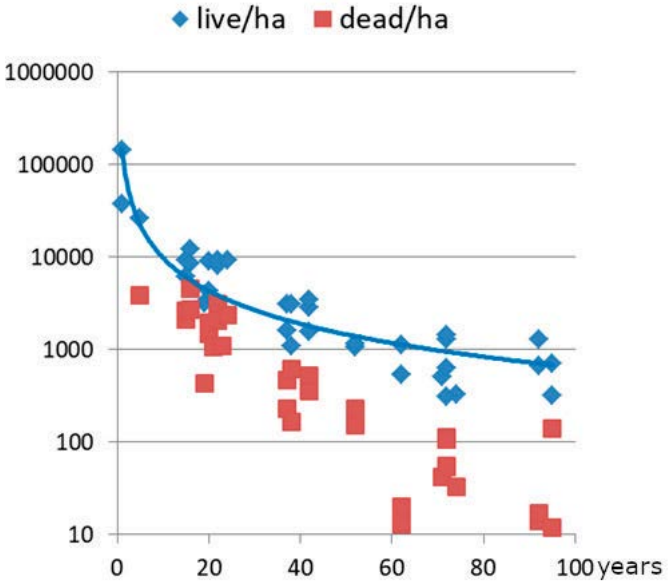


06. The points plotted are the median values for each site of the maximum, median and minimum stem diameters of each stool within that site. The red points are the median diameters for singled sites.

The tallest stems increased in diameter more than the shorter, presumably because they were better lit. With permission from Natural England and the Forestry Commission, selected stems were cut close to their base; the strongest growing stems had complete growth rings consistent with the years since last cut but partial rings and lower ring numbers were found in shorter stems that had grown for the same number of years; a proportion of these smaller thinner stems died each year (07, 08). The proportion dying each year decreases as stools get older, but around one in ten of the stems standing on the stools throughout the age range were dead – presumably because the thicker stems took longer to decay enough to fall. In the oldest stools that had not been singled, there were usually two or three stems left standing (07) (median 2.5 stems for 50 stools 72-95 years).



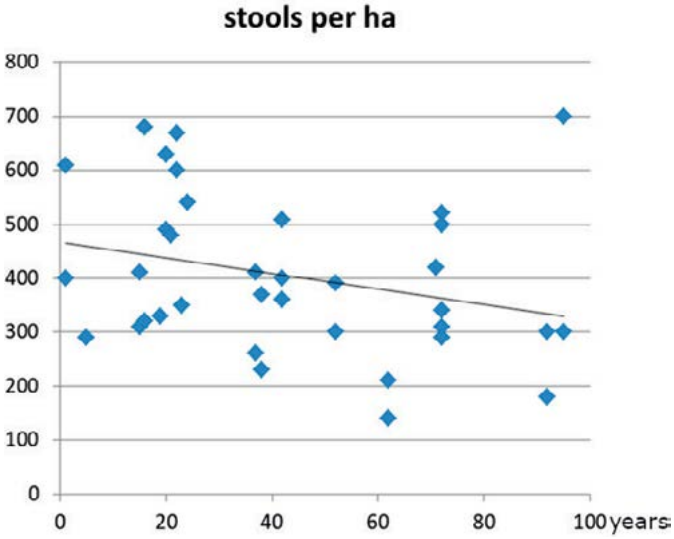
07. Median number of live stems per stool



08. Numbers of stems per hectare.

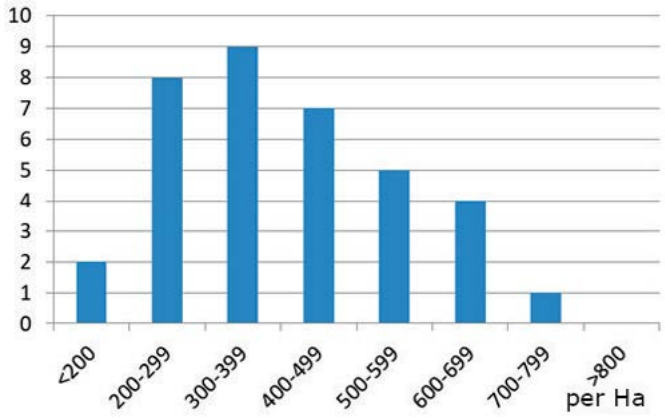
These growth curves (height, stem diameter, stem numbers) are similar to those of growth class 1 and 2 in Russia reported by Tyurin *et al* 1956 as reviewed by Pigott.[5]

The stool spacing varied from one site to another with a weak relationship to the age of the bind (09). Gradual stool loss through competition may account for the fall in density with age. The taller canopy of older coppice reduces the light available to shorter stems, many of which then die. Not only does this lead to the pattern seen in (08), but it will also compromise growth of closely spaced stools with some winners and some losers. Even without human intervention this will remove some of the stools that are too close together, explaining the downward trend in density with age.

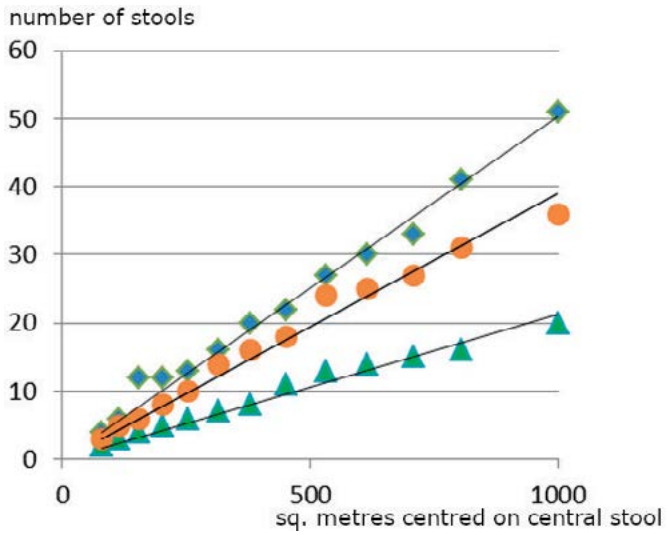


09. Stool density plotted against time since last cut.

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10. Number of sites with stool density in each range.



11. Three examples of homogeneity of stool spacing.

The points in (11) indicate the number of stools (y-axis) counted in circles of increasing radius (x-axis values = area of circle in m^2): despite the wide difference in density between these three sites, the density is relatively uniform within each site indicating that the range of different densities in (10) is not simply due to low sample size in a randomly distributed population. This study does not explain the reasons behind the different densities; the highest density (site 5) is in one of the oldest singled subcompartments, in one of the

south-facing gullies leading down to the New Pool. Maybe the soil and water availability can support a density not matched elsewhere. Stools may split (12) or spread by layering (13) and so it becomes difficult to count an exact number of stools when there are groups of stools close together and any putative connection between them has disappeared.



12. Stool-splitting:
a) The core of the stool rots, leaving a ring of stems.
b) The original stool disappears.
c) The groups of stems mature.
d) Later, the site of the original stool may disappear completely or, as here, be hinted at by small stems arising between these two groups of 72-year-old stems. After this last stage, further coppicing results in stool clusters; DNA typing can prove their clonal origin; synchronous leaf opening increases the probability they started as a single stool. (see chapters Lime DNA patterns pp. 330-7, Drone study of phenology pp. 323-330)



13. Stool layering:
a) Small horizontal branch has set root and the stem beyond this has started to thicken.
b) Larger layered branch. Which was the original stool? Or did this entire group arise from another stool out of the picture when a stem fell to the ground?
c) A fallen tree on the steep eastern slope of the wood. The original stool is still producing stems but the fallen stem has set root and branches have become stems.
d) Phoenix regeneration – a large stem has fallen and set root but the original stool has died: new stems have arisen all along its length.

At the suggestion of Harry Green, we investigated this further by tracing the roots to look for connections. We chose a ring of five close stools in {1Ac2}, an area last cut in 1975.



14. The root dig.

With permission from the Forestry Commission and Natural England, a team of us (Harry Green, Hugh Milner, Mike Averill, Francesca Llewellyn and I) exposed the roots by careful removal of the very light sandy soil between the stools (14). The results were surprising and seem to indicate that *T. cordata*, unlike many other tree species, seem reluctant to graft their roots to their neighbours (15). Stools 3 and 6 have failed to graft despite their close contact and the pressure that must exist between their touching surfaces. However, the DNA studies on this ring showed that 4 of the 5 stools (the number 6 in the photos is a stem of stool 3 that seems to have an independent root system, the expected norm following coppicing *T. cordata* according to Pigott[5]), shared genetic identity and had therefore all come from a single seed.[8] Whether this was by layering or splitting of a central old stool cannot be established from the data we have.

15. The root dig findings.



a: roots connecting stools 1 and 2. These may possibly be joined by root graft rather than a relic of a previous single stool.



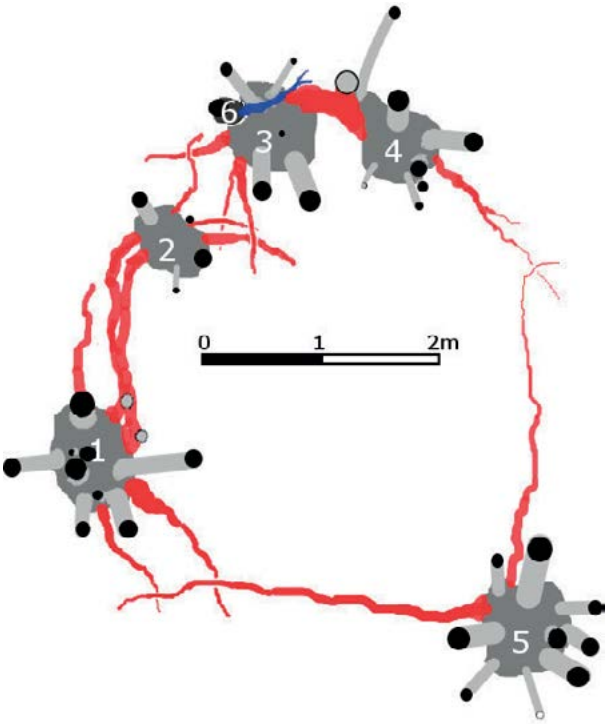
b: thick continuous root system between stools 3 and 4, strongly suggesting that previously this was a single stool.



c: stem 6 is tightly in contact with stool 3 but shows no sign of grafting to it.



d: stem 6 root arching over the bases of stems on stool 3 – again there is no sign of grafting.



e: diagram of the stool circle showing the stem cross-section at breast height (black discs for live stems, grey for dead stems), stems below breast height (light grey), stools (mid grey); roots (red for stools 1—5; blue for stem 6). Stools 1 & 2 may be joined by root graft or relic of previous stool base: two scars on the roots by stool 1 shown as light grey discs may be the remains of dead stems or dead roots. Stool 2 seems independent of stool 3. Stools 3 & 4 appear to be tightly joined: an old stem base on the root by stool 4 is indicated as a grey disc. Stool 5 shows no sign of being related to the other stools. After careful examination of stool 3 it appeared that the roots of stem 6 was independent of the rest of the stool.

There have been reports that the stools in Shrawley Wood were planted in rows[9] regularly at nine feet apart[10] and others that the spacing was random[11]. There are points in the Wood where the stools appear to have a linear arrangement (16), in some places it is possible this was the result of old trackways rather than from planting on open ground. Satellite or drone images disprove more general linearity when viewed from above.



16. View of coppice giving the impression of a linear arrangement.

When the standards were oak and all the limes were coppiced, there were few mature limes to set seed and new stools must have been generated by layering into any open areas; this would be unlikely to lead to straight rows but would regulate the overall spacing of the stools. Now there are many lime standards and overstood coppice mature enough to flower; in summer the wood is full of the sound of bees pollinating the lime trees. Each year the ground under them is covered with lime seedlings (17), though few of these survive their first year. Pigott[5,12] found that wood mice and bank voles eat both fruit and seedlings and deer graze then. There are many muntjac in Shrawley Wood.



17. *T. cordata* seedlings

T cordata seedlings covered the ground over much of the wood in May **2**017 and 2018,[e] including amongst the *Pseudotsuga menzesii*. By July nearly all had vanished.

[e] This pattern has been repeated in 2019—2021.



18. a carpet of *T. cordata* seedlings and two slender saplings.



19. *Armillaria* attack on roots of a lime sapling with bark damaged by muntjac.

Scattered in a few places in the wood a few (mostly sickly) saplings can be found (18). Most have been damaged by muntjac and many of these then become infected by fungi such as *Armillaria* (19). The almost complete failure of *T cordata* to regenerate from seed in the Wood seems likely to be because of these controlling agents, not the lack of flowers or the inability of the flowers to produce fertile seed. One probable maiden lime in study site 26 (22 years post cut) looked under threat of extinction by its neighbouring stools.

The canopy cover and closure were measured at each site and related to the undergrowth. In the first year after cutting there is no canopy cover although parts of the horizon were obscured to varying degrees by trees in neighbouring binds. All the plants that had been kept in check by the lack of light under the canopy began to flourish again. Shrawley Wood is famous for its native bluebells *Hyacynthoides non-scripta*. For the first few springs, the bluebells reappeared but by the first summer, brambles *Rubus fruticosus agg.* and nettles *Urtica dioica* dominated over much of the recently cut coppice together with a dense growth of common hemp nettle *Galeopsis tetrahit* in several places and foxgloves *Digitalis purpurea* in others. The lowest stems of each recently coppiced stool grow almost horizontally so that after six years, the spreading canopy excludes light from the ground around it, suppressing most of the other plants. By year sixteen, the canopies of neighbouring stools had met and risen to 10—15m and most of the undergrowth between stools was suppressed. Canopy cover in the range 95-98% was found in the summer at most of the older sites apart from those recently thinned in forestry operations. Canopy closure was less towards the edge of binds with adjacent more recent coppice and brambles had grown in some places. These findings are comparable to those of Fuller and Green in Shrawley Wood in 1985.[7]

The distribution of stools between 200-700/ha may have been a natural outcome rather than artificially engineered, resulting from the facility with which *T cordata* layers, the durability of old stools that split and move apart by growth on the outer sides and the severe competition that kills overcrowded stems and stools.

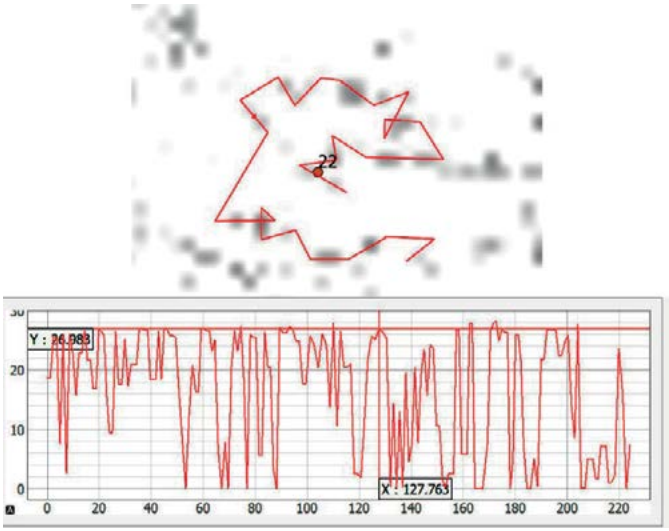
There is a difference between stools coppiced regularly on (say) a 17-year cycle when cutting was by axe and the largest stems were around 12-15cm diameter, and the stools in this study that had been left overstood for years before restarting coppicing by sawing through stems that were 60-80cm diameter near ground level. These large bare areas inevitably succumb to fungi and parts of the stool die. The most recently cut study sites are within what was a 75-year-old bind and there had been no time since the recent cut for any new layering, splitting or maidens to become established. Left for another 20 years, it may be that the density would have increased in line with the 20-year-old binds in (06). The delayed cut and damaged stools may also result in a wider spread of diameters and growth rates than would have been seen with a regular cutting cycle from the fifteenth to the nineteenth centuries.

Increasingly the lime coppice has acquired additional species such as birch, rowan, sweet chestnut, sallow, yew and holly. Their absence in some central areas of the coppice suggests that historical forestry had included "weeding" out some of these species (payments were made for "underwooding" though we do not know exactly what this entailed). The retention of these species in other areas suggests they may have been valued and retained or even planted. Immediately following coppicing the density of birch seedlings was in places over one hundred per square metre, reducing each year thereafter, presumably through competition with each other and the re-growing lime stools. In the Wood Books, the Woodmen were regularly paid for falling birch: 17-year-old birch was cut for fencing rails and 34-year-old ("*double growers*") for clogwood. A photograph from around the turn of the last century[13] shows an area of recently felled coppice with much birch evident among the cut wood and among trees left standing.

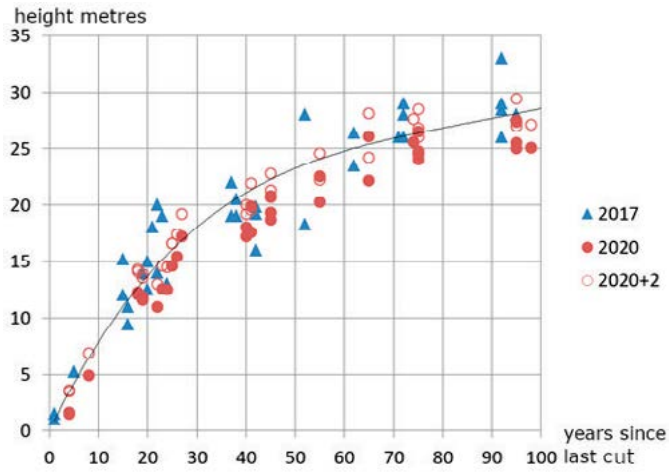
Now there may be discussion about the future management of the wood: should the increasing diversity of neglected woodland be encouraged or should there be some attempt to maintain the pattern of coppicing to preserve popular characteristics of the Wood, such as its bluebells? If coppicing were resumed, what should the cycle length be? Local tradition would have 17 years. The best bluebells in Shrawley Wood are found in a 55-year-old bind. The most dense brambles are found under the Douglas fir but they also grow well under the singled coppice that has been thinned in recent years. Maximum biomass yield might be expected around 50 years. Currently the market for this is not good, and lime is not favoured because of its stringy bark and low calorific yield. Nonetheless, even lime woodland is a carbon trap and a valuable local amenity.

Addendum

The 2020 LiDAR published by the Environment Agency shortly before this monograph went to press gave us more data relevant to this chapter. It is now possible to derive canopy heights for Small-leaved lime *Tilia cordata* at each survey site as described in (20) and plot them as in (21). This LiDAR data allows the height of *every* tree to be estimated but because the flight was mid-winter, even the frDSM failed to detect the thinnest branches. Comparison of measurements by hypsometry and LiDAR (21) suggests that the frDSM underestimated the canopy height by around two metres at each survey site.



20. Above: map of survey site 22 showing canopy above 25m and the course taken to derive the profile below which indicates a typical canopy height of 27 metres (26.988 on the graph) at this site, as seen by the first return DSM.



21. Canopy height in metres measured by hypsometry 2017-8 and those derived from the 2020 LiDAR as illustrated in (20). The additional set of data with two metres added to the LiDAR figure (2020+2) gives a better match to the heights obtained by hypsometry 3 years earlier. It seems therefore that the LiDAR may have underestimated the canopy height by two metres because the trees had no leaves and the point cloud was relatively low resolution.

Acknowledgments

I am grateful to all those who helped me make the measurements during the course of this survey, in particular Mike Averill and Joe Pumphrey, and to Rob Somer for countless hours of drone photography. Also to Harry Green and Robert Fuller for critical review.

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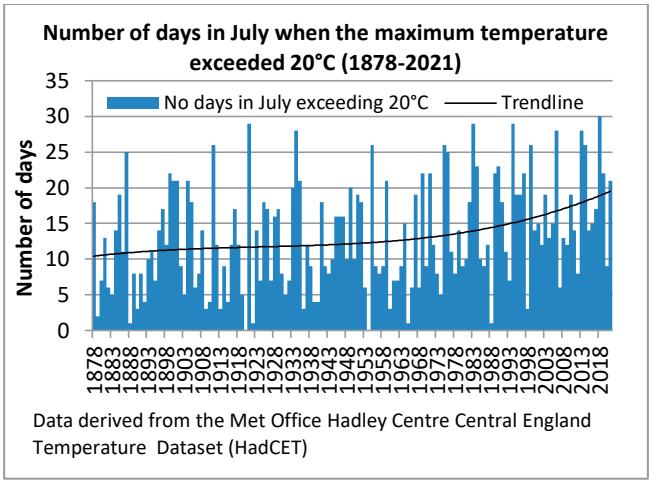
The ability of Small-leaved Limes to produce viable seed and seedlings and the relevance of Climate Change

Mike Averill

Accepted knowledge tells us that the Small-leaved Lime (SLI) *Tilia cordata* struggles to produce successful seedlings in parts of the UK because the summer weather is not warm enough. Yet reports in the last ten years, in Shrawley Wood, describe numerous seedlings in the early summer. Having access to open source meteorological data (Met. Off., HadCet) gives the opportunity to see how the weather has changed, at least in more recent times, and link that with past research and recent observations in Shrawley wood.

It seems likely that the success of the species has been very much linked to a changing climate over the previous 8000 years or so and in particular since the last ice sheets started to retreat from England. Pollen analysis has shown that at around 5000 years ago England would have been covered in a forest where SLI would make up a large proportion of the trees (Grant, Waller & Groves 2011). This was because the temperature was about 3°C warmer than now. Grant *et al* speculate that the massive clearance by man would have had a profound effect on the ability of SLI to recover naturally especially at the northern edges of its climate range. The very occurrence of the species now is regarded as an indicator of an ancient woodland site.

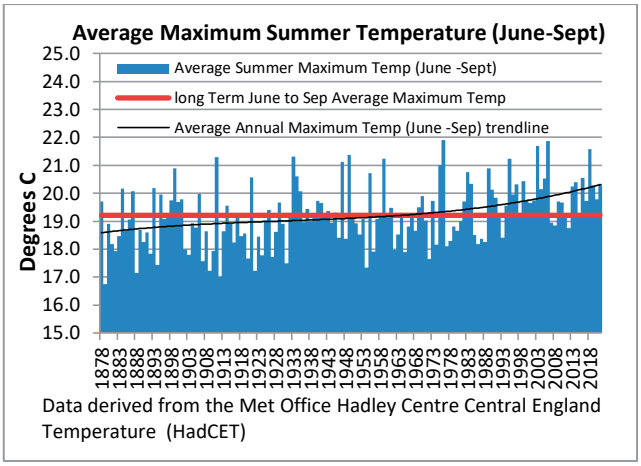
Although it is a relatively rare and scattered species at present, SLI was very abundant in the past and probably quite dominant in early primeval forests in Central Europe (Pigott 2012). Key to understanding how the fortunes may have changed is to look at the impact of temperature on the development of seed and whether they will go on to produce seedlings. Donald Pigott has looked into this extensively and has shown that SLI is a warmth loving species benefiting from heat throughout the summer but particularly in July when the trees are in flower (Pigott & Huntley 1981). In Pigott's book (Pigott, 2012) he shows, in the case of the Lake District, how the success of pollination and pollen tube extension in late July appears to be optimal when the mean daily maximum temperature was 17-22°C and warmer temperatures in to the mid 20's accelerated the extension rate. As 20°C is currently the average maximum temperature for central England in July, any days above this will be beneficial.



01. Graph showing Number of days in July when the maximum temperature exceeded 20°C (1878-2021).

In the graph of data from the Central England temperature dataset (01) it can be seen there has been a rise in the number of days when the average maximum daily temperature in July has been exceeded from approximately 11 to 18 times a month from 1878-2021. It is not just July that is warmer. Average maximum temperatures in other summer months have generally increased as well, although not as much in June as August and September.

In the graph below, Central England data has again been used to show the general rise in average summer maximum temperatures using the combined months June to September. Here the average has risen by over 2°C from 18.8°C to 20.2°C, with a particular rise most recently. With trends like this the phenology of the SLI is changing and its flowering time will be earlier in the year possibly by 5-10 days.



02. Graph showing the average maximum summer temperature (June-Sept) for Central England.

It is clear from the preceding graphs that within the gradual rise in temperatures since 1878, there has been an increase in the gradient in just the last 40 years. This increase in extremes is one of the predicted features of climate change. Just the last three years produced some of the highest maxima since 1878, with 2019 receiving the highest June and July temperatures since the HadCet records began (Table 03)

	June	July	Aug	Sep
2019	Highest	Highest		
2020	Eighth	Second	Third	Sixth
2021				Fourth

03. Table showing how some of the highest summer maximum temperatures from 1878-2021 occurred in recent years.

Pigott found that away from the coast or further north in England the number of days receiving high summer temperatures was less. He found that the primary cause of the absence of regeneration at the northern limit of woods in Lancashire was because the temperature might be 2°C lower than in central England. In Pigott's book *Lime trees and Basswoods* he writes that it seems almost certain that an increase in temperature of more than 2°C during July and August over the last 50 years would increase the frequency of years in which significant quantities of fertile seeds are produced at the northern limit of Small-leaved Lime in Western Europe. This is certainly already happening in Central England and the highest in the rates of change in central England are the daily maxima in July and August. September is also an important month in England as sustained warm weather will help the fruit develop, something which Finland does

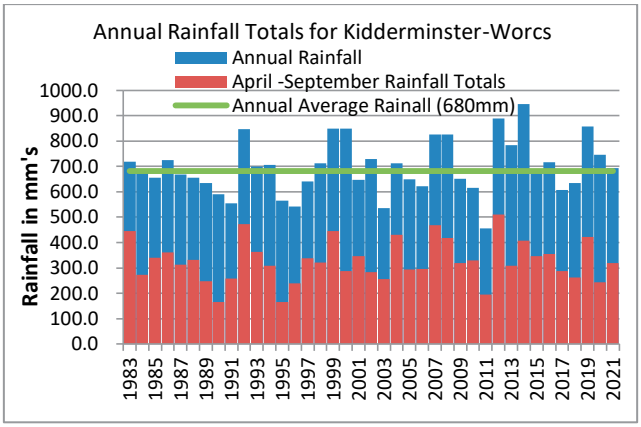
not enjoy, leading to incomplete seed development there. (Pigott 1981).

As Small-leaved Lime flowers from mid to late July, this is a crucial month for temperatures both for the development of pollen and for the production of nectar. This the time when the air is filled with insects and an observation on 17 July 2018 by M. Averill saw many thousands of marmalade hoverflies (04) over the canopy, probably millions over the whole wood. A wonderful sight in times when such insect numbers are now rarely reported.



04. Marmalade Hoverfly *Episyrphus balteatus*. M. Averill.

The summer months of July August and September are all important for the production of pollen, the fertilisation and setting of seed and its release from the tree to the ground. Seeds may be produced in most favourable years but numbers will also depend on nutrient and water availability. (Kelly and Sork 2002). Rainfall is another weather parameter that is important to consider as although SLI is mainly controlled by temperature, dry conditions during hot spells can add to the stress put on the tree. The annual rainfall requirement is in the order of at least 550 mm per year (Pigott 2012) and so Shrawley with annual amounts in excess of 680mm is well within its range. Looking at the table below of rainfall locally, only 2011 had a lower total than 550mm (05). Summer totals are also shown in the graph as droughts usually occur in the summer months.



05. Rainfall Data from the Met. Off. Daily Rainfall Station Greenhill (Kidderminster)

When a potential seedling has run the gauntlet of variable weather conditions in the tree canopy, it then has to deal with what faces it on the ground. If the seed finds suitable soil, germination can take place the following spring or even several years later (Pigott, 1991) and this long dormancy may be due to the tough pericarp, the impermeability to water and the embryo's dormancy, which requires 14–18 weeks of chilling conditions. (Suszka et al 1994) and (Hardy 1979). There is no doubt that young first year seedlings (06, 07) can be abundant and reports of good years in the mid 1980's have been followed by records in every year from 2009 to 2021. What then happens to these seedlings now that the weather is obviously conducive to seed production?



06 A Small-leaved Lime seedling. M. Averill

In this monograph there are references to the numerous seedlings that fail to become young trees (Chapter: Some History of Shrawley Wood Limewoods Pages 44, 47 & 55); (Chapter: Measuring and mapping the Trees of Shrawley Wood, Page 281); (Chapter: Small-leaved lime regrowth and regeneration in Shrawley Wood, Pages 294 and 299), (Chapter: DNA fingerprinting reveals genetic diversity and spatial patterns in *Tilia cordata* in Shrawley Wood, Page 308). One reason might be slug attacks but an evening in the Wood with a torch in 2018 failed to identify this (Chapter: Some History of Shrawley Wood: Hearts of Oak, page 75). Donald Pigott found that captive Bank Voles severely damaged and even destroyed lime seedlings, preventing natural repopulation (Pigott, 1985). A project to install vole exclusion guards on seedlings in a lime wood in Hampshire (Milner, Chapter: Recent Times, page 226) showed no noticeable difference compared to non-guarded seedlings but a rabbit/deer fence excluded rabbits, hares and deer, which proved significant. In Shrawley Wood there are now many deer, mainly Muntjac and they have access to graze anywhere in the wood.



07. Seedlings in 1985. G. H. Green.

Between voles, wood mice and deer and the probability of over shading, most seedlings struggle to get to any size, and those that have been attacked very often become infected with fungi such as *Armillaria* (Chapter: Small-leaved lime regrowth and regeneration in Shrawley Wood, page 299). This explains the low success of

seedlings to survive in Shrawley despite the required weather conditions now being experienced.

Some seedlings are successful and the one pictured in 08 was seen in a more open aspect by the side of New Pool.



08. Two or three year Small-leaved Lime. M.Averill.

Weather data used in this analysis is from the data derived from the Met Office (Hadley Centre) Central England Temperature Dataset (HadCET), which is the longest running set of daily data that is available in the UK. It is for Central England so is not data recorded specifically in Shrawley Wood but it is still useful for showing trends and comparisons with other local stations which show a close agreement with maximum temperatures. Using data derived in a standard way using meteorological measuring screens allows comparison across different habitat and in different countries. It should be remembered that the actual temperature recorded at the canopy level is likely to be quite different to the standard measurement of shade temperatures at near ground level.

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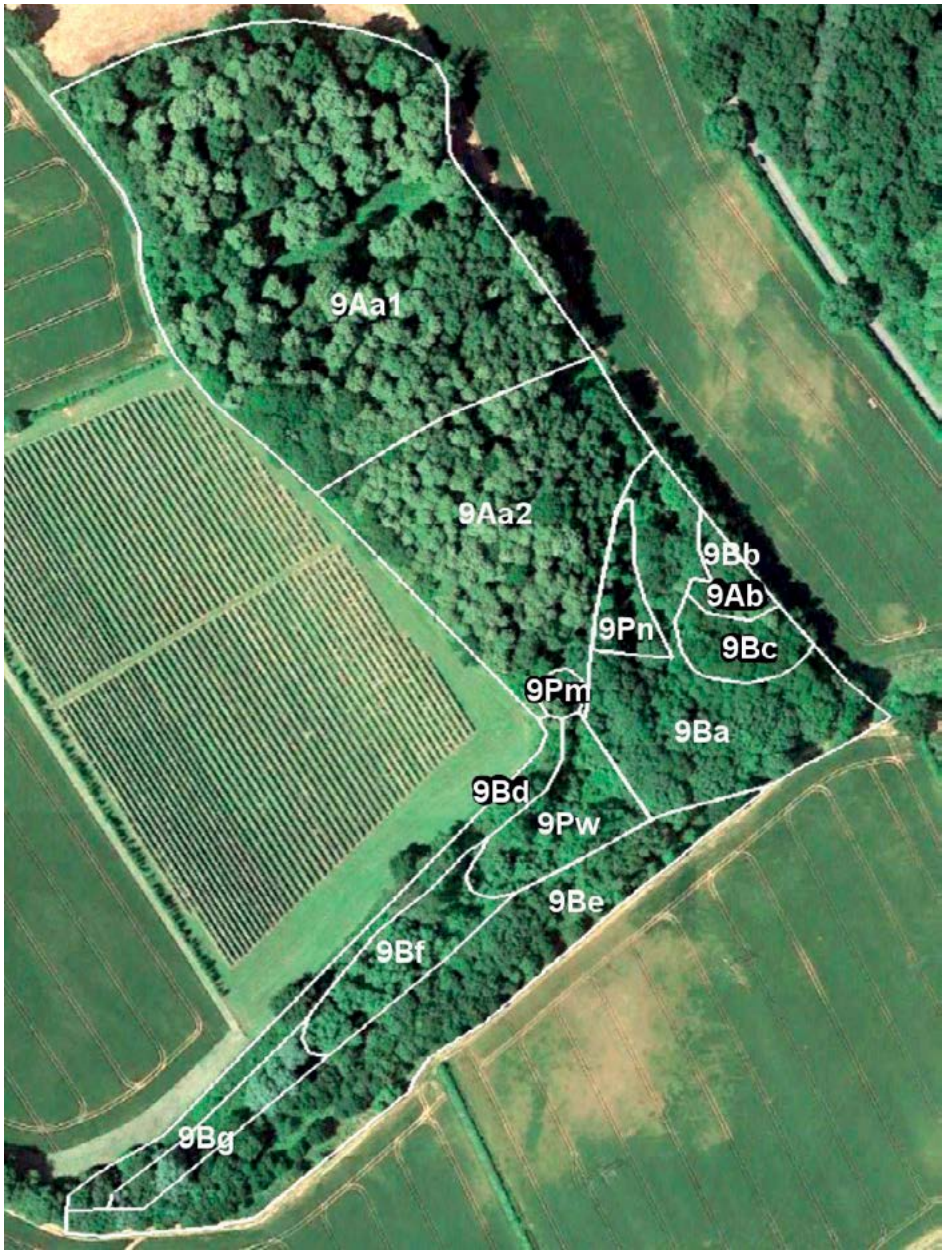
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Shotgrove mapped

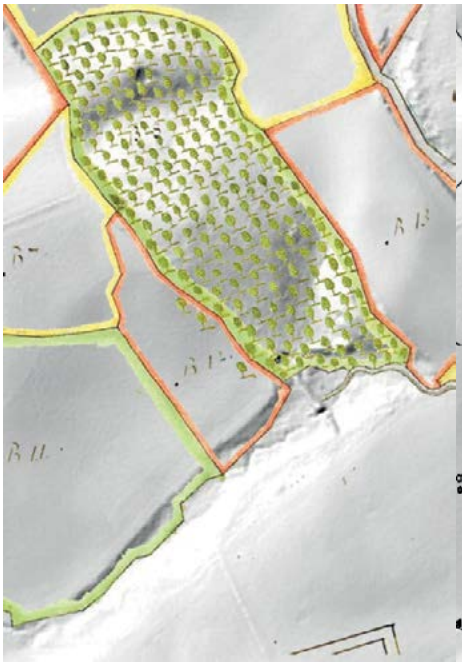
Richard Pumphrey



01. Map of subcompartments in compartment 9, Shotgrove, marked on 2019 satellite view taken from Google Earth. A = small-leaved lime coppiced 1945 with oak standards; at this time of year, the paler trees are lime, the darker are birch and oak. B = broad leaved woodland. P = pool

C	T	sC	area name	Ha	OG	date	detail	%SLI	%DF	%BI	%OK	%SY	%SC	%WCH	%CAR	%AH	%PO	%other	%OG	other=
9	.	all	Shotgrove	6.89	1.48															
9	A	a1	grazed Shotgrove	2.68	0.27	1945	coppiced	49	.	22	12	.	0.5	0.15	.	3	.	3.35	10	ГМ,ELD,HAZ,+
9	A	a2	ungrazed Shotgrove	1.14	0.00	1945	coppiced	67	.	25	10	.	.	.	.	3	.	.	0	
9	A	b	Lime coppice island	0.04	0.00	1945	coppiced	100		.	.	.	.	.	.	.	.	.	0	
9	B	a	Shotgrove SE	0.81	0.00		unmanaged	.	.	5	5	.	.	3	25	47	.	15	0	HAZ, ELD, HM
9	B	b	Excavation	0.05	0.00	1890?	planted ash trees	.	.	.	.	.	.	.	.	100	.	.	0	
9	B	c	Wild cherry grove	0.15	0.00	1950?	planted cherry trees	.	.	.	.	.	.	100	.	.	.	.	0	
9	B	d	Tail North	0.28	0.20	1900?	planted ash trees	.	.	.	10	.	.	.	.	40	2	18	30	ГМ, WCM, WL
9	B	e	New Plantation	0.92	0.00	1997/8	planted OK, WCH, AH	.	.	.	33	0	.	25	.	33	.	10	0	HM, WL, HAW
9	B	f	Withy Bed	0.26	0.10	1891	planted withy sets	.	.	.	.	.	.	.	.	.	.	100	0	WL
9	B	g	Willows	0.15	0.80	1990?	planted willows	.	.	.	.	.	.	.	.	.	.	50	50	WL, HAW
9	P	m	Middle Pool	0.03	0.00	1930?	excavated	.	.	.	.	.	.	20	.	60	.	20	0	HAZ, ELD
9	P	n	North Pool	0.11	0.11	1890	dammed	.	.	.	.	.	.	.	.	.	.	.	100	
9	P	w	West Pool	0.27	0.00	2007	dried up	.	.	.	.	.	.	.	4	4	0	92	0	WL

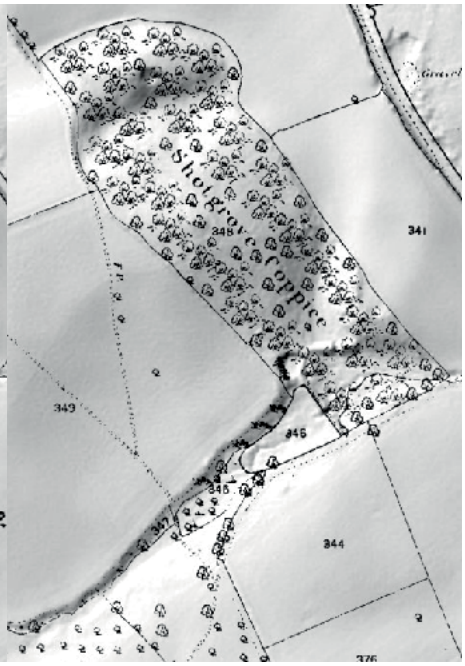
Table 1: details of Shotgrove subcompartments. C = compartment, T = type (A = lime coppice, B = broad leaved, P = Pool), sC = subcompartment, Ha = area in hectares, OG = open ground hectares. %XX = percent canopy occupancy by species XX estimated from satellite and drone images. See pp. 337-9 for Forestry abbreviations. References to subcompartments in this chapter are in the form {9Aa1}.



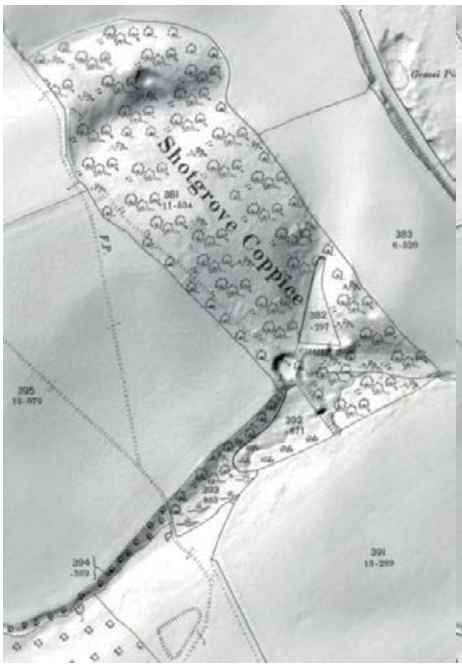
1732



1839



1883



1901



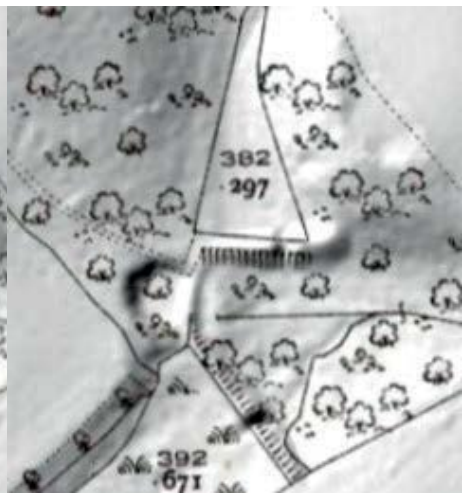
1927



1945



1901



1927

02. Above: sequence of maps overlaid on the LiDAR digital terrain model.

02. Left: enlargement showing track running over the corner of the middle pond.[These and all other OS maps in this chapter were obtained by screen capture, reproduced under a Creative Commons Attribution-NonCommercial-ShareAlike 4.0 International (CC-BY-NC-SA) licence with the permission of the National Library of Scotland]

1945 was a screen capture from Google Earth.© The Geoinformation Group.

Shotgrove

Richard Pumphrey

Preface

Shotgrove was not initially part of this study of Shrawley Wood. When we discovered from the Wood Books[1], the Vernon Estate Farm Worksheets[2] and the report from c. 1495 by the tenants of the coppices comprising Shrawley Wood [3] that Shotgrove has been managed as a bind of Shrawley Wood for at least the last 600 years (chapter Coppices & Binds pp. 200-205), it became of interest to study its history and structure.

Historical maps

Our first detailed map was surveyed by Joseph Dougharty in 1731-2 (02; 1732). Here his map[4] has been rotated -16º for best fit to the LiDAR image used throughout (02). His error in orientation was only 2º because at time magnetic north was 14º west of north[5]. This map is far more accurate than his map of Shrawley Wood where the orientation error was 16.4º and the cartography severely distorted in parts (chapter Historical Maps p. 267).

The next accurate map was surveyed 1839 and was prepared for the Tithe Commissioners by an unknown cartographer (02: 1739). Shotgrove is tithe 79; tithe 77 is a withy bed and tithe 78 the pool. This image was rotated -96.4º for best fit. Tithes 75 and 76 between Shotgrove and the Lenchford were called Washing Pool Meadow; it is likely that this washing pool was by the road, not tithe 78.

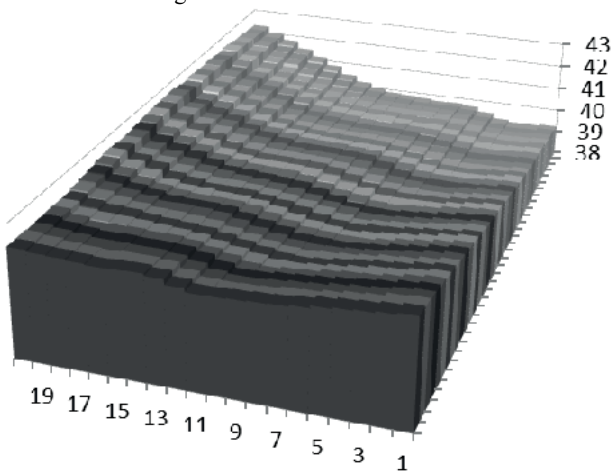
The first detailed and accurate Ordnance Survey to show Shotgrove was surveyed in 1883 (02: 1883); revisions were surveyed 1901 and 1926-7.

Google Earth provides a series of historical images of Shotgrove back to 1945 (02: 1945) and up to 2019 (01). In the 1945 image the alignment to the other Google Earth images is displaced 55metres to the southwest and an imperfectly matched cut-and-paste junction is visible crossing the grove.

The implications of details in these maps are discussed at length below.

History

Although our first detailed map dates from 1732, Shotgrove has a much longer history. The pronounced wood bank around much of its periphery (03), (04) suggests it has been an isolated coppice since medieval times or longer.



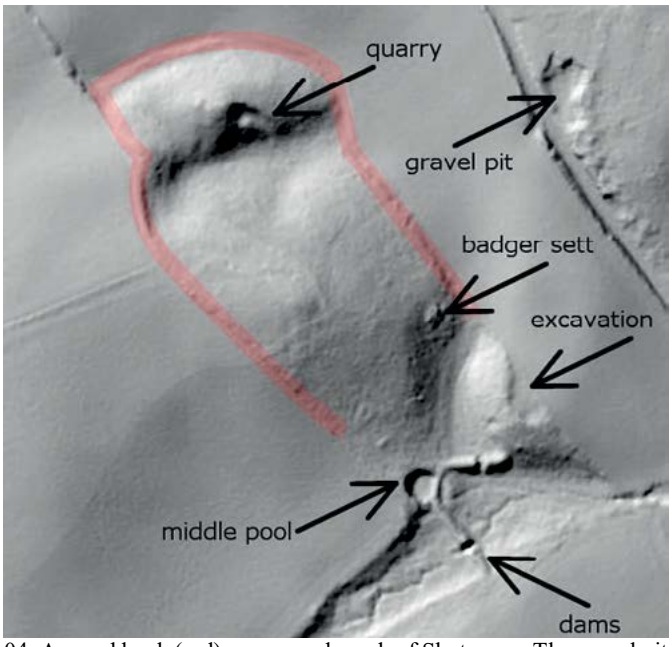
03. Block digital terrain model (DTM) from LiDAR imaging of the wood bank at the north end of Shotgrove; numbers are distances in metres, the y-axis being height above sea level.

Throughout most of its history, it seems likely that Shotgrove had the same owners as Shrawley Wood. The 1389-1390 Account of Robert Hullhampton, Bailiff for Shrawley[6], reporting to Thomas, Earl of Warwick, mentioned in a list of charges *"...for the farm of one piece of green below Shobbegrove, no charge because farmed with the Demesne land".*

Shopgrove was coppiced at the same time as The Roughcentz Bind of Shrawley Wood as recorded in "*A Report on the Coppices of Shrawley Wood by the Tenants of the same*" around 1495 (see chapter Coppices & Binds p. 203). Shoppe Grove is mentioned specifically again in the litigation of 1654 between members of the Childe family[7] (see chapters Owning Shrawley Wood p. 31).

An advertisement in 1835 for the sale of Severn Bank House, a property south of Shotgrove, included the pool by Shotgrove. Four years later in 1839 the tithe map and list of allocations indicate that tithe 79 "Shopgrove" was then owned by the Trustees of Thomas Bowater Vernon and tithe 78 "pool" and 77 "withy bed" were owned by Edward Vernon. Shotgrove remained in the possession of the Vernon Estate until acquired by the present owner *circa* 1990.

The name Shapgrove was used by the woodmen until 1818 and Shopgrove until at least 1841 but by 1875 they were calling it Shotgrove. The use of Shotgrove by the Ordnance Survey in 1883 ensured that that became the name used today.



04. A wood bank (red) runs round much of Shotgrove. The gravel pit was probably used for repairs to the main road through Shrawley.

The trees of Shotgrove

It seems likely that the part of Shotgrove within the wood bank (04) was originally a small-leaved lime *Tilia cordata* coppice with native oak *Quercus spp.* standards and birch *Betula spp.* trees. A higher proportion of oak trees remain here than in Shrawley Wood, but certainly fewer than there used to be as there are also many oak stumps. All the old oaks examined in this part of Shotgrove were pedunculate *Q. robur* and the birch were predominantly *B. pubescens* with 25-30% *B. pendula*.

There is a sweet chestnut tree *Castana sativa* in{9Aa1}[a], diameter at breast height (d.b.h) of 110cm; it is conceivable that this originated from the planting of 1877 (see chapter 1875-1897 p. 210). One could imagine that saplings left over from plantings in Shrawley Wood such as ash and chestnut were put in Shotgrove to prevent them going to waste. The 25" OS map surveyed 1883 shows a couple of

[a] References to subcompartments in this chapter are in the form {9Aa} referring to the table and (01)

conifers in the position of the middle pool which may have been left-over larch or Scots pine from the plantings listed in chapter 1875-1897 p. 210. But unlike Shrawley Wood, no beech trees have survived if any were planted.
Along the wood bank on the west border of the grove, as well as the oaks and limes, there is a variety of other shrubs and trees, including at the north end a row of damson *Prunus domestica*, at the south end a tall old holly *Ilex aquifolium* (height 16.5 metres in 2019), and in between a thicket of dogwood *Cornus sanguinea*, a clump of gooseberry *Ribes uva-crispa* and scattered field maple *Acer campestre*, hawthorn *Crataegus monogyna,* elder *Sambucus niger*, hazel *Corylus avellana*, and more. In all, these trees and shrubs form a dense hedge to the west of the grove, whereas the north and east wood banks have few trees or shrubs on them and the grove is open to the surrounding fields.

The undergrowth in {9Aa1}, {9Aa2} and {9Ba} has many elder and scattered hazel and field maple; unlike Shrawley Wood, there are no yew trees, and despite the half dozen tall old holly trees indicated in (07), there are no young holly or holly thickets. In the bed of the empty west pool {9Pw} which includes most of tithe 78, there is a thicket of willows *Salix sp x?* possibly arising from the older willows to the west. Allen Medlicott among others planted new withy sets "*at the Shotgrove Pool*" in 1891 (chapter 1875-1897 p. 212). The long-overstood withy pollards *Salix x fragilis* seen there now may be their remains (06).

In {9Bd}, as well as the row of large ash *Fraxinus escelsior* in the east and widely spaced mature pedunculate oak trees, there is a wych elm *Ulmus glabra* and several field maples, hawthorn and elder and a goat willow *Salix caprea*. The rate of growth of the white willows *S. alba* in {9Bg} in the sequence of "satellite" images in Google Earth (14) indicates they were planted with 10 metre spacing sometime around 1990.

In the late 1990s around 1000 trees were planted in a regular 3 metre grid in {9Be} comprising ash, oak *Quercus spp.* (mostly *Q. robur* but two *Q. petraea* were found in the sample population examined) and wild cherry *Prunus avium*; a proportion of the trees planted failed to establish and subsequent "beating up" (replacement of failed saplings) included hawthorn and spindle *Euonomys europaea*. Occasional other species that may have been original or included in the beating up include field maple, sycamore *Acer pseudoplatanus*, larch *Laryx europaea* and willow *Salyx x fragilis*; it is possible some of these out of line with the planting grid arrived through natural regeneration. The progress of this plantation can be followed in (14).



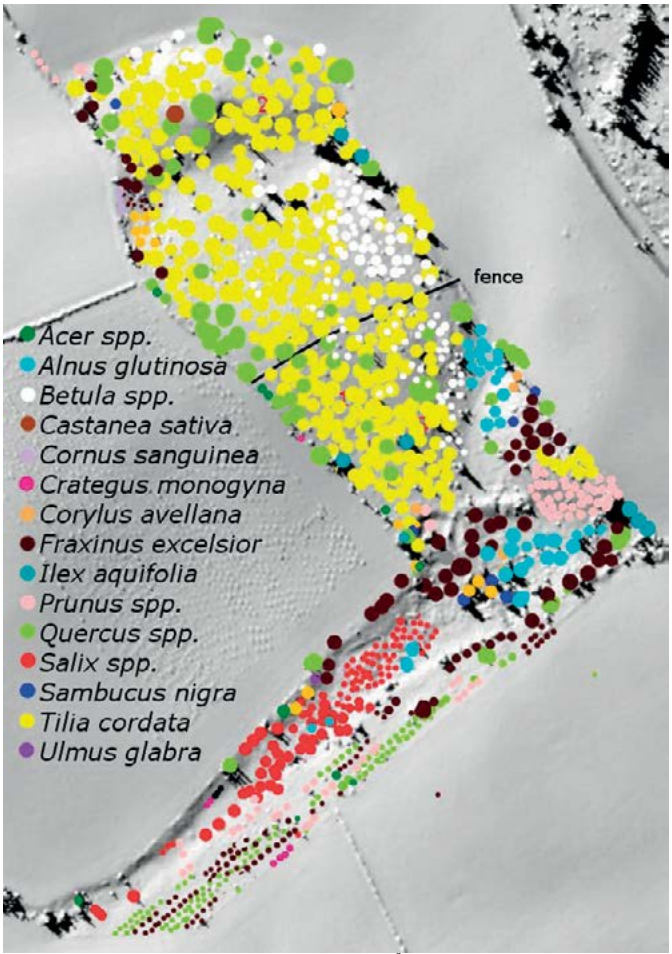
05. Wild cherry blossom in Shotgrove, April 5th 2019. [Drone photograph © R Somer]

Near the north end of the north pool {9Pn} there is an area of five by ten metres where multiple small springs combine to form the northern tributary to the Lench Brook[8]. These springs are surrounded by alders *Alnus glutinosa* and on the bank above then going south are hazel and ash trees, planted in what had been an excavation {9Bb}, and south of this beyond a small residual island of small-leaved limes {9Ba}, there is a dense grove {9Bc} of exceptionally tall wild cherry *Prunus avium* (05), (07).

Subcompartment {9Ba} includes what used to be tithe 77 (withy bed); this area now has no willows; instead the lowest part around the Lench Brook is populated by alder with ash around the sides of the valley. Underneath the canopy of these alder and ash are hazels and elder. Just as in the ash beds in Shrawley Wood, the ground here is covered with wild garlic *Allium ursinum*, suggesting a more alkaline soil than in {9Aa} where there are bluebells *Hyacinthoides non-scripta*. Ash trees are also dotted round the edge of Shotgrove; their arrangement suggests they many were planted rather than arising from natural regeneration.



06. Overstood pollard willows *Salix x fragilis*, the remains of a withy bed, possibly the ones planted in 1891 by Allen Medlicott



07. LiDAR digital surface model (DSM)[9] with species of the trees indicated.

The fence
The litigation Childe versus Childe in 1654 was all about protecting the young shoots of recent coppice in Shoppe Grove and Shrawley Wood. The statutory responsibility of coppice owners demanded they hedge it about to effectively exclude grazing animals from April 20 after the cutting for four whole years if it had been under 14 years since last cutting, or six years if between 14 and 24 years. This statute was needed because the villagers would otherwise use the area for their livestock, preventing regrowth and thus destroying the coppice. Shotgrove {9Aa1} is divided from {9Aa2} by a wire fence which dramatically demonstrates the effect of grazing on coppice regrowth and regeneration. In the aerial photograph (02: 1945) all {9Aa1} and {9Aa2} have recently been coppiced, leaving the oak standards; a fence can be seen around 100 metres north of its current position. North of the current fence, the trees are widely spaced and between them the ground cover is grass with a few patches of brambles; it has started its conversion to parkland rather than coppice. South of the fence the trees are closer and the ground cover more typical of lime coppice as seen in Shrawley Wood. In the spring of 2020 this fence had been flattened by fallen birch trees and presented no barrier to grazing animals.

Regrowth and regeneration of the lime trees
Data was collected as for the chapter Regrowth and regeneration (p. 294). Three sites were selected; each centred around a stool away from the outside border and in an area that seemed typical of that part of Shotgrove. The nine nearest neighbouring stools were measured for girth at ground level, and each stem with a diameter at breast height (d.b.h.) larger than one tenth of that with the maximum d.b.h. were recorded. All the stools within 17.8 metres of the central stool were plotted on a polar graph for estimation of stool density, which was then derived from the slope of the best fit line of increasing numbers of stools included within circles of increasing diameter from the central stool.

The median stem diameters at breast height (d.b.h) in sites 1, 2 & 3 (red numerals in (07)) were 39, 40.5 and 38. The corresponding median stem numbers were 1, 2 and 2; judging by the figures for regrowth in Shrawley Wood (chapter Regrowth and Regeneration p. 295) this is compatible with regrowth since 1945, the date of last cutting indicated by the aerial photograph in (06).

The corresponding stool densities were 260, 170 and 220, the last of these having an oak standard with d.b.h.98 cm, two large birch and a large holly tree within the 0.1 hectare. For site #1, south of the fence, the stem number, stem diameter and stool density, together with the brambles in the undergrowth were more like the areas in Shrawley Wood that had been singled, though we have no record that that had happened in Shotgrove. In this site there were also stools that had died within the last few years; the stem size suggested that these had failed to grow sufficiently to keep pace with the rising canopy.

In site #2, north of the fence, most of the stools had more stumps of large stems than there were live stems suggesting they may have had the number of stems reduced maybe 15-30 years ago; this may explain the low stool density. The ground flora in spring here included a blanket covering of lesser celandine *Ficaria verna* with bluebells *Hyacynthoides non-scripta* and wood anemones *Anenome nemorosa*.

In site 3, south of the fence and close to the badger setts, the ground cover in spring had bluebells, wood anemone and brambles, but the dominant species later in the season was Himalayan balsam *Impatiens glandulifera* with dense growth from the northern pool to the fence and beyond, now covering all {9Aa2} and the southeast third of {9Aa1}.

As with Shrawley Wood, the density of lime stools along the outside border was much higher than the internal density, confirming the requirement for sufficient light being a limiting factor for stool density. Although there were plentiful lime cotyledons growing in the spring of 2020, no evidence such as lime saplings or maidens smaller than the regrown coppice stools was found to suggest regeneration of the lime trees since the time of the last coppicing.

Extraction and despatch
Shapgrove (as it was called by the Shrawley Woodmen 1764-1850) provided timber and underwood much as any other bind in Shrawley Wood. We have no hard information about the routes of extraction, but from the northern half of the grove it is likely this was north along a level track towards the church, then down to the B4196. From the southern half the route may have been directly east across the field to the road; the 1883 OS map shows a track along the south border of the grove and across the field to the road (now B4196). From that point some was used locally in the parish as hop poles, cooperage and firewood and the rest transported by road to Hanbury or by river up and down stream to cratemakers and tanners.

In 1897 the fall was at Shotgrove, with 12 ton 16¼ cwt of oak bark being peeled and cordwood cut. The timber was tushed out of Shotgrove by Allen Medlicott[b] with the estate horses, who also carted the bark by road at 2 tons per load to the tanneries in Henwick, Worcester. At this time Henry Thrupp, Licenced Victualler of the Lenchford and Cratewood Merchant (among his other businesses) was buying cratewood from the Estate and poles and cratewood were drawn to the Lenchford by Allen Medlicot in September that year.

Hedging and fencing
The woodmen and others of the local workforce spent much time mending the hedge round Shapgrove as already discussed (1764-1850). The same was true in 1887-1897 round Shotgrove. A dense hedge remains on the western wood bank but to the north and east all signs of hedging have disappeared.

Other farming activities
There were pig cotes by Shot Grove Cottage, built and fenced around there by carpenter Samuel Oakey in 1897.

Shooting and fishing
There were regular shoots in Shotgrove during the time of Samuel Powick, Gamekeeper.

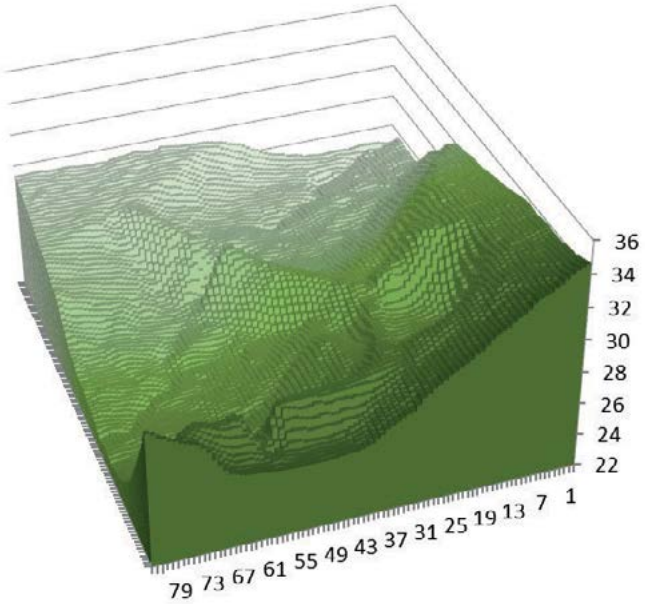
Shotgrove pools
The history of the pools by Shotgrove is enigmatic. Bailiff Robert Hyllhampton's account of 1390 lists the expenses of building fishponds that year, and a suggestion has been made that these were the ponds by Shotgrove[10] with no better evidence than the mention of a fishpond in the same document as a mention of Shobbgrove. In consequence, these pools are now listed as an ancient monument, HER Reference: WSM06731.

Although Dougharty's map of 1732 does not show a pool, the map stops at the estate boundary. This boundary is shown where the pool margin would have been if it existed rather than the Lench Brook, which would have been a more likely boundary if the pool was not there, so it seems probably the west pool is older than 1732. The tithe map and 1884 Ordnance Survey map show only the west pool; the level of detail in the 25 inch OS map makes it highly unlikely the middle or north pool existed at that time. The 1901 and 1951 maps show both west and north pools but the current online map shows only the north pool (08).

The LiDAR DTM (08) allows an estimate of the approximate volumes of the dams: west 1050m^3, north 810m^3, and the volume removed to dig the middle pool a maximum of 600m^3. The most likely source for the gravel-laden clay soil that the dams are made of is the neighbouring fields, which have a similar composition. The first OS map to show the north pool dam also shows a new pit, 250 metres to the southeast of the dam (02:1901). This pit is still seen on (02:1926) but scarcely visible now on the LiDAR DTM. This may

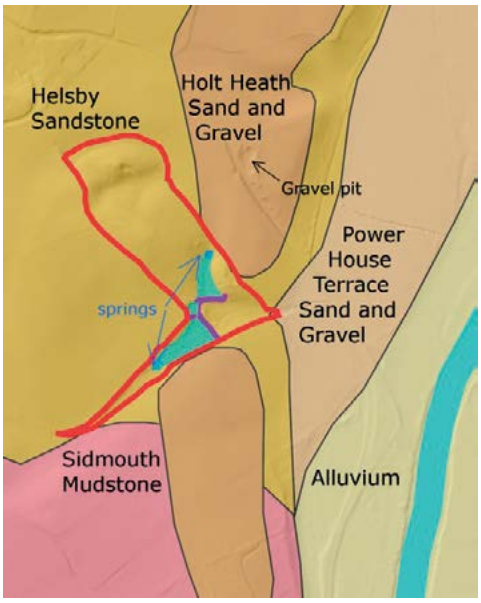
b see chapter 1875-1897 p. 217

have been the source of the material for the north dam; while the west dam may have come from the excavation underlying {9Bb}. The later middle dam was probably largely formed by the soil removed to expose the spring that fed it.



08. Block DTM of the dams in Shotgrove, looking towards the south.

In 2020, the flow from the springs feeding the pools and Lench Brook was noticeably greater after the driest April on record than it was two months earlier after the wettest February; this area is all part of the important Shrawley groundwater unit of the Triassic sandstones (09) and there are two wells which monitor local groundwater levels, one at the New Inn and one at St Mary's Church. Generally with sandstone aquifers there is a three month lag after heavy periods of rainfall before springs respond. Even during the downpours of the wettest February, the surface water flowing down the valley above these springs was a sluggish trickle. The pools therefore can only have had a static water use, never to power any mill, contrary to the supposition of H W Gwilliam.[11]

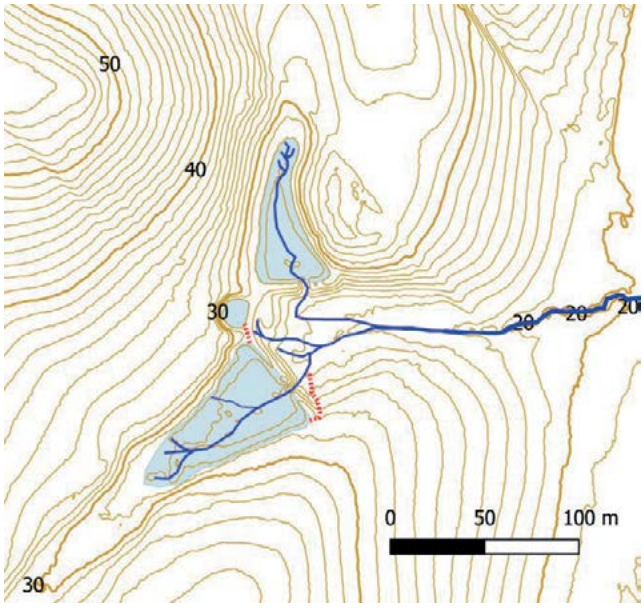


09. Geological map of the Shotgrove area. The underlying bedrock is Helsby Sandstone, similar to Shrawley Wood.

The level of the overflow gulley (10) defines the intended top water level of the west pool: it is in the 28m contour (11), which therefore indicates the top of the dams and the extent of the water surface in the pools when they were full. The spring feeding the small middle pool has now re-emerged below the dam but judging from its flow in 2020, the middle pool must have overflowed into the west pool, flowing along the channel between the pools. The last year water is visible in the north pool on Satellite pictures was 2006 although the pool area remained partially inundated for a couple more years[12]. Even in the exceptionally wet February 2020 there was no standing water in any of the pools.



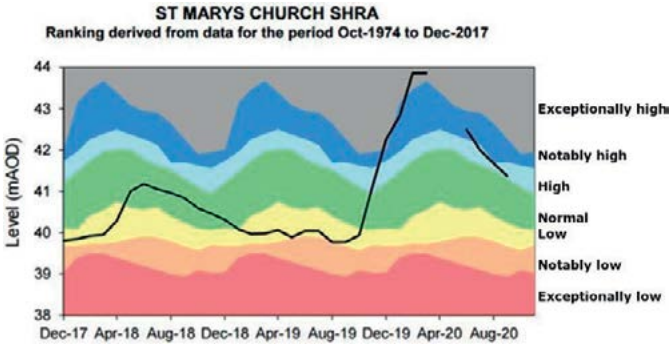
10. (Above) overflow gulley at the south end of the dam for the western pool. (Below) brick pipe draining the overflow gulley.



11. One metre contour plot of the dam area; the figures are the height in metres above OS datum. The pools are indicated at the maximum size in their history. The brook is shown as its course in 2020, The red dotted lines indicate the historic overflow streams.

According to the current owner of Shotgrove, the dams were breached following exceptionally heavy rain in 1926 but it is not

easy to reconcile this with the sequence of mapping the pools. It seems likely that the overflow gulley (10) became blocked and the dams overflowed at their lowest point, the stream of water eroding a narrow canyon through the dams. The limited rate of flow from the springs prevented the catastrophic rupture of the dams that happened elsewhere in Shrawley, leading to the very narrow eroded breach in each dam. Some water remained in the west pool until around 2008, when an oak tree that had been growing on the dam fell and opened a channel.[12]



11a. Water levels in St Mary's Church well (400 metres from the Shotgrove springs). The black line is the 2020 levels, (recording interrupted by COVID-19). The springs in Shotgrove are driven by this Shrawley groundwater unit and their flow varies with the changes in level in the well. [Environment Agency data.[13]]

Because any breach in the dams will only have been narrow, similar to the breaches there now, it will have been trivial to repair the dams, so this may have happened repeatedly over the years.
There is a sandstone block structure in the bank of the Lench Brook where it leaves Shotgrove. It seems likely that this is the remains of the bridge for the track shown on the OS 1883 survey crossing the brook at this point.

Conclusion
The old part of Shotgrove is like a miniature version of Shrawley Wood. At 4.65 hectares it is only half the size of one of the Shrawley Wood binds, but like Shrawley Wood it is on Helsby Sandstone with Holt Heath Sand and Gravel at its edge, with man-made pools with alder and withy beds; ash plantations on the slightly more alkaline soil where wild garlic grows, a central glade with bluebells surrounded by oaks with small-leaved lime understorey (now long overstood), brambles growing under the area that has more single stemmed stools, a sweet chestnut centrally, a tall grove of wild cherry (in the south rather than north of the wood as it is in Shrawley Wood), more birch trees to the east than the west, hazel trees scattered around its margins and so on. It is surrounded by a wide wood bank consistent with its long history as an isolated coppice.

It has probably had the same owners as Shrawley Wood throughout much of its history, and was worked by the same men under the same management and harvesting the same produce in all the years we have evidence for, some of this produce being used locally, the rest despatched up and down the Severn *via* the Lenchford Inn wharf. Game was shot by the same people, shoots managed by the same gamekeeper with the same beaters. The wood hedges were regularly maintained by the same workers as Shrawley Wood.

One difference is remarkable: it did not fall into the hands of the Forestry Commission and has escaped having Douglas fir planted within it. It is therefore to be prized as the best example we have of this type of coppice and we would do well to preserve it, though how best to go about that will need careful planning.



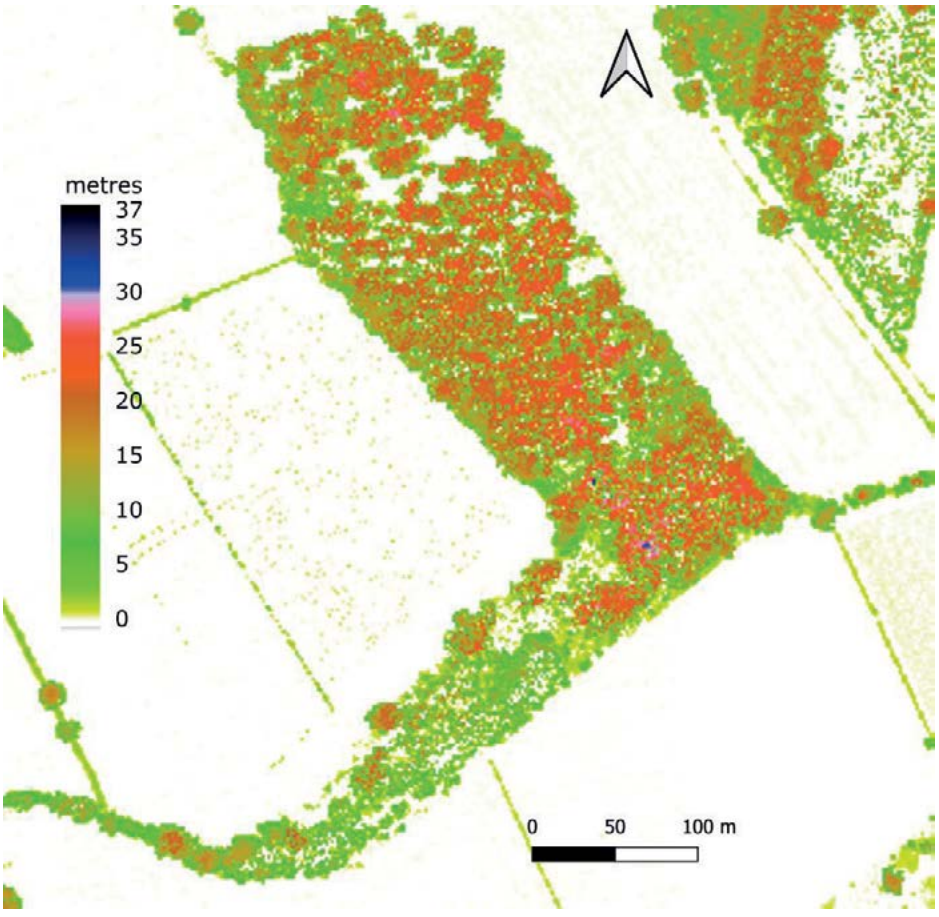
12. Collection of stills from video clips taken by a trail camera in Shotgrove, March 2020. See chapter Mammals pp.586-92.

Acknowledgements
Grateful thanks to John Ballard for permission to enter Shotgrove and fly a drone over in repeatedly, and to Robert Somer for his collaboration over drone surveys of Shotgrove.

1 Worcester Archives and Archaeology Service 705:7 BA 7335/108, 109, 132 & 133. Account books entitled "Shrawley Wood book". With letters, receipts and accounts etc.
2 WAAS Shrawley Farm worksheets: 705:7 BA 7335 Parcels 25, 26, 27, 59, 60, 61, 113, 114 Accounts and receipts relating to the Vernon Estates in Shrawley 1875 - 1897
3 WAAS 705:7 BA7335/18/i/1-20 c.20 deeds relating to property in Shrawley. Vernon, Weaver, Severn and other families. 1701 - 1733. Vernons of Hanbury Hall. Document No. 11
4 Worcestershire Archive and Archaeology Service (WAAS) 705:7 BA 7335/154/1 A Book of Maps Containing all the Estates Belonging to Bowater Vernon Esq. In Worcestershire, Warwickshire and Shropshire ... Drawn by John Dougharty of Worcester Surveyor Survey'd and map'd by John Dougharty Jur : Worcester in 1731. 1732. Map 16 'A Map of an Estate in Shraley belonging to Bowater Vernon Esq Mappt and Measur'd by Jos Dougharty of Worcester Surveyor; Map the First.
5 Alexandrescu, Mioara: Courtillot, Vincent; Le Mouël, Jean-Louis 1997. High-resolution secular variation of the geomagnetic field in western Europe over the last 4 centuries: Comparison and integration of historical data from Paris and London. Journal of Geophysical Research Volume 102, Issue B9, Pages 20245–20258
6 (WAAS) 705:66 BA 4221/7/ii Compotus roll of the Manor of Shrawley, [29 September], 13 Richard II - [29 September], 14 Richard II, [1389 - 1390]
7 The National Archives C6/41/116 Child v Child. Plaintiffs: Thomas Child. Defendants: Wm Child and others. Subject: woods in Shrawley, Worcs. 1 Jan 1654 - 31 Dec 1654.
8 The name Lench Brook for this stream is said to have come from the research of Valerie Powick. I have seen no confirmation in contemporaneous documents.
9 https://environment.maps.arcgis.com/apps/MapJournal/index.html?appid=c6cef6cc642a48838d38e722ea8ccfee#
10 https://www.heritagegateway.org.uk/Gateway/Results_Single.aspx?uid=MWR2079&resourceID=1035
11 Gwilliam, H. W. Mills in Worcestershire. Microfiche Watermills and Forges No 4 held at The Hive.
12 Personal communication, John Mattock.
13 St Mary's well monitoring: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/952780/Midlands_Water_Situation_Report_December_2020.pdf



12. Drone composite images from March and April 2019 by Robert Somer. Together with the LiDAR DSM, these photographs are helpful in mapping the positions of individual trees within the Grove in (07). The timing of leaf burst and flowering are characteristic of each genus of tree but close inspection is usually needed to confirm the species.



13 Height map of Shotgrove trees .

Heights were derived from the difference between the first-return Digital Surface Model and Digital Terrain Model from the 21/3/2020 LiDAR provided by the Environment Agency (see chapter LiDAR p. 258).

Only two of the ash trees gave first returns above 30 metres high.

The cherry trees mostly gave first returns above 24 metres and some over 25. The true height may be around 2 metres greater.



14. Sequence of images from Google Earth to follow growth of the plantations in {9Be} and {9Bg}. [1999, 2006, 2007 © Infoterra Ltd & Bluesky; 2005 © Getmapping plc].

Shotgrove through the Centuries

Hugh Milner

Evidence

The generic 'Grove', OE *Graefe, Graf or Grafe* means a 'Coppiced Wood'. Grove is derived from *Grafan*, 'to dig' (think 'grave'). "Kitson defines 'grove' as a wood of limited extent, in private ownership, digged about with a boundary ditch. The obvious reason for treating a wood in that way would be that it was coppiced"[1]. Thus, livestock had to be excluded for several years after coppicing.

Discussion

Onomasticians emphasize the importance of finding the first recorded evidence of a place-name to understand its meaning. In this case, 1390 usefully pre-dates the great vowel shift, most prevalent in the 15th and 16th centuries. The transmogrification is from Shobbe through Shop, Shoppe, Shap, Shop to Shot. Were the Shrawley villagers careless speakers or were new names coined?

The first recording of this word in 1389-90 is as 'Shobbe-', Old English (OE) *Sceobba,* a personal name, though only recorded in the place-name Shobdon near Leominster[1,2,3]. If we didn't have the document from 1390, we might erroneously have wondered about the derivation of the subsequent variants over the following 630 years. The word is next found in 1495, as 'Shop-', then in 1627, 'Shap-'. In 1654 it is 'Shoppe-'. It changes again in 1764 to 'Shap-', then in 1832 to 'Shot Copse', the only instance of dropping 'grove' but it is back to 'Shopgrove' by 1835. For a while in early Victorian times, it was Shotgrove Copse (a clear misunderstanding of the meaning of 'grove'!) before the name settled on Shotgrove from 1875, since held in aspic by Ordnance Survey mapping.

But it is recognised that consonants changed too. In this case only the last one in each word: b – p – t. 'B' to 'p' is unexpected. 'Shob' may have been altered by analogy with another word such as 'shop' with a further change much more recently to 'shot'.

Perhaps significantly the first pair of consonants 'Sh', originally spelt 'Sc', are prominently constant.

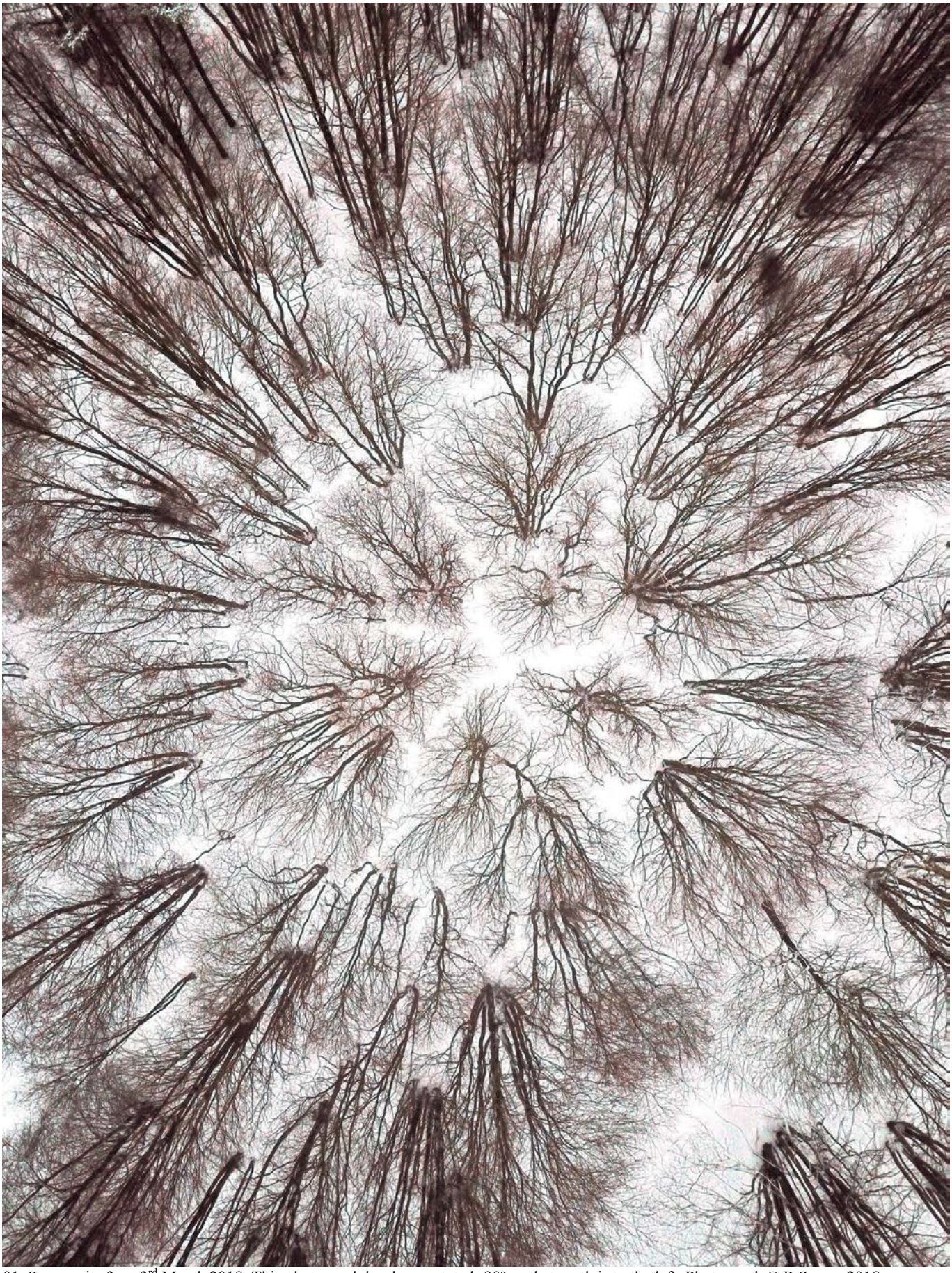
The Grove is very close to Shrawley Church and an ancient Cross. Is there a religious link? Is it an engaging coincidence that the OE personal name, 'Sceobba' sounds like Sheba?

With the passage of time, the name has taken on different guises. '*Sceobbagraefe*' certainly sounds alien to our ears but it seems we have here the name of a local person from the Anglo-Saxon era, a Weogoran[4].

Acknowledgements

I am indebted to Dr John Baker and Prof Richard Coates of the English Place-Name Society for their guidance and contributions.

1.Gelling M. & Cole A. 2000. *The Landscape of Place-Names.* Shaun Tyas, Stamford
2.Mills A.D. 1991, 1998. A Dictionary of English Place-Names. Oxford University Press, Oxford
3.Ekwall E. 1960. *The Concise Oxford Dictionary of English Place-Names*. Clarendon Press, Oxford
4.Hooke, D. 2008. Early medieval woodland and the place-name lēah. In: A commodity of Good Names, essays in honour of Margaret Gelling. P 370. Shaun Tyas, Donnington.
5.Smith A.H. 1987. *English Place-Name Elements*. University Press, Cambridge
6.Colby. 1832. Map
7.Brown L (Ed.). 1993. *The New Shorter Oxford English Dictionary*. Clarendon Press, Oxford



01. Survey site 3 on 3rd March 2018. This photograph has been rotated -90º so that north is to the left. Photograph © R Somer 2018

Shrawley Wood from a Different Point of View

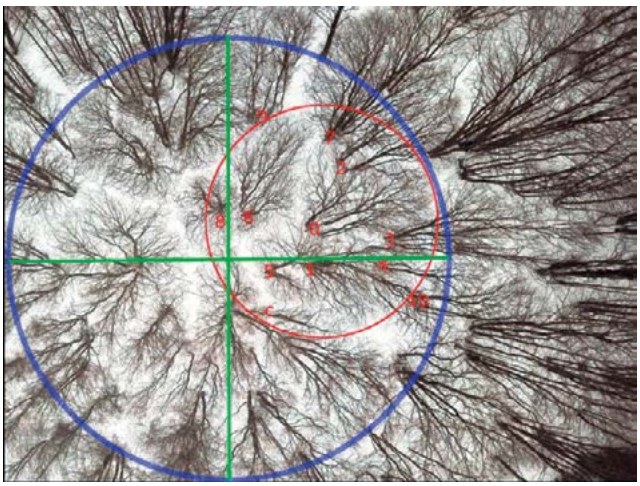
Richard Pumphrey & Robert Somer

Introduction

We have subjected Shrawley Wood to intensive scrutiny during the last few years but sometimes, as it were, it is difficult to see the wood for the trees. Standing back a bit, new patterns become clear. If you were able to sit still in the air over Shrawley Wood for years on end, you would see an ever-changing pattern below you. Each area of the wood has its own arrangement of trees of different ages and different species. Each species of tree has its own sequence of leaf burst in the spring, flowering, fruiting and leaf-fall in the autumn. Each year the sequence is repeated but the timing of the cycle may be shifted earlier or later by changes in the weather. Until recently, it was difficult to appreciate these slowly changing patterns but the advent of drones with high quality cameras allowing time lapse photography has opened our eyes to what has been going on. This short report presents some of the vast quantity of information gathered by drone over Shrawley Wood during 2018-2021.

One reason for collecting aerial photos was to follow the seasonal changes in our survey sites (Chapter Regrowth and regeneration p.294). Twenty-four of the thirty-six study sites were in the Forestry Commission compartments of Shrawley Wood and we are grateful for permission to fly a drone repeatedly over these sites to record the changes.

We also demonstrate how the pattern of leafing-out, flowering and leaf-fall can help identify the genus of each tree in sites of interest. We have shown in other chapters how a combination of the digital surface model (DSM, computed from LiDAR) together with drone photography has enabled us to map individual trees of species of interest over a whole wood (Chapters Shotgrove, Measuring and Mapping the Trees).



02. Survey 4 (red) with 0.1ha circle (blue).

Methods

A DJI Mavic Pro drone was programmed using the Litchi App to fly to a point around 60m above each survey site, orient the camera so that north was at the top of the image and take 12MP photographs vertically downward over the centre of the site. The photographs were compiled into time-lapse sequences for each site. Because of the imprecision of the GPS location and height, and the very variable lighting conditions, the raw images needed rotation, scaling, light level and colour adjustment and cropping; this was achieved using GIMP – a free graphics utility.

Results and discussion

We were fortunate in that at the beginning of March 2018 there had been a significant fall of snow that carpeted the ground. By 3rd March, the snow had gone from the branches but still lay on the ground. This happened at an early stage in the drone study and only 20 of the 24 sites were photographed on this date. Quite apart from their scientific value, these first images struck us as beautiful (01). They allowed accurate identification of the stools within each of the survey sites against the snowy background and because the separation of these was known, a 0.1ha circle could be drawn on the drone image, enabling a 0.1ha stool count for the study sites where this had not already been done on the ground. Where the central stool was too far off-centre within the drone image, new measurements were made on the ground to improve the accuracy of the 0.1ha area used for the stool density count (02).

Given a time-lapse sequence of photographs, (04-07) we were usually able to identify the genus of each individual tree. We could not readily distinguish between similar species such as pedunculate oak *Quercus robur* and sessile oak *Q. petrea* or silver birch *Betula pendula* and downy birch *B. pubescens*. Sometimes the appearance was surprising, such as the old field maples *Acer campestre* that appeared white in winter because of lichens on the top of branches but then turned green in spring (10).

Rowan *Sorbus aucuparia* (11,13), birch, sycamore *Acer pseudoplatanus* (12) and oak trees opened their leaves before lime, aspen *Populus tremula* after (10). Before this, birch were easily recognisable as a narrow columnar tree with a small dense dome of thin branches, purple tinted in March until the pale yellow-green leaves burst between 13th and 22nd April 2018. The large standard birches that had survived coppicing intact opened their leaves at the same time as the majority of smaller intrusive trees e.g. (13). Downy birch and silver birch opened their leaves at the same time.



03. Pussy willow (Sallow *Salix ?caprea or cinerea)* 23 March 2019.

The sequence of flowering is equally characteristic but only easily visible for some of the trees. Hazel *Corylus avellana* catkins for example were easily visible from the ground, but because they hang vertically down, they were difficult to detect in the drone photos. The catkins of Pussy willow *Salix caprea/cinerea* were much easier to see and grid-mapping revealed dense patches of these willows that could only be seen from the ground by walking through areas of coppice where there were no paths (03). Wild cherry *Prunus avium* trees stood out so clearly from the background that they were visible on Google Earth "satellite" images (see chapters: Measuring and mapping the Trees and Shotgrove); cherry blossom appeared at much the same time as birch leaves. Later rowan (13), then elder *Sambucus nigra* flowers were visible as clusters of white dots; sweet chestnut *Castanea sativa* as pale stars and lime bracts as a diffuse paleness against the green of the leaves. It proved impossible to

distinguish between lime bracts with buds and those with open flowers without flying low over the trees (04).



04. Survey site 3 on July 6th 2018. Lime flowers were only distinguishable when flying close to the canopy.

A video-recording looking vertically down was also recorded while the drone was moving between sites giving a helpful 3-D impression of trees beneath and revealing the sub-canopy trees when there were no leaves on the lime trees. In winter, evergreen trees such as holly *Ilex aquifolia,* laurel *Prunus laurocerasus* and yew *Taxus baccata* stand out under the bare branches of the deciduous trees and are visible in the DSM, though inspection on the ground is still needed to distinguish between different similar shaped evergreens. Combining a grid flight path video with the map from the equivalent still photographs made it possible to map out the density of young yew trees around their ancient mother. Further combining this information with the LiDAR DSM yielded accurate distribution maps. [see Measuring and Mapping the Trees].

Each flight we also collected some scenic photographs to record wider views throughout the year (05—09).



05. 10th October 2018. The chestnut coppice in the foreground with survey areas 01 (2 year old stools) , 02 (8 year old stools) and 04 coppiced 1975 and all the leaves stripped off by recent gales).



06. The main ride near sunset, 8th May 2018. The straight row of lime trees has regenerated in what used to be a broad cleared ride, leaving only a narrow trackway to the left. The direction of the sun prompted an investigation into the orientation of the main ride which revealed it was closely aligned with sunrise at the winter solstice.



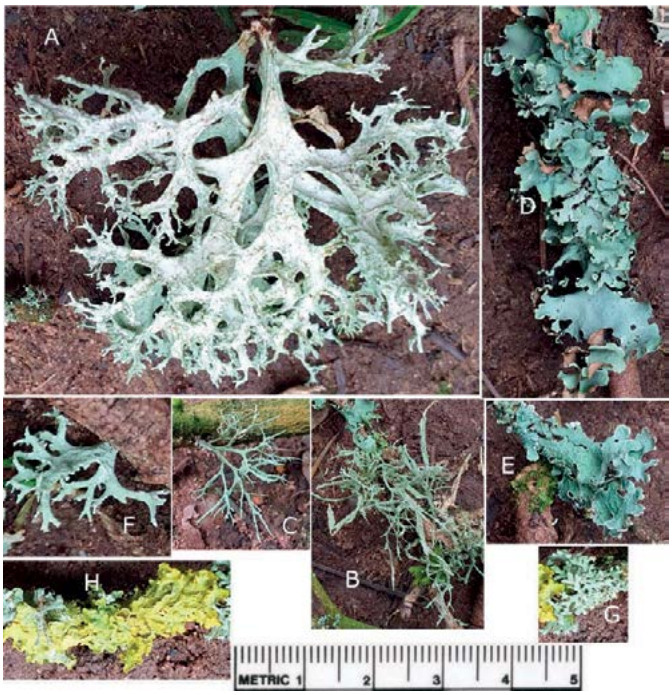
07. The New Pool seen from above the top of Oliver's Mound, 13th April 2018. The whitened limes at the bifurcation of the New Pool are covered in guano from cormorants *Phalacrocorax carbo.*



08. Wellingtonias *Sequoiodendron giganteum* on the skyline, 3rd March 2018. This day gave us many beautiful photos such as (01).



09. 17th October 2019. Fields flooded by the River Severn seen beyond the autumn colours of Shrawley Wood. These more sheltered trees have held onto their leaves in contrast to those on the western border of the wood that had their leaves stripped a week earlier by the westerly gales (05).



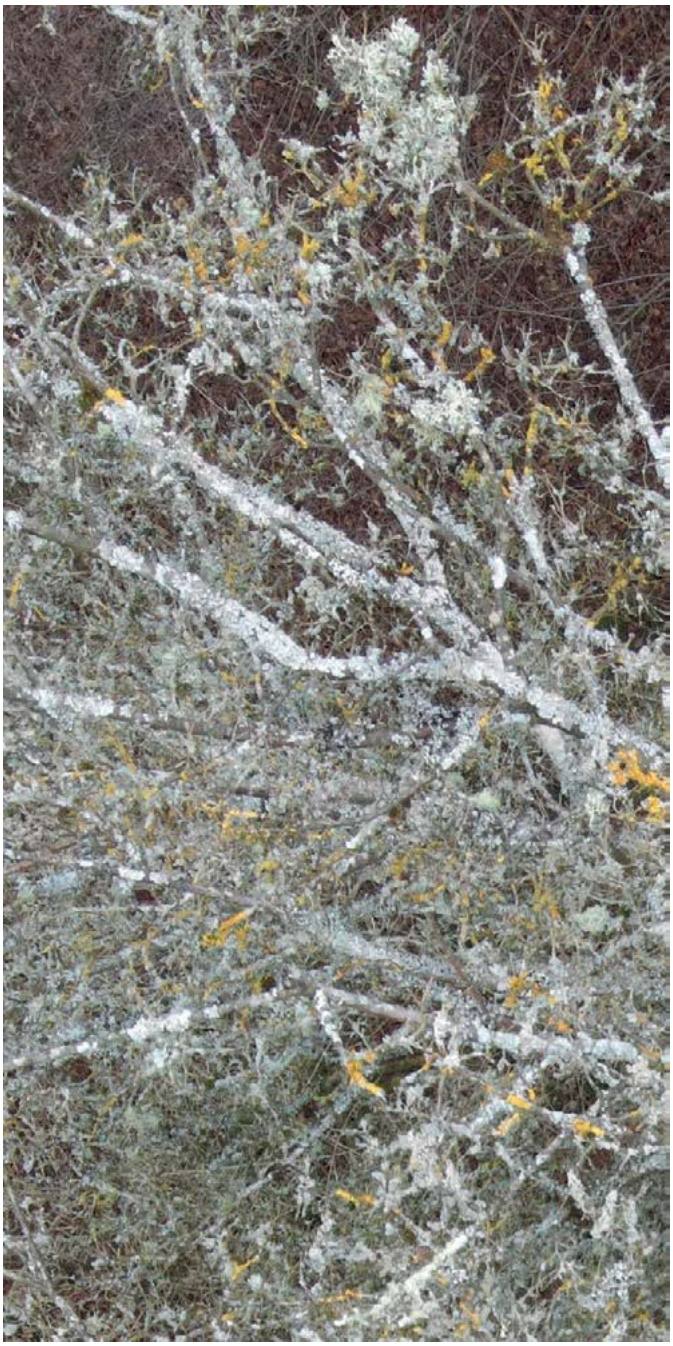
10a. Lichens collected on 3rd March 2021 from high in the canopy of the field maple seen in (10d).

A, F *Evernia prunastri*
B, C *Ramelina farinacea*
D *Parmotrema perlatum*
E *:Parmella sulcata*
G *Physcia tenella*
H *Xanthoria parietina*

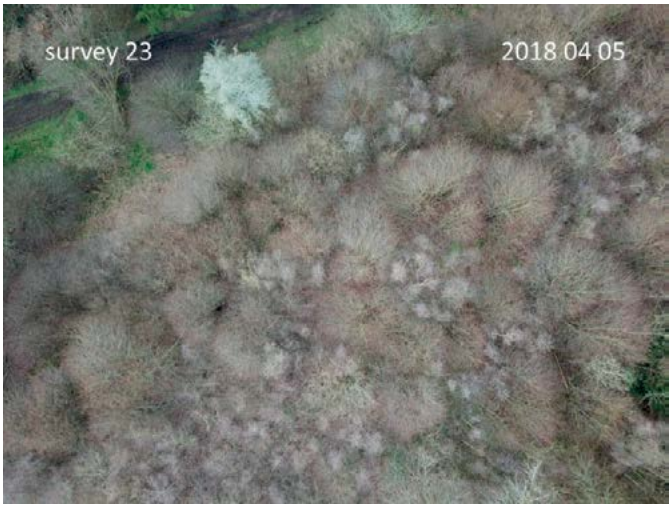
The preference of these lichens for this tree over the others around it may be due to its greater age and the chemistry and pH of the bark. In this part of Shrawley Wood many of the old field maples are densely covered in lichens similar to the one in these photos.



10b. Drone view of the canopy of the field maple seen in (10d)



10c. Drone close-up of the top of the canopy of the field maple (FM) seen in (10b). 3rd March 2021













10d. Survey site 23

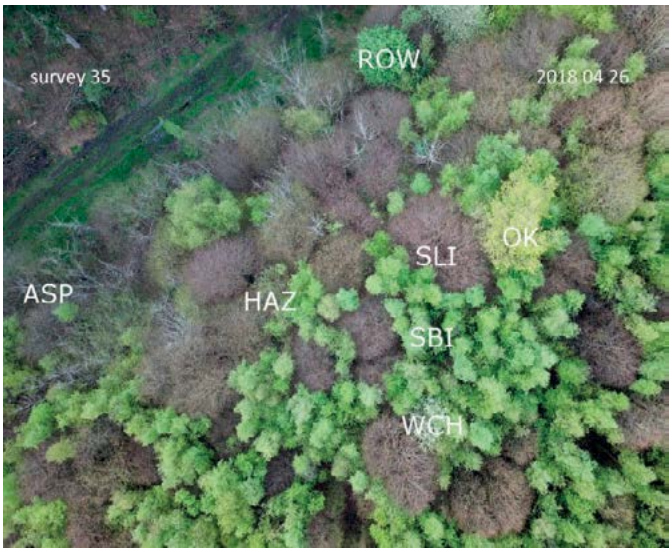
Lime coppiced 2002. There is a steep slope down to path across NW corner. This is recorded by the Forestry Commission as “coppice with standards” but there were no significant trees left uncut near the survey site apart from the old field maple, as can be seen in the 2005 Google Earth image of this area.

The field maple appears white before leaf burst because of the lichens coating the branches - see (10a), (10b)..

WCH = wild cherry
SLI = small-leaved lime
SBI = silver birch
FM = field maple













11. Survey site 35.
Lime and hazel coppice cut 2001 with an oak standard and birch and aspen; occasional rowan.
No sign of flowers on the coppiced lime (age 17 years). The lime trees are among the first to lose their leaves in autumn.
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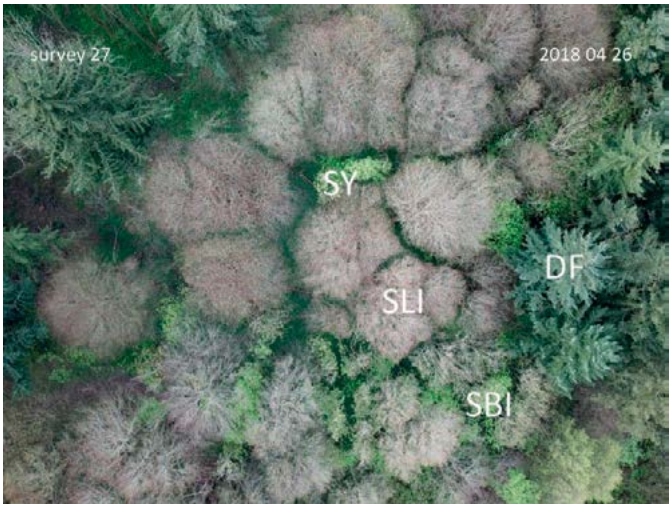
SBI = silver birch
OK = oak
SLI = small leaved lime;
HAZ = hazel;
ASP = aspen
ROW = rowan
WCH = wild cherry







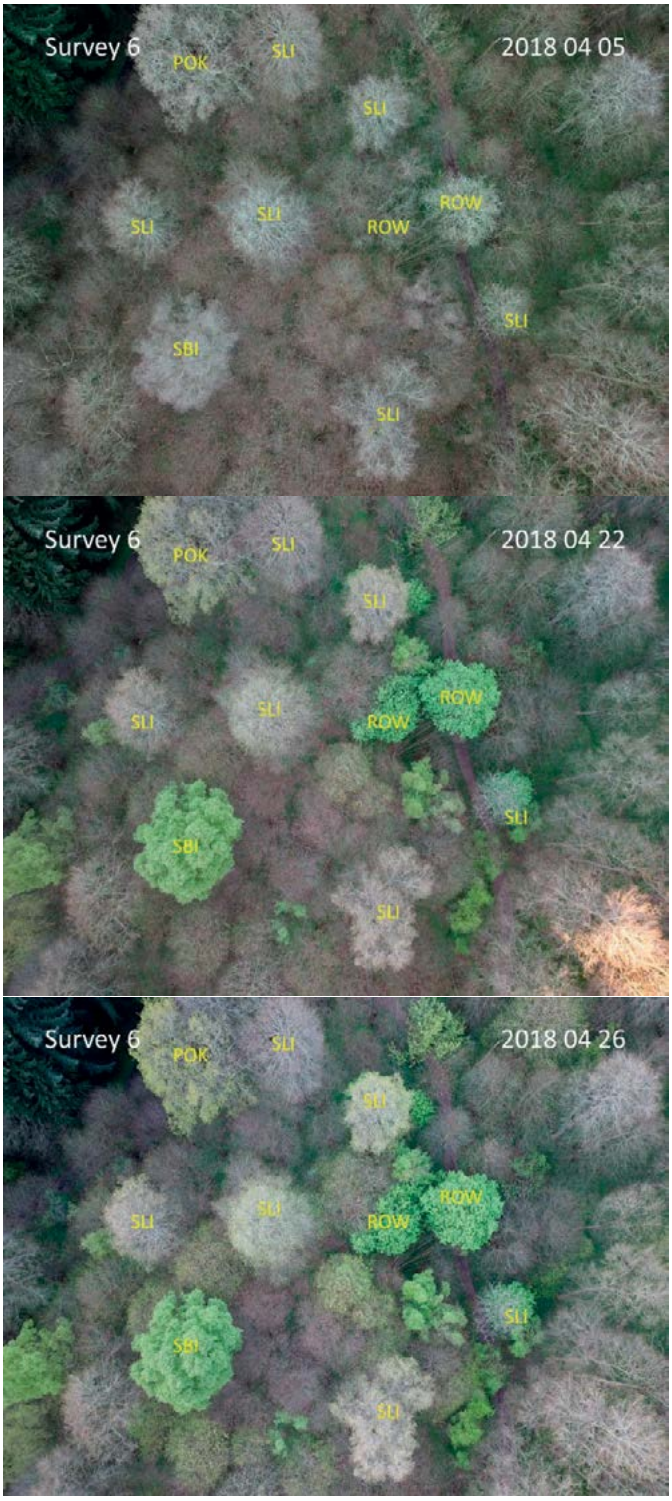






12. Survey site 27.
Lime coppiced 1955 left as an island within Douglas fir plantation. The central lime lost one of its stems during the summer leaving a gap in the canopy.

DF = Douglas fir *Pseudotsuga menziesii*
SY = sycamore
SBI = silver birch
SLI = small-leaved lime



13. Survey site 6.
Lime coppice cut 1996 with standards of lime, pedunculate oak, silver birch and rowan.

By 22 April the old silver birch standard and the rowans have come into leaf. On 11 May, 3 weeks later, the rowans can easily be distinguished by their flowers. Although both sweet chestnut and lime were flowering on 12 July 2018, there is no difficulty in distinguishing between them.

POK = pedunculate oak
ROW = rowan
SBI = silver birch
SC = sweet chestnut
SLI = small leaved lime

Conclusion

Drone photography provides a valuable new tool for fine detailed mapping of woodland and for studying the phenology of trees. The programme allowing the drone to visit the same point in the air above study sites at intervals throughout the year was a particularly valuable tool.

Acknowledgements

Many thanks to Trevor Duke for the identification of the lichens in (10).

Drone study of Phenology in Shrawley Wood

Richard Pumphrey

Many studies of the phenology of woodland trees have focussed on the effects of climate change[1] but few have looked specifically at small-leaved lime *Tilia cordata*. Here I present new findings on the fine details of leaf-burst and leafing-out of small-leaved lime and attempt to relate this to the preceding weather conditions.



01. Three lime stools on survey site #01, 8th May 2019. Stool A has not started to leaf, stool C is at an early stage with some buds unopened, some with leaves emerging and a few with leaves unfurled; every stem on the stool B has most of its buds burst, many with leaves fully unfurled.

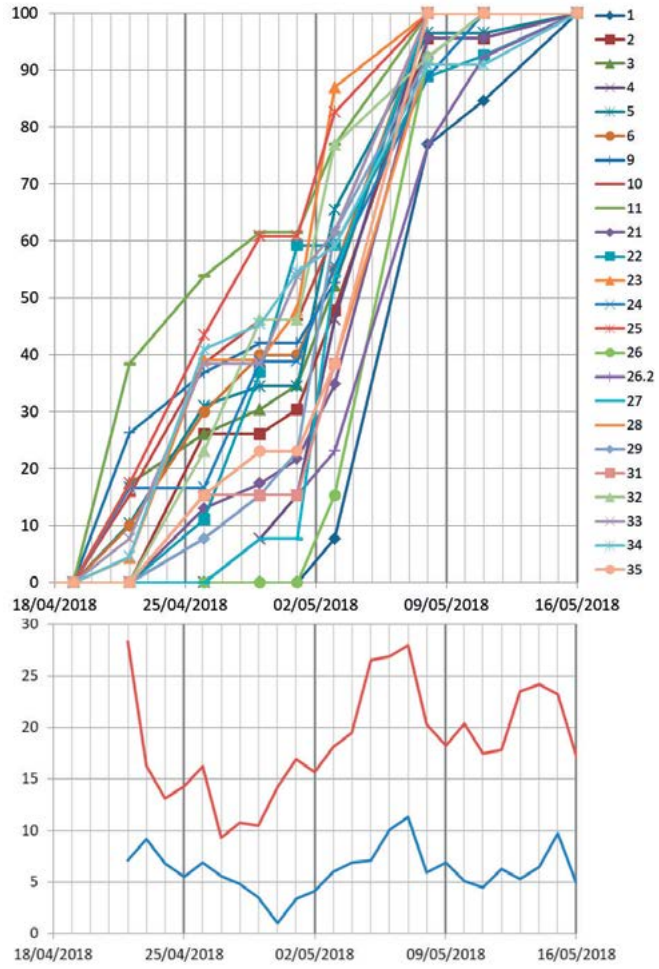
Bud burst and leafing-out of small-leaved lime.
Looking at a recently coppiced bind in the spring (01), it is immediately obvious that while all the stems on a stool develop their leaves in synchrony with each other, some stools start leafing-out many days before others. What is not so obvious is that the order in which the stools leaf-out is preserved year after year. In every site I surveyed, from recent to 95-year-old coupes, the sequence in which stools developed their leaves was the same in each of the four years 2018—2021 but the start date and rate of progress varied widely between the years. This strongly suggests that the sequence of leafing-out is determined by genetic factors but that environmental factors, in particular the temperature, play a major role in the time at which leaf-burst starts and, as I will show, the rate at which leafing-out progresses.

In older coupes the crown of each main stem appears as a discrete entity in our drone images (05). Each crown develops from bare branches to fully leaved over the course of two to four weeks and during this process many crowns are at a different stage from their neighbours (asynchronous crowns) but among these are clusters of crowns that proceed synchronistically throughout leafing-out (synchronous crown clusters SCC) such as cluster [D] in (05). These may all stem from a single stool or from close but separate stools. The groups of clonal stools that we found in our DNA study appear as SCC in drone images (chapter Lime DNA p. 330). Until now, all clonally identical but spatially separated stools identified in lime woods have been within 15 metres of each other.[2] If one were searching for more distantly separated clonal limes, synchronous leafing-out might be a good indicator for a possible match.

Bud-burst describes events at the level of individual buds. Full details of a seven-grade scale have recently been illustrated in an account of a grading system for bud-burst in beech *Fagus sylvatica* with accompanying photographs[3]: in grade A the buds are dormant; B buds are swollen; C buds are swollen with brown scales open, and the green tips of the developing leaves appear; in D buds are swollen and open; E leaves partly unfolded, the petiole is not visible; in grade F the leaves have unfolded, 10% of leaves have final shape, but not final size and colour, the petiole is visible; grade G has mature leaves with final size and colour. A condensed form of this scale was used in a study of five species including small-leaved lime in Białowieża National Forest.[4] Grade 0 in this study corresponds to stage A and B (no leaves visible on buds), grade 1 to stage C,D and E (leaves exposed but not fully unfurled) and grade 2 to stage F and G (leaves opened with petioles visible) in the beech study. While each bud develops through these 7 stages, not all buds on a single lime open at the same time: there is a spread of several days from the first to the last.

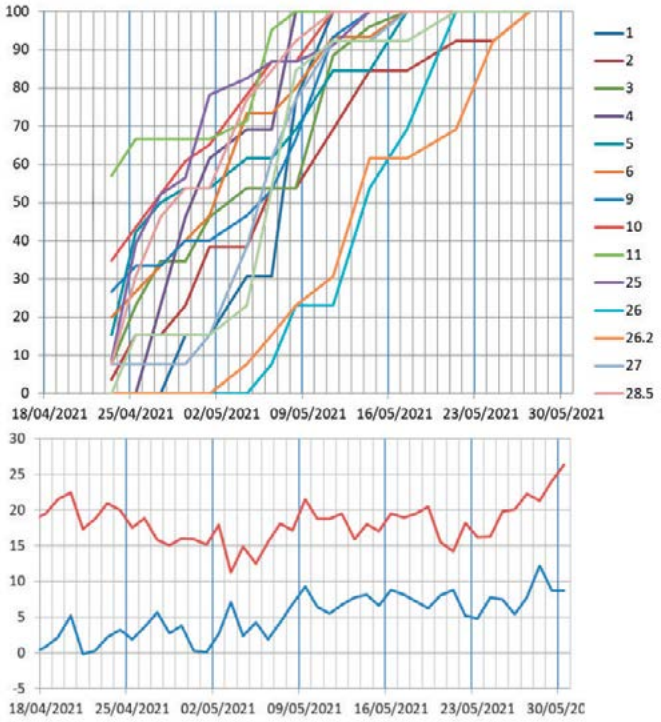
In the Białowieża National Forest study progress of leafing-out was assessed on alternate days from ground level using a telescope. Ten apical leaf buds randomly selected from the south side of the crown of each of ten lime trees were graded as 0, 1 or 2; these results were added together to give a total score for the ten buds and these scores were used as the measure of leafing-out. Altogether they assessed 10 buds on each of 10 lime trees.

The use of drone images for phenology dictates a different approach. Our study is based on 12 megapixel drone photographs from a height of 30—60 metres above the canopy giving a resolution of around 1—2 cm per pixel, so while fully opened leaves can be distinguished as individual entities, the earlier stages before leaves unfurl are only distinguishable by the apparent colour of the twigs bearing the buds. I took the first day that any leaves were visible within a crown as the start of its *leaf-burst* (02), (03), though progress through this stage was rapid and in the two to three days between photographs, the first change has often already progressed from 0% to 5-20% (04).



02. above: percentage crown or SCC with open leaves at each of 24 sites in 2018: 410 crowns were assessed on each of 9 dates from 19th April to 16th May.
below: daily maximum and minimum temperatures ºC.

Subsequent *leafing-out* takes place over several days (04), eventually leading to the full quota of leaves. The majority of lime crowns were fully leaved by 16th May 2018, but the leaves continued to develop and darken until at least until 13th June 2018, when the crowns of older limes started getting paler as the bracts developed. .



03. A similar plot to (02) for 2021. A warm March may have primed the buds for leaf burst but then a cold April and early May slowed down the progress so that it was spread over twice as long as 2018. A drone flight on 12th April fond no limes with leaves but by the next flight on 23rd April leaves were visible on many crowns.

Sites 1 and 29 had been coppiced in 2017 so the stems had only one year's growth in 2018. They were among the latest come into leaf in 2018, but by 2021 they had started leafing out earlier compared to the median for all crowns.

Progress of leafing out

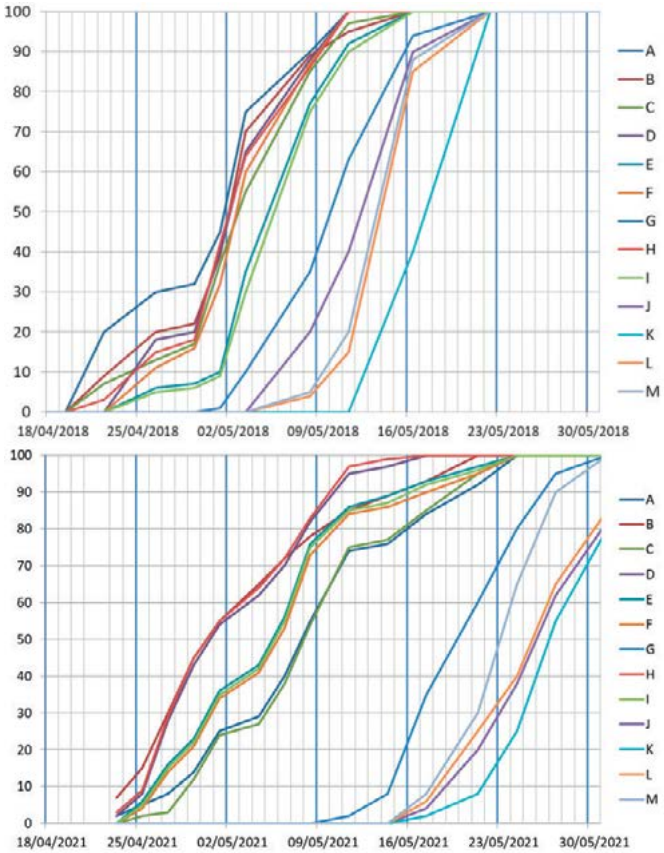
Photographs of each of 24 survey sites were organised into multilayer stacks within the graphics utility GIMP so that within each site, the crown of each stem was in a fixed location on the screen whichever date was selected. At each site, each crown with distinct leafing-out timing or cluster of synchronous crowns was labelled ($13<n<29$, total of 410). On each of nine dates in 2018 from 19th April to 16th May 2018, and 15 dates from 12th April to 31st June 2021, I counted the number that had undergone leaf-burst. The resulting plot showed a marked slowing in progress around 28/4/2018 to 3/5/2018 (02). A local private weather station 1.1 km south of the wood had temperature records that showed a cold spell coinciding with the pause in leaf-burst (02), (03).

In 2018 the earliest lime trees leaves in Shrawley Wood appeared by 22nd April 2018 and the last by 16th May, with trees fully leaved several days after their first leaves. We have no photographs from 17th May to 12th June 2018 because of a gap in flights due to a public holiday and adverse flying conditions.

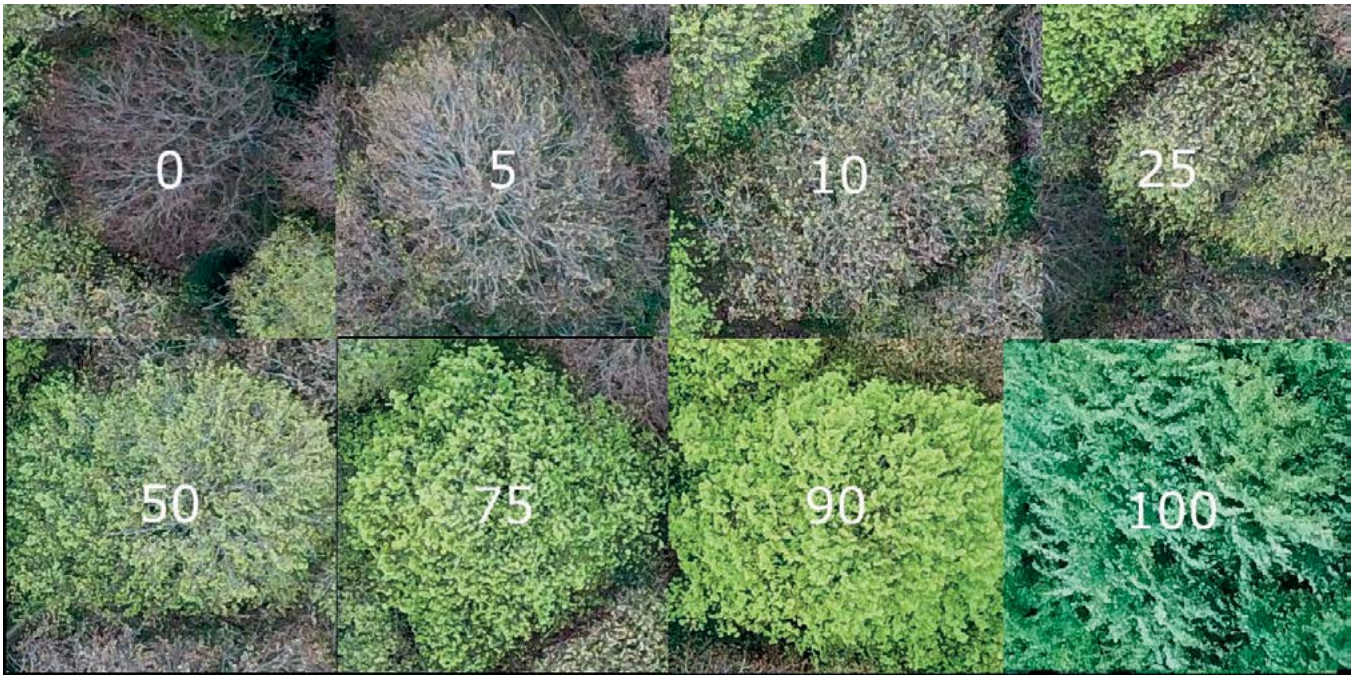
In 2021 following a warm March, although no lime trees had leaves on 12th April, our next flight on 23rd showed many crowns already had leaves, but then the weather turned cold for several weeks with frost at night; subsequent progress of leaf-burst was slower (03), (04).

An arbitrary 0—100 scale of opening was defined (05). The values on this scale were notional estimates of percentage leaf opening obtained by looking at a large number of examples but lack the precise basis that could have come from measurement of a large sample of leaves on a large number of branches and establishing the appearance in drone photographs. Nevertheless, the curves of leafing-out I derive from this scale (04) are similar to the equivalent curves for lime trees in the Białowieża National Forest study that were based on assessment of bud-burst rather than the whole tree observations used here. With a stochastic process such as the timing of leafing-out there is advantage in sampling large numbers of leaves comprising the whole crown rather than the ten apical buds sampled in the Białowieża National Forest study and 410 crowns in 24 sites rather than one in each of ten sites; nevertheless the conclusions from the two studies were similar.

Each crown followed its own time-course from leaf-burst to fully open over intervals of around three weeks; this is probably longer than usual due to delay caused by the cold spell 23rd-30th April 2018. Drone photos taken 26/4/2018 and 29/4/2018 showed little if any emergence of new leaves in any of the sites over the three days when the daytime maximum remained below 15C (02) and leaf-burst was also inhibited over this period (04). In 2021 the cold spell lasted longer, with frosts at night: the slow progress of both leaf burst and leafing out is clearly seen. While the early group (A-E) and the late group (J-M) were respectively early and late in both years, and while the pattern of crowns opened was very similar in every year (09), (10), (11), there were subtle differences in the precise order (04), maybe due to different responses of different genotypes to the complex pattern of temperature changes prior to and during leafing out.



04. Leafing-out timing for small-leaved lime at survey site 5, 2018 compared to 2021. For clarity, only the capital letters are plotted; the lower case labelled stems all fell between the early (A-D) and late (J-M) group. There is obvious delay in 2021, most markedly affecting the late group, during the persistent cold and morning frosts.



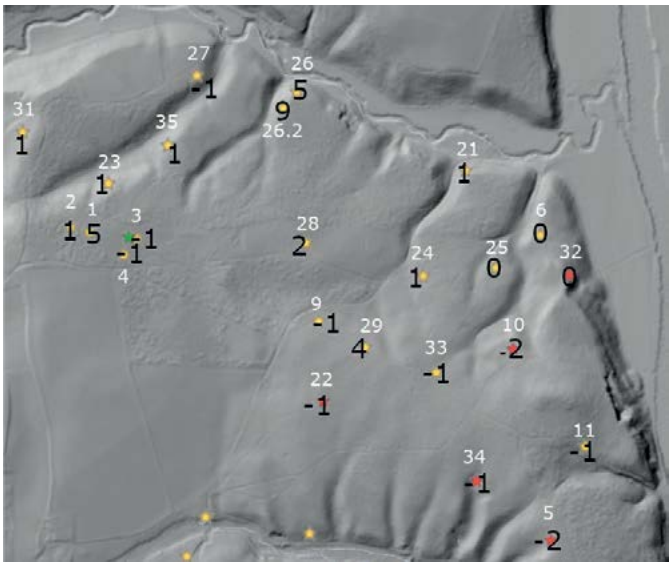
05. Above: crowns seen in the singled[a] sites with the leaf-opening score attributed to them. Each crown was compared with these to assess its score. These approximate scores were then adjusted, first by pairwise comparisons of crowns through the study period to ensure the more fully leaved crown had a higher score, then if two crowns had the same score on a particular date, one was adjusted by the minimum amount required to avoid overlapping lines in that site, the final value always remaining well within the limits of discrimination for the score. Parallel curves one percent apart may be taken as synchronistic.

Below: survey site 5 on 3rd May 2018. Individual crowns or synchronous crown clusters (SCC) are labelled and each of these was followed throughout leafing-out. Labels A-M were allocated to distinguishable crowns or SCC such that A-D were the earliest to open and J-M were the latest, with E-I being a selection of those in between; lower case labels were then allocated to the remaining distinguishable crowns and labels 1-n ($5 \leq n \leq 10$) were allocated to standards when these were present. There is no significance in which symbol was used other than convenience when processing the scores.



[a] Singled means removal of all but one stem from a coppice stool. In Shrawley Wood this was done around 1968 to coupes of 1922 and 1945

s



06. The survey sites (stars:- yellow = coppice stools, red = singled, green = root dig site) labelled with white numbers on a hill-shading map. Black numbers indicate for 2018 the days delay relative to the median date 7th May 2018 for 50% leafing-out at each site; negative indicates days in advance of this date.

Discussion

Tree leaf opening in the spring is well known to depend on the arrival of warmer weather and for many species there is also a requirement for chilling below some threshold during winter.[5] It is also recognised that there must be a genetic factor and our results (Lime DNA patterns) confirm that there is a strong genetic element to the timing of leafing-out in lime. Attempts to identify the genes involved are at an early stage.[6] There have been almost as many different heuristic algorithms proposed for the relationship between environmental temperature through winter and spring as there are different papers on phenology, all attempting to find a way of predicting the date of phenological events such as leaf unfurling. This objective is fraught with difficulties and given the variation between different individuals, let alone the great differences between species, such heuristic algorithms can only ever achieve some partial improvement on guesswork. Our results seem consistent with the idea that cold spring weather before bud-burst will delay the start of the process, and we observed that the cold spell during leafing-out in 2018 and even more dramatically in 2021 slowed down both leaf-burst and leafing-out until the warm weather returned. Thinking logically about the genetic processes that must be completed in sequence between winter dormancy and spring leafing out, there must be many steps, each with its own processes, each of which will depend on the interplay between genes and their products, all of which will have different responses to varying temperatures. To expect a simple algorithm to predict the date of successful completion of these developmental steps seems naïve, yet some success has been claimed for simply summing the days after a particular date with temperatures above a defined limit: in the case of small-leaved lime in Białowieża National Forest, above 0C after 1 March.

Another study of small-leaved lime phenology examined the relationship between phenological observations from 1956 to 2010 and mean annual temperature in Vytautas Magnus University botanical garden, Lithuania.[7] This showed the rising temperature was accompanied by an advance in leaf opening and delay in autumn colouring. In our study small-leaved limes were among the first trees to lose their leaves in autumn e.g. (chapter Drone Survey (05), p. 317). At leaf-fall, in sheltered areas the pattern of leaf loss followed a similar sequence to leaf-burst, with those lime trees that had opened their leaves early losing them early and those opening late retaining their leaves later. Along the western edge of the Wood, a gale stripped all the leaves from the lime before any pattern of loss could develop preventing comparison with leaf burst.

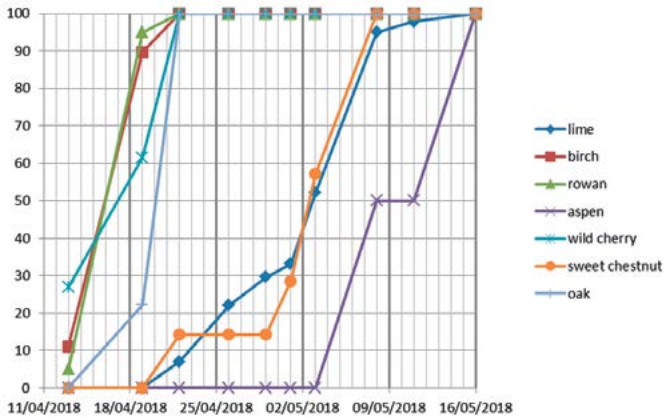
The similarity in pattern of stools at different stage of leaf burst at each site on 3rd May 2018, 24th April 2019, 22nd April 2020 and 4th May 2021 (09) suggests that each stool follows the same pattern from year to year but that the weather affects the start of leaf burst. Thus it seems possible that the ten-day delay in leaf-burst in 2018 compared to 2019 might be attributed to the effects of "the Beast from the East", a cold spell late February-early March, and the two-day advance in 2020 due to a warm and sunny April. However, the very warm March in 2021 failed to cause early leaf-burst: it seems probable that this was because the weather turned unusually cold through April and May, slowing down leafing-out.

(06) maps the positions of the study sites and the timing of their leafing-out relative to the median day. Early-opening sites were early each year and late-opening sites such as 26 and 26.2 were late each year (02), (03), but sites 1 and 29 that had been coppiced in 2017 and opened late in 2018 had moved to a relatively earlier timing for leaf burst by 2021.

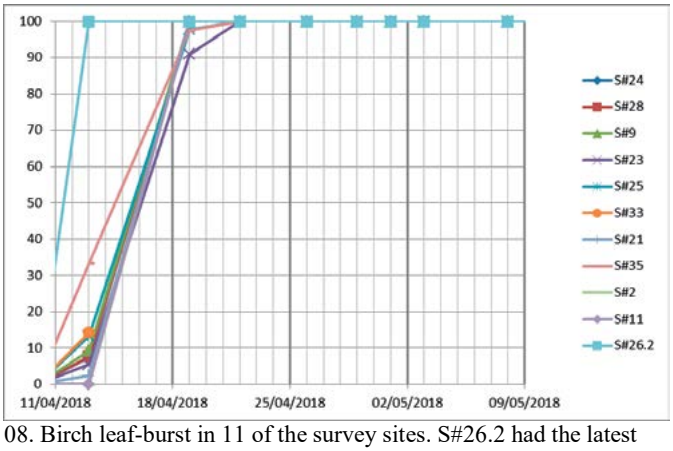
Our conclusions closely match those of the Białowieża National Forest study "*Within a species, individual trees were developing leaves consistently early or late. The high repeatability across years, despite strong environmental variation, suggests existence of genetic differences. Leaves appeared earlier and grew faster in warmer springs. This variation was strongest influenced by weather variation in March and April, the temperature sums accumulated from March 1 were the best predictors of the actual burst dates*." We have not established why lime leaf-burst some sites such as 26 and the adjacent 26.2 were later than all others whereas leaf-burst for birch at these sites was earliest.

Leaf-burst in other species.

Birch crowns outnumbered lime in drone photographs of eight of the survey sites and were present in ten more. Leaf-burst was first visible in ten sites on 13/4/2018 and was completed in all by 22/4/2018 (08).



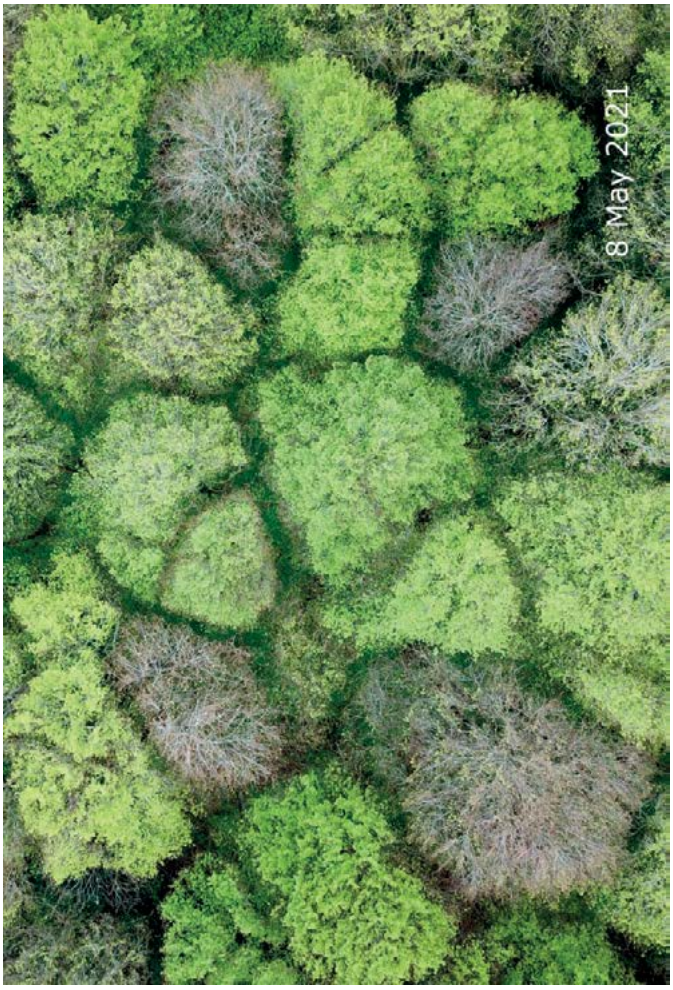
07. Combined leaf-burst plots for some of the species in Shrawley Wood.



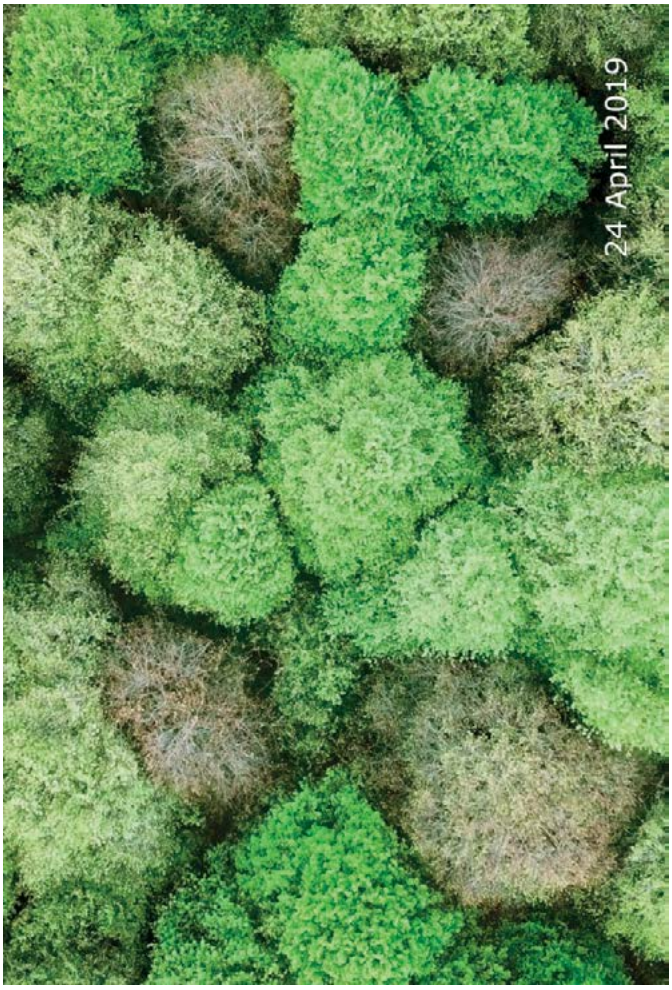
08. Birch leaf-burst in 11 of the survey sites. S#26.2 had the latest lime leaf-burst but was the earliest for birch.

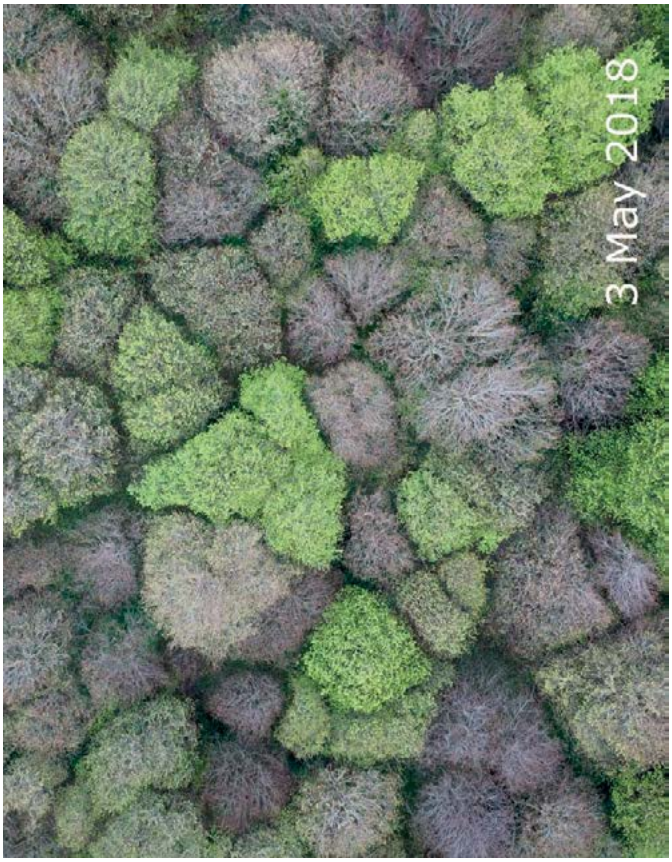
Aspen was present in survey #35 with as many as 100 stems that came into leaf synchronistically, bare on 3/5/2018 but in leaf soon after judging by the leaves on 8/5/2018. A second similar sized area of aspen lay under the flight path between surveys #9 and #24; here the stems were still bare on 11/5/2018 bud densely leaved by 22/5/2018, suggesting leaf-burst was not long after 11/5/2018.

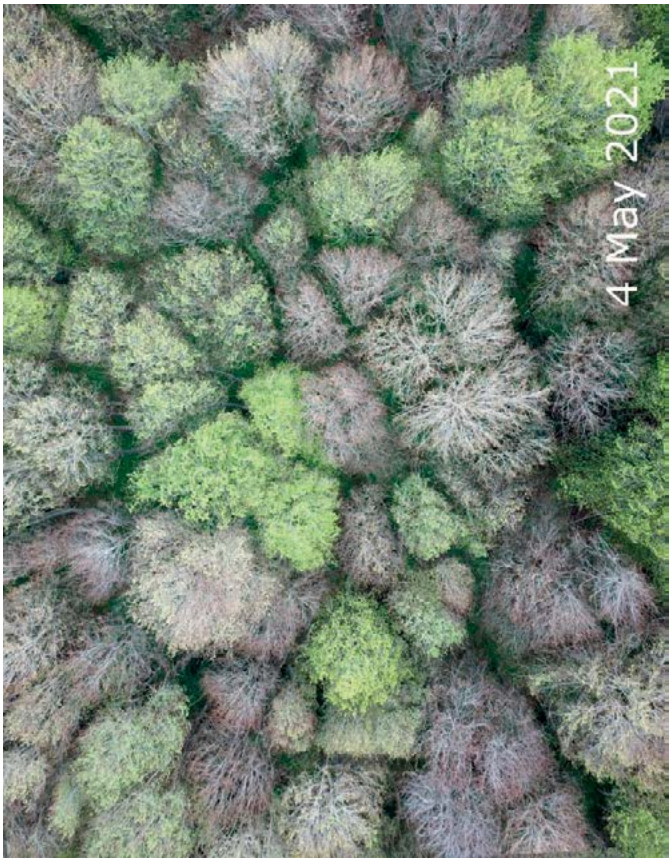
09. Drone photographs of survey site #10. Leafing out of crowns is at a similar stage on 24/4/2019, 22/4/2020 and 8/5/2021 and the pattern of crowns at different stages remained the same over the three years.

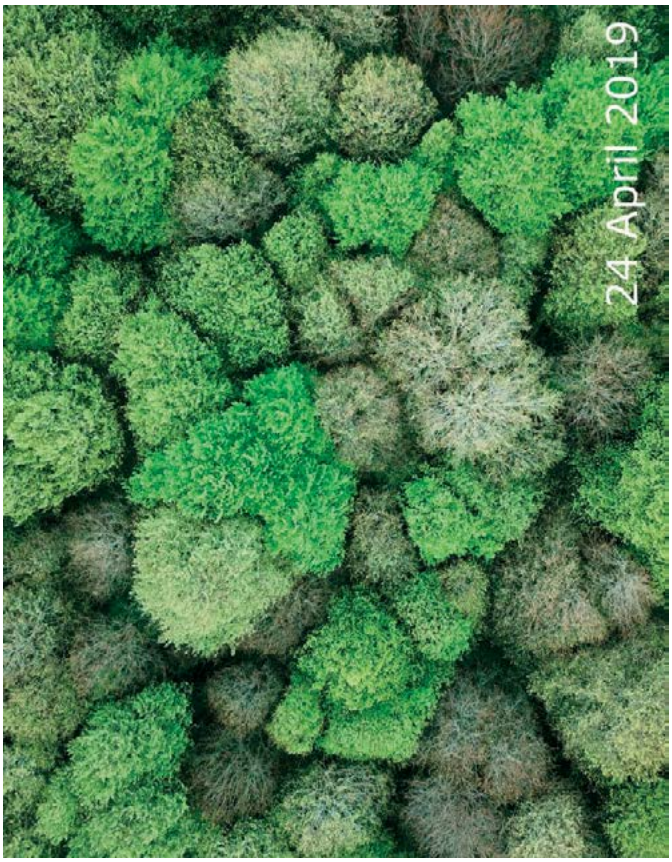














10. Drone photographs of survey site #05:

above - the leafing-out of crowns is at the same stage on 3rd May 2018 and 4th May 2021

below – the leafing out of crowns is at the same stage 24th April 2019 and 14th May 2021











11. left and above: leaf burst in survey site 5, 2018.

Conclusion

Although the use of drone photography to survey forest canopy is becoming increasingly widespread and its use in phenology publications has recently been become more frequent, I think this is the first report of repeated drone photography from a set of fixed GPS x-y-z coordinates over four years to follow woodland phenology at high resolution, and the first to examine small-leaved lime in such detail.

Acknowledgement

I am most grateful to Robert Somer who spent a huge amount of time on many days flying the drone over Shrawley Wood during the four years of this study.

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DNA fingerprinting reveals genetic diversity and spatial patterns in *Tilia cordata* in Shrawley Wood.

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Introduction

The genus *Tilia* consists of approximately 23 species, occurring mostly in temperate regions of the Northern Hemisphere, including Europe, North America and parts of Asia (Pigott, 2012). In Britain only *T. cordata* (small leaved lime) and *T. platyphyllos* (large leaved lime) are endemic, with *T. cordata* reaching slightly higher latitudes, both in Britain and the rest of Europe. During the last ice age parts of Britain were covered with ice and elsewhere little vegetation was present. After the last ice age, ending 12,000 – 15,000 years ago, flora and fauna migrated north from their ice age refugia, such as the Iberian Peninsula, Italy and the Balkans. Pollen records were used to estimate the migration rate and abundance of trees. These records show that woodland covered much of NW Europe, including the UK, 6000 years ago (Huntley and Birks, 1983). *Tilia* was, together with oak, the predominant tree in these woodlands, but started to decline about 6000 years ago in many places when the climate became cooler and humans cleared land for agricultural purposes (Pigott, 1991; Giesecke *et al*., 2017). Because *Tilia* is rarely planted in woodlands and struggles to re-establish once cleared, the presence of *Tilia* generally indicates ancient woodland.

In woodlands trees are 'keystone species' because they are crucial for many plants and animals; they can be the host and food source for many insect and fungus species. For example, hollow trees are nesting opportunities for birds and insects (bees). Excellent leaf litter makes *Tilia* also important for soil improvement (Coello et al., 2013; Hommel and De Waal, 2003; Maes and Van Vuure, 1989). Since *Tilia* was, and in some locations still is, a dominant woodland tree their importance for biodiversity should, therefore, not be underestimated (Hemery *et al*., 2010; Coello *et al*., 2013).

In addition, *Tilia* has also played a role in NW European societies since medieval times and even earlier in pre-Christian mythology (Miller, 2004; Bengtsson, 2005). In the past *Tilia* trees were economically useful, with importance as fodder, for rope making and delivering material for wood carvers. In many north western European countries, such as Germany and the Netherlands, lime trees were often planted at central places in villages where they had diverse functions. For example, they served as the place where justice was spoken (Gerichtslinde) or where young people met (Tanzlinde) (Brunner, 2007). The planting of these village trees before 1600, and maybe later as well, seems to be from local sources as they are often genetically unique, and usually it was *T. platyphyllos* (Wolff *et al*., 2019).

Hybridisation

In the UK and mainland Europe both *T. cordata* and *T. platyphyllos* are endemic and occasionally, where both species grow intermixed, the hybrid *T.* x *europaea* is found. The two species have only limited overlapping flowering times, with *T. cordata* flowering about two weeks later than *T. platyphyllos*, which likely is one of the reasons for hybrids to be rare, even in forests where the two parental species co-occur. Hybrids seem to grow and flower well and can compete with the two parental species, and other tree species. However, they appear not to be fertile as they either set few fully developed seeds and/or the resulting embryo or seedling does not result in a healthy plant (Wolff, unpublished). Therefore, introgression, gene flow from one species to another through backcrossing of the hybrid to a parental species, does not occur and the two species remain separate evolutionary units. However, in urban landscapes the hybrid *T. x europaea* is one of the most planted trees. From the 17th and 18th century onwards this was often in baroque landscaped gardens, and along avenues leading up to stately homes. All *Tilia* species remain a sought after tree in north western Europe, including the UK, due to their low invasiveness, low disease, pest susceptibility and drought resistance (Wolff *et al*., 2019; De Jaegere *et al*., 2016).

Clonal vs sexual reproduction

Solitary *Tilia* trees and those reaching the canopy of a woodland will flower from about 20 years old, but, particularly in dense woodland, often much later. Flowers are pollinated by flies and bees and appear to be largely self-incompatible, meaning that pollen of one tree cannot fertilise its own ovules and instead the pollen has to be from another tree. Therefore, sexual reproduction is through cross fertilisation and results in high genetic diversity. The novel genotypes generated increases opportunities for adaptation, e.g. to climate change.

The success of seed set and germination of *Tilia* depends on local temperatures and season length. At its northerly range edge, such as northern UK, summers are often not sufficiently long and warm for sexual reproduction (Pigott & Huntley, 1978, 1981), while in southern and central England warmer and longer summers lead to a higher seed set and germination rate. After the last ice age, *Tilia* reached northern climates in the mid-Holocene, some 5000 – 8000 years ago, temperatures were high enough for successful sexual reproduction and seed dispersal allowed fast movement of the migration front. Since then climates have cooled down, limiting sexual reproduction in Britain and northerly countries in Europe for several centuries (Svejgaard Jensen, 2003; Huntley & Birks, 1983). However, as an alternative to sexual reproduction trees also have the ability to reproduce asexually. This is described as a survival mechanism in several *Tilia* species, e.g. in *T. sibirica* (Logan *et al*., 2018) and in *T. americana* (Evans & Morris, 2016). Clonal reproduction can be, for example, through sprouts at the base of the stem (root collars, also called basal sprouts,) and through branches touching the ground (layering) forming new stems (Pigott, 2012; Del Tredici, 2001).

Human activities, such as coppicing and pollarding, have also limited flowering and therewith reduced seed set and sexual reproduction. However, these activities also seem to promote sprouting from collars (base of the stem) or as epicormics sprouts and encourage clonal reproduction (Pigott, 2012). In un-managed woodlands clonal reproduction may be seen as a security fall-back in northerly regions with short summers, such as the UK and Scandinavia (Logan *et al.,* 2019). Northerly regions (e.g. Scandinavia) with cold and short summers have more clones than warmer Central European (e.g. Austria) regions (Logan *et al*., 2019). This ability to reproduce via clones also means that trees can become very old: although the main stem may rot after some 200 or 300 years, or earlier if repeatedly pollarded, the genotype may survive through root collar sprouting. This means that in some woodlands, especially in colder regions, the surviving trees are likely to be thousands of years old. The age of trees of some tree species can be determined by making a core and counting the number of rings. However, for *Tilia* this only works to determine the age of the stem, not the genotype or clone. Once a stem is hollow and further sprouts form from the base of the stem its age cannot be determined; at most the circumference of all stems belonging to a single clone can be used to estimate its age.

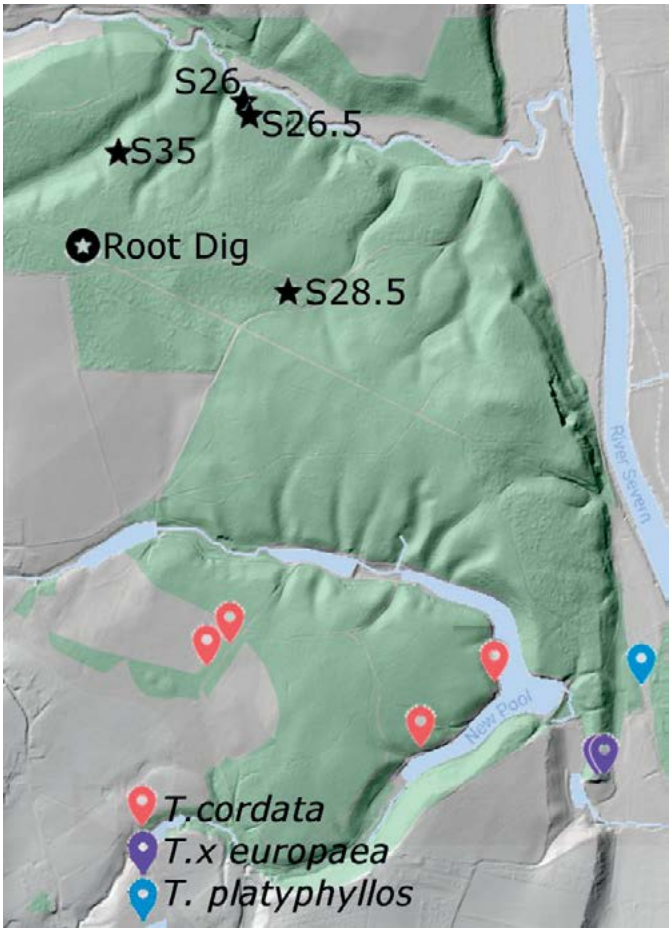
The geographic position of Shrawley Wood could, in principle, allow seed set and sexual reproduction. Indeed, seedlings have been observed in recent years (see Chapter Lime Seedlings p. 302). However, seedlings and saplings may be unsuccessful in becoming mature trees due to grazing or lack of light in the understory. In other words: recruitment may be low. For these reasons and the frequent coppicing of many forests such as Shrawley Wood (see Chapter Coppices & Binds p. 200) we expect clonal reproduction of *T. cordata* to currently contribute more to its maintenance at this location than sexual reproduction and that genotypes are ancient.

Molecular markers identify genetic diversity, structure and clones

Molecular markers have been used to assess the genetic composition of woodland trees. To assess genetic diversity markers are needed that are sensitive enough to distinguish individual genotypes and that can be used to quantify their genetic differences. For this purpose microsatellite markers are one of the most commonly used and versatile DNA markers. They are developed for specific target species; for *Tilia,* markers have been developed by Phuekvilai & Wolff (2013). Each microsatellite marker has a number of variants called alleles (often 2-15 per marker) that can be recorded for each tree. The process used for this is PCR (polymerase chain reaction) that amplifies specific stretches of DNA to make the variants visible. A combination of a number of microsatellites is called a genotype and is specific for each individual. It can also be used to generate a measure of variability of a group of samples and of genetic distances between samples. These methods are similar to those used for human forensic analyses (DNA fingerprinting or DNA profiling). Once genotypes are recorded analyses can be performed to confirm the exact *Tilia* species (Logan *et al*., 2015), to determine the diversity of a population and to compare that with other populations (e.g. Logan *et al*., 2019), using dedicated population genetic analysis programmes, such as, Genalex (Peakall & Smouse, 2012). Also, samples with identical genotypes (i.e. clones) can be discovered and geographically mapped in the populations (Erichsen *et al*., 2019).

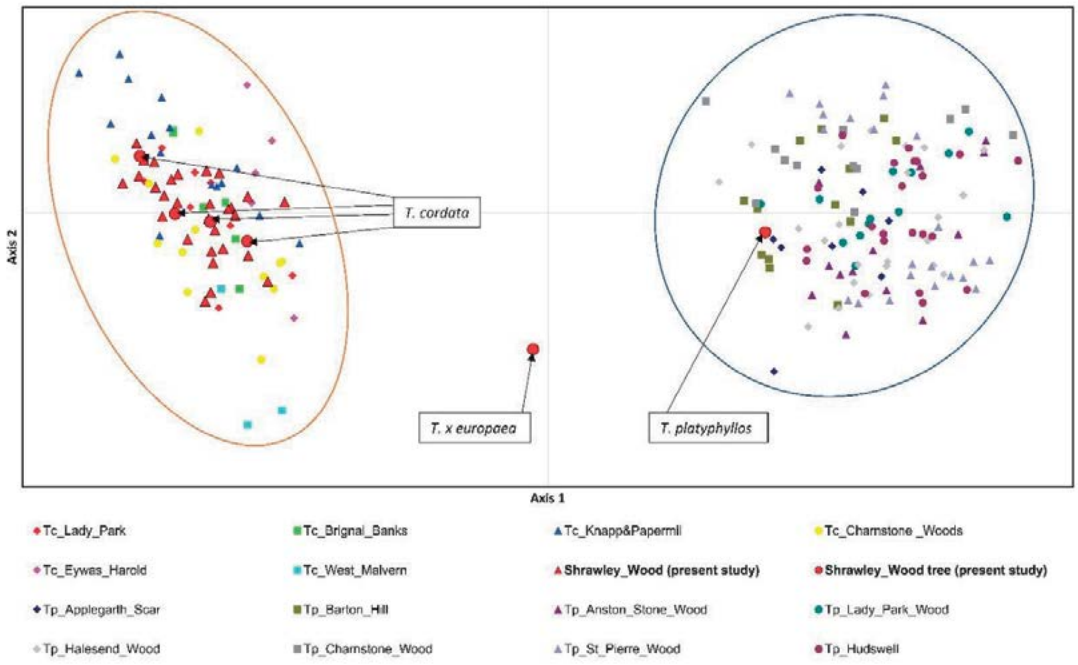
Results and discussion

Sixty-eight trees were sampled from Shrawley Wood and genotyped using 12 microsatellite markers (Sample sites 26, 26.5, 28.5, 35 and scattered trees of interest, Fig. 1).



01. Location of sample sites in Shrawley Wood. S indicates survey sites, map pins indicate lime trees with *Viscum album*

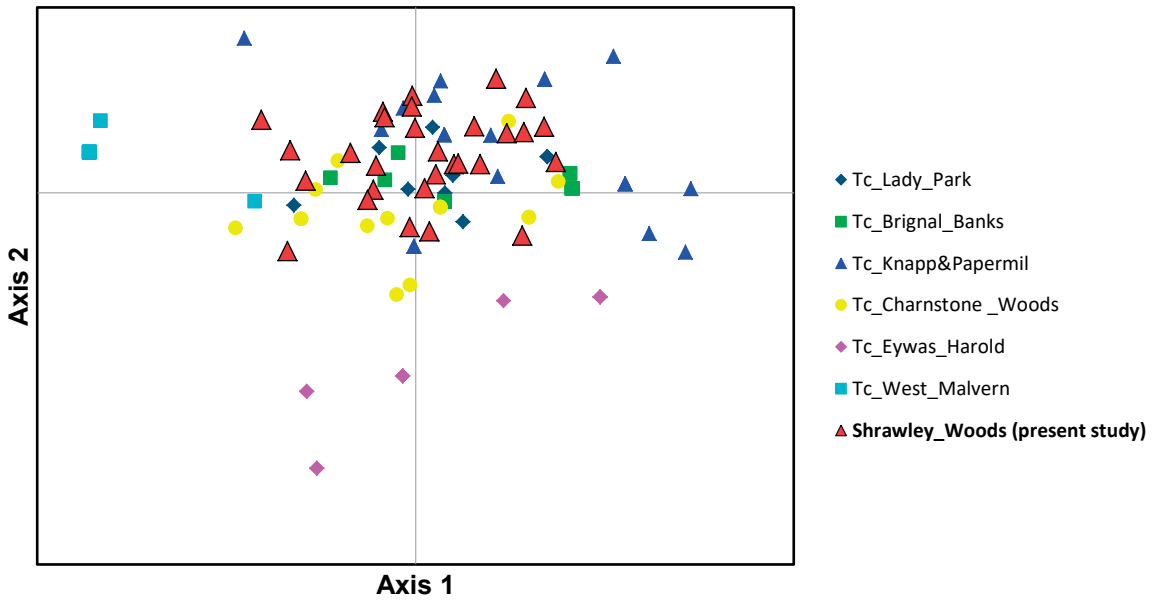
The genotypes were used to determine genetic distances between each pair of trees and from this a Principal Coordinate Analysis (PCoA) was used to visualise the genetic differences between the trees in a two dimensional graph.



02. PCoA of 263 *Tilia* individuals from 15 locations across the UK (from Logan *et al*., 2015). Orange circle contains *T. cordata* populations including the Shrawley Wood samples (large red triangles), while the blue circle contains UK *T. platyphyllos* populations. Shrawley Wood trees from outside the survey sites are indicated with red circles and indicated with arrows. Axes 1 and 2 together explain 43.6% of the genetic variation.

The majority (63 trees) sampled Shrawley Wood trees were all in the left group of samples, together with other trees that are known from morphology to be *T. cordata*. However, one *T. platyphyllos* and two hybrids were detected in the samples included here from Shrawley Wood (01 and 02). The *T. platyphyllos* tree detected was located on the edge of an old ash bed, outside the putative wood bank of ancient Shrawley Wood. The presence of both *Tilia* species is not unexpected as many of the UK woodlands have both species and the occasional hybrid. In relation to only UK *T. cordata*, the samples from Shrawley Wood are genetically similar to other UK *T. cordata* (03).

The two hybrids (*T.* x *europaea)* were at the top of the rock face to the south of Oliver's Mound, one 3m east of the other. On October 2nd 1884 Mr J Wormington, Estate Manager, bought six lime trees. We do not know where these were planted, but it is not impossible this was the origin of these two hybrid trees. Moreover, they had an identical genotype and are, therefore, clones. Comparing their genotype with those of known cultivated hybrid limes (Wolff et al., 2019) made clear that it was cultivar Hatfield, confirming that those two trees were planted and not of natural hybrid origin. Hatfield is a cultivar that only occurs in Britain, and not in mainland Europe, as opposed to the other two often-used hybrid cultivars (Pallida and Zwarte linde).



03. PCoA of 113 *Tilia* individuals from seven UK *Tilia cordata* populations (mostly from Logan *et al*., 2015) including the Shrawley Wood samples (large red triangles). Axes 1 and 2 together explain 33.9% of the genetic variation.

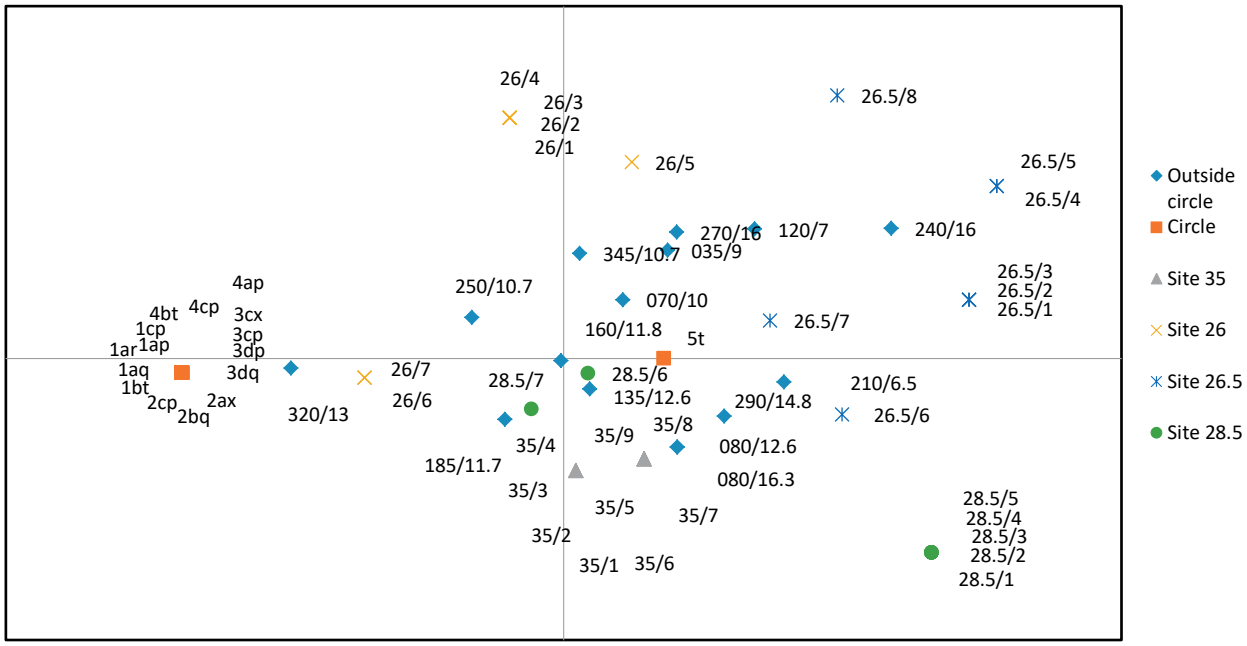
To understand whether genetic diversity of the Shrawley Wood trees was similar to other UK populations the expected heterozygosity (He) was calculated as an estimate for genetic diversity.

Table 1. Genetic diversity, expressed as expected heterozygosity (H_e), in Shrawley Wood and compared to other UK *T. cordata* populations (* data from Logan *et al*., 2015).

Population	Genetic diversity: H_e
Shrawley Wood	0.52
Brignall Banks*	0.51
Roudsea Wood*	0.57
Hardy Gang Wood*	0.51
Easton Hornstock*	0.56
Bedford Purlieus*	0.53
Average UK populations*	0.51

The genetic diversity at Shrawley Wood was similar to other *T. cordata* populations in the UK studied by Logan *et al*., (2015) (Table 1). In general, diversity in the UK is lower than on the mainland of Europe, and Shrawley Wood is no exception to this (Logan *et al.,* 2019, Phuekvilai, 2014). This may be because UK populations are at the range-edge of the distribution of the species, and thus are remnants of small populations at the fore-front of the migration wave from the ice-age refugia, which generally have decreased genetic diversity. The diversity detected, normal for the region and species, and the absence of micro-geographic patterns in the UK points at the *T. cordata* trees at Shrawley Wood not being planted, but instead natural and ancient.

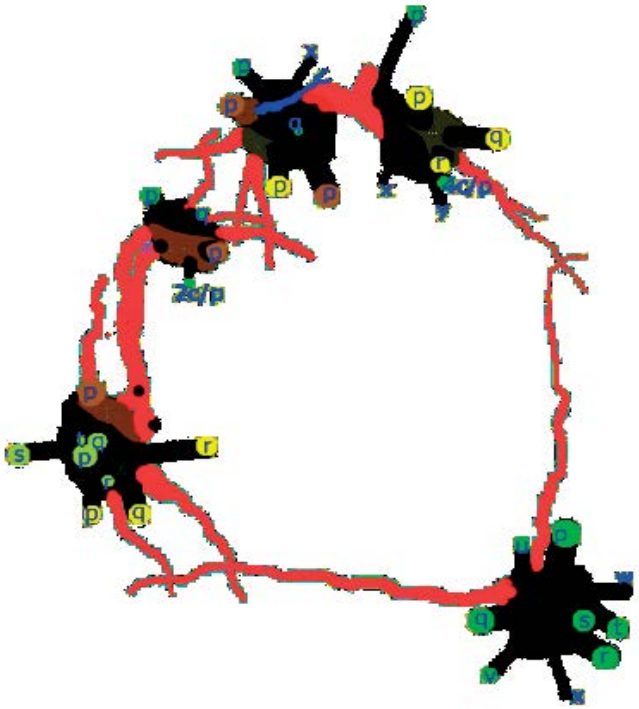
The genetic diversity of only the Shrawley Wood *T. cordata* trees can also be depicted in a PCoA (04), to understand whether there are micro-geographic genetic patterns in Shrawley Wood. It shows that there is no fine scale grouping by sub-location, but instead that samples group with samples from other sub-locations.



04. PCoA of *T. cordata* individuals from Shrawley Wood samples, showing clones, with the sites indicated by symbol and colour.

Clones

The microsatellite markers were also used to detect clones. Individual samples belonging to one clone are all linked to a single data point (04). For example, 26.5/4 and 26.5/5 (top right corner) are two samples belonging to a clone, and 28.5 samples 1 to 5 (bottom right corner) are a clone, but 28.5/6 and 28.5/7 (two green points in middle of figure) are different genotypes. The root dig from S3 (map 01 and 05) - is labelled 'circle' with orange squares on the PCoA (04). It is clear that the majority of samples are on the left as a single data point indicating that these trees are clones but tree 5t, which is in the middle of the graph, indicates that it is genetically different (04). One other clonal pair of stools (80/12.6 & 80/16.3) was detected near S3.



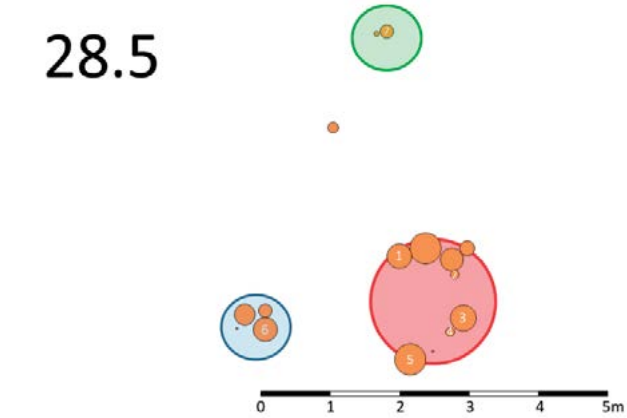
05. Root dig stool at site S3, with analysed samples indicated

The number and variability of the markers used are powerful enough to ensure that identical genotypes are indeed part of the same clone as opposed to being simply identical due to chance. The likelihood to obtain a specific genotype by chance alone is very small, ranging from 2×10^{-15} to 5×10^{-73}. In other words: there is a 1 in 2,000,000,000,000,000 chance or less that two samples with the same genotype are identical due to chance, and not because they are clones.

Finding clones (identical genotypes) is strongly dependent on how trees were sampled and the size of actual clones: if stems are sampled that are very close (e.g. 1 metre distance) it is much more likely that they will be clones as opposed to samples from stems that are distant from each other, e.g. 10m. In Shrawley Wood specific areas were targeted and samples were taken that were potentially part of a clone: they were sampled near to each other, and for some stems the roots were revealed by digging and on visual inspection the stems appeared to be connected to each other by the roots. Here the markers were used to confirm this observation.

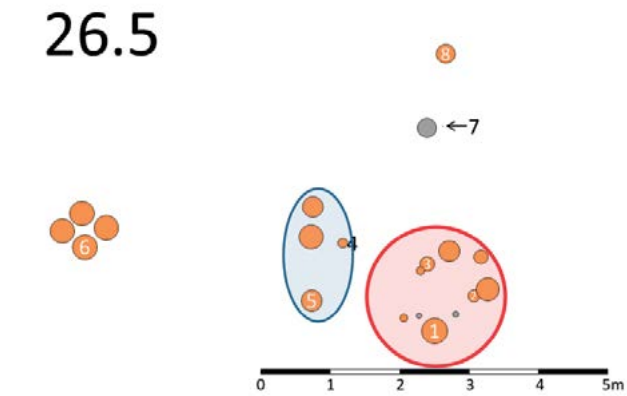
Amongst the 62 Shrawley Wood samples, nine clones were detected, with between two and 15 samples for each clone. Overall there were only 20 unique (non-clonal) genotypes. Clones were indeed only found to be samples collected near to each other and confirmed the visual observation of 'connected' roots as in the case of the root dig at site 3. In other cases, layering may have been the cause of clonal reproduction. Samples taken from stems further apart were all genetically different (04). Both at location S28.5 (06) and S26.5 (07), it is clear that nearby collected samples often belong to the same clone, but those further apart are a different clone (see also 04).





06. Location S28.5 in situ photograph at time of sampling and plan of stems positions sectioned at breast height with DNA samples indicated. Only numbered stems have been genotyped.





07. Location S26.5 in situ photograph at time of sampling and plan of stems positions sectioned at breast height with DNA samples indicated. Only numbered stems have been genotyped.

The pattern seen as Shrawley Wood was similar to patterns elsewhere in the UK and northern Europe where stems that were closer than 15 meters may well be clones (Logan, 2016; Logan *et al*., 2019). It is likely that very large clones indicate a high 'age' of the clones, most likely to be hundreds if not a thousand years old. The existence of clones with a potentially high age supports the idea that they were not planted, but instead are of natural origin.

Clones are more predominant at range-edge locations (such as in Scandinavia and middle and northern parts of the UK) than at areas central to the distribution of the species, such as Austria and France (Logan *et al*., 2019). Also, locations with steep hills or strong human management (e.g. coppicing) are more likely to have clones (Logan, 2016). At Shrawley Wood it may have been, at least partly, the effect of coppicing over the past three centuries that has contributed to the formation of clones.

Genotyping combined with drone data

The moderate genetic diversity observed at Shrawley Wood indicates that there is potential for adaptation to micro-ecological differences and conditions altered due to climate change. The data obtained from images of drones (chapter Drone Phenology p. 323) is a unique opportunity to confirm that the genetic diversity indicated by the microsatellites is indicative of ecological diversity. In particular the clear molecular indication of single clones combined with dates of leaf emergence and leaf senescence is very informative, especially if observed differences are repeatable over the years.

The information obtained from the drones over four seasons shows that there is a high diversity between genotypes in date of leaf emergence and leaf senescence, confirming genetic diversity for ecologically important traits. The images also show that those stems belonging to a single clone have leaf emergence/senescence at very similar times, often contrasting to the genotypes surrounding them. The fact that clones generally have similar phenology and the finding that the observations are repeatable across years gives us the unique insight that there is a strong genetic component to leaf emergence and senescence date.

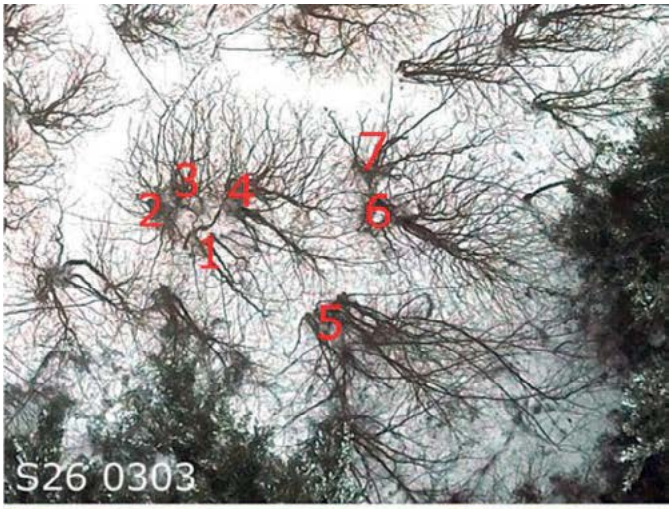






08. Location S35 drone images taken 03/03/2018, 05/05/2108 and 08/05/2018 with the sample positions 1-9 indicated.

At location S35 samples 1 to 4 are very near, showing similar leaf phenology (08) and the PCoA plot (04) shows them as being part of the same clones.







09. Location S26 drone images taken 03/03/2018, 27/4/2020 and 08/05/2018 with sample sited 1-6 indicated.

At site S26 (09), stools 1 to 4 are clones, 6 and 7 a different clone and with 5 different (04). The drone images show stools 5 to leaf out earlier than the others.



10. Location S28.5 drone photo of 1 May 2021. The stems sampled were almost synchronous, with cluster 1-5 synchronous with 7 and just a day or so ahead of 6.

Conclusions

The genetic diversity of *T. cordata* at Shrawley Wood is moderate, and comparable to diversity in other UK woodlands. Clones (identical genotypes) were detected up to 4m apart, and again this is similar to studies across the UK and the rest of Europe. There is no evidence that the *T. cordata* trees were planted, instead they can be presumed natural and those with large clones are likely to be ancient, up to several hundred years old. Interestingly, combining the genetic data with images obtained by drones showed that those stems that are clones are not only close to each other but also have a similar date of leaf emergence and senescence. This means there is a strong genetic component to phenology. In addition, it means that the genetic diversity shown is of ecological importance and may indicate sufficient genetic diversity for adaptation to take place, once sexual regeneration becomes possible in the warming climate and recruitment becomes successful.

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Trees and Woody Shrubs in Shrawley Wood

John Day & Hugh Milner

Listed or identified to date. See separate maps for the most prevalent species: pp. 290-292

Species Common Name	Abbreviated Code	Latin Name	First recorded	Presence (DAFOR)	Notes and Location In Wood
Acacia, see 48					
1 Alder 'Olar'Oldr'Oldar'Older'Ollar'Oller'Olor'	CAR	*Alnus glutinosa*	1770	Loc F	
2 Apple	AP	*Malus pumila*	2017	R	South of Oliver's Mound
3 Apple, Crab	^CAP	*Malus sylvestris*	1909	R	Lost after 1917
4 Ash, 'Afsh'	AH	*Fraxinus excelsior*	1772	O	Expect loss from Ash Disease, Chalara fraxinea
5 Aspen 'Asp', 'Aspes', see 61-64	^ASP	*Populus tremula*	1767	R	
Authern Quick, see Hawthorn			1840		
Aythern Quick, see Hawthorn			1842		
Balsam, see 62					
6 Barberry	*BBY	*Berberis spp.*	2017	R	South-east of Woodhouse
7 Beech	BE	*Fagus sylvatica*	1801	O	500 planted
Beech, Copper	CBE	*Fagus sylvatica var. cuprea*	2017	R	In Woodhouse section
Beech, Southern, see 66					
8 Berberis	BER	*Berberis aquifolia*	1877	R	
Birch 'Burch(es)'	BI	*Betula sp.*	1770	A	
9 Birch, Downy	PBI	*Betula pubescens*	1963	A	
10 Birch, Silver	SBI	*Betula pendula*	1856	Loc A	
'Black Poles', see 51-53			1807		
11 Blackthorn	BLK	*Prunus spinosa*	1877	R	
12 Box	BOX	*Buxus sempervirens*	1978	R	
13 Broom	BRM	*Cytisus scoparius*	1961	O	
14 Buckthorn, Purging	PBK	*Rhamnus cathartica*	1978	R	In Brickpits
15 Buddleia, Common	*BUD	*Buddleja davidii*	1990	R	
16 Cedar, Deodar	d*DCD	*Cedrus deodara*	1978	was R	One large dead tree. Hollow butt found 2017, c. 100 years old
17 Cedar, Japanese	*JC	*Cryptomeria japonica var. japonica*	2017	R	West edge 2070e
18 Cedar, Western Red	*RC	*Thuja plicata*	1966	R	College Plot
19 Cherry, Wild (Gean)	WCH	*Prunus avium*	1948	F	
20 Chestnut, Horse	*HCH	*Aesculus hippocastanum*	1978	R	
21 Chestnut, Sweet/Spanish Chestnutts	*SC	*Castanea sativa*	1834	Loc F	
22 Cotoneaster, Simons	*COT	*Cotoneaster simonsii*	2008	R	
Crab Apple, see 3					
23 Cypress, Swamp	SWC	*Taxodium distichum*	2017	R	New Pool reed-swamp around inflow from Middle Pool
24 Damson family	DAM	*Prunus domestica*	2001	R	
25 Dogwood	DWD	*Cornus sanguinea ssp sanguinea*	1917	R	
26 Dogwood, Eastern European	*EWD	*Cornus sanguinea ssp australis*	2017	R	North of Middle Pool
27 Dogwood, Red	*RWD	*Cornus sericea*	1978	R	
28 Dogwood, Variegated Red-barked	VWD	*Cornus alba var. Elegantissima*	2017	R	New Pool valley. (N.B. It is probably this variety)
29 Elder	ELD	*Sambucus nigra*	1909	F	
'Elmn' see 30 & 31			1811		Used to make a water pump
30 Elm, English	EEM	*Ulmus procera*	1948	O	
31 Elm, Wych, see 89	%^WEM	*Ulmus glabra*	1856	R	By Dick Brook and the east cliffs
False Acacia, see 48					
Field Maple, see 49					
32 Fir, Douglas, "Abies Douglasii'	*DF	*Pseudotsuga menziesii*	1889	Loc D	

Fir, Scotch, see 59					
Gean, see 19					
33 Gorse	GOR	*Ulex europaeus*	1990	O	
34 Grape, Oregon	*GRP	*Mahonia aquifolium*	1912	R	
35 Guelder Rose	GEL	*Viburnum opulus*	1917	R	
36 Hawthorn "Quick"	HAW	*Crataegus monogyna*	c.1835	Loc F	See Lees 1851
37 Hazel "Hazle"	HAZ	*Corylus avellana*	1773	F	
38 Holly	HOL	*Ilex aquifolium*	1948	A	
39 Honeysuckle, Chinese	*HON	*Lonicera pileata*	2015	R	
40 Hornbeam	HBM	*Carpinus betulus*	2015	R	
Larch	LAR	*Larix (probably decidua)*	1801	O	50 planted on 'Waste Land', M2,3 & 4, Dougharty map?
41 Larch, European	*EL	*Larix decidua*	1877	Loc O	New Pool
42 Larch, Hybrid	*HL	*Larix x marschlinsii*	2017	R	
43 Larch, Japanese	*JL	*Larix kaempferi*	1982	R	In Cpt 2070a
44 Laurel, Cherry	i*CLA	*Prunus laurocerasus*	1978	R	
45 Laurel, Spurge	^SPL	*Daphne laureola*	1909	R	Lost after 1913
46 Lime, Common; 2 trees	CLI	*Tilia xeuropaea*	1991	R	Planted
Lime, Common; 4 trees	nhCLI	*Tilia cordata x platyphyllos*	1990	R	At Quarry and two south end of Oliver's Mound
47 Lime, Small-Leaved 'Lyne' 'Linetree'	^SLI	*Tilia cordata*	1548	D	
48 Locust (False Acacia)	*LOC	*Robinia pseudoacacia*	1889	Loc O	Noted in Tree Register: height 18m, girth 5m
49 Maple, Field	^FM	*Acer campestre*	1963	O	
Mapul but see 75			1845	As 49	
50 Monkey Puzzle	*MPZ	*Araucaria araucana*	2017	R	In Woodhouse section, east of parkland
Norway Spruce, see 73					
Oak 'Oack' 'Oake', 'Oke', 'Roak'	OK	*Quercus sp.*	1538	F	
51 Oak, English	XOK	*Quercus x rosacea*	1994	F	
52 Oak, Pedunculate	POK	*Quercus robur*	1538?	F	
53 Oak, Sessile	SOK	*Quercus petraea*	1963	O	
54 Oak, Turkey	i*TOK	*Quercus cerris*	2015	R	
Olar etc., see 1					
55 Osier, Common	OWL	*Salix viminalis*	2008	R	But found in Brickpits in 1978
Oziers, see 55 but maybe Willow			1845		
56 Pear	PER	*Pyrus pyraster*	2012	R	Pears are a Worcs. speciality with many species
Pine	PIN	*Pinus (probably sylvestris)*	1909	Loc O	
57 Pine, Austrian	*AUP	*Pinus nigra*	1948	R	
58 Pine, Monterey	*RAP	*Pinus radiata*	2017	R	At New Pool
59 Pine, Scots, 'Scotch Fir'	*SP	*Pinus sylvestris*	1877	Loc O	At New Pool
60 Plane, London	*LPL	*Platanus acerifolia*	2017	R	At south end of Old Avenue from Woodhouse
Poplar but also see 5	*PO	*Populus sp.*	1802	O	
61 Poplar, Black (Native)	BPO	*Populus nigra ssp. betulifolia*	1948	R	One fine mature tree near R. Severn at SO81306640
62 Poplar, Western Balsam	*TPO	*Populus trichocarpa*	2003	(Loc D) R	North of Oliver's Mound
63 Poplar, Canadian Black	*CPO	*Populus x canadensis 'Serotina'*	1978	R	In Brickpits
64 Poplar, Canadian Black	CPO	*Populus x canadensis '178'*	2003	R	Near confluence of Dick Brook and River Severn
65 Privet, Wild	WPR	*Ligustrum vulgare*	1877	R	
'Quick', see 36 but maybe 31 or 67	1767	*Planted*			
66 Raoul	*RAO	*Nothofagus alpina (was procera)*	1965	R	In College Plot
67 Rowan	ROW	*Sorbus aucuparia*	1839	(Loc A) O	On Severn scarp
68 Redwood, Giant	*/WSQ	*Sequoiadendron giganteum*	1855-60	O	Soon after their

					introduction into UK
69 Rhododendron	*ROD	*Rhododendron ponticum*	1912	R	
'Sall(e)(y), Sallee, see 80-88			1770		*Planted in the Bottum*
'Seate' [Sett], see 80-81			1843		
70 Service, Wild	^WST	*Sorbus torminalis*	1909	R	On eastern Cliffs, one tree with seedlings nearby
71 Snowberry	*SNO	*Symphoricarpos albus*	1980	R	
72 Spindle	SPN	*Euonymus europaeus*	1917	O	
Spruce, probably 73	1843				
73 Spruce, Norway, "Spruce Fir"	*NS	*Picea abies*	1889	R	Near New Pool dam
74 Spruce, Sitka	*SS	*Picea sitchensis*	2017	R	
75 Sycamore but see mapul	*SY	*Acer pseudoplatanus*	1931	(Loc A) O	Much in north-west
76 Walnut, Black	*BWN	*Juglans nigra*	1950	R	In Woodhouse Parkland
77 Walnut, Common	*CWN	*Juglans regia*	2012	R	In Brickpits and beside New Pool
78 Wayfaring Tree	WAY	*Viburnum lantana*	1968	R	
Wellingtonia, see 68					
79 Western Hemlock		*Tsuga heterofolia*	2010	R	10+ Planted in the private compartment c. 2010
'Whititree', (Whitty Pear, True Service Tree?)	TST	*Sorbus domestica*	1760		Recorded carried (from Wyre Forest to Hanbury?)
'Whitterne', 'Whit(t)urens', see 47			1770		
Wild Service, see 70					
Willow 'seats' 'Seates'	WL	*Salix sp.*	1800		'Dutch (Willow) Setts/Seates' planted in 1802
80 Willow, Crack	CRW	*Salix x fragilis*	1968	O	In Brickpits
81 Willow, Dragon's-Claw	*DCW	*Salix babylonica var pekinensis Tortuosa 2017*	R		In valley near Middle Pool
82 Willow, Goat	GTW	*Salix caprea*	1963	(Loc F) O	In Brickpits
83 Willow, Goat x Grey	nhGXW	*Salix caprea x cinerea(S.x reichardtii)*	2009	R	
84 Willow, Golden	*GOW	*Salix alba var vitellina*	2017	R	In valley near Middle Pool
85 Willow, Grey	GRW	*Salix cinerea*	1963	O	
86 Willow, Grey (sub spp)	GRW	*Salix cinerea ssp oleifolia*	2009	O	In Brickpits
87 Willow, Purple	*PUW	*Salix purpurea*	1991	R	By Middle Pool and by River Severn
88 Willow, White	WHW	*Salix alba*	1998	R	In Brickpits
Withy, see 80, 82, 85 but see 55					
89 Wych Hazel 'Hazle', 'Whichazle' 'Wicheasle	%*WHZ	*Hamamelis mollis*	1810		Most unlikely, probably Wych Elm (see 31)
Wyches, see 31	%				
90 Yew	YEW	*Taxus baccata*	(+1700) 1856	F	C. 14 old trees across wood and a young thicket around an old female in the north-east.

KEY

DAFOR: Dominant, Abundant, Frequent, Occasional, Rare.
Loc: Locally
*: Exotic
i*: Invasive Exotic
+: But one tree is over 300 years old
^: Native Ancient Woodland Vascular Plant (AWVP)
nh: Possibly native hybrid
%: May refer to 'Witchen' or 'Witty', dialectal words for Rowan (with its supposed supernatural powers). Witty was recorded in Salop
d: Died
/: 7 (or 8) mature plus 2 replanted in 2007 at the Cross-Rides.

Shrawley Wood – Invasive Exotic Species

Hugh Milner

The botanical assemblage of this 141ha Limewood is mostly native species, dominated naturally in most areas by small-leaved lime, *Tilia cordata*. Other than plantation Douglas fir, *Pseudotsuga menziesii*, few exotic species are present, mainly introductions over decades around Wood House with a few in the north-west, see the Trees and Woody Shrubs listing. But some of these exotics are invasive and should not be promoted in such an important woodland. The few that follow should be monitored indefinitely and actively discouraged or eliminated. Inclusion of all within a management plan with an appropriate course of action, is essential.

Cherry laurel *Prunus laurocerasus*	Exotic woody shrub. 2 bushes only, one ring-barked 17/5/17. Invasive on these acid soils, so monitor both bushes and control spread or eliminate.
Himalayan balsam *Impatiens glandulifera*	Exotic plant. Formerly abundant and invading south-eastern cliff-top and Oliver's Mound. FC staff and volunteers have done sterling work over many years, reducing its presence in the public part to just a few spots but it remains rife in the private part where a recent felling took place and in Middle Brook Bottom. Its control here is essential. An over-arching management plan to embrace this type of problem is recommended, see Recent Times p. 226. Long-term monitoring must continue, see *Balsam Control in Shrawley Wood* p. 341-350. Biological control is being trialled in three places in England at present. Pods explode June to October, casting seed up to 9m away!
Rhododendron *Rhododendron ponticum*	Exotic woody shrub. There are some bushes in the Ladywell area. It is highly invasive on acidic soils, such as Shrawley, emitting a cocktail of gases from its root System, including cyanic acid, preventing other plants from growing in competition and so sterilising the ground for many years. Until recent decades, R. ponticum was used as the rootstock for less hardy others but it can sucker from its root system and spread.
Sycamore A*cer pseudoplatanus*	Exotic tree (unless you call it Celtic Maple). Invading in west. There are mature specimens near Wood Farm, on the Avenue and at Riddings Bridge with many younger ones in the north-west and beyond the area of False Acacia. Forestry England is expected to condone it but Natural England may insist upon its control within the SSSI.
Turkey oak *Quercus cerris*	Exotic tree. One tree in north in private area. Ring-bark and control if possible, to prevent Knopper Gall Wasp from completing its life-cycle and causing English Oak acorns to be infertile.
Western red cedar *Thuya plicata*	Exotic tree. A few only in the College Plot but many more are further north. May produce profuse seedlings on these generally acid soils, following thinning or felling, when monitoring should be undertaken and control exercised, if necessary. Following PAWS Restoration, a further final sweep should be conducted.
Western Hemlock *Tsuga heterophylla*	Can behave the same as Western Red Cedar, see above, on similar acid ground, 10+ trees

Himalayan Balsam control in Shrawley Wood from 2002-2020

Phil Rudlin

Since its introduction to the UK in 1839 from Northern India, Himalayan Balsam *Impatiens glandulifera,* has become one of our most invasive alien plant species. Growing up to 3m tall, it has spread up most of our waterways, out-competing many of our less competitive native plants. The sea of pink along many of our canals and rivers in summer is very attractive - but to the detriment of many other species.



Himalayan Balsam *Impatiens glandulifera* flowers.



Himalayan Balsam *Impatiens glandulifera* flower and seedpods.

It is not, unfortunately confined to just wet areas. It has managed to adapt in many places – spreading quickly from river banks to dry land, using its amazing "springs" to disperse up to 16 seeds per pod and up to 500 seeds per plant over a 7 m radius!



Himalayan Balsam *Impatiens glandulifera* seed head before "explosion".



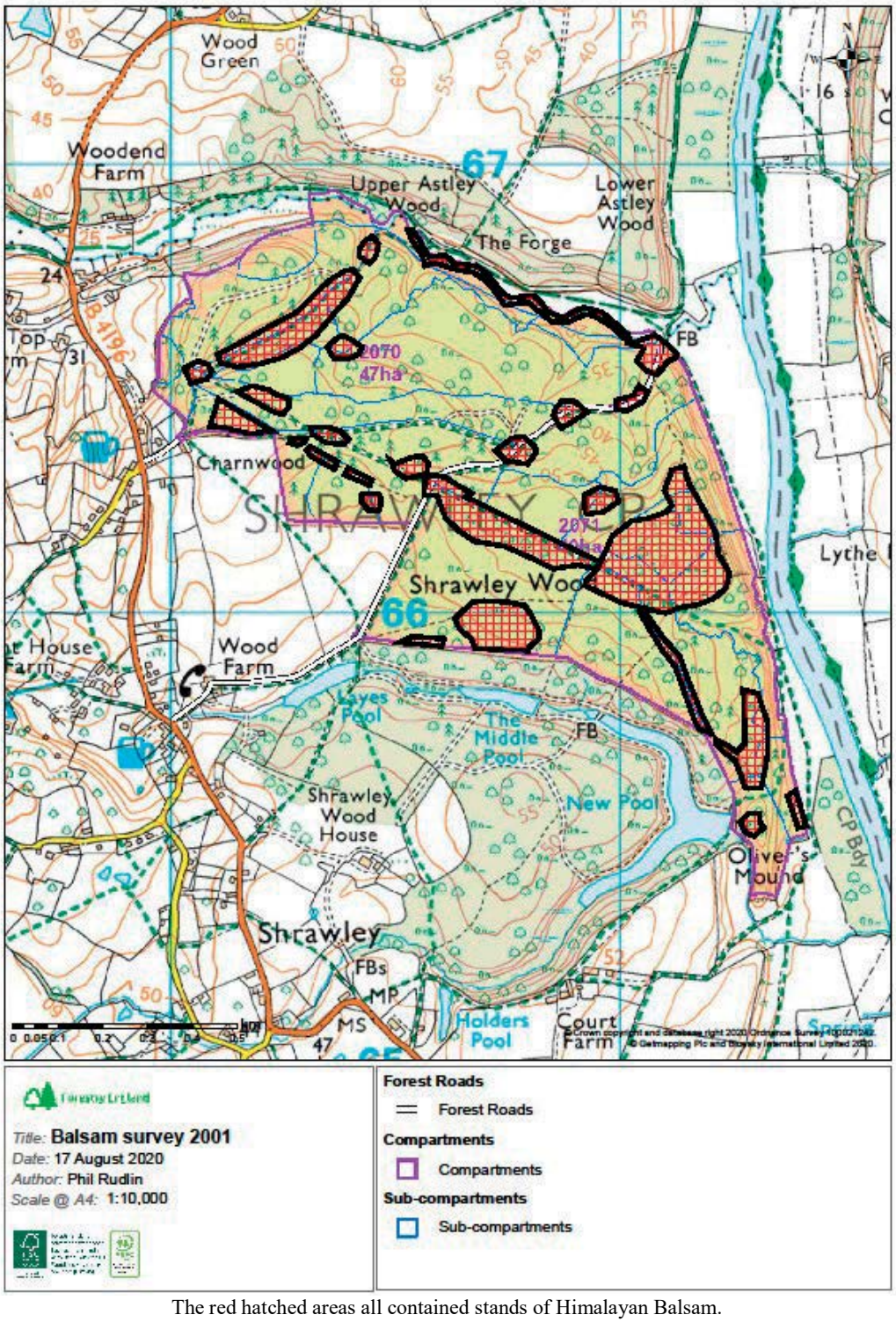
Himalayan Balsam *Impatiens glandulifera* seed head after "explosion".



Himalayan Balsam *Impatiens glandulifera* seedlings in an approximately1 m square.

Himalayan Balsam had been recorded in Shrawley Wood for many years, spreading up from the river Severn and Dick Brook on to the light sandy soils of the woodland. Surveyed on Forestry England land (formally Forestry Commission) in 2001 it occurred in just about every open area of the wood (see survey map) and even managed to thrive beneath the canopy of the Small-Leaved Lime and conifers.

Himalayan Balsam survey map 2001



The red hatched areas all contained stands of Himalayan Balsam.

Plans were made in 2002 to begin controlling this alien species. Various methods were tested, including strimming, mowing, hand pulling and crushing using an All-Terrain Vehicle (ATV) and bracken roller. (The roller is a heavy cylinder with fins along its length and is towed behind an ATV. As it rolls over the plant the fins crush the stem three or four times up its length.)

Strimming was encouraging at the time but, unfortunately often created a coppice stool as it was difficult to strim below the bottom node. Rather than having one flowering stem you ended up with many!



Stem cut above bottom node and regrowing.



Stem cut above bottom node and regrowing – closer view.

Mowing was effective, as not only did it cut the stem very close to the ground, but also it mulched all parts of the plant. Unfortunately, due to the terrain and tree density it was not practical to use a tractor and mower.

Pulling the plant by hand can be very effective. It is, however very time consuming and if it is pulled and left on the ground it will re-root either from the base or produce new roots from the nodes up the stem. It has to be either crushed or draped over a branch above ground!

The rolling was by far the most effective mechanical method, particularly under the Lime canopy where there wasn't any other vegetation to cushion the weight of the fins.

In late June 2002 control began in earnest. Two ATV's and rollers were used for three days, crushing the plant in all the areas that were accessible to these vehicles. It appeared to work well, crushing the stems effectively. However even these small, versatile machines could not manoeuvre between all of the trees. In most cases about 90% crushing was achieved but as long as some plants seeded it was not fully effective. Therefore, the following weekend 18 members of a newly formed Forestry Commission volunteer group, led by Phil Rudlin and Chris Doncaster, hand pulled the core areas to remove the remaining plants. As most of the plants had been crushed the job did not seem so daunting and two large areas were completely cleared.

A contingent from Bewdley High School also cleared another area as part of their end of year activities.



Rolling by Phil Rudlin & Simon Tuffley, June 2002



After rolling by Phil Rudlin & Simon Tuffley, June 2002.

After this initial effort regular visits were made to monitor the sites. Two of the areas were very encouraging with almost 100% kill, but the other was disappointing with many more plants having to be pulled up on follow up visits. The best areas were both under the canopy of Lime with no other plant species visible (i.e. bare ground). The poor area was open space where grass was more dominant beneath the plants. This seemed to have a cushioning effect, thus diminishing the crushing power of the roller.

This was an encouraging start as virtually no plants managed to set seed in the first two areas and the amount of seed heads significantly reduced in the other.

The "crushing" definitely had a dramatic effect beneath the understorey. The photo below was taken in August after rolling in June – note the plants remaining around the trees where the machine could not get to. It is important to note that this method of control alone will not work. Even on level open sites the roller will not kill every plant. Hand pulling after rolling is essential to remove ALL plants before the seeds set.



The effect of rolling after six weeks

The seed is said to be viable in the ground for about 2 years. The area below was rolled and hand pulled in June 2002. The photos below show the site before and after rolling and then the vastly reduced number of plants growing the following year from the seed bank.



Before rolling – June 2002



After rolling – June 2002.



One year after rolling. June 2003

This combination of rolling and hand pulling continued until 2009. At this stage there were no more accessible areas left where the ATV could control it safely. After this hand pulling by volunteers controlled the plant every June and July. Children from local schools, Duke of Edinburgh's Award (DofE) Students, Cubs and Scouts also helped over the years. In some of the more inaccessible areas contractors were employed from 2013. Photos below show an area of Douglas Fir which was inaccessible to machinery, before and after hand pulling by volunteers.



Before and after hand pulling under Douglas Fir – June 2008

One lesson quickly learned was that, no matter how vigilant volunteers were, some plants were overlooked. Often very small plants were beneath the canopy of flowering plants. Once the larger plants were removed and light levels increased these smaller plants thrived and would flower and set seed if not removed. Some plants were setting seed in October that were missed during the summer months. Therefore the areas of control were checked again in early autumn to remove any stragglers.



Seeds setting – 22nd October 2015

At one stage any areas of open canopy were completely taken over by Balsam. The small glade is in the central area of Shrawley, almost completely surrounded by Yew trees. First controlled in 2011 it took 3 years to eradicate and was still "Balsam clear" in 2020.



Yew tree glade with seedings – March 2011.



Yew tree glade June 2011



Yew tree glade July 2020.

Of course while we were controlling the plant in one area it was spreading in others. We therefore concentrated on two areas every year and, once they were significantly reduced, moved on to the next, ensuring that previously controlled areas were surveyed and plants hand pulled if necessary. Once the volume of the plant was reduced, it created another issue. Given the opportunity, our native "bullies" started to take over. Bracken, bramble and nettle grew more densely in many areas and finding odd balsam plants became increasingly difficult. The ATV came into its own again as it was far easier to survey for the plant across the whole wood. It was particularly useful when plants were found in waist high bramble, 2m bracken or dense nettle to drive to the plant rather than fight to get to it!



Flowering in dense bracken – July 2020



ATV searching for Balsam – July 2015

Finally, in July 2019 the volunteer group paid their last visit to Shrawley Wood as the alien plant had been all but eradicated! This is not to say that control has finished. There are still small pockets of the plant along Dick Brook and, although contractors will continue to control it in these more inaccessible places, it will not be beaten until it is removed from the whole length of Dick Brook and the River Severn! Shrawley will be surveyed every year as the seeds can also be transported via animals such as Foxes, Badgers, humans and dogs as well as birds, etc. Therefore, it could return to fight another day!

Between 2002 and 2019 there were 35 volunteer sessions involving the Forestry England conservation work party, controlling the plant in June & July most years. It took 510 man days or 3060 hours of hard labour covering almost 60Ha to complete this epic task! A total of 131 different volunteers came to the sessions with four coming from start to finish (number of sessions attended in brackets) – Chris

Doncaster (30), Peter Doncaster (32), Suzanne Hardy (24) and Steve Hardy (31). 15 others came for 10 or more sessions - Adrian Baker (16), Emma Baker (10), Fiona Baker (17), Mary Bendall (10), Sonya Hardy (18), Val Lambourne (22), Judith Lawson (16), Adrian Pearson (18), David Rea (10), Brenda Rea (10), Carol Rudlin (10), Ben Rudlin (15), Natalie Stenström (Clements) (11) Jackie Wickham (18) and Paul Wright (10).

Team photo in Shrawley Wood – July 2017



From left to right: David Rea, Steve Hardy, Ben Rudlin, Phil Rudlin, Brenda Rea, Natalie Stenström, Joseph Stenström, Suzanne Hardy, Adrian Pearson, Susan Jones, Paul Wright, Mary Bendall, Judith Lawson and Peter Doncaster.



Steve Hardy July 2006.



Natalie Stenström (Clements) June 2007.



Sonya Hardy July 2015.



Paul Wright July 2017.



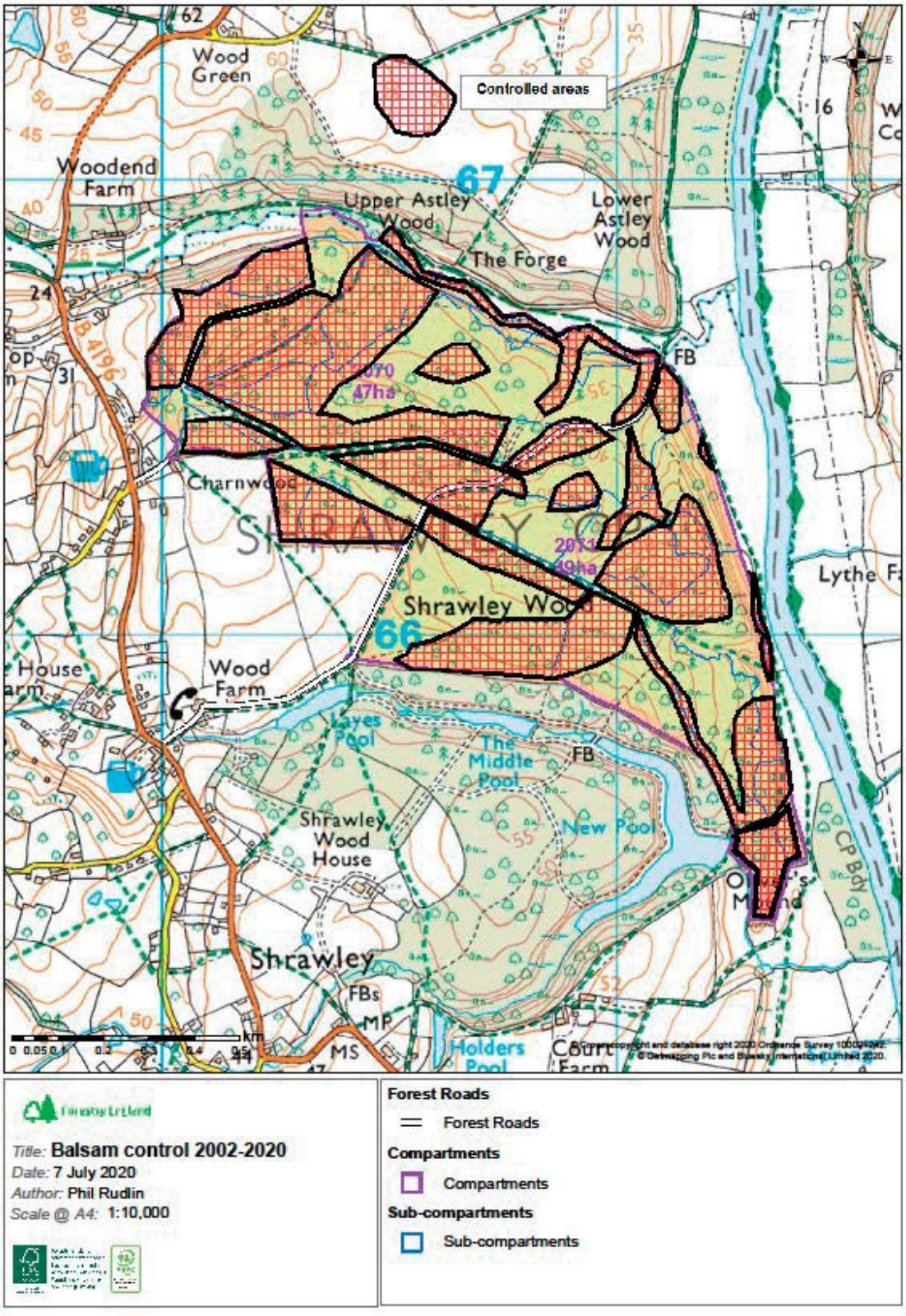
Judith Lawson July 2017.

Final team photo in Shrawley Wood – July 2019



From left to right: David Rea, Brenda Rea, Sean Bainbridge, Mary Bendall, Ciara Finn, Jean Norman, Joseph Stenström, Natalie Stenström, Judith Lawson, Steve Hardy, Chris Doncaster, Jonathon Holmes, Jackie Wickham, Esther Holmes, Suzanne Hardy, Val Lambourne, Adrian Pearson & Mark Royall. (Peter Doncaster was also there but missed the photo call as he had just a few more to pull!!)

Map of control areas:



The history of Small-leaved Lime at Shrawley Wood and in the wider landscape

Suzi Richer

Background

Pollen grains preserved in waterlogged sediments provide a biological archive of the vegetation history for a site; this study is known as palynology. The discipline is relatively young compared to other sciences and it was only formerly recognised in 1916 (Edwards, 2018). Pollen grains can be identified to an individual species, family or group of plants, which in turn allows the reconstruction of some aspects of the vegetation that was growing at the site in the past.

Due to the amount of human influence on the landscape over the Holocene (approximately 10000 years ago) - it is also possible to study human activity in the landscape through specific 'anthropogenic indicator' taxa (Behre, 1981). These include the appearance of pollen grains from cereals and weeds associated with agriculture, disturbed ground or where there was a concentration of nitrogen. The pollen assemblage is not an exact 'snapshot' of the past vegetation for several reasons, including the following:

i) Post-depositional processes: The reworking or drying out of sediments will destroy some and occasionally all of the pollen grains.
ii) Accumulation rate. Organic sediments take time to build up, therefore the results from a $1cm^3$ sample are likely to be a composite representation covering many years of vegetation growth.
iii) Identification. Visual identification of the pollen from flowering plants is often only possible to family level, not to species level.
iv) Pollination. The mechanism of pollination i.e wind, insect, affects how well and how far pollen travels, and also how much pollen is initially produced.

Whilst it remains that a pollen sample is never likely to be wholly representative of the original vegetation, many of these factors can be taken into consideration when taking samples and during interpretation of the results.

Small-leaved Lime (*Tilia cordata*) has been of interest to palynologists since the early days of palynology. A wonderful letter to *Nature* (Hyde & Williams, 1945) documents how people were attempting to further understand pollen production of Small-leaved Lime by trapping pollen on the roofs of the National Museum of Wales, Cardiff and the Botany School at Cambridge in the early 1940s. *Tilia* also features in early accounts of the vegetation history of the British Isles (e.g. Godwin & Mitchell 1938, Godwin 1940) identified as a native British species during the early Holocene.

Small-leaved Lime pollen is heavy and insect pollinated, which means it is mainly found within a few hundred metres of the tree it developed on (Pigott & Huntley 1980), compared to Scots Pine, which is wind pollinated, with pollen able to travel hundreds of miles. The limited ability of *Tilia* pollen grains to travel means that they are often under-represented in the pollen record, as the tree needed to be growing nearby to enable the pollen grains to be recovered. When the pollen is present there is usually a high degree of certainty that the tree was growing nearby, unless the pollen was found in the sediments of a flowing watercourse. Pollen grains of the two main species of *Tilia*, *T. cordata* and *T. platyphyllos*, although morphologically different, are rarely separated using light microscopy (Huntley & Birks 1983; Pigott 2020), this is primarily because there is a large overlap in the morphological differences that are used to separate them. One of these differences is size (Pigott 2020), and whilst it cannot be ruled out *T. platyphyllos* pollen was present in this study, none of the pollen grains fell into the larger category that is exclusive to *T. platyphyllos.* The term *Tilia* is therefore used here to refer to *T. cordata* or Small-leaved Lime.

Vegetation history of Small-leaved Lime

The history of Small-leaved Lime in Britain has been traced through pollen evidence by Huntley & Birks (1983), Pigott & Huntley (1980) and more recently by Grant *et al.* (2011). The most recent work (Grant *et al.* 2011) found a decline in Small-leaved Lime pollen occurring primarily between the late Neolithic and late Bronze Age (4500-3000 cal BP), but with some sites continuing to decline in the middle to late Iron Age. This latter decline has been linked to the clearance/exhaustion of primary woodland and with soils becoming increasingly saturated. More widely across Europe, where sites continue to exist beyond c.950 cal. BP (*ca* AD 1050), they are thought to represent relict populations.

The Severn Valley and the surrounding countryside has seen previous pollen studies undertaken by various analysts over the last 40 years. The first major work was conducted by Tony Brown in the 1980s (e.g. Brown & Barber, 1985; Brown, 1982, 1988) and subsequently a number of pollen studies have been undertaken as part of developer-funded work. Daffern (2016) has drawn some of this work together in terms of understanding the history of Small-leaved Lime in the West Midlands, especially in terms of the prehistoric period for the region. This work notes that Small-leaved Lime had largely been cleared by *ca*2000 cal BC during the late Neolithic/early Bronze Age, which is comparable to the conclusions of Grant *et al*. (2011). However, it is worth noting that by the Bronze Age in Worcestershire, woodland of all types had largely disappeared to be replaced with wet meadows, especially along floodplains (Richer 2014). The site of Wilden (Brown 1988), which is perhaps the closest detailed and dated pollen site to Shrawley Wood, has lime declining suddenly at 2640 uncal BP (920-750 cal BC) in the Iron Age, along with all other tree species. This illustrates that not all sites in Worcestershire saw a decline in Small-leaved Lime, or woodland more generally, during the Neolithic/Bronze Age.

The persistence of Small-leaved Lime in historic times is observed from further afield in the pollen recorded at Peghouse Farm, Wichenford, Worcestershire (Head 2006a). This site illustrates that Small-leaved Lime declined and disappeared during the period cal AD1720-AD1820. The pollen record from nearby Laugherne Meadow, Wichenford (Head 2006b) demonstrates the isolated occurrence of Small-leaved Lime pollen after this date, showing that it maintained a presence within the largely cleared historic landscape and that it did not entirely disappear from the Worcestershire landscape in a uniform manner.

Objective

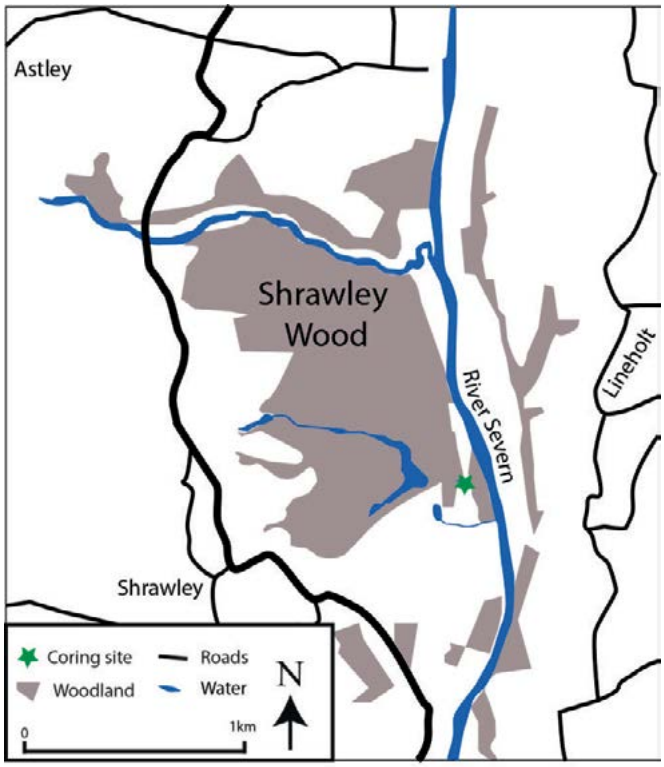
Pollen analysis was undertaken in Shrawley Wood to gain an understanding of the vegetation history, in particular its woodland history, and that of Small-leaved Lime (*Tilia cordata*). Secondly, it was hoped to understand more about woodland management practices over time.

Methodology

The coring site was located with the assistance of John Day, Harry Green, Francesca Llewellyn and Terry Chandler). The site needed to demonstrate the following characteristics:

i) waterlogged
ii) slow accumulation of sediments
iii) potential longevity
iv) lack of disturbance, especially from industrial activities known to have taken place in the area, e.g. clay extraction for brickmaking, or withy beds established for basket making, fencing, thatching spars, eel-traps, etc.

After testing a series of sites, a small infilled pond was chosen that was situated on the edge of the floodplain immediately adjacent to the woods (01). The site is located at O.S. grid reference SO814655. The core obtained was carefully wrapped and transported to the laboratory at Worcestershire Archive and Archaeology Service for sub-sampling for pollen, plant macrofossils and for samples for radiocarbon dating (02, 03)



01. Location map of coring location


02. Extracting a 1.35m core for pollen analysis using a Russian corer


03. Opening the corer, recording the core and preparing it for transport

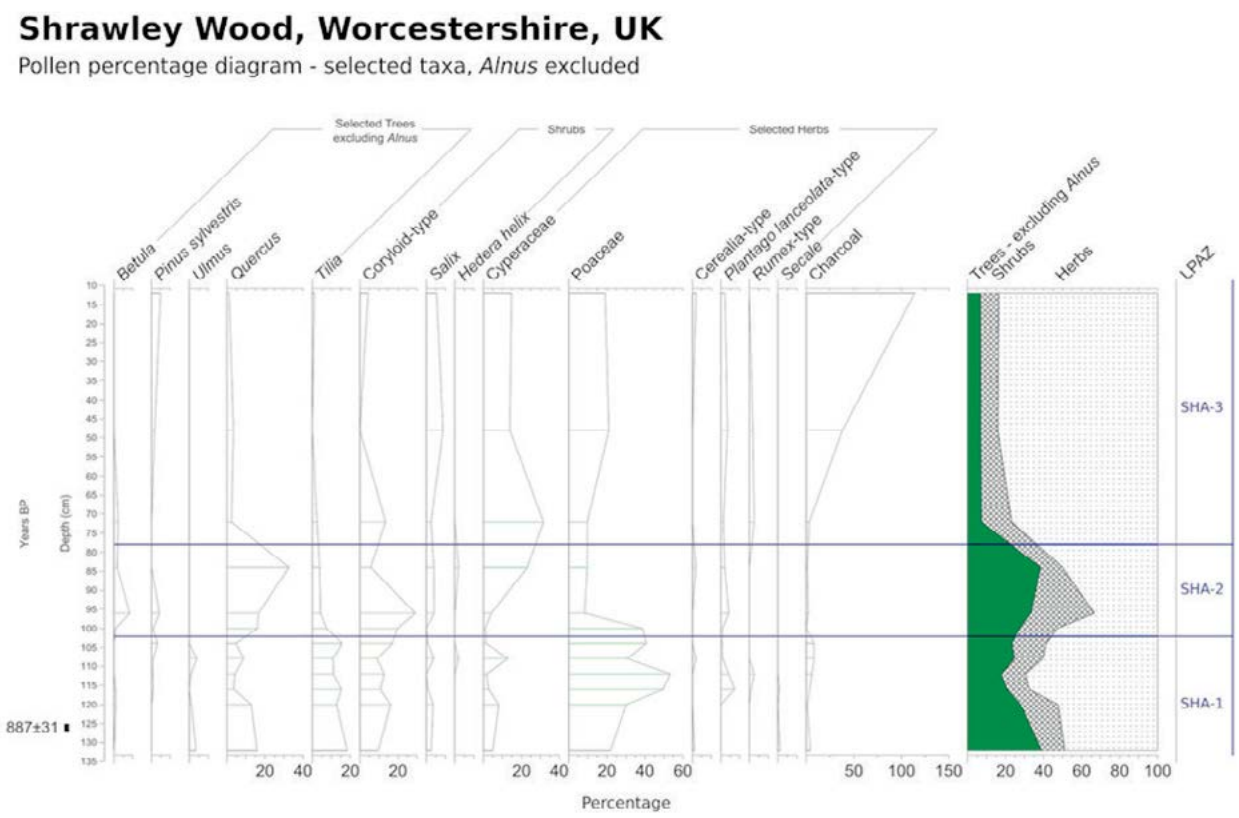
Twelve samples were subjected to chemical processing by the author at Cardiff University, following standard pollen extraction methods (Faegri & Iversen, 1989). The samples focused on the lower part of the core in order to potentially detect the oldest changes in *Tilia cordata* pollen. This analysis was only made to assessment level, where 100 land pollen grains were counted per sample.

An Olympus binocular polarising microscope (x400) was used for identification of the pollen grains. Pollen reference manuals (Moore *et al*., 1991; Beug, 2004) and the author's own reference collection were used to aid pollen identification. Nomenclature for pollen follows Beug (2004). Reference photographs and criteria from van Geel (1978) and van Geel *et al*. (2003) were used for the specific identification of other non-pollen palynomorphs.

Once the pollen grains were identified and counted, a pollen diagram/graph was produced (04) where the results of the assessment are displayed as percentages. This was produced using the software Tilia 2.1.1 (Grimm, 2017). This diagram should be read from the base upwards, with the oldest records at the base and the youngest at the top. The diagram was then split into three sections called Local Pollen Assemblage Zones (LPAZ) based on significant and statistical changes in the pollen data using CONISS (Grimm 1987). Pollen of *Alnus* (alder) was excluded from the diagram because it produces large amounts of pollen and accounted for between 30%–80% of total land pollen (TLP) at the site therefore masking changes in other taxa.

Chronological results

To assist with aging the pollen core and the periods of vegetation change observed in the pollen diagram, a sample was submitted for radiocarbon dating. One radiocarbon measurement was obtained from towards the base of the core at a depth of 1.25m–1.27m. The core was checked for identifiable plant macrofossils suitable for dating, however, none were present (*pers. comm.* Liz Pearson, Worcestershire Archaeology), therefore an organic sediment sample was dated. This provided a calibrated date of cal AD 1030–1220 (95% probability; SUERC-63639; 887±31 BP).



04. Pollen diagram from Shrawley Wood.

Pollen results
Three local pollen assemblage zones (LPAZs) were defined on the pollen diagram *viz*. SHA-1, -2 and -3 (04).

During LPAZ SHA-1 *Quercus* (oak), *Tilia* (Small-leaved Lime), Coryloid-type (hazel) and Poaceae (grass) dominate, with pollen from *Ulmus* (elm), *Plantago lanceolata*-type (plantain) and *Rumex*-type (sorrel or dock) also being present. Small fluctuations in the *Quercus* (oak) and *Tilia* (Small-leaved Lime) curves occur during this zone but their concentrations (this diagram is not shown) change in tandem and they are generally present in high amounts, 5%–15% for *Quercus* (oak) and 10%–18% for *Tilia* (Small-leaved Lime). Given that *Tilia* is insect pollinated (the pollen will not travel far from the host tree by other means) these percentages suggest that it was growing locally. This is the only zone where cereal pollen grains were identified to a specific crop type, *Secale* (rye), suggesting that this was cultivated close-by.

The *Tilia* (Small-leaved Lime) pollen curve starts to fade in LPAZ SHA-2 and does not recover; *Ulmus* (elm) also disappears. There are peaks in *Quercus* (oak), *Corylus* (hazel), *Betula* (birch) and *Pinus sylvestris* (Scots' Pine) pollen during this zone. *Corylus* (hazel) shows an early peak, and *Quercus* (oak) peaks later in the zone.

In the final zone (SHA-3) the pollen curves of all tree species decline, including *Alnus* (alder) (not shown), with herbaceous taxa and microcharcoal rising.

Discussion
The radiocarbon date from the base of the pollen core suggests that the pond was in use by the 13th century AD at the latest, possibly as early as the 11th century AD. The date is largely contemporaneous with the nearby archaeological site of Oliver's Mound, thought to have been occupied between the 12-14th centuries AD, and the first historical record of the woodland from the 800s (see timeline p. 109). This is not to say that the start of the pollen diagram marks the beginning of the woodland, but rather that it appears to record the point at which the woodland saw a change in its occupation and usage, significant enough to be recorded historically and to make a physical mark on the landscape.

The regional significance of the site
Whilst we cannot answer questions about the longer-term Holocene history of Shrawley Wood, the site is unique in that it is has provided the longest pollen sequence for a woodland context in the region. More importantly, the nature of the site, i.e. a small pond, means that the pollen signal is detecting localised changes in vegetation. This enables us to begin suggesting hypotheses for the woodland's vegetation history and importantly it allows comparisons to be made with the full range of historical records for the wood. The pollen record confirms that *Tilia* (Small-leaved Lime) has been continuously present in this area at least since cal AD 1030–1220 (95% probability), which according to Grant *et al.* (2011) would suggest that this is a relict population.

The persistence of Small-leaved Lime at Shrawley together with the evidence from Wilden (Brown 1988) and Peghouse Farm, Wichenford (Head 2006a) further illustrates that the history of Small-leaved Lime in Worcestershire is far from straightforward. It is likely that some areas of primary woodland were not fully exploited in parts of Worcestershire until historic times.

Woodland management
If the prehistoric primary woodland survived climate change (seen through an increase in wet conditions) and the action of people (in the form of prehistoric clearance for agriculture), it would appear that historic woodland management practices may have worked to preserve Small-leaved Lime at Shrawley Wood.

Usually a reduction in pollen is interpreted as trees being cut down and removed, however, a reduction in pollen can also be caused by woodland management practices, such as coppicing, where trees may never reach full pollen productivity because they have been coppiced (Waller *et al*. 2012). Recent work undertaken by Waller *et al*. (2012) in East Anglia examined the present-day pollen caught in traps placed in Small-leaved Lime coppice compartments of known ages. This study found that the following pollen percentages were indicative of the length of coppice rotation (Table 01):

Pollen percentage	Length of coppice rotation
29%	Standard or unmanaged tree
2.9%	30 years
0.7%	20 years
0.04%	10 years

Table 01. Pollen percentages and the suggested length of coppice rotation they represent based on work undertaken by Waller *et al.* (2012).

Whilst these exact percentages and the length of coppice rotations cannot be applied directly to Shrawley Wood, when they are compared with the patterns shown in the pollen results they may indicate the type of woodland management in place. Using these figures and returning to the Shrawley pollen core, the following interpretations of woodland management can be made:

SHA-1
The pollen diagram begins with a high percentage of *Tilia* (lime) between 10%-18%. This suggests unmanaged Small-leaved Lime trees greater than 30 years old.

SHA-2
This LZAP likely marks the start of coppicing in this area of the woodland. The reduction in Small-leaved Lime pollen to *ca*4% would suggest 30-year coppice cycles were present at the start of the zone. This interpretation is further supported by the spike in hazel just after the drop in Small-leaved Lime, which is to be expected with the opening-up of the canopy in conjunction with the beginning of coppicing. It is also likely that by the top of this zone, oak was being grown as a standard amongst the coppice, seen by the spike in *Quercus* (oak) again, with the high percentages indicative of more mature trees.

SHA-3
The final decline in Small-leaved Lime pollen to *ca*1%-2% would suggest a shortening of the coppice cycle in this zone to around 20 years. The start of the zone also sees a spike in hazel indicating an opening-up of the woodland, possibly associated with the change to shorter coppice rotations. Oak pollen also declines at this time suggesting that oak trees were largely removed from the woodland, or they were also moved to shorter coppice cycles. Oak does not start to flower until it is *ca*20 years old, which would suggest that it was being managed on a similar rotation to lime in this area of the woodland.

Conclusions
The pollen study at Shrawley Wood has been significant for several reasons. Firstly, it is rare to find a pollen sequence within a woodland context that is more than 200-300 years old. Secondly, it has added to our understanding of Small-leaved Lime woodland in Worcestershire and has shown that not all 'lime declines' within the area were prehistoric in date. Thirdly, the interpretations of woodland management practices are only made possible because of the localised nature of the pollen assemblage and that the core covers a period when the landscape was heavily managed by people. The evidence from the archaeology and the historical documents supports the fact that this was a managed landscape, but written records often fail to add the detail of *how* the management was occurring and which species were both present or managed. Lastly, it is extremely rare to be able to potentially detect such detail of woodland management in a pollen record supported by both historical and archaeological evidence.

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Quaternary Research Association for funding; Worcestershire Archive and Archaeology Service for the use of equipment and support; Mr J Powick, the landowner; Francesca Llewellyn, Terry Chandler, Tina Virr (North Worcestershire Archaeology Group), Harry Green and Nick Trustram Eve for help with coring. Liz Pearson assisted with the analysis of plant macrofossils. Jane Bunting and Michael Grant for discussions on lime and evidence of coppicing in the pollen record. Paul Whitehead for reviewing the document.

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The Flora of Shrawley Wood

Roger Maskew

Introduction

Shrawley Wood is outstanding in that it has probably the largest stand of *Tilia cordata* (Small-leaved Lime) remaining in Britain, and therefore has always attracted a great deal of attention. Members of the Worcestershire Naturalists' Club (hereinafter the Club) were frequent visitors from the middle of the nineteenth century, arriving at the wood by various means of transport, including in horse-drawn barges from Worcester. At this time Edwin Lees (1856) remarked *'the diversified ground that this wood covers...renders this a most delightful and exciting place to wander in, and a stranger may easily get entangled in its leafy labyrinths'*.

Throughout the nineteenth century and the early part of the twentieth the rotational coppicing regime meant there were always some parts of the wood suitable for the proliferation of plant life, and judging by the huge displays of some of the now rare species that frequently occurred, such as *Convallaria majalis* (Lily-of-the-Valley) (01) and *Campanula patula* (Spreading Bellflower) (02), it was a much more open environment in those days. The Club noted in 1917 that the Small-leaved Lime was quite a small tree, hence the dense shade was not conducive to the growth of flowering plants, but along the 'rides' where the light conditions were more favourable there was a great variety of plants.



01. Lily-of-the-Valley *Convallaria majalis*. John Bingham.



02. Spreading Bellflower *Campanula patula*. John Bingham.

There have been many significant changes in the management of Worcestershire's semi-natural woodlands in the last hundred or so years. At the beginning of the twentieth century coal was replacing wood as the main source of fuel, and a drop in demand for other by-products meant that the majority of the woods that had been regularly coppiced became unattended or at best intermittently coppiced, Shrawley Wood being no exception. As a result of variable management or a lack of it, the botanist visiting Shrawley Wood nowadays finds a patchwork of mixed woodland of various ages, mainly overgrown clearings, and only a fragment of the open ground and rides remaining from former times.

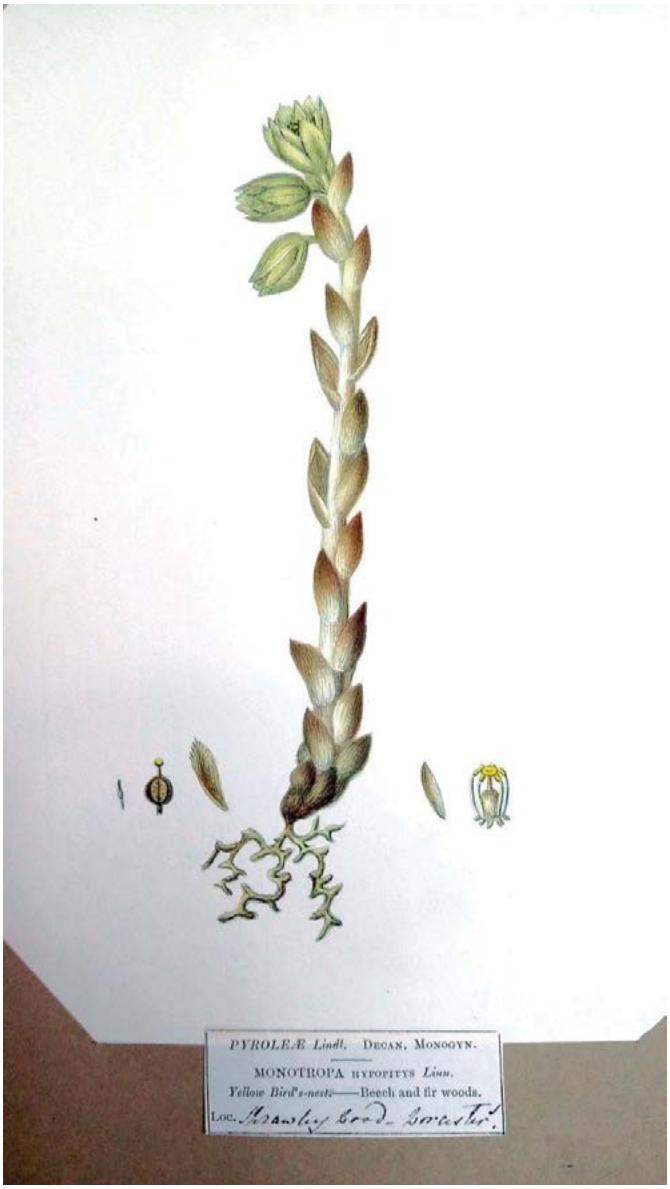
By the end of the eighteenth century there were only a small number of records of Worcestershire plants, covering about 200 species. But from the middle of the nineteenth century there was a gradual increase in reliable records, and those for Shrawley Wood were made by the Club during its regular field meetings, although naturally most of the information was confined to the rarer and more interesting species. From these records we are able to gain an historical perspective of the flora of the wood, allowing interesting comparisons to be made with the current status and distribution of at least the scarcer species. It is also worth mentioning at this point that Worcestershire mycologists have always regarded the wood as one of the best hunting grounds in the county, and many of the meetings, particularly towards the end of the century and into at least the early part of the twentieth century, were autumn fungus forays. These were often attended by Carleton Rea, who although co-author of *The Botany of Worcestershire* (1909) (herein after A&R (1909)) was primarily a mycologist, who in 1896 became one of the founder members of the British Mycological Society. From the middle part of the twentieth century, after the publication of Rea's appendix (1932) to A&R (1909), as elsewhere in the county, botanical recording in the wood went through a period of relative quiescence. It was not until the 1970s and 1980s that the status of the plants in Shrawley Wood and its surrounds was updated, during habitat surveys conducted by the Worcestershire Wildlife Trust. But undoubtedly the most organised and thorough survey of the flora was made during the last decade of the century as part of the county-wide survey being conducted by the Worcestershire Flora Project. More recently recording has continued on a somewhat *ad hoc* basis, mainly during the Worcestershire Recorders' field meetings.

Extinct Plants

First of all there is a need to highlight some of the important species that no longer occur in the wood. It is usually very difficult to be certain when a particular species has become extinct. If it was known to occur in the wood in the past, then it will almost certainly have been searched for on a number of occasions. A failure to re-find the plant is clearly good evidence that it has been lost from the site. The gradual enclosure of the woodland appears to have been the main driver for the extinction of the species**,** which became extinct sometime after the date of the last record : some later occurrences may have gone un-recorded as some botanists are more thorough with their recording than others. More difficult to access are species which were, for example, recorded during the Worcestershire Flora Project but not subsequently, and possibly may have been recently overlooked.

The following is not necessarily an exhaustive list but includes a selection of the scarce and more interesting species, for which at least some information regarding their former presence is known. One of the real treasures of the wood was *Gymnocarpium dryopteris* (Oak Fern). According to Lees (1856) the fern festooned a shaded rock close to a spring, but in 1865 the Club *'regretted the wanton destruction...having been seen by some greedy excursionists, they had rooted the whole up and carried it away root and branch'*; it was just surviving in 1881, and finally A&R (1909) stated *'we have grounds to believe it is not exterminated there'*. Another local rarity *Hypopitys monotropa* (Yellow Bird's-nest) (03) was re-discovered by Rea and his daughter in 1917, in great quantity under Lime and Hazel Coppice in the portion of the wood opposite the New Inn, where it had originally been found by a Mrs Gardner (Purton 1821);

it was again present in 1920, but could not be found a few years later and has never been seen since.



03. *Hypopitys monotropa* (Yellow Bird's-nest). A painting by Harriet Moseley labelled 'Shrawley Wood' but not dated. She was born on 1st March 1803 at Glasshampton, The painting probably dates from the first half on the 19th century. Photographed with permission by Peter Byfield at the collection in the National Archive at Kew.

Then there is the intriguing story surrounding the discovery of *Vicia orobus* (Wood Bitter-vetch). According to Rea (1932) Arthur Bennett, a well-known local botanist and geologist of the time had informed him that he had found a single specimen of the plant in the herbarium of the Royal Botanic Garden Edinburgh, which had been collected from the wood by Edwin Lees in 1837, and misidentified by him as *Ervilia sylvaticus* (Wood Vetch). This is surprising as Lees knew this species well, writing that it *'grows among bushes'* (1867)**:** there appears to be no further mention of this species after A&R (1909). In 1872 the delicate *Pyrola minor* (Common Wintergreen) (05) was described as *'rather rare'*, and included in a list for 1881. The now nationally rare and declining parasite, mainly of *Cytisus* (Broom), *Orobanche rapum-genistae* (Greater Broomrape) (06) was first recorded in the county from Shrawley Wood, (Stokes in Withering 1787), where Lees (1834) knew it from *'by the pool'*, and the Club included it in a list for 1881. *Omalotheca sylvatica* (Heath Cudweed) (07) *'stood out conspicuously as a feature of the grassy stretches'* in 1917 but, as a plant of open ground, was last recorded as a single plant on a pathside in 1991. Another plant of open sandy ground *Jasione montana* (Sheep's-bit) (08) was still 'abundant' in 1917, after which there are no further records. Orchids too slowly disappeared: *Platanthera chlorantha* (Greater Butterfly-orchid), *Epipactis helleborine* (Broad-leaved Helleborine) (09) , *Neottia nidus-avis* (Bird's-nest Orchid) and *Orchis mascula* (Early-purple Orchid) were all known until at least the end of the nineteenth century, but there is no subsequent information, and *Neottia ovata* (Common Twayblade) has not been seen since the 1960s. *Blackstonia perfoliata* (Yellow-wort) a plant usually associated with limestone soils has only been recorded sometime in the 1960s. *Calamagrostis epigejos* (Wood Small-reed) was recorded just once in the vicinity in 1979.

Virtually no details are known for the following species, the last known mention of them being in A&R (1909), usually without any comment on whether or not they were still extant. These include, *Dianthus armeria* (Deptford Pink) (04), *Hypericum montanum* (Pale St John's-wort), *Valeriana dioica* (Marsh Valerian), *Daphne laureola* (Spurge-laurel), *Luzula forsteri* (Southern Wood-rush), *Melica nutans* (Mountain Melick**)** (10), and *Equisetum sylvaticum* (Wood Horsetail).



04. Deptford Pink *Dianthus armeria. Kevin McGee.*



05. Common Wintergreen *Pyrola minor. John Bingham.*



06. *Orobanche rapum-genistae* (Greater Broomrape) John Bingham.



07. Heath Cudweed *Omalotheca sylvatica*. John Bingham.



08. Sheep's-bit *Jasione Montana*. Kevin McGee.



O9. *Epipactis helleborine* (Broad-leaved Helleborine). Kevin McGee.



10. Mountain Melick *Melica nutans.* John Bingham.

Ferns

There has always been a good selection of the True Ferns in Shrawley Wood. *Pteridium aquilinum* (Bracken) is widespread and blankets the ground in any open areas. Three species of Spleenwort have been recorded in the wood, *Asplenium scolopendrium* (Hart's-tongue) is widespread, and *A. adiantum-nigrum* (Black Spleenwort), and *A. trichomanes* ssp. *quadrivalens* (Maidenhair Spleenwort) occur in a few damp and shady spots. *Blechnum spicant* (Hard-fern) is also widespread. *Athyrium filix-femina* (Lady-fern) is less common and scattered. *Polystichum setiferum* (Soft-Shield-fern) is frequent, but A&R (1909) commenting on *P. aculeatum* (Hard Shield-fern), states *'there is considerable confusion about this plant and its varieties'*, is borne out by the many wrongly-named nineteenth century specimens in the Worcestershire Museum, none being confirmed from this time for Shrawley Wood, apart from which there is only a single unconfirmed record for 2015. There is still some disagreement over the correct taxonomic treatment of the complex genus *Dryopteris* (Buckler-Ferns), yet despite this the more distinct taxa have recently been recorded. *Dryopteris filix-mas* (Male Fern) is very common; both subspecies (ssp. *affinis* and ssp. *borreri*) of *D. affinis* (Golden-scaled Male-fern) are frequent, and a large form of ssp. *borreri,* recently collected from the eastern cliff, was expertly determined as morphotype 'robusta'; occasionally the Male-fern hybrid *D.* x *complexa* (D. *affinis* ssp. *borreri* x *D. filix-mas*) occurs as isolated vigorous plants up to 1.5m tall. *Dryopteris dilatata* (Broad Buckler-fern) is abundant, but *D. carthusiana* (Narrow Buckler-fern) appears to have always been rare, with only a single plant being last recorded in 2001. Two species of Polypody, *Polypodium vulgare* (Polypody) and *P. interjectum* (Intermediate Polypody) are locally frequent on the eastern cliff, and their hybrid *P.* x *mantoniae*, although not yet recorded from the wood, could be present as it has recently been found in nearby Lower Astley Wood. As mentioned above, Oak Fern and Wood Horsetail were lost a long time ago, but a third locally scarce species *Oreopteris limbosperma* (Lemon-scented Fern) still survives in small quantity.

The Common Flora

The ground flora in the coniferous and more open parts of the wood is dominated by *Rubus* spp. (Brambles), and in the few clearings *Pteridium aquilinum* (Bracken) usually blankets the ground. At the northern end of the wood close to the Dick Brook the ground flora quickly becomes dominated by *Urtica dioica* (Common Nettle), *Mercurialis perennis* (Dog's Mercury) and *Ribes rubrum* (Red Currant) and in several places by large patches of *Allium ursinum* (Ramsons) which, as by many streamsides elsewhere in the county, has sometimes become as serious a threat to the streamside flora as *Impatiens glandulifera* (Himalayan Balsam) is along riversides later in the year.

Shrawley Wood is also famous for its displays of *Hyacinthoides non-scripta* (Bluebell) which occur throughout the wood, covering extensive areas in a several places (11). These attractive blue swards attract many visitors in early spring, but Bluebells have a negative impact on the general flora in that very few other species can exist where they occur, and when the show is well and truly over by the end of May, the woodland floor is left bare and more or less devoid of plant life.



11. Bluebells *Hyacinthoides non-scripta* beneath Small-leaved Lime coppice. Harry Green.

Therefore the best of the typical spring and early summer woodland flora is to be found in the remaining Bluebell-free areas, mainly on the slopes at the northern and eastern margins of the wood, the damp ground and flushes close to the Dick Brook, and woodland path sides and rides. On the margins of at least one of the main rides there is an attractive spring carpet of *Conopodium majus* (Pignut), *Hypericum perforatum* (Perforate St John's-wort), *Rumex acetosella* (Sheep's Sorrel), *Teucrium scorodonia* (Wood Sage), and *Veronica chamaedrys* (Germander Speedwell). Other common and widespread woodland species include, *Ajuga reptans* (Bugle), *Anemone nemorosa* (Wood Anenome), *Cardamine pratensis* (Cuckooflower), *Circaea lutetiana* (Enchanter's-nightshade), *Euphorbia amygdaloides* (Wood Spurge), *Galanthus nivalis* (Snowdrop), *Lamiastrum galeobdolon* (Yellow Archangel), *Lathyrus linifolius* (Bitter-vetch), *Lysimachia nemorum* (Yellow Pimpernel), *Myosotis sylvatica* (Wood Forget-me-not), *Oxalis acetosella* (Wood-sorrel), *Ranunculus auricomus* (Goldilocks Buttercup), *Stellaria alsine* (Bog Stitchwort), *Veronica officinalis* (Heath Speedwell), and the early flowering *Viola reichenbachiana* (Early Dog-violet), shortly followed by the similar *V. riviniana* (Common Dog-violet).

Much less common are *Moehringia trinerva* (Three-nerved Sandwort), the often overlooked *Stellaria neglecta* (Greater Chickweed), and *Hypericum maculatum* (Imperforate St John's-wort) is scarce in damp grassy places; *Sanicula europaea* (Sanicle), the only truly woodland 'umbellifer', is occasionally seen along the edges of some of the paths. *Caltha palustris* (Marsh-marigold) (12) crops up in a few damp spots mainly at the foot of the eastern cliff; the typical woodland grasses include the attractive *Milium effusum* (Wood Millet) and *Melica uniflora* (Wood Melick), and the diminutive *Aira praecox* (Early Hair-grass) occurs on bare ground and sandy outcrops. The climber *Lonicera periclymenum* (Honeysuckle) is frequent throughout the wood. Shrubs such as *Euonymus europaeus* (Spindle) are to be found and in a few places, and on the woodland margins the brilliant white flowers of the *Viburnum opulus* (Guelder-rose) provide colour in early summer as do the red berries in the autumn (13).

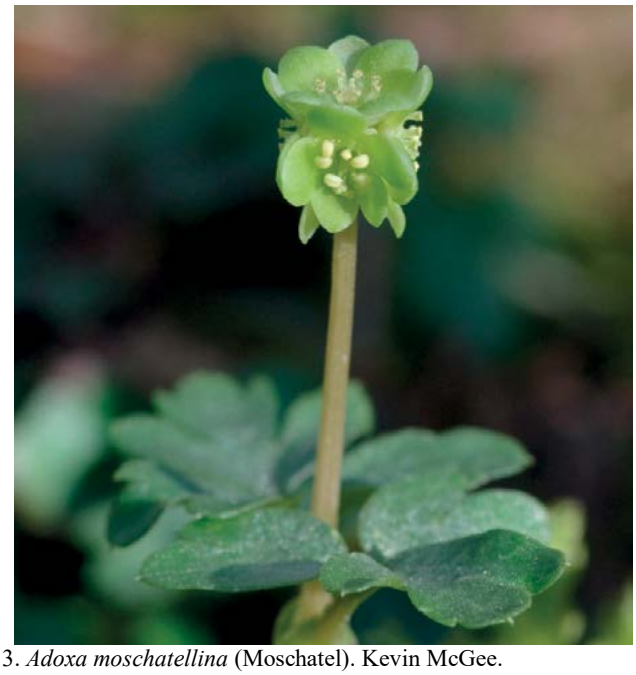


12. Marsh-marigold *Caltha palustris* . John Bingham.



13. *Viburnum opulus* (Guelder-rose). John Bingham.

A few other species to be found in the wood have a more restricted distribution in Worcestershire, being mainly confined to the northern and western parts of the county. Good examples are *Chrysosplenium alternifolium* (Alternate-leaved Golden-saxifrage), and especially *Adoxa moschatellina* (Moschatel) (13) and *Lathraea squamaria* (Toothwort) (14), both of which are generally under-recorded as, unless seen in very early spring, soon disappear under an overgrowth of vegetation. *Veronica montana* (Wood Speedwell) is distributed throughout the wood; and the densely tufted *Carex strigosa* (Thin-spiked Wood-sedge) is locally abundant on damp paths.



13. *Adoxa moschatellina* (Moschatel). Kevin McGee.



14. *Lathraea squamaria* (Toothwort), Kevin McGee.

As the season progresses much of the interesting flora is to be found in the woodland pools: the one beside Oliver's Mound and in the adjacent brick-pit. The old brick-pits along the Severn are dangerous places and botanising in them is a risky business. Up until the beginning of this century many species had been recorded in the brick-pit between the Severn and Shrawley Wood, including *Hypericum tetrapterum* (Square-stalked St John's-wort), *Scutellaria galericulata* (Skullcap), the hybrid *Mentha arvensis* x *M. aquatica* (Whorled Mint) and *Ribes nigrum* (Black Currant). Although *Scirpus sylvaticus* (Wood Club-rush) and *Carex riparia* (Greater Pond-sedge) are still abundant, and *C. pseudocyperus* (Cyperus Sedge) frequent, because of an increasing overgrowth of mainly Willow scrub the botanical value appears to have recently deteriorated and the present status of the majority of the species is uncertain. There is another dense stand of Wood Club-rush around the margin of the pool beside Oliver's Mound in which can be found *Potamogeton crispus* (Curled Pondweed) and plenty of *P. natans* (Broad-leaved Pondweed). Also in the pools and ditches two of the less common Duckweeds occur, *Lemna trisulca* (Ivy-leaved Duckweed) and *Spirodela polyrhiza* (Greater Duckweed), and two of the rapidly spreading recent arrivals include *Lemna minuta* (Least Duckweed) and *Elodea nuttallii* (Nuttall's Waterweed).

The uncommon and critical flora

Worcestershire's critical plant groups have recently been thoroughly investigated (1987-2014). Most importantly during this period numerous modern records were added to the county's flora, with some of the critical genera determined by national experts. In addition, the search for historical records and their contributors has been greatly enhanced by the investigation of the literature, and especially the examination of the herbarium in the Worcester Museum, which contains many specimens corresponding to the old and controversial records.

In 1991 the author was joined by the late British and European Bramble expert Alan Newton to visit the wood. At least a dozen species were recorded and described as being a typical Wyre Forest-type assemblage. These included *Rubus informifolius* (Shapeless-leaved Bramble), in Britain virtually confined to north-west Worcestershire, *R. triangularis* (Triangular-spined Bramble), a local endemic, *R. rubritinctus* (Purple-ribbed Bramble), a typical bramble of the Severn Valley, *R. pampinosus* (Simple-leaved Bramble) a Worcestershire speciality, well described by Lees (1852). *R. longithyrsiger* (Slender-prickled Bramble) was first recorded in the county from Shrawley Wood by William Mathews in 1849, where Lees (1856) found it occurring in '*great thickets'*.

Brambles thrive best on sandy acid soils, the reverse being the case with Wild Roses : only *Rosa canina* (Dog-rose), *R. arvensis* (Field-rose), their hybrid *R.* x *irregularis*, and *R. squarrosa* (Glandular Dog-rose) have been recorded.

Another critical group, the Hawkweeds are distinctly scarce in native woodland, but do occasionally occur in open secondary woodland. *Hieracium sabaudum* (Autumn Hawkweed) is the commonest lowland hawkweed throughout England and Wales and a few plants were recently found in two places on the eastern cliff, whereas only 9% of Worcestershire records for *Hieracium consociatum* (Sociable Hawkweed) are from this habitat. Although not found recently, it was first recorded in Worcestershire from Shrawley Wood by George Reece, once curator of the Worcestershire Museum, where there is a specimen collected by him from the wood in 1846. Two subspecies (ssp. *euronota* and ssp. *officinarum*) of the closely related *Pilosella officinarum* (Mouse-ear-hawkweed) are found on the tops of anthills on a grassy bank close to Oliver's Mound.

Shrawley Wood also contains a small number of rare or uncommon Worcestershire species. Perhaps pride of place goes to *Drymochloa altissima* (Wood Fescue) a tall elegant perennial grass of mainly rocky wooded slopes, often in virtually inaccessible places (15, 16). It is most frequent in some areas of northern Britain, Shrawley Wood being one of only a few isolated southern sites. It has been known here since the beginning of the nineteenth century and Lees (1867) reported that the finder M.W. Moseley had stated that it *'only appeared on the sandstone ledges of the wood after periodical falls of the coppice'*. Lees himself was unable to find it, although it was included in a list of plants seen in 1865. But in 1881, referring to its earlier discovery, it was stated *'hitherto the members of the Club have sought for it in vain'* and it was not recorded again until 1979. Although a few plants have recently been found at three other Worcestershire sites, the Shrawley Wood colony is by far the largest consisting of some 300-400 tufts**.** It appears to be stable, despite large patches of *Luzula sylvatica* (Great Wood-rush) occurring nearby, which fortunately has not penetrated as far as the colony



15, *Drymochloa altissima* (Wood Fescue). Roger Maskew.



16. *Drymochloa altissima* (Wood Fescue). Roger Maskew.

Other species with detailed records include *Convallaria majalis* (Lily-of-the-valley) about which in 1865 the Club stated *'luxuriates in all its native wildness'*, and again '*seen in profusion'* in 1870. More recently it was *'locally frequent'* by Layes Pool in 1980 and there was a *'small patch'* under Sessile Oak in 1991. In 2018 a 25 square metre patch of *Paris quadrifolia* (Herb-Paris) (17) was recorded. *Cardamine amara* (Large Bitter-cress) occurs in small quantity in flushes near the Dick Brook. *C. impatiens* (Narrow-leaved Bitter-cress) is intolerant of competition and, although quick to colonise well-lit open ground, numbers may fluctuate from year to year or suddenly disappear (Maskew 2014), it was recorded as *'frequent'* in two-year old lime coppice in 1996. The nationally scarce *Campanula patula* (Spreading Bellflower) frequently occurred in quantity, as in 1872, when it '*appeared in great abundance its blue flowers adorning the mossy bank in numerous spots'*; now of rare occurrence, a small colony of some 24 plants was recorded in 2008. A few plants of *C. latifolia* (Giant Bellflower) are still to be found near the Dick Brook**,** and at the foot of the eastern cliff, where *Dipsacus pilosus* (Small Teasel), although no longer appearing as in 1881, in *'great profusion'*, also occurs in small numbers. In the brick-pit *Berula erecta* (Lesser Water-parsnip) (18) was formerly found, and is still present at the old site by New Pool. *Oenanthe aquatica* (Fine-leaved Water-dropwort) was *'common'* in the brick pit in 2001, in the same year as a 20 m. sq. patch of *Impatiens parviflora* (Small Balsam) was detected. *Scrophularia umbrosa* (Green Figwort) is still occasionally recorded along the Severn banks**,** but as already stated, the present status of this and the species formerly recorded in the brick-pit is unknown.



17. *Paris quadrifolia* (Herb-Paris) Kevin McGee.


18. Lesser Water-parsnip *Berula erecta*. Michael Liley.

It is clear there is a lack of very recent detailed information for many of the species recorded since the 1990s in Shrawley Wood, its pools, and the adjacent wet meadows and brick-pit. A new detailed survey of these places would be a worthwhile project for the future.

Taxonomy, nomenclature and English names follow Stace (2019), except for the English names of the *Hieracium* and *Rubus* spp. which are taken from Sell & Murrell (2006 and 2014).

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Shrawley Wood – Vascular Flora; Timeline for all records 1700 – 2020

John Day

The following timeline is compiled from the records held by John Day, the vice-county recorder for Worcestershire, on behalf of the Botanical Society of Britain and Ireland (BSBI). It includes all available records up to and including 2020.
The date of the first record for each taxon is given followed by a plot for each 25 year period starting in 1700. Undated literature records are plotted for the year of publication.

The main list incorporates all records attributed to *Shrawley Wood.* It includes a few additions from the area of parkland around Shrawley Wood House, much of which was carved from the woodland proper in the mid nineteenth century.

Records attributed to *Shrawley* or only localised to the local tetrads (2 x 2 km square) SO86C, SO86D and SO76Y are excluded.

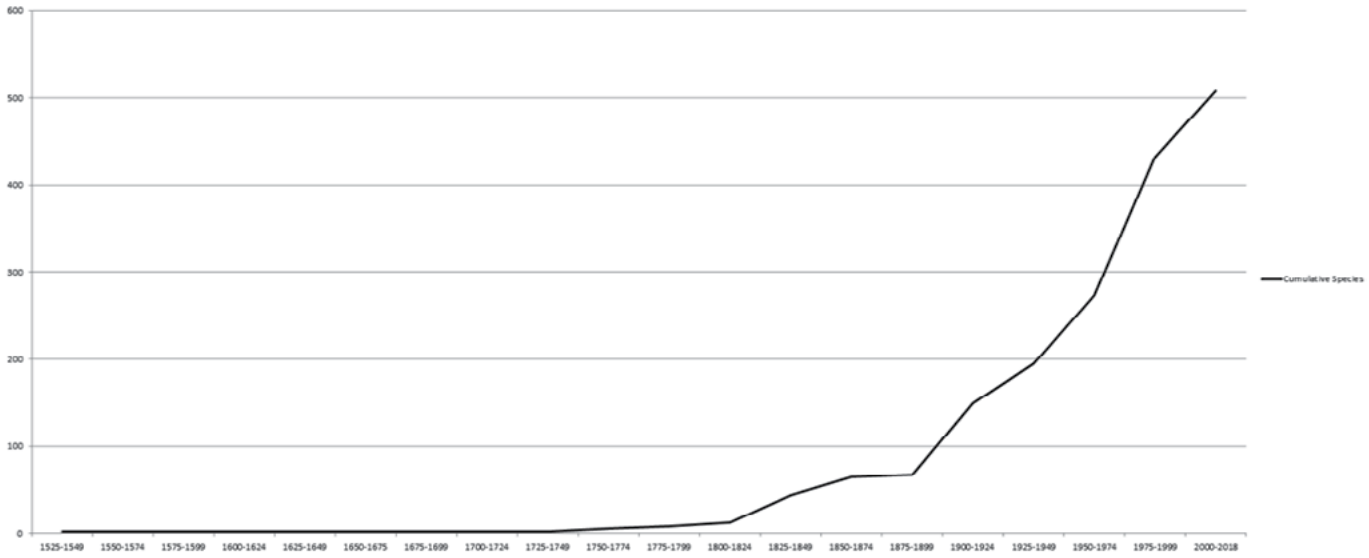
The list has 514 names. If ambiguities relating to aggregations are excluded a total of 490 taxa have been recorded in the past 220 years. Of these, 436 have been seen since 1975 and 375 since 2000.

Adjoining the southern and south-eastern edges of the wood is a series of species-rich semi-natural habitats, including grassland, marsh, pools and wet woodland, including the former Shrawley Brickpits site. Records from these locations have been included within the woodland by some observers. For completeness, following the main timeline table is a list of species recently recorded from these locations but not as yet from within the current woodland boundary.

Record accumulation by date. Also shown in the graph 01.

Period	Novel taxa	Cumulative taxa*
1525-49	2	2
1750-74	3	5
1775-99	3	8
1800-24	4	12
1825-49	32	44
1850-74	21	65
1875-99	2	67
1900-24	82	149
1925-49	46	195
1950-74	78	273
1975-99	159	432
2000-18	75	508

*Totals include some aggregates thus final total is greater than 490



01. Graph showing rate of accumulation of vascular flora records.

The high accumulation of novel taxa post-1950 relates to recorder bias. Pre-Second World War most recording focused on scarcer species. Systematic recording of all taxa began only after 1950.
In a site of this size and over 220 years some species turnover is expected. However, losses among woodland and woodland edge specialist are likely to reflect changes in both forest management and wider environmental change. The following 27 species have not been seen within the woodland since 1950 and are most probably lost. About 60% of these species are rare or very rare in the county and one Wood Bitter-vetch, *Vicia orobus* is considered extinct.

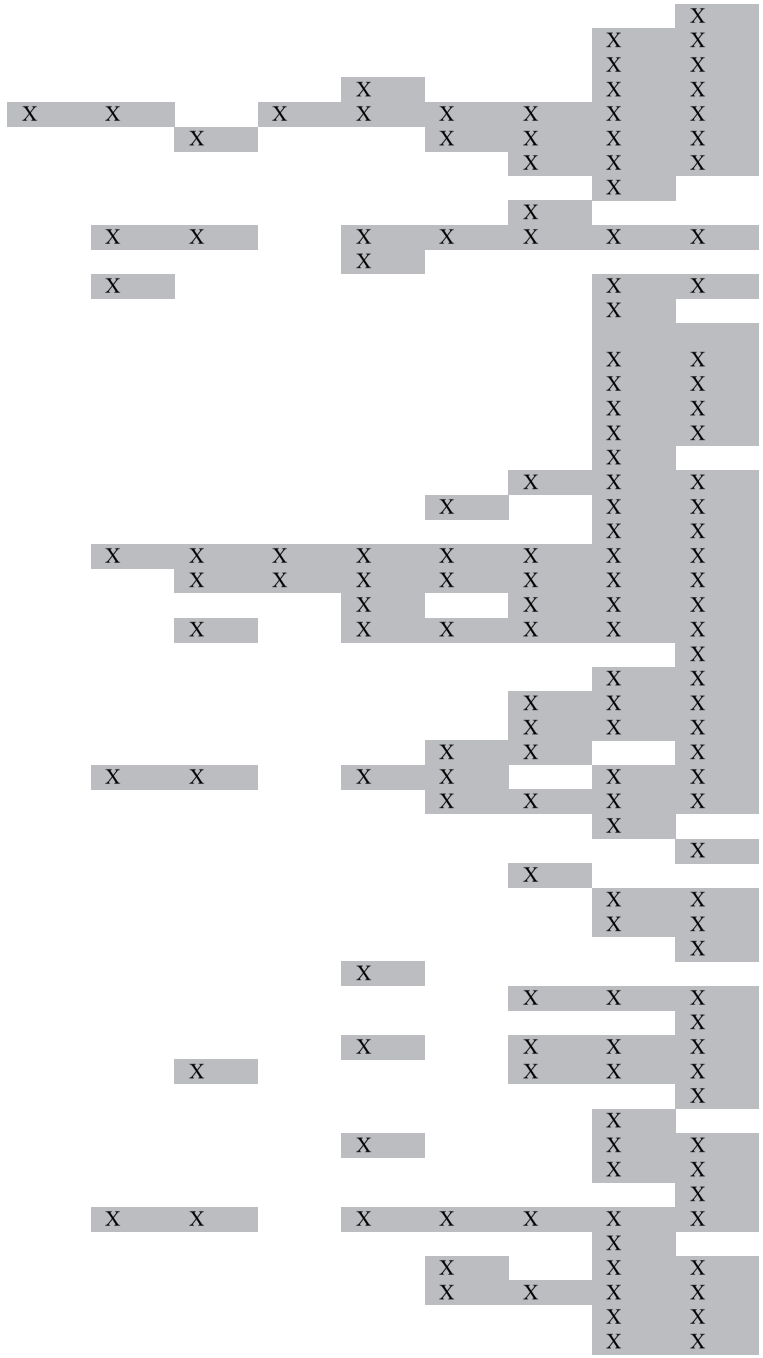
Woodland and woodland edge species not seen since 1950

Agrimonia procera	Fragrant Agrimony
Aira caryophyllea	Silver Hair-grass
Brachypodium pinnatum sens.lat.	Tor-grass
Carex pallescens	Pale Sedge
Chrysosplenium alternifolium	Alternate-leaved Golden-saxifrage
Daphne laureola	Spurge-laurel
Dianthus armeria	Deptford Pink
Equisetum sylvaticum	Wood Horsetail
Gymnocarpium dryopteris	Oak Fern
Hypericum montanum	Pale St. John's-wort
Hypopitys monotropa	Yellow Bird's-nest
Jasione montana	Sheep's-bit
Juncus subnodulosus	Blunt-flowered Rush
Malus sylvestris sens.str.	Crab Apple
Melica nutans	Mountain Melick
Neottia nidus-avis	Bird's-nest Orchid
Orchis mascula	Early Purple Orchid
Orobanche rapum-genistae	Greater Broomrape
Platanthera chlorantha	Greater Butterfly-orchid
Primula veris	Cowslip
Pyrola minor	Common Wintergreen
Scrophularia umbrosa	Green Figwort
Sedum telephium	Orpine
Solidago virgaurea	Goldenrod
Valeriana dioica	Marsh Valerian
Vicia orobus	Wood Bitter-vetch
Vicia sylvatica	Wood Vetch

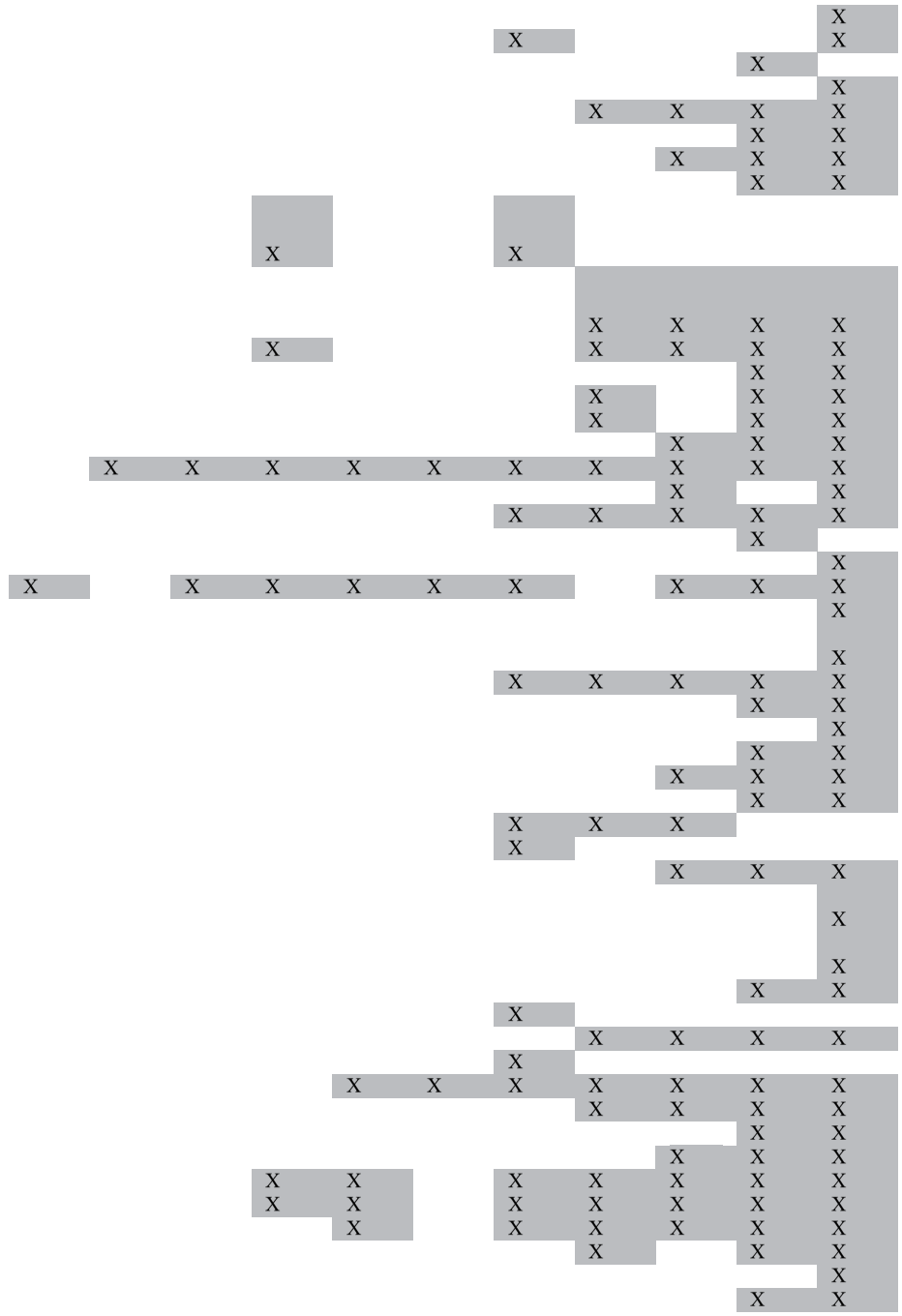
Timeline Vascular Plants 1700 – 2020

Taxon	English name	First record	1700-	1725-	1750-	1775-	1800-	1825-	1850-	1875-	1900-	1925-	1950-	1975-	2000-
Acer campestre	Field Maple	1839						X					X	X	X
Acer pseudoplatanus	Sycamore	1931										X	X	X	X
Achillea millefolium	Yarrow	1980												X	X
Aconitum napellus sens.lat.	Monkshood	1976												X	X
Acorus calamus	Sweet Flag	1986												X	
Adoxa moschatellina	Moschatel	1961											X	X	X
Aegopodium podagraria	Ground-elder	1978												X	X
Aesculus hippocastanum	Horse-chestnut	1978												X	X
Agrimonia procera	Fragrant Agrimony	1883								X					
Agrostis canina sens.str.	Brown Bent	2008													X
Agrostis capillaris	Common Bent	1978												X	X
Agrostis gigantea	Black Bent	1990												X	
Agrostis stolonifera	Creeping Bent	1978												X	X
Aira caryophyllea	Silver Hair-grass	1834						X							
Aira praecox	Early Hair-grass	1986												X	
Ajuga reptans	Bugle	1946										X	X	X	X
Alchemilla filicaulis subsp. vestita	Hairy Lady's-mantle	1963											X		
Alisma plantago-aquatica	Water-plantain	1960											X	X	X
Alliaria petiolata	Garlic Mustard	1975												X	X
Allium ursinum	Ramsons	1948										X	X	X	X
Alnus glutinosa	Alder	1773			X	X	X		X	X	X	X	X	X	X
Anagallis arvensis subsp. arvensis	Scarlet Pimpernel	1982												X	X
Anchusa arvensis	Bugloss	1980												X	X
Anemone nemorosa	Wood Anemone	1931										X	X	X	X
Angelica sylvestris	Wild Angelica	1912									X		X	X	X
Anisantha sterilis	Barren Brome	1990												X	X
Anthoxanthum odoratum	Sweet Vernal Grass	1978												X	X
Anthriscus sylvestris	Cow Parsley	1963											X	X	X
Aphanes arvensis agg.	Parsley Piert	1986												X	X
Aphanes arvensis sens.str.	Parsley-piert	2008													X
Aphanes australis	Slender Parsley-piert	1991												X	X
Apium nodiflorum	Fool's Water-cress	2002													X
Aquilegia vulgaris	Columbine	1834						X	X	X	X				X
Arctium lappa	Greater Burdock	1872							X						X
Arctium minus subsp. minus	Lesser burdock	1963											X	X	X
Arctium minus subsp. pubens	Lesser burdock	1909									X			X	
Armoracia rusticana	Horse-radish	1980												X	
Arrhenatherum elatius	False Oat-grass	1978												X	X
Artemisia vulgaris	Mugwort	1978												X	X
Arum maculatum	Lords-and-ladies	1961											X	X	X
Asplenium adiantum-nigrum	Black Spleenwort	1990												X	X
Asplenium ruta-muraria	Wall Rue	1968											X		
Asplenium scolopendrium	Hart's-tongue	1913									X		X	X	X
Asplenium trichomanes subsp. quadrivalens	Maidenhair Spleenwort	1939										X		X	X
Astragalus glycyphyllos	Wild Liquorice	1992												X	
Athyrium filix-femina	Lady Fern	1917									X	X	X	X	X
Atriplex patula	Common Orache	1968											X		
Avena fatua	Wild Oat	1990												X	
Ballota nigra	Black Horehound	1980												X	

Bambuseae	a Bamboo	2002
Bellis perennis	Daisy	1978
Berula erecta	Lesser Water-parsnip	1978
Betonica officinalis	Betony	1903
Betula	Birch	1805
Betula pendula	Silver Birch	1856
Betula pubescens	Downy Birch	1963
Bidens tripartita	Trifid Bur-marigold	1978
Blackstonia perfoliata	Yellow-wort	1966
Blechnum spicant	Hard Fern	1834
Brachypodium pinnatum sens.lat.	Tor-grass	1909
Brachypodium sylvaticum	False-brome	1834
Bromopsis ramosa	Hairy Brome	1978
Bromus hordeaceus subsp. hordeaceus	Soft-brome	1978
Bryonia dioica	White Bryony	1980
Buddleja davidii	Butterfly-bush	1990
Buxus sempervirens	Box	1978
Calamagrostis epigejos	Wood Small-reed	1979
Callitriche stagnalis sens.str.	Common Water-starwort	1968
Caltha palustris	Marsh Marigold	1948
Calystegia sepium subsp. sepium	Great Bindweed	1978
Campanula latifolia	Giant Bellflower	1834
Campanula patula	Spreading Bellflower	1853
Campanula rotundifolia	Harebell	1917
Campanula trachelium	Nettle-leaved Bellflower	1856
Cannabis sativa	Cannabis	2017
Capsella bursa-pastoris	Shepherd's-purse	1980
Cardamine amara	Large Bitter-cress	1963
Cardamine flexuosa	Wavy Bitter-cress	1963
Cardamine hirsuta	Hairy Bitter-cress	1948
Cardamine impatiens	Narrow-leaved Bitter-cress	1828
Cardamine pratensis	Cuckoo-flower	1948
Carduus crispus	Welted Thistle	1980
Carex acuta	Slender Tufted-sedge	2017
Carex acutiformis	Lesser Pond-sedge	1965
Carex divulsa subsp. divulsa	Grey Sedge	1979
Carex hirta	Hairy Sedge	1990
Carex otrubae	False Fox-sedge	2015
Carex pallescens	Pale Sedge	1909
Carex pendula	Pendulus Sedge	1960
Carex pilulifera	Pill Sedge	2012
Carex pseudocyperus	Cyperus Sedge	1909
Carex remota	Remote Sedge	1837
Carex riparia	Greater Pond-sedge	2017
Carex spicata	Spiked Sedge	1980
Carex strigosa	Thin-spiked Wood-sedge	1909
Carex sylvatica	Wood-sedge	1980
Carpinus betulus	Hornbeam	2015
Castanea sativa	Sweet Chestnut	1834
Cedrus deodara	Deodar	1978
Centaurea nigra sens.lat.	Common Knapweed	1948
Centaurium erythraea	Common Centaury	1946
Cerastium fontanum	Common Mouse-ear	1978
Cerastium glomeratum	Sticky Mouse-ear	1978



Ceratocapnos claviculata	Climbing Corydalis	2015	
Ceratophyllum demersum	Rigid Hornwort	1917	
Ceratophyllum submersum	Soft Hornwort	1978	
Chaerophyllum temulum	Rough Chervil	2001	
Chamerion angustifolium	Rosebay Willowherb	1948	
Chelidonium majus	Greater Celandine	1990	
Chenopodium album sens.str.	Fat-hen	1968	
Chenopodium polyspermum	Many-seeded Goosefoot	1982	
Chrysosplenium alternifolium	Alternate-leaved Golden-saxifrage	1834	
Chrysosplenium oppositifolium	Opposite-leaved Golden-saxifrage	1948	
Circaea lutetiana	Enchanter's-nightshade	1834	
Cirsium arvense	Creeping Thistle	1978	
Cirsium palustre	Marsh Thistle	1931	
Cirsium vulgare	Spear Thistle	1948	
Conopodium majus	Pignut	1963	
Convallaria majalis	Lily of the Valley	1799	
Conyza canadensis	Canadian Fleabane	1968	
Cornus sanguinea	Dogwood	1913	
Cornus sericea	Red-osier Dogwood	1978	
Cortaderia selloana	Pampass Grass	2008	
Corylus avellana	Hazel	1773	
Cotoneaster simonsii	Himalayan Cotoneaster	2008	
Crataegus laevigata x monogyna (C. x media)	Hybrid Hawthorn	2017	
Crataegus monogyna	Hawthorn	1913	
Crepis capillaris	Smooth Hawk's-beard	1990	
Cryptomeria japonica	Japanese Red-cedar	2017	
Cynosurus cristatus	Crested Dog's-tail	1978	
Cytisus scoparius	Broom	1961	
Dactylis glomerata	Cock's-foot	1978	
Dactylorhiza fuchsii	Common Spotted-orchid	1913	
Daphne laureola	Spurge-laurel	1909	
Deschampsia cespitosa	Tufted Hair-grass	1963	
Deschampsia cespitosa subsp. cespitosa	Tufted Hair-grass	2008	
Deschampsia cespitosa subsp. parviflora	Tufted Hair-grass	2008	
Deschampsia flexuosa	Wavy Hair-grass	1980	
Dianthus armeria	Deptford Pink	1909	
Digitalis purpurea	Foxglove	1948	
Dipsacus fullonum	Common Teasel	1909	
Dipsacus pilosus	Small Teasel	1853	
Dryopteris affinis	Scaly Male Fern	1927	
Dryopteris affinis subsp. affinis	Scaly Male Fern	1991	
Dryopteris borreri	Borrer's Male Fern	1951	
Dryopteris carthusiana	Narrow Buckler-fern	1844	
Dryopteris dilatata	Broad Buckler-fern	1843	
Dryopteris filix-mas	Common Male Fern	1872	
Elymus caninus	Bearded Couch	1980	
Elytrigia repens	Common Couch	2001	
Epilobium ciliatum	American Willowherb	1978	

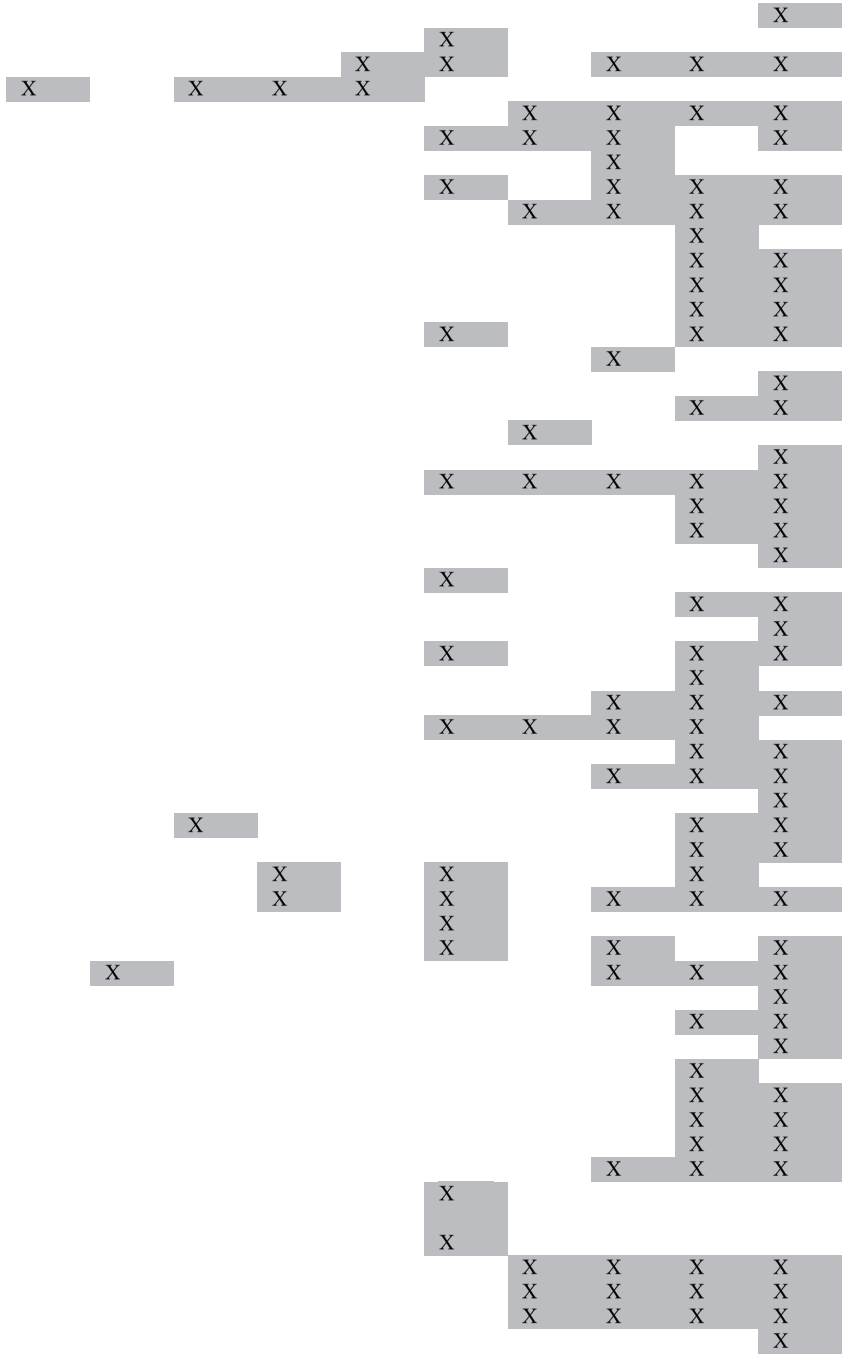


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Oenanthe crocata	Hemlock Water-dropwort	2015
Orchis mascula	Early Purple Orchid	1909
Oreopteris limbosperma	Lemon-scented Fern	1884
Orobanche rapum-genistae	Greater Broomrape	1787
Oxalis acetosella	Wood-sorrel	1948
Paris quadrifolia	Herb Paris	1909
Pedicularis sylvestris	Lousewort	1950
Persicaria amphibia	Amphibious Bistort	1917
Persicaria hydropiper	Water-pepper	1946
Persicaria lapathifolia	Pale Persicaria	1982
Persicaria maculosa	Redshank	1978
Phalaris arundinacea	Reed Canary-grass	1978
Phleum pratense sens.str.	Timothy	1990
Phragmites australis	Common Reed	1909
Picea abies	Norway Spruce	1956
Picea sitchensis	Sitka Spruce	2017
Pilosella officinarum	Mouse-ear-hawkweed	1978
Pinus nigra	Austrian Pine	1948
Pinus radiata	Monterey Pine	2017
Pinus sylvestris	Scots Pine	1909
Plantago lanceolata	Ribwort Plantain	1978
Plantago major	Greater Plantain	1978
Plantago major subsp. major	Greater Plantain	2008
Platanthera chlorantha	Greater Butterfly-orchid	1909
Poa annua	Annual Meadow-grass	1978
Poa humilis	Spreading Meadow-grass	2017
Poa nemoralis	Wood Meadow-grass	1909
Poa pratensis sens.lat.	Smooth Meadow-grass	1980
Poa trivialis	Rough Meadow-grass	1969
Polygala vulgaris	Common Milkwort	1913
Polygonum arenastrum	Equal-leaved Knotgrass	1990
Polygonum aviculare sens.str.	Knotgrass	1963
Polygonum rurivagum	Cornfield Knotgrass	2008
Polypodium interjectum	Intermediate Polypody	1840
Polypodium vulgare sens.str.	Polypody	1977
Polystichum aculeatum	Hard Shield-fern	1865
Polystichum setiferum	Soft Shield-fern	1865
Polystichum setiferum var. lobatum	Soft Shield-fern	1913
Populus (x canadensis)	Poplar	1909
Populus tremula	Aspen	1807
Populus trichocarpa	Western Balsam Poplar	2003
Potamogeton crispus	Curled Pondweed	1986
Potamogeton pectinatus	Fennel-leaved Pondweed	2002
Potentilla anglica	Trailing Tormentil	1990
Potentilla anserina	Silverweed	1980
Potentilla erecta	Tormentil	1978
Potentilla reptans	Creeping Cinquefoil	1990
Potentilla sterilis	Barren Strawberry	1963
Primula veris	Cowslip	1912
Primula veris x vulgaris (P. x polyantha)	False Oxlip	1909
Primula vulgaris	Primrose	1946
Prunella vulgaris	Selfheal	1927
Prunus avium	Wild Cherry	1948
Prunus domestica	Wild Plum	2001



Prunus laurocerasus	Cherry Laurel	1978	
Prunus spinosa	Blackthorn	2001	
Pseudotsuga menziesii	Douglas Fir	1948	
Pteridium aquilinum	Bracken	1901	
Pyrola minor	Common Wintergreen	1834	
Pyrus pyraster sens.str.	Wild Pear	2012	
Quercus	Oak	1538	
Quercus cerris	Turkey Oak	2015	
Quercus petraea	Sessile Oak	1963	
Quercus petraea x robur (Q. x rosacea)	Hybrid Oak	1994	
Quercus robur	Pedunculate Oak	1909	
Ranunculus acris	Meadow Buttercup	2017	
Ranunculus bulbosus	Bulbous Buttercup	2017	
Ranunculus repens	Creeping Buttercup	1963	
Ranunculus sceleratus	Celery-leaved Buttercup	1968	
Raphanus raphanistrum	Wild Radish	1982	
Rhododendron ponticum	Rhododendron	1912	
Ribes nigrum	Black Currant	2017	
Ribes rubrum	Red Currant	1909	
Ribes uva-crispa	Gooseberry	1980	
Robinia pseudoacacia	False Acacia	1968	
Rorippa nasturtium-aquaticum	Water cress	1978	
Rorippa palustris	Marsh Yellow-cress	2001	
Rosa arvensis	Field Rose	1968	
Rubus bloxamii	Bloxam's Bramble	1849	
Rubus botryeros	a bramble	1990	
Rubus caesius	Dewberry	1990	
Rubus echinatus	Echinate Bramle	1849	
Rubus flexuosus	a bramble	1867	
Rubus fruticosus agg.	Bramble	1909	
Rubus idaeus	Raspberry	1834	
Rubus longithyrsiger	a bramble	1849	
Rubus pampinosus	a bramble	1990	
Rubus pyramidalis	a bramble	1852	
Rubus rufescens	a bramble	1849	
Rubus triangularis	a bramble	1990	
Rubus tuberculatus	a bramble	1990	
Rubus vestitus	a bramble	1990	
Rumex acetosa subsp. acetosa	Common Sorrel	1978	
Rumex acetosella	Sheep's Sorrel	1978	
Rumex conglomeratus	Clustered Dock	2008	
Rumex obtusifolius	Broad-leaved Dock	1978	
Rumex sanguineus	Wood Dock	1909	
Sagina procumbens	Procumbent Pearlwort	1980	
Salix	a Willow	1807	
Salix alba	White Willow	2017	
Salix caprea	Goat Willow	1963	
Salix caprea x cinerea (S. x reichardtii)	Hybrid Sallow	2009	
Salix cinerea	Grey Willow	1963	
Salix cinerea subsp. oleifolia	a willow	1978	
Salix viminalis	Common Osier	2008	
Salix x fragilis	Hybrid Crack Willow	1968	
Sambucus nigra	Elder	1909	



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serpyllifolia			
Artemisia absinthium	Wormwood	X	
Bidens cernua	Nodding Bur-marigold	X	
Brassica nigra	Black Mustard	X	
Briza media	Quaking-grass	X	
Carex caryophyllea	Spring Sedge		X
Carex disticha	Brown Sedge	X	
Carex leporina	Oval Sedge	X	
Clinopodium vulgare	Wild Basil	X	
Convolvulus arvensis	Field Bindweed	X	
Cruciata laevipes	Crosswort	X	
Danthonia decumbens	Heath-grass		X
Eleocharis palustris	Common Spike-rush	X	
Elodea canadensis	Canadian Waterweed	X	
Elodea nuttallii	Nuttall's Water-weed		X
Epilobium palustre	Marsh Willowherb		X
Equisetum fluviatile	Water Horsetail	X	
Festuca ovina s.l.	Sheep's Fescue	X	
Galium saxatile	Heath Bedstraw	X	
Geranium pusillum	Small-flowered Crane's-bill		X
Glyceria declinata	Small Sweet-grass	X	
Glyceria notata	Plicate Sweet-grass		X
Hordeum murinum	Wall Barley		X
Juncus acutiflorus	Sharp-flowered Rush	X	
Juncus inflexus	Hard Rush	X	
Matricaria chamomilla	Scented Mayweed		X
Mentha aquatica x arvensis (M. x verticillata)	Whorled Mint	X	
Nasturtium microphylla	Narrow-fruited Water-cress		X
Oenanthe aquatica	Fine-leaved Water-dropwort	X	
Pimpinella saxifraga	Burnet Saxifrage		X
Potamogeton natans	Broad-leaved Pondweed		X
Rhamnus cathartica	Buckthorn	X	
Rorippa amphibia	Greater Yellow-cress	X	
Rorippa sylvestris	Creeping Yellow-cress	X	
Rosa canina agg.	Dog Rose		X
Rumex crispus	Curled Dock		X
Saponaria officinalis	Soapwort	X	
Schedonorus pratensis	Meadow Fescue	X	
Scorzoneroides autumnalis	Autumnal Hawkbit	X	
Scutellaria galericulata	Skullcap	X	
Tanacetum vulgare	Tansy	X	
Veronica filiformis	Slender Speedwell	X	

The birds of Shrawley Wood: the influence of coppicing

Harry Green

Like so many ancient woods there is nothing especially remarkable about the birds of Shrawley Wood – over the decades it seems to have supported exactly the types of woodland bird communities you would expect for this part of England. However, given the diversity of stand types it contains, Shrawley Wood gives extremely good opportunities for assessing how woodland structure and management affect bird communities and populations, especially in the breeding season. There have been various observations on birds over the decades which are difficult to summarise and compare. The period from the late 1970s to the mid-1990s saw considerable ringing and census activity in Shrawley Wood which is described in the first two sections of the chapter. This is followed by a description of several less systematic counts and surveys at different periods since the 1940s. The most recent surveys by Natural England in 2019 are snapshots of the breeding birds found in the present day woodland. Short accounts of selected bird species are given in the following chapter. These opening paragraphs explore what is known of the birds of Shrawley Wood in earlier times.

The first hints of wildlife albeit in association with game keeping are in the Shrawley Court Rolls transcribed by Prattinton where pheasants, partridges, rabbits and hares are mentioned on 21st November 1578.

The next records are from gamekeepers' accounts of game sent from Shrawley to Hanbury, summarised in table 01. Partridges are omitted from table 01 as they were a mixture or reared and shot birds. Further information is in the appendix to chapter Shrawley Wood 1760-1763. in this book.

Years	Woodcock	Snipe	Land Rail (Corncrake)	Water Rail	Quail	Teal	Mallard	Duck	Moorhen
1750-51	43		2						
1752-53	80	2			1	1			
1756-57	93	2							
1757-58	33				4		1		
1760-61	72				3				
1762-63	54	7			1				
!764-65	28					2			
1765-66	40	6				4	2		
1772-73	30			1					2
1779-80	12	1							
1810	14								
1811	26								
Totals	**526**	**18**	**2**	**1**	**9**	**7**	**3**		**2**

Table 01. Totals of birds shot at Shrawley and sent to Hanbury excluding partridges. Data extracted from the archive by Richard Pumphrey. Note the large numbers of Woodcock.

Examples of documents in the archive follow. One, entitled *'Game from Shrawley'*: Partridge 10th October 1772; Woodcock 25th October 1772; duck 7th November 1772; Water Rail 2nd January 1773; Moorhen 8th January 1773. Another 'A List of game taken to Hanbury Hall [from Shrawley] for the use of Henry Cecil Esq' made in March 1780 lists '3 brace and a half of burds' for 2nd September 1779 and similar entries follow referring to partridges.
A list for 16th April 1811 includes '8 woodcock, 1 Hare, 1 Partridge'. A 'Game Bill' running from September 1811 to February 1812 lists the same species with the addition of 'wildfowels' and 'wild duck'. Woodcock are listed on 12 occasions throughout the winter (108/ii/1-232 C.19 account books entitled "Shrawley Wood book").

Shrawley Wood, managed mainly as Small-leaved Lime coppice with oak standard tree, has apparently been a good habitat for wintering Woodcock for centuries. Most were shot between November and March and were probably winter visitors from eastern Europe and beyond. The Wood provided good daytime shelter and although there are relatively few damp patches in which Woodcock could probe for food there must have been many damp sites close to the wood they could visit at night.

Woodcock have also bred in the Wood for a very long time – see data from a survey later in this chapter.



Woodcock by R M Bishop

It is unlikely that all the species listed in table 01 were shot in Shrawley Wood itself as some are open field or wetland species and the main lakes in the wood had not been created. So it seems likely that the first recorded properly wild bird for Shrawley Wood is woodcock. Presumably the species was both breeding and wintering there from at least the 1500s.

Woodcock is one of three species – the others being nightingale and turtle dove – that were once widespread in the region around Shrawley Wood and would have been characteristic of the Wood itself but now are extremely scarce in this part of Worcestershire in keeping with national declines (Balmer *et al*. 2013). Kendrick Watson, writing an account of the parish of Shrawley in 1840 notes *"All the birds which are commonly met with in the midland districts of the kingdom are found here"* and he mentions turtle dove, woodcock and nightingale. Shrawley Wood is mentioned only once in the chapter on birds in the *Victoria County History* (Tomes 1901), under notes on Heron stating that the only heronry in Worcestershire is at Shrawley Wood. (Herons have nested occasionally in subsequent years). Elsewhere Tomes notes *"Nightingale is plentiful in the valleys of the Severn, Avon, and Teme";* and *"Turtle Dove common all over the County"* and that *"Woodcock breeds in Wyre Forest and it is believed in some other large woods in Worcs.".*

The Worcestershire Naturalists' Club visited Shrawley Wood many times, most often in October on fungus forays but also at other times of the year. Reports from the1800s and early 1900s in the *Transactions* contain long lists of fungi, records of flowering plants, ferns, butterflies and moths, but hardly ever mention birds. Bird song and abundant birds were probably a normal part of their daily lives: they were just there! The occasional rarity perhaps caused some excitement. The first bird list attached to an account of a Club fungus foray is by Fred Fincher (1901-95) for the 4th October1948: Chiffchaff, Great Spotted Woodpecker, Grey Wagtail, Mistle Thrush, Moorhen, Nuthatch, Treecreeper, Pied Wagtail, and Wood Pigeon. Fred was probably the most versatile naturalist Worcestershire has ever produced. He visited Shrawley Wood on

many occasions and included lists of birds in his hand-written Journals between 1946 and 1980, including spring visits in 1948. 1954, 1961 and 1968. On these latter visits the most frequent birds recorded were blackcap, blue tit, chiffchaff, coal tit, dunnock, garden warbler, great tit, long-tailed tit, marsh tit, robin, song thrush, willow warbler and wren. His records are listed in the appendix to the chapters on birds.

Another notable naturalist with an interest in Shrawley Wood was Gordon Simmons (1922-1976). In an account of Shrawley Wood (Simmons 1970) noted that in 1963-64 lesser spotted woodpecker, great spotted woodpecker, green woodpecker, tawny owl, woodcock, nightjar, blackbird, song thrush all occurred in the Wood, stating that the last two were present in large numbers in young coppiced lime often with nests within a foot or two of the ground. He suggested that an abundance of invertebrates provided a good food resource. Simmons (1968) also published one of the few lists of winter birds in Shrawley Wood collected by his students from The Department of Rural Studies, Worcester College for Education where he was a teacher and this information is in the chapter of selected species of birds. Their studies were made between 1962 and 1968.

The West Midland Bird Club was founded in 1933 to cover the counties of Staffordshire, Warwickshire and Worcestershire including the West Midlands conurbation as it does today. Records from Shrawley Wood in the Club's Annual Reports are few and far between and can be found on their web site.

One of the first national surveys undertaken by the British Trust for Ornithology was of woodcock in 1933 and 1934. The report on the results states that *"These two counties [Worcestershire and Warwickshire] were covered more completely and systematically than any other area of equal size owing to efforts of Mr. J. D. Wood, though there were no particulars from certain districts".* Overall there were 26 reports for Worcestershire and 24 for Warwickshire, summarised by Mr. Wood as follows: *In Worcs. breeds Teme valley, in some numbers Wyre Forest and other woods in NW and on high ground in NE, but not S of Hewell. On lower ground between Avon and Severn breeds occasionally, but no records from SW below Worcester (no information from extreme W). At least 60 pairs breed. Numbers said to be constant on some estates and to have decreased others; formerly bred in a few woods where not now. Apparent general decrease Wyre Forest recent years* (Alexander 1945).

In reviewing the Report on the woodcock enquiry in the West Midland Bird Club Annual Report, Wood (1945) notes *Most schedules [reports from sites] state that breeding has occurred for 70 years, but at Shrawley Wood it is said to have been going on "since the memory of man and before according to tradition"* (!); *numbers noted as steady; keeper says they do not migrate another says leave in October and replaced by migrants in November."*

Simon Walker's bird ringing activities

The first modern systematic data on the birds of Shrawley Wood come from a team led by Simon Walker who started to catch birds in mist nets for ringing in the 1970s. Narrow (about 2 metres wide) mist net rides were cut in two separate study areas.

They first worked mainly in the northern part of the wood purchased from Ruth Horton of Shrawley Wood House by the Forestry Commission (FC) in1961. This section of the wood had been 'devastated' by felling during WW2 as clearly shown in the 1945 aerial photograph viewable on Google Earth. Ordnance Survey (OS) maps dated 1953 show extensive open scrubby areas. FC cleared some conifer that had been planted years previously and attempted to remove lime coppice as described elsewhere in this book ('lime' in this chapter refers to small-leaved Lime *Tilia cordata* unless otherwise stated). At the time of the activities of Simon Walker *et al* the area was of regenerating scrub and young conifers. The exact sites are not known but in a report to FC this area was described as *'low coppiced lime/conifer plantation section of the north end of the wood'* and further ... *'the undergrowth is rich and quite dense consisting of much bramble and bracken'*. The report also contained a compiled list of 80 bird species recorded in Shrawley Wood, including some historical records. This is the first extensive list of spring and summer birds of Shrawley Wood and is in the appendix to the chapters on birds.

On the FC area, a total of 537 birds of 29 species were caught, ringed and released. Interestingly, summer visitor warblers – willow warbler, garden warbler, chiffchaff and blackcap – were the most frequently caught. Other summer migrant species included whitethroat, lesser whitethroat and tree pipit: all birds often found in young scrub habitats. Several resident species notably blackbird, song thrush, dunnock, robin, wren, redpoll and bullfinch were frequently caught. These species breed in a wide range of young woodland and scrub.

The second ringing study area lay within an area of young coppice in the privately owned part of the wood and the mist net sites are shown on the map (01). Here, in 1985, Simon Walker undertook one of the first Constant Effort Site (CES) studies developed by the British Trust for Ornithology (BTO) to assess annual productivity of breeding birds. The CES requires multiple visits between early May and late August using standardised netting effort. This area was one of the study plots subsequently chosen for a detailed 10-year census study described later in this chapter. Simon's totals of birds ringed in this area again highlighted the importance of young lime coppice for scrub birds and especially for summer visitors. Seven mist-netting visits were made in 1985 between 5th May and 7th July catching 262 birds of 23 species including many garden warblers and willow warblers (details are in the appendix to the chapters on birds). Many blue tits were also caught, probably adults moving to and from nest holes in big trees or young birds or foraging on insects in the young coppice. Unfortunately, the CES project did not continue beyond 1985. Simon's ringing work encouraged Rob Fuller and Harry Green to embark on their detailed census study which is the subject of the following section.

A 10-year bird survey in coppiced and thinned lime

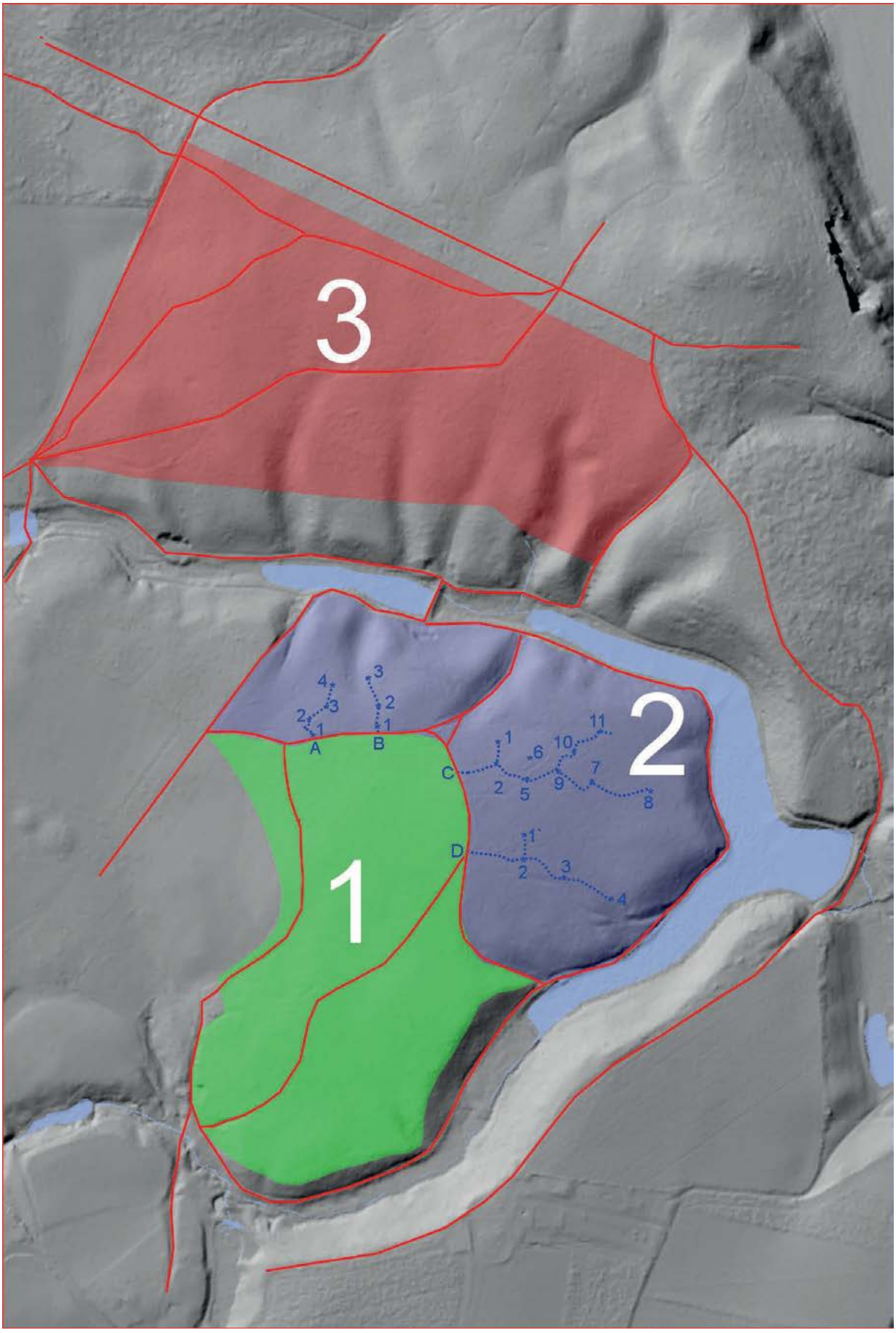
For ten years, 1984-1993, bird populations were assessed in three plots in Shrawley Wood. The results were published in 1998. The paper *"Effects of woodland structure on breeding bird populations in stands of coppiced lime (*Tilia cordata*) in western England over a 10-year period"* by R. J. Fuller and G H Green in *Forestry* 71:198-218 is reproduced facsimile within this chapter with permission of the publishers Oxford University Press and The Institute of Chartered Foresters. In this chapter this is referred to as 'the facsimile paper'.

The surveyed plots are described on pages 201-205 of the facsimile paper together with black and white photographs. Their location is shown on the map superimposed on a LiDAR image of Shrawley Wood in (01). The pictures that follow illustrate the changes in structure within the three plots during the10-year survey period.

Bird names

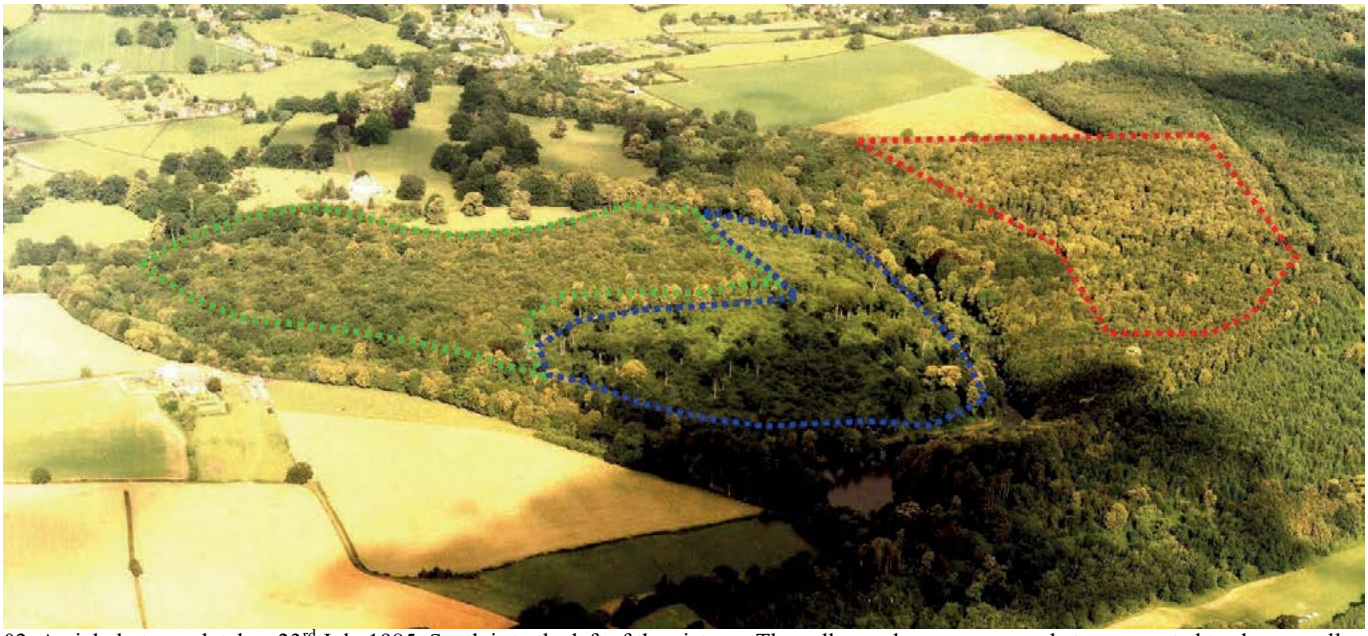
The scientific names and the currently accepted vernacular names are listed in the Appendix to the bird chapters.

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01. Map showing the location of the plots surveyed for birds 1984-1993 imposed on a LiDAR image of Shrawley Wood. The blue dotted paths in Plot 2 mark the mist net paths cut by Simon Walker for the Constant Effort Site study. Map prepared by Richard Pumphrey.

02 shows a scanned image of a print of an aerial photograph taken in July 1985, the second year of the survey.



02. Aerial photograph taken 23rd July 1985. South is to the left of the picture. The yellow colours are somewhat exaggerated to show small-leaved lime trees and old coppice in flower and to lessen the intensity of the cloud shadow. Bird survey plot 1 (old coppice) is bounded by green dots, plot 2 (young coppice) by blue dots and plot 3 (singled lime forming a high canopy) by red dots.

03 is taken from the same colour print as 02 and shows more precisely the tree and shrub structure of the survey plots 23rd July 1985. The area centre left is the part of the old unmanaged lime coppice (plot 1) showing a few big lime trees in full flower and a yellowish tint throughout the coppice canopy which is also in flower. This area was probably last coppiced in the 1940s. The top right hand corner shows part of the singled lime in flower (plot 3) probably created from stools last coppiced in the 1940s. The centre foreground is partly covered by cloud shadow. It shows young lime coppice (plot 2) with a scattering of big standard trees showing bare trunks. These are mainly oak with some lime. This young coppice was cut in 1979 and 1980, five and four years previously, probably from unmanaged coppice last cut in the 1940s. The bushy nature of the re-growing lime coppice is very obvious. The right hand corner of this plot shows an area where more big trees were retained forming lime coppice with standards of lime and oak. The spaces between the bushes are filled with bramble *Rubus* sp. and tall herbaceous plants. These areas of plot 2 proved to be excellent habitat for several species of migrant warblers.



03. This enlarged image from the photograph in 02 is centred on plot two.

The internal appearance of the three study plots is shown in monochrome in the facsimile paper pages 202-203. 04 shows the structure of the young coppice shown in the centre foreground of 03 but photographed July 1983, the year before the bird censuses began. Note the bramble and pink Rosebay Willow Herb *Chamaenerion angustifolium* between the bushy three year old lime coppice, the whole is ideal habitat for garden warblers.



04. Plot 2 young coppice as shown in the centre foreground of 03 photographed July 1983.

The following pictures 5-16 illustrate the structure of plots 1, 2 and 3 and the changes in plot 2 as the coppiced stools grew.

05 shows Plot 1 consisting old lime coppice uncut probably since the 1940s. Apart from the carpet of bluebells little else grows beneath the lime which cast heavy shade in summer. 06 shows the closed canopy of plot 1.

Photographs 07 to 11 show plot 2 and the growth of the young coppice, photographed at intervals from the same point on the NW side on the high bank of the New Pools looking SW and named **"The View"**. These pictures illustrate coppice growth from scattered lime 'bushes' in 1984 to a closed canopy by 1992 after which the view became obscured by other trees. The central oak tree acts as a marker against which the coppice growth can be seen. Note also the flush of epicormic growth on trunk and branches of the trees released after many years shading by tall unmanaged coppice probably previously cut in the 1940s.

Photographs 12-13 show the appearance within plot 2 in May 1992. The changes in the bird population are documented in the facsimile paper. Especially note the rise and fall of summer migrant warbler populations shown graphically on facsimile page 209.

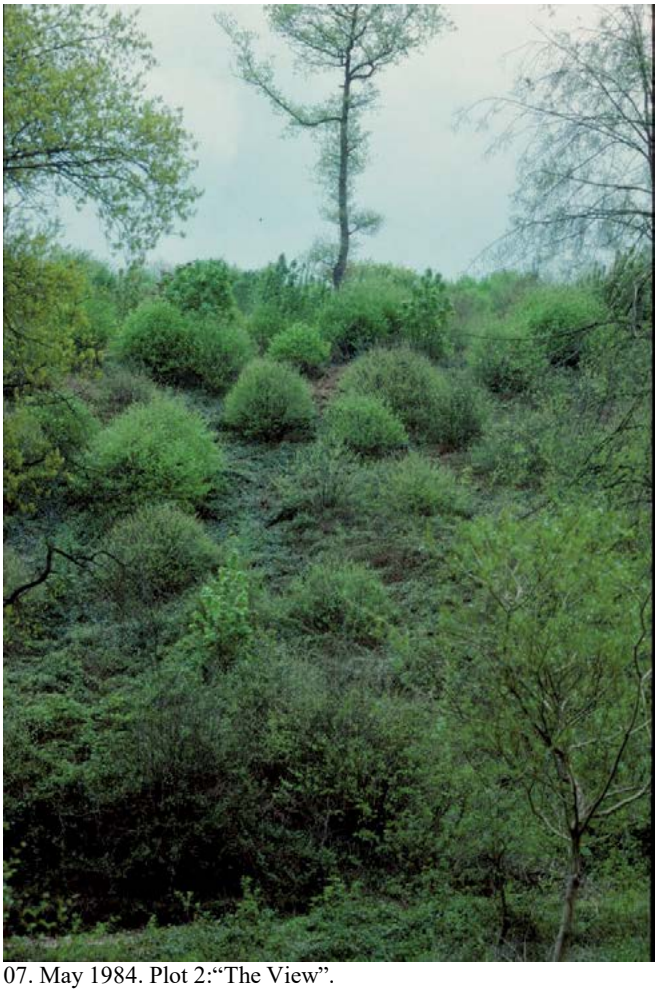
Photographs 14 Plot 3 May 1986 shows lime singled in the 1960s probably from old coppice last cut in the 1940s. Many of the trees show bushy re-growth at the base which dwindled as the years passed. The ground flora consisted mainly of low brambles and bluebells and the shrub layer of a scattering of holly and yew



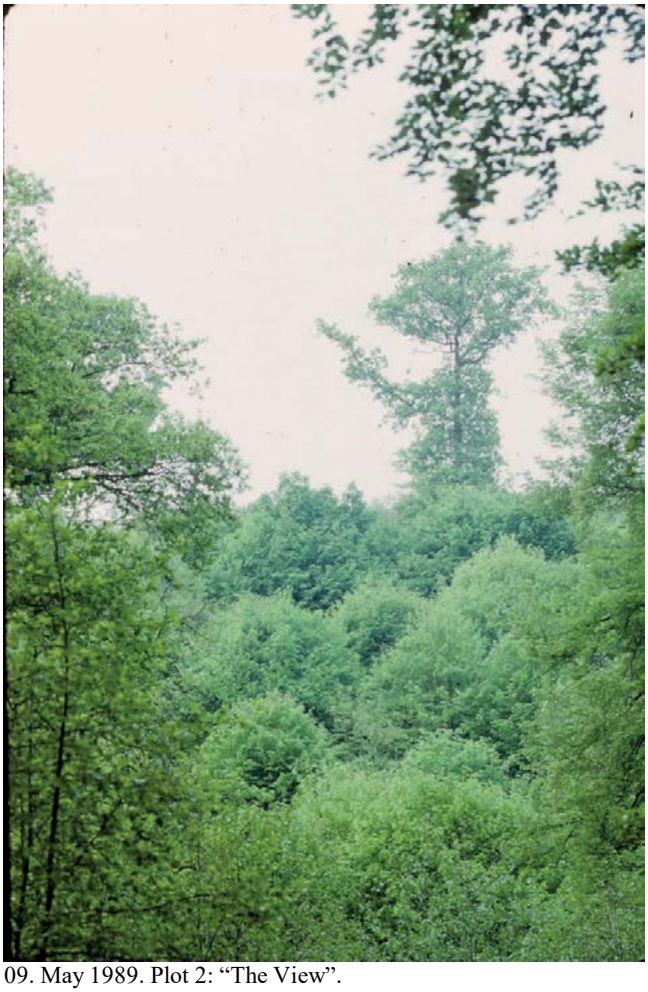
05. Plot 1 old coppice, photographed May 1991.



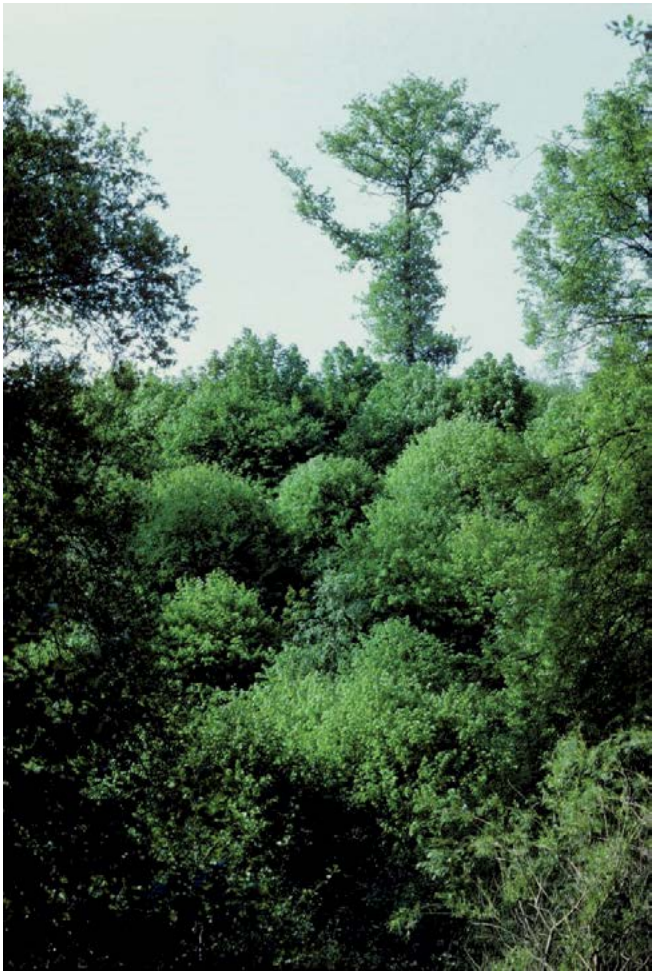
06 Plot 1 looking vertically to the canopy, photographed May 1989



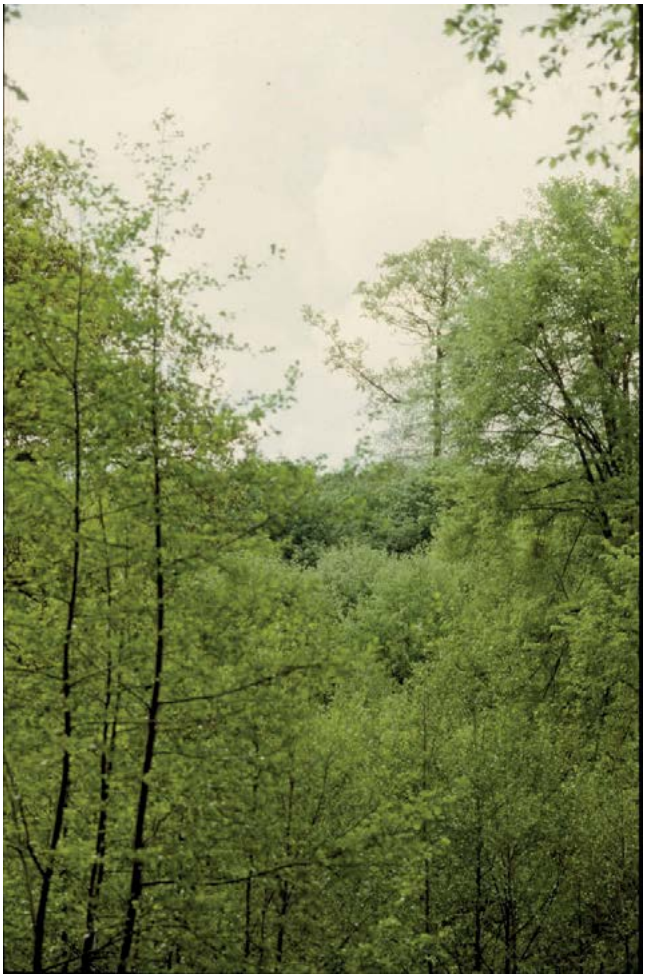
07. May 1984. Plot 2:“The View”.



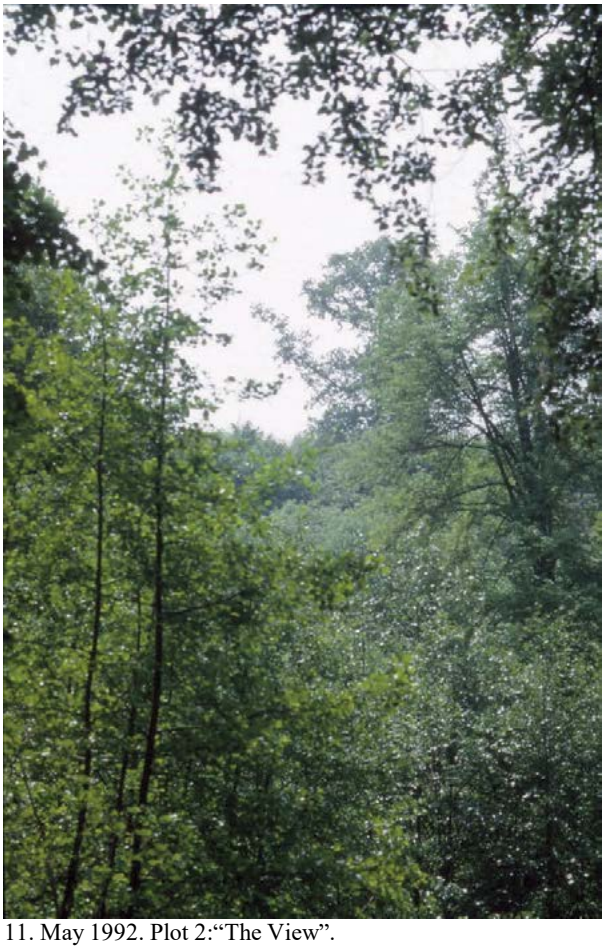
09. May 1989. Plot 2: “The View”.



08. May 1987. Plot 2:“The View”.



10. May 1991.Plot 2: “The View”.



11. May 1992. Plot 2:“The View”.



12. May 1992 within plot 2 showing complete shading-out of most shrubs and herbaceous plants other than bluebells.



13. May 1992 within plot 2 showing the multi- stemmed coppice at this stage. The number of stems reduce (self-thinning) as the growth ages – see chapter on coppice re-growth



14. Plot 3 of singled lime cut in the 1960s from old coppice last cut in the 1940s. Photographed in May 1986

In May 2017 an assessment of the vegetation structures of the woodland within each of the three plots was undertaken using exactly the same methods as described in Fuller & Green (1998). This gives a measure of the continuing changes in the vegetation structure in the absence of any further major management. The results are given in the appendix to the this chapter..

The facsimile of the paper by Fuller & Green is on the following pages. The results show which birds were present in May over the ten year period 1984-1993. These results are compared with earlier and present records in the pages following the facsimile.

Effects of woodland structure on breeding bird populations in stands of coppiced lime (*Tilia cordata*) in western England over a 10-year period

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Summary

Bird populations were estimated in three adjacent stands of small-leaved lime (*Tilia cordata*) at Shrawley Wood, Worcestershire, between 1984 and 1993. The stands were old coppice, recent coppice cut in the late 1970s and thinned coppice that had been singled probably in the 1970s. It is thought that the stands were all previously coppiced in the 1940s. The study area presented an unusual opportunity to (1) assess effects of woodland structure on bird populations in the absence of any major differences in tree species, (2) to compare the dynamics of bird populations, and hence assess habitat preferences, within large samples of each habitat. Overall densities of birds were consistently lowest in the old coppice and generally highest in the recent coppice. The singled coppice supported the least diverse bird communities as measured by a simple diversity index and the expected numbers of species within standardized samples of individuals. Warblers (Sylviidae) were strikingly more abundant in recent coppice than other habitats, being virtually absent from the old coppice. Wrens were by far the most abundant species in the singled coppice. There was strong evidence that the old coppice was the least preferred habitat of wren and robin. The most striking change during the study was the collapse of the warbler populations in the recent coppice after some 11 to 12 years of coppice growth. This was predictable from previous studies, but the timing of the warbler decline occurred later than expected and was probably a consequence of the relatively slow canopy closure of the coppice at Shrawley Wood. Differences between stands, and changes over the 10 years within stands, were interpreted in terms of habitat structure and effects of winter weather on survival of resident species. The findings are discussed in relation to management of abandoned coppice; it is suggested that for conservation purposes thinning should be regarded as a complementary approach, alongside coppicing and non-intervention.

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Introduction

Woodland in western Europe exhibits great variation in its associated bird communities. Numbers of species and densities of species can vary strikingly within small geographical areas, even between adjacent stands. Three of the predominant factors causing this variation are growth stage, stand structure and tree species (Fuller, 1995). Tree species differ in the food resources and habitat structures that they offer birds. Seldom is it possible to study the effects of woodland structure on bird communities in isolation from those of tree species. This paper, however, presents a case study of woodland management in which three different treatments were applied in adjacent stands of botanically uniform woodland in Shrawley Wood, Worcestershire. Differences in bird communities could, therefore, be attributed to the variation in woodland structure that arose from the management. Bird populations were surveyed annually over a 10-year period (1984–1993) to assess the consistency of bird distribution between the stands and to monitor responses of birds to structural changes within the stands.

The stands were ancient woodland with a long history of coppice management and were dominated by small-leaved lime (*Tilia cordata* Mill.). Large areas of unmanaged coppice woodland exist within many areas of lowland England. It is by no means clear which are the most appropriate treatments for such stands where conservation considerations apply (Fuller and Peterken, 1995). There are particular problems in restoring and maintaining active coppice regimes in the presence of increasing deer numbers (Kay, 1993; Cooke and Lakhani, 1996). In presenting a comparison of unmanaged coppice, recently cut coppice and singled coppice, this paper provides information that is relevant to the issue of whether old coppice is best left alone, re-coppiced or transformed to high forest.

Actively coppiced woods are typically composed of a patchwork of small coppice compartments at different stages of growth. Previous studies of the responses of birds to coppicing have relied on comparisons of different compartments at various stages of growth in one or a small number of years (Fuller, 1992). During the 1980s Shrawley Wood gave a rare opportunity to examine changes in bird populations over several years within an unusually large area of even-aged recently cut coppice. This opportunity was all the more valuable because the recently cut coppice was adjacent to stands of derelict and singled coppice. Single year studies may generate patterns of habitat preference that are more apparent than real. Underlying habitat preferences may become clearer if observations are made over several years to determine whether the distribution of individuals differs between habitats at varying population levels. This is because populations in preferred habitats may be expected to exhibit greater stability than those in less preferred habitats, even though densities may not differ greatly between habitats in some years (Glas, 1960; Fretwell and Lucas, 1970; O'Connor, 1986). In this paper the dynamics of bird populations in three coppiced habitats are examined over a 10-year period with the aim of assessing habitat preferences of individual species.

Study area

Shrawley Wood appears to be ancient primary woodland. The first written record is from 1588 and the earliest information on woodland management from 1760. Accounts from the late eighteenth and nineteenth centuries show that the wood was rotationally coppiced (Gough, 1982). The wood, which now covers about 300 acres, was then much larger, probably exceeding 500 acres in the early 1800s. It was mapped in 1731–32 by the famous Worcestershire map makers, the Dougharty family, as part of their map of the Hanbury estates, and the map shows woodmen felling trees, a quarry and a weir on the nearby River Severn (Smith, 1967).

Shrawley Wood (grid reference SO810660) is unusual for the strong dominance of small-leaved lime which occurs as almost pure stands over substantial areas (Hadfield, 1963). Small-leaved lime appears to have been the dominant tree in Shrawley Wood for a long time. Writing in 1856, Lees says that the lime was coppiced throughout the wood and therefore rarely flowered, although ancient trees at the woodland edge were undoubtedly small-leaved lime. West

Worcestershire from Wyre Forest to the southern end of the Malvern Hills was, and to some extent still is, a notable 'lime zone' with native unplanted small-leaved lime in many woods and hedgerows. Within the zone, Shrawley Wood has been the most extensive stand for centuries (Lees, 1856, 1867; Elwes and Henry, 1913). Shrawley Wood remains an exceptional place which so inspired Oliver Rackham on a visit in 1985 that he used a photograph of our old coppice census plot on the dust jacket of the revised edition of his book (Rackham, 1990).

In 1959 part of the wood was acquired by the Forestry Commission and in the following years some areas of lime were planted with Douglas fir (*Pseudotsuga menziesii* (Mirb.) Franco). Of the surviving area of lime, 57 ha are currently managed by Forest Enterprise within a formal management plan designed to maintain and enhance the nature conservation value of the site. An adjacent area of the wood is privately owned and contains a further approximately 25 ha of lime. During the nineteenth and early twentieth centuries the lime was coppiced and was grown beneath oak (*Quercus* spp.) standards. Much of the oak has since been felled, mainly to pay death duties, so that large standard trees are now sparsely distributed. Coppicing appears to have been last carried out on a large scale in the 1940s. Subsequently two types of management have been implemented within the surviving lime stands. First, the Forestry Commission singled (i.e. thinning to leave single stems on each stool) most of the old lime coppice under its management, though exact dates of the thinning are unavailable. Second, the private owner re-coppiced an area of 9.8 ha of old lime coppice over a 2-year period (1979–1980). A stand of unmanaged lime coppice remained in the private part of the wood thus providing a control against which the effects of the singling and the coppicing could be compared.

The study area covered 35 ha of lime woodland which included nearly all the available area of unmanaged lime, the entire area of recent coppice and a large sample of the singled lime. The unmanaged lime and recent coppice were directly adjacent. The area of singled lime selected for the study was that closest to the other two study plots and was at its closest point approximately 100 m from the recent coppice. The three study plots were at similar altitude (40–60 m) and on similar soils overlying Triassic Keuper sandstone. The soils are generally free-draining and often mildly acidic, although soil pH varies from 4.5 to 8.5, and there is a considerable mix of both calcifuge and calcicole plants ranging from foxgloves (*Digitalis purpurea*) to yellow-wort (*Blackstonia perfoliata*). Soil profiles reveal bands of calcareous material which perhaps explains why small-leaved lime thrives in much of the wood (Simmons, 1970). Each plot contained small patches of relatively acid ground characterized by bracken (*Pteridium aquilinum*) and low densities of coppice stools. Throughout the period of the study, no woodland management activities were undertaken within the three study plots. Furthermore, deer were extremely scarce on the study area throughout the entire period and are not thought to have affected the woodland structure. The structures of three plots are illustrated in Figure 1 and a summary of their vegetation characteristics is given in Table 1. Further details of the three plots are given in the following descriptions.

Plot 1 Unmanaged lime coppice (10.3 ha)

The lime trees were probably last coppiced in the 1940s and grow with a scattering of standards of oak and sweet chestnut (*Castanea sativa*). The lime was mixed with far smaller quantities of birch (*Betula* spp.), sycamore (*Acer pseudoplatanus*), sallow (*Salix* spp.) and elder (*Sambucus nigra*). The birch and sycamore were very patchy in their distribution. There was no shrub layer, virtually no bramble (*Rubus fruticosus*) and the field layer was dominated by bluebell (*Hyacinthoides non-scriptus*) or ramson (*Allium ursinum*) in damper areas. The ground was more or less level except on the southern edge where it dropped steeply to a stream which lay outside the plot boundary. The density of the lime stools was estimated in 1985 by establishing two 20 × 30 m quadrats considered to be typical of the plot. All lime stools within the quadrats were mapped and distances to nearest neighbours measured, centre stool to centre stool. A total of 50 lime stools was recorded with a mean inter-stool distance of 3.34 m (s.e.

Figure 1. The three study plots: (a) old coppice, (b) recent coppice, (c) singled coppice. The old coppice was photographed at the end of the study, the recent and singled coppice at the start of the study (photographs D. and G.H. Green).


(c)


(b)

Table 1: Vegetation in 1984 and 1990 based on measurements made within four randomly located 10-m radius circles in each stand. Stem diameters and numbers of trees were only recorded in 1984

		Old coppice		Recent coppice		Singled coppice	
Canopy cover*	1984	93	(90–95)	2	(0–5)	71	(65–75)
(range) (%)	1990	95	(all 95)	4	(0–10)	85	(75–95)
Shrub cover†	1984	1	(0–2)	44	(30–55)	15	(5–30)
(range) (%)	1990	2	(0–4)	89	(70–95)	28	(15–40)
Bramble cover‡	1984	0	(0)	9	(5–15)	89	(80–95)
(range) (%)	1990	0	(0)	13	(5–20)	93	(80–100)
Canopy height§	1984	17	(16–18)	—		20	(20–21)
(range) (m)	1990	19	(18–20)	—		22	(20–23)
Shrub height¶	1984	1	(0–2)	4	(3–4)	4	(2–7)
(range) (m)	1990	2	(0–3)	9	(7–10)	6	(4–9)
Stem diameter‖							
d.b.h. 10–20 cm		199	(78%)	10	(83%)	18	(38%)
d.b.h. 20–30 cm		51	(20%)	0		26	(54%)
d.b.h. 30–40 cm		2	(1%)	0		3	(6%)
d.b.h. >40 cm		3	(1%)	2	(17%)	1	(2%)
Number of trees**							
Tilia cordata		80	(77%)	54	(78%)	53	(100%)
Acer pseudoplatanus		1	(1%)	13	(19%)	0	
Quercus spp.		3	(3%)	2	(3%)	0	
Betula spp.		17	(16%)	0		0	
Salix spp.		3	(3%)	0		0	

* Canopy defined as foliage >10 m above ground. Mean of four estimates to nearest 5%.
† Shrub layer defined as foliage <10 m above ground. Mean of four estimates to nearest 5%.
‡ Bramble cover estimated to nearest 5%. Mean of four estimates.
§ Canopy height estimated with hypsometer. Mean of four maximum total height estimates. Only scattered standards present within recent coppice.
¶ Shrub height was the maximum height of woody foliage in the shrub layer.
‖ Total number of stems within 10-m radius circles according to diameter at breast height classes.
** Number of single-stemmed and multi-stemmed trees (i.e. coppice stools plus standards >10 cm d.b.h.).

0.15). This stool density is probably typical of much of Shrawley Wood, excluding the most acid areas.

Plot 2 Recent coppice (9.3 ha)

The tree species composition was very similar to plot 1 with a dominance of lime and lesser amounts of birch and sycamore in the understorey and scattered oak, small-leaved lime and sweet chestnut standards. The plot was coppiced in 1979 and 1980 so that when the study started in 1984 the coppice on approximately half the plot had completed four summers of growth and the remainder five summers of growth. At the time of coppicing the coppice was of similar age to that on plot 1. Vigorous bramble grew in parts of the plot. Approximately two-thirds of the plot were level, the remainder being steep slopes to the north and east.

Plot 3 Singled coppice (14.9 ha)

This was almost pure single-stemmed lime with virtually no larger standard trees. It is likely that non-crop trees were removed at the time of thinning. The singling probably occurred in the mid 1970s and at the time of singling the lime was of similar age to that on plot 1. There was a very small amount of birch and a handful of isolated yews (*Taxus baccata*). A small proportion of

limes were showing multi-stemmed regeneration 1–2 m high from the cut stumps (this growth did not increase markedly during the study period). Bramble growth 0.5–1 m in height was extremely vigorous throughout most of the plot. The ground gently sloped to the south with several steeper gullies.

Botanical nomenclature follows Stace (1991).

Methods

Vegetation measurement

In 1984 and 1990 measurements of vegetation were made in each plot to permit broad comparisons of vegetation structure. Within each plot four 10-m radius circles were positioned at random with the condition that the centre of each was at least 50 m from the plot boundary. Canopy cover, shrub layer cover and bramble cover were each estimated by eye to the nearest 5 per cent. Woody foliage more than 10 m above ground was regarded as the canopy layer and that below 10 m as the shrub layer. Canopy height (top height) was estimated to the nearest 0.5 m using a hypsometer. All trees greater than 10 cm diameter at breast height were identified and stems allocated to d.b.h. classes.

The recent coppice underwent far larger changes than the other two plots during the study period. Therefore, additional measurements of vegetation structure were made at this plot in most years. In 1985 seven 10-m radius circles were located at random and coppice cover and coppice height were estimated at each. Coppice height was estimated in two ways—maximum height of any stool within the circle and the height at which the coppice regrowth was judged to be widespread. In subsequent years the sample was increased to 10 circles (the same locations were used each year) and an additional variable was recorded—the density of the shrub layer at 1.5 m above ground. This was scored on a subjective scale from 5 (extremely dense foliage) to 1 (no shrub layer).

Bird counts

A simple territory mapping method was used (Bibby *et al.*, 1992). The aim of the counts was to derive an index of abundance for each species on each plot to permit robust comparisons of abundance between plots and to determine trends in numbers over time. We did not aim to determine the absolute population size of each species within the study area. Each plot was visited on three occasions during which the locations and activities of all birds were marked on 1:2500 maps. On each visit the observer covered the entire plot systematically by a series of transects, recording birds up to a distance of 50 m beyond the plot boundary. Based on experience in the field, differences in vegetation structure between plots were not considered to have been sufficient to have greatly affected detectability of birds and hence compromise comparisons between plots. In all plots the great majority of individual birds were detected by songs and calls, rather than visually. Much emphasis was given to recording simultaneously singing individuals of the same species. All fieldwork was carried out by the authors who alternated their visits to individual plots to ensure that comparisons between plots could not be confounded by variation in observer efficiency.

In each year the three visits were timed to take place in mid-May after the main arrival of migrant birds, notably warblers (Sylviidae). Each plot received two morning and one evening visit. At the end of the fieldwork the registrations (the mapped records of birds made in the field) were transferred to species-specific maps and were interpreted in terms of probable territories using guidelines adapted from those employed in conventional territory mapping with larger numbers of visits (International Bird Census Committee, 1969). Initial analysis used simultaneously recorded birds, especially singing birds, to identify approximate locations of territories. *Probable territories* had to contain registrations from at least two of the three visits. *Possible territories* were also recognized in those cases where the evidence was based on a registration from just one of the three visits. For purposes of analysis, probable territories where at least two registrations lay on or inside the plot boundary were given a score of 1.0, probable territories with just one registration within the boundary scored 0.5 and possible territories also scored 0.5. For each species in each year the total territory score was calculated and divided

by the plot area to give a measure of density expressed as territories per 10 ha.

Analyses have been restricted to songbirds, which are defined here as all passerines excluding Corvidae and starling (scientific names of birds are in Appendices 1–3). The reason for limiting analysis to this group of species is that territory mapping tends to be more efficient for these species. Many non-passerines are wide-ranging and have poorly defined territories. This procedure is consistent with previous similar studies (e.g. Fuller and Henderson, 1992).

Analysis of songbird species number was conducted using rarefaction, a non-parametric technique that estimates the expected number of species in a defined number of individuals drawn at random from a larger sample (James and Rathbun, 1981; James and Wamer, 1982). Comparisons of species number that are not corrected for variations in sample size are likely to be biased because larger samples of individuals are expected to contain more species. Rarefaction can be used to avoid this bias by estimating the number of species in a standardized number of individuals. The expected number of species can only be estimated for a sample containing fewer territories than the original sample. In the present study rarefaction was used to estimate the number of songbird species in samples containing 20 and 40 territories. The former sample permitted comparison of species number in the three plots for each year, with the exception of the old coppice in 1985 where only 19 territories were recorded. The latter allowed comparison of species number between the recent and singled coppice, with the exception of 1993 when only 35 territories were recorded in the recent coppice. Species diversity was also measured using the Berger–Parker index (May, 1975) which was calculated as the proportion of total territories contributed by the most abundant species. We term this index 'songbird dominance' and high values indicate strong dominance by one species, and hence relatively low diversity.

Results

Vegetation: comparison of plots

Vegetation structure is summarized in Table 1 and the three stands are illustrated in Figure 1. Canopy cover was highest, shrub cover lowest and bramble cover lowest in the old coppice. The singled coppice had by far the greatest cover of bramble which formed a uniform carpet over much of the stand, in places exceeding a height of 1 m. Canopy height was similar in the old and singled coppice and in 1984 was four to five times taller than most of the trees in the recent coppice. By 1990 the recent coppice had grown to approximately half the canopy height of the other stands. The structure of the old coppice remained virtually unchanged throughout the study. The singled coppice, however, underwent some closing of the canopy and an increase in the cover and height of the shrub layer. By far the most striking changes in vegetation structure occurred in the recent coppice which grew rapidly over the 10 years of the study.

Vegetation changes in the recent coppice

Changes in vegetation within the recent coppice are detailed in Table 2. At the start of the study the coppice was extremely open—on average less than 50 per cent of the ground was covered by coppice foliage—and individual coppice stems did not exceed 4 m in height. Ten years later the coppice canopy was fully closed and the height of the coppice had increased threefold to fourfold. The rate of canopy closure was variable from one part of the plot to another. As early as 1987, when the coppice had grown for 7–8 years, parts of the plot had a nearly closed canopy. It was not until 1991, however, that the canopy was virtually closed over most of the plot. The growth of the coppice was accompanied by the disappearance of low dense foliage as bramble, rose-bay willowherb (*Chamaenerion angustifolium*), birch saplings and the lower branches of the stools themselves became shaded out. The shrub layer density index shows that by 1992, after 12 to 13 summers of growth, the coppice had become very open beneath the canopy. Large vigorous patches of bramble persisted widely until 1990, but by 1993 only a few isolated small patches remained and these were confined to the eastern side of the plot where the coppice was thought to be the youngest.

Bird populations

Densities of bird species in each of the three plots are detailed in Appendices 1–3 and trends in densities are illustrated for selected species in Figure 2.

There were substantial differences between plots in the densities of species. The most striking difference between plots was that during the first 8 years garden warbler, chiffchaff and willow warbler were far more abundant in the recent coppice than elsewhere. Blackbird, robin, blackcap and blue tit were also most abundant in the recent coppice in the majority of years. Densities of the first three of these species were always higher in recent than old coppice. Wren was consistently most abundant in the singled coppice. No species was consistently most abundant in the old coppice though great tit reached highest density in that habitat in 7 years. Wren, robin, blackcap and chiffchaff tended to be scarcest in the unmanaged coppice, chaffinch in the recent coppice and blue tit and great tit in the singled coppice.

Relatively cold winters in 1984/85, 1985/86 and 1990/91 reduced national populations of some species of resident birds (Marchant *et al.*, 1990; Marchant and Musty, 1992) and this effect is evident in the population trends of wren and robin at Shrawley. There were, however, differences between habitats in the population changes especially for wren. In the early 1980s both species reached considerably lower population levels in the old coppice than in the other habitats. In the case of wren, numbers recovered to a much higher level in the singled coppice than elsewhere and they recovered most slowly in the old coppice. The decline in wrens between 1990 and 1991 was least severe in the singled coppice (41 per cent compared with 70 per cent in the recent coppice and 80 per cent in the old coppice). In the case of robin the decline between 1990 and 1991 was also largest in the old coppice (81 per cent) but similar in the recent coppice (48 per cent) and singled coppice (43 per cent).

Until the early 1990s overall density was consistently highest in the recent coppice, intermediate in singled coppice and lowest in old coppice (Figure 3a). In the last 3 years of the study overall density in the recent coppice declined sharply and in the final year was lower than that in singled coppice. This trend was largely due to the pattern of change in warbler (Sylviidae) populations which were very high in the recent coppice in the first 5 years but collapsed thereafter (Figure 3c). Densities of thrushes (Turdidae) also tended to be highest in recent coppice and lowest in old coppice and this pattern was evident in both the early and

Table 2: Changes in vegetation structure in the recent coppice plot based on estimates within 10-m radius circles. No measurements were made in 1988

Year	*n*	Coppice cover* (range) (%)		Coppice ave. height† (range) (m)		Coppice max. height‡ (range) (m)		Shrub layer§ density index
1984	4	44	(33–55)	1.6	(1.5–2.0)	3.6	(3.0–4.0)	—
1985	7	60	(50–75)	2.0	(1.5–2.5)	3.1	(2.5–3.5)	—
1986	—	—	—	—	—	5.5	(4.0–6.0)	—
1987	10	83	(70–95)	2.8	(2.5–3.0)	7.0	(6.0–8.0)	3.9
1989	10	87	(70–95)	4.4	(4.0–5.0)	7.1	(6.0–8.0)	2.7
1990	10	92	(70–100)	4.6	(4.0–6.0)	8.2	(7.0–10.0)	2.6
1991	10	96	(90–100)	6.0	(5.0–7.0)	9.0	(8.0–10.0)	2.3
1992	10	97	(80–100)	6.9	(6.0–8.0)	9.2	(9.0–10.0)	1.6
1993	10	99	(90–100)	7.0	(6.0–8.0)	10.0	(9.0–11.0)	1.4

* Mean coppice cover estimated to nearest 5%.

† Mean height at which coppice growth judged to be most widespread (estimated to nearest 0.5 m).

‡ Mean maximum total height of coppice growth (estimated to nearest 0.5 m).

§ Index of foliage density at 1.5 m above ground. Each point scored on scale from 5 (extremely dense foliage) to 1 (no shrub layer). Mean value of scores taken as the index.

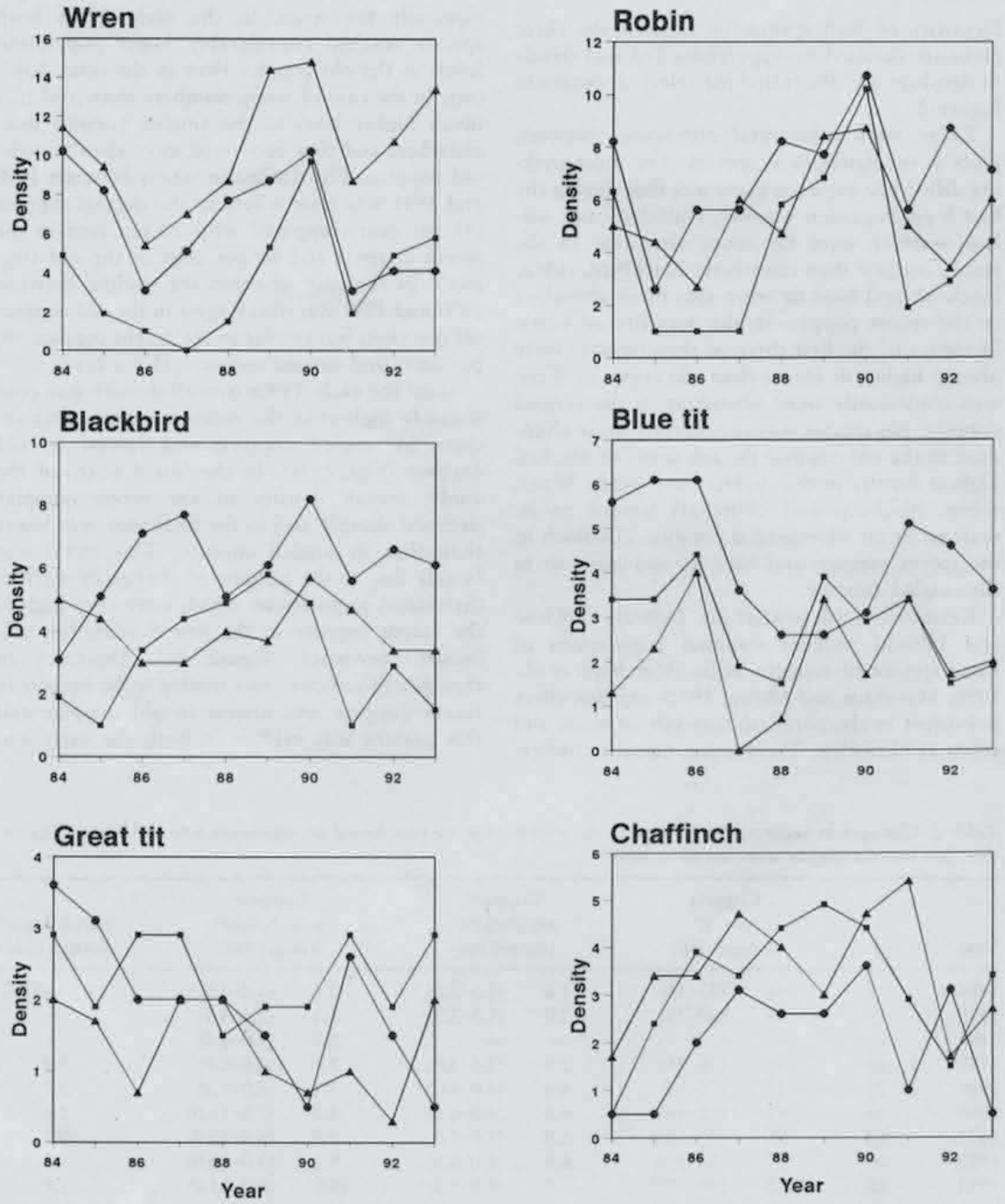
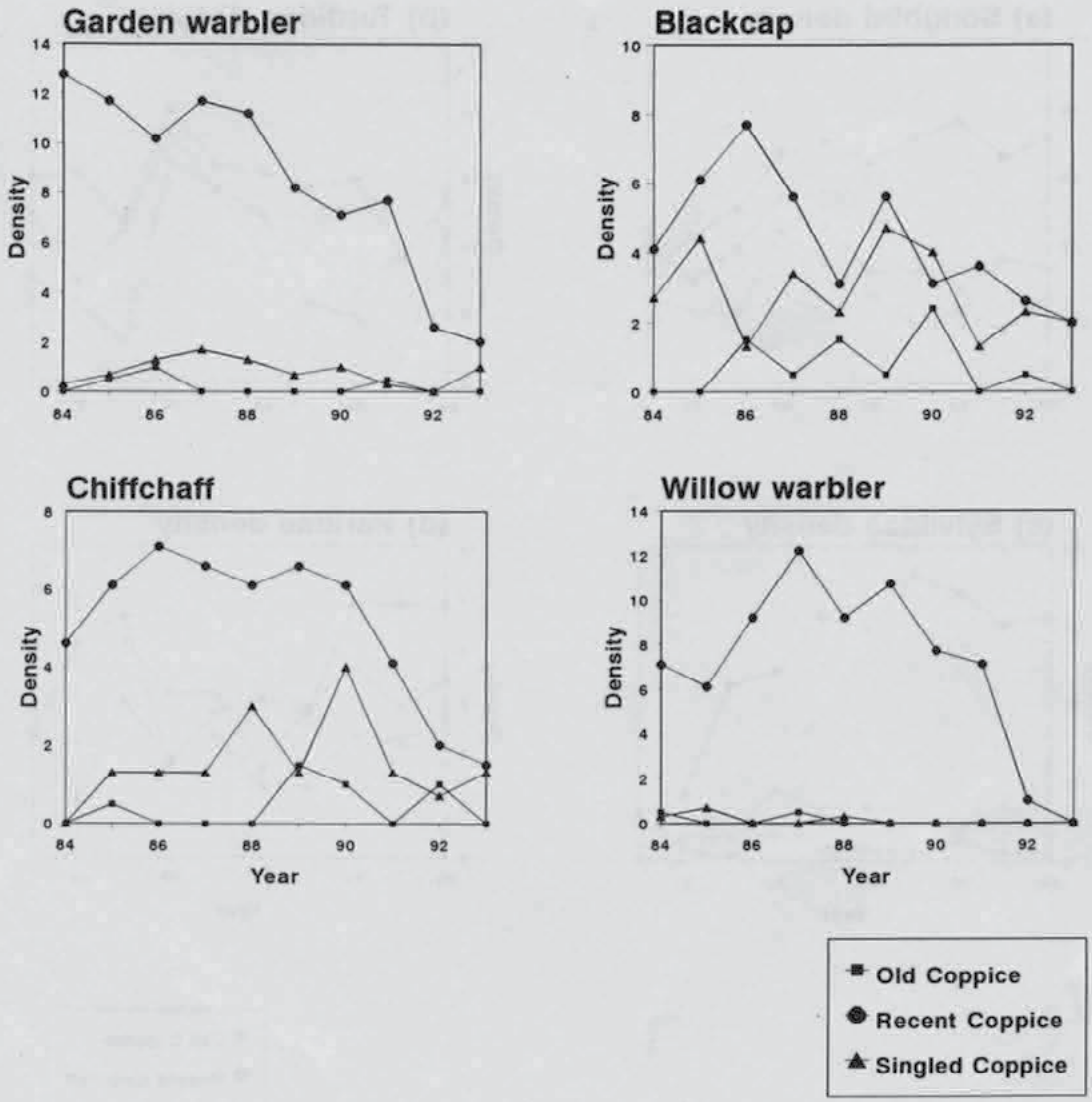


Figure 2. Densities (territories 10 ha^{-1}) of 10 species of songbirds. Squares are the old coppice, circles are the recent coppice and triangles are the singled coppice. The species shown are all those that were among the five most abundant in each plot in any single year.



late years of the study with no evidence of a decline in recent coppice (Figure 3b). Tits (Paridae) were least abundant in the majority of years in the singled coppice (Figure 3d).

Each of the four common warbler species—garden warbler, blackcap, chiffchaff and willow warbler—underwent a strong population decline in the recent coppice (Figure 2). Turtle dove, whitethroat, dunnock, yellowhammer were also confined to, or were characteristic of, the recent coppice in the earlier years of the study but not in the later years (Appendix 2). Unlike the recent coppice, there was no evidence of any systematic change in bird species composition within the old or singled coppice.

In the first half of the study, higher numbers of species (total species and songbird species) were recorded in the recent coppice than elsewhere (Figures 4a and 4b). In the majority of years fewer songbird species were recorded in the old coppice than in the other plots. Use of rarefaction, however, showed that the expected number of species in a sample of 20 territories did not in fact differ greatly between the old and recent coppice (Figure 4c). Rarefaction indicated that in most years the number of species was

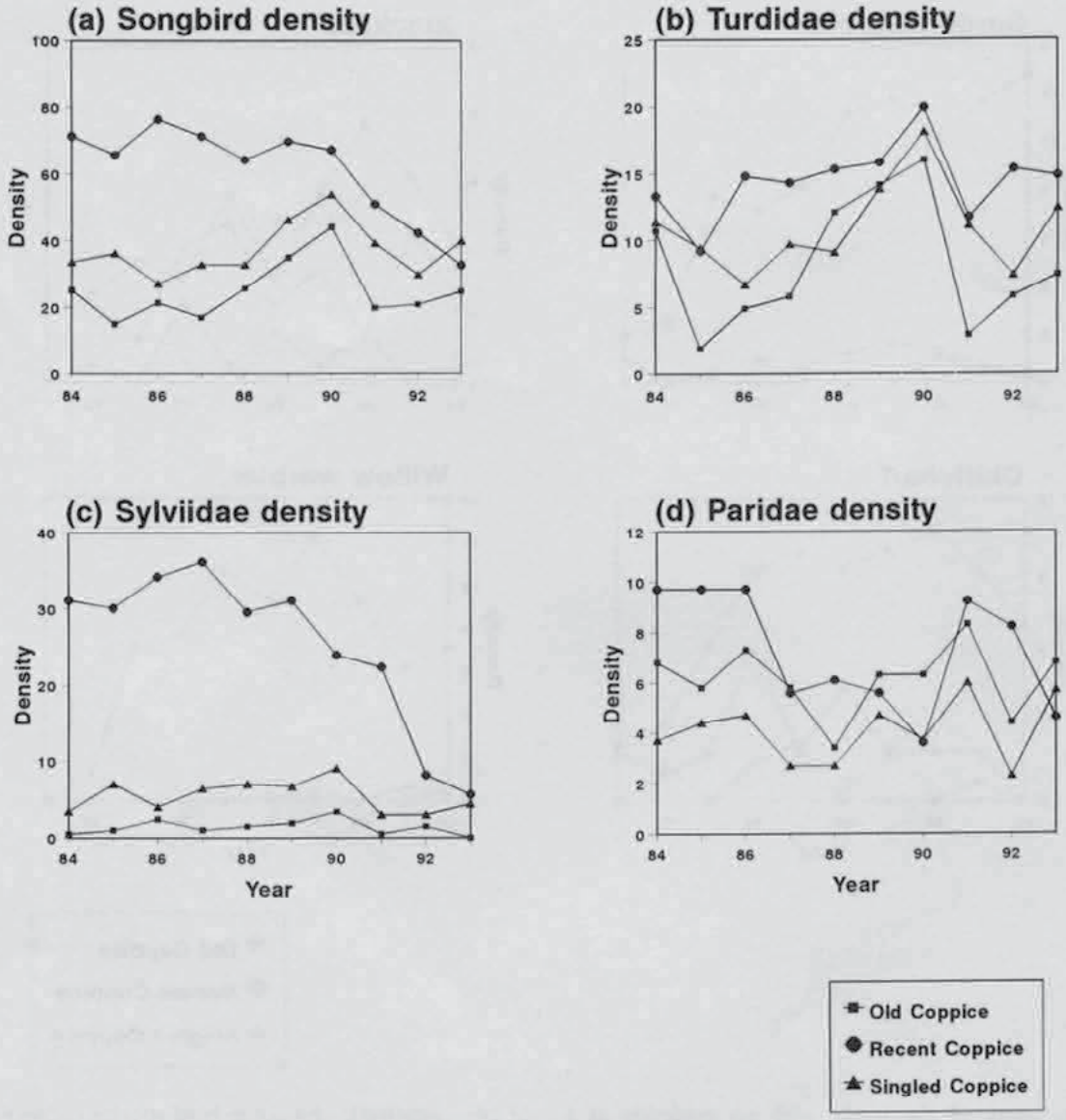


Figure 3. Densities (territories 10 ha^{-1}) of songbirds: (a) all species combined, (b–d) species within three families. Species within each family recorded on the study areas were: Turdidae (thrushes and chats)—robin, blackbird, song thrush, mistle thrush; Sylviidae (warblers)—whitethroat, garden warbler, blackcap, wood warbler, chiffchaff, willow warbler; Paridae (tits)—marsh tit, willow tit, coal tit, blue tit, great tit.

lower in the singled coppice than the recent coppice, though in some the difference between the plots was not large in terms of absolute numbers of species (Figures 4c and 4d). Songbird dominance was consistently lowest in recent coppice and generally highest in singled coppice where the bird community was strongly dominated by wren (Figure 4e). These results indicate that the singled coppice tended to support the least diverse communities of birds.

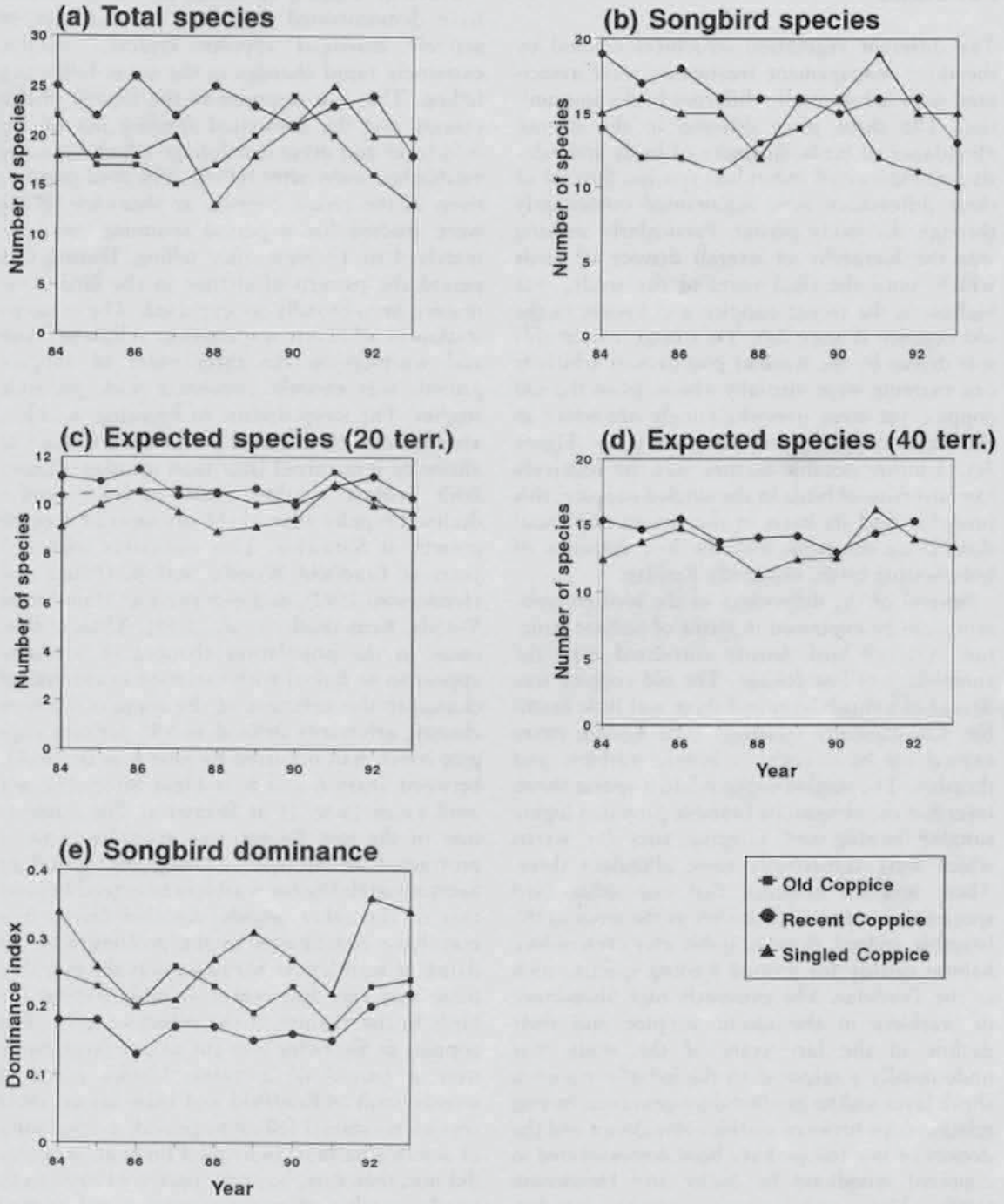


Figure 4. Trends in numbers of species and diversity: (a) all species uncorrected for area or sample size, (b) songbird species uncorrected for area or sample size, (c) expected number of species in a sample of 20 territories, (d) expected number of species in a sample of 40 territories, (e) songbird dominance.

Discussion

The different vegetation structures created by the three management treatments were associated with substantially different bird communities. The three plots differed in the overall abundance of birds, diversity of birds and relative abundance of individual species. Several of these differences were maintained consistently through the study period. Particularly striking was the hierarchy of overall density of birds which, until the final years of the study, was highest in the recent coppice and lowest in the old coppice (Figure 3a). To a large extent this was driven by the warbler populations which at one extreme were virtually absent from the old coppice yet were overwhelmingly abundant in the recent coppice until the last 2 years (Figure 3c). Another notable feature was the relatively low diversity of birds in the singled coppice; this probably had its basis in the strong numerical dominance of wrens and the low densities of hole-nesting birds, especially Paridae.

Several of the differences in the bird communities can be explained in terms of habitat structure. Overall bird density correlated with the complexity of low foliage. The old coppice was devoid of a shrub layer and there was little bramble. Consequently relatively little nesting cover existed for birds such as wrens, warblers and thrushes. The singled coppice had a sparse shrub layer but the ubiquitous bramble provided highly suitable nesting and foraging sites for wrens which were consistently most abundant there. There was no evidence that any other bird species responded as positively as the wren to the bramble. Indeed, dense bramble may even reduce habitat quality for ground feeding species, such as the Turdidae. The extremely high abundance of warblers in the recent coppice and their decline in the last years of the study was undoubtedly a response to the initially vigorous shrub layer and its gradual disappearance. Strong relationships between warbler abundance and the density of low foliage have been demonstrated in coppiced woodland by Fuller and Henderson (1992). Hole-nesting species notably Paridae, nuthatch and treecreeper were scarcest in the singled coppice. In part this may have been due to the relatively small number of large standard trees in the singled coppice.

Previous studies, reviewed by Fuller (1992), have demonstrated that bird communities in actively managed coppice typically exhibit extremely rapid changes in the years following felling. This is a response to the closing of the canopy and the associated shading out of the field layer and other low foliage which becomes established soon after felling. The bird populations in the recent coppice at Shrawley Wood were studied for a period spanning approximately 4 to 13 years after felling. During this period the pattern of change in the bird community was broadly as expected. The concentration of whitethroat, dunnock, yellowhammer and warblers in the early years of coppice growth was entirely consistent with previous studies. The steep decline of breeding warblers after canopy closure was predictable, though at Shrawley it occurred later than in other woods. Both willow warbler and garden warbler declined rapidly after 11–12 summers of coppice growth at Shrawley. This compares with 5–7 years at Bradfield Woods, Suffolk (Fuller and Henderson, 1992), and 6–9 years at Ham Street Woods, Kent (Fuller *et al.*, 1989). These differences in the population changes of warblers appear to be linked with variation in the rate of change in the structure of the coppice. Canopy closure, arbitrarily defined as >95 per cent coppice cover, had occurred by year 6 at Bradfield, between years 6 and 8 at Ham Street but not until years 10 to 11 at Shrawley. The attenuation of the low foliage was accordingly more protracted at Shrawley causing the period of habitat suitability for warblers to extend beyond that of the other woods. Another factor that may have contributed to the prolonged abundance of warblers at Shrawley was the fact that there was very little other suitable habitat for birds in the vicinity of the recent coppice. The coppice at Shrawley was cut as one large block over a period of 2 years. Unlike coppiced woods, such as Bradfield and Ham Street, there was no rotational felling to provide a continuity of suitable habitat. Individual birds at Shrawley did not, therefore, have the option of moving to nearby patches of younger coppice and so may have remained longer in deteriorating habitat than might be the case in rotational coppice. In the absence of information about the fidelity of individual birds to particular coppice patches

the likely importance of this factor is unknown.

The recovery of wren and robin from the hard winters in the early 1980s was slower in the old coppice than in the recent and singled coppice. This strongly suggests that during the 1980s old coppice was the least preferred habitat of these species. As overall population size rose, birds appear to have preferentially occupied the recent and singled coppice. A hierarchy of habitat occupancy by the wren in relation to its population level was also recorded by Williamson (1969) who showed that woodland and streamsides were occupied preferentially to gardens and hedges. The data from Shrawley, however, indicate that far more subtle patterns of habitat occupancy can operate within woodland habitats. Declines of wren and robin in 1991 were strongest in the old coppice. Furthermore, both species achieved by far their highest densities in the old coppice in 1990 which was the year in which their overall population levels were greatest. These observations are consistent with the notion that the old coppice was a suboptimal habitat for both species. Unfortunately no data are available on the fitness of the birds in the different habitats, either in terms of breeding production or survival, so the underlying mechanisms for the observed density-dependent pattern of habitat selection are unknown.

Following the 1990/91 winter, wrens declined least in singled coppice and they recovered quickly in this habitat. In contrast to the declines of the 1980s, however, the wren population did not recover in the recent coppice. This is probably because by the 1990s the recent coppice had started to assume a similar structure to the old coppice and was no longer prime habitat for the species. Previous studies show that wren and robin are relatively scarce in the earliest years of coppice growth but they rapidly colonize the coppice and typically level off at about 4–6 years of growth (Fuller, 1992). In some woods wrens decline after canopy closure but robins remain abundant and are typically one of the dominant species in old abandoned coppice. By the time the present study was started both species were firmly established in the recent coppice. It is reasonable to assume, therefore, that the changing habitat structure within the recent coppice had less influence on numbers of these two species than winter weather, at least until the last 2 years of the study.

Hard weather effects were not apparent in other species with the possible exceptions of blackbird and chaffinch which declined sharply in 1991 in the old coppice. This possibly indicates that the old coppice was the least preferred habitat for these species but the evidence is less compelling than for wren and robin. There were two marked population changes that could not be explained in terms of weather or habitat change. These were the sharp decline of blue tits between 1986 and 1987 in all habitats and the gradual increase and subsequent decline of chaffinches in all habitats.

We are aware of just one previous comparison of bird populations in conventionally managed coppice and thinned coppice—at Ham Street Woods, Kent (Fuller *et al.*, 1989). This study found that the bird populations, especially warblers, underwent similar trends in the two types of stands in the first seven years after management. Wren, chaffinch and blackcap were significantly more abundant in the thinned coppice and blackbird, whitethroat and willow warbler were more abundant in the coppice. These findings are in close agreement with those for Shrawley where wren and chaffinch were consistently more abundant in the thinned than the recent coppice and blackbird and willow warbler were more abundant in the recent coppice. Whitethroat was only recorded in the recent coppice at Shrawley. The main difference was that in most years blackcap was more abundant in the recent coppice at Shrawley. It is possible that the shrub layer in the singled coppice at Shrawley was sparser than at Ham Street but no data are available to test this. Densities of warblers in the singled coppice at Shrawley were lower than those occurring in stands of thinned ash–lime coppice in Lincolnshire (Fuller, 1990). Stands that had been coppiced some 30–40 years previously and had been thinned during the late 1970s supported approximately 40 warbler territories 10 ha^{-1} in 1982 (unpublished data). Most of these birds were willow warblers, which were virtually absent from the Shrawley singled coppice, but there were also substantial populations of garden warblers and blackcaps in the Lincolnshire thinned coppice. This large

variation in bird communities in singled coppice may be linked with the severity of the thinning and the response of the low foliage. At Shrawley there was little regrowth from the singled stools whereas in the Lincolnshire stands many of the singled lime stools showed prolific regeneration.

The relatively impoverished bird community of the old coppice can be attributed to its simple structure, in particular the absence of any patches of low dense foliage. If old abandoned coppice is left indefinitely it may gradually assume a more heterogenous structure as individual trees die, gaps develop in the canopy and the average size of the trees increase. This will probably result in an increase in the diversity and density of birds. Management of old coppice is, however, likely to enrich the bird community far more rapidly than natural processes. This study shows that coppicing can generate a high diversity and density of birds including exceptionally large populations of warblers. This attractiveness to warblers is, however, ephemeral and can only be maintained through a programme of regular coppicing. This course of action is highly desirable at certain sites, especially where there has been a recent history of coppice management (Fuller and Peterken, 1995). However, even where nature conservation is an important objective, coppicing is not always economically feasible once labour costs, protection against deer and markets have been considered. Based on observations in Shrawley Wood and elsewhere the authors suggest that thinning should be considered as a complementary approach to old coppice, alongside recoppicing and non-intervention. Although the singled coppice at Shrawley held the least diverse communities of birds (largely a consequence of the strong dominance of wrens) it carried higher overall densities of birds than the old coppice, it was marginally more attractive to warblers and was a preferred habitat of wrens and robins. It is possible that a heavier thinning of the lime in Shrawley would have initiated greater lime regeneration beneath the canopy and a stronger response from the warblers. As the trees mature within the thinned coppice one would predict that hole-nesting species should increase which is the case in the Lincolnshire ash–lime woods (Fuller 1990). Two future lines of work are suggested. First, it would be valuable to monitor long-term changes in the bird communities of the singled coppice at Shrawley Wood in comparison with those in unmanaged coppice. Second, habitat manipulation studies are desirable to assess the effects of different thinning regimes on habitat structure and bird communities. Fuller (1990) suggested that it may be possible to achieve an optimum balance between mature trees, canopy openness and low foliage to create a habitat supporting substantial densities both of summer visitors and hole-nesting species.

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Appendix 1: Estimated abundance (territories/10 ha) of songbirds in the unmanaged coppice. Numbers of non-songbirds were not estimated but asterisks indicate years in which they were recorded. Nomenclature follows Voous 1977

		1984	1985	1986	1987	1988	1989	1990	1991	1992	1993
Songbirds											
Wren	*Troglodytes troglodytes*	4.9	1.9	1.0		1.5	5.3	9.7	1.9	4.9	5.8
Dunnock	*Prunella modularis*					0.5	1.0				
Robin	*Erithacus rubecula*	6.3	1.0	1.0	1.0	5.8	6.8	10.2	1.9	2.9	4.4
Blackbird	*Turdus merula*	1.9	1.0	3.4	4.4	4.9	5.8	4.9	1.0	2.9	1.5
Song thrush	*Turdus philomelos*	1.0			0.5	0.5	0.5	0.5			
Mistle thrush	*Turdus viscivorus*	1.5		0.5		1.0	1.0	0.5			1.0
Garden warbler	*Sylvia borin*		0.5	1.0					0.5		
Blackcap	*Sylvia atricapilla*			1.5	0.5	1.5	0.5	2.4		0.5	
Chiffchaff	*Phylloscopus collybita*		0.5				1.5	1.0		1.0	
Willow warbler	*Phylloscopus trochilus*	0.5			0.5						
Pied flycatcher	*Ficedula hypoleuca*							1.0			
Long-tailed tit	*Aegithalos caudatus*	0.5	0.5	0.5				0.5	1.0		
Marsh tit	*Parus palustris*		0.5			0.5			1.0		0.5
Coal tit	*Parus ater*	0.5			1.0		0.5	1.5	1.0	1.0	1.5
Blue tit	*Parus caeruleus*	3.4	3.4	4.4	1.9	1.5	3.9	2.9	3.4	1.5	1.9
Great tit	*Parus major*	2.9	1.9	2.9	2.9	1.5	1.9	1.9	2.9	1.9	2.9
Nuthatch	*Sitta europaea*	0.5			0.5	1.0	0.5	1.0	0.5	0.5	
Treecreeper	*Certhia familiaris*	1.0	1.0	1.0	0.5	1.0	1.0	1.5	1.9	2.4	1.9
Chaffinch	*Fringilla coelebs*	0.5	2.4	3.9	3.4	4.4	4.9	4.4	2.9	1.5	3.4
Greenfinch	*Carduelis chloris*		0.5								
Bullfinch	*Pyrrhula pyrrhula*			0.5				0.5			
Non-songbirds											
Sparrowhawk	*Accipiter nisus*							*	*		
Pheasant	*Phasianus colchicus*	*	*	*	*	*	*	*	*	*	
Woodcock	*Scolopax rusticola*	*									
Stock dove	*Columba oenas*	*					*	*			
Cuckoo	*Cuculus canorus*	*									
Tawny Owl	*Strix aluco*	*	*			*		*	*	*	
Green woodpecker	*Picus viridis*								*		
Great spotted woodpecker	*Dendrocopos major*	*	*	*	*	*	*	*	*		*
Jay	*Garrulus glandarius*	*	*	*		*	*	*	*	*	*
Jackdaw	*Corvus monedula*				*		*	*	*	*	*
Carrion crow	*Corvus corone*			*	*		*	*	*	*	
Starling	*Sturnus vulgaris*	*	*	*							

Appendix 2: Estimated abundance (territories/10 ha) of songbirds in the recent coppice. Numbers of non-songbirds were not estimated but asterisks indicate years in which they were recorded. Nomenclature follows Voous 1977

		1984	1985	1986	1987	1988	1989	1990	1991	1992	1993
Songbirds											
Tree pipit	*Anthus trivialis*			1.0							
Wren	*Troglodytes troglodytes*	10.2	8.2	3.1	5.1	7.7	8.7	10.2	3.1	4.1	4.1
Dunnock	*Prunella modularis*	3.1	2.0	4.1	2.0	1.5	2.0	1.5		0.5	
Robin	*Erithacus rubecula*	8.2	2.6	5.6	5.6	8.2	7.7	10.7	5.6	8.7	7.1
Blackbird	*Turdus merula*	3.1	5.1	7.1	7.7	5.1	6.1	8.2	5.6	6.6	6.1
Song thrush	*Trudus philomelos*	1.5	1.5	2.0	0.5	1.5	1.5	1.0	0.5		1.5
Mistle thrush	*Trudus viscivorus*	0.5			0.5	0.5	0.5				
Whitethroat	*Sylvia communis*	2.6									
Garden warbler	*Sylvia borin*	12.8	11.7	10.2	11.7	11.2	8.2	7.1	7.7	2.6	2.0
Blackcap	*Sylvia atricapilla*	4.1	6.1	7.7	5.6	3.1	5.6	3.1	3.6	2.6	2.0
Chiffchaff	*Phylloscopus collybita*	4.6	6.1	7.1	6.6	6.1	6.6	6.1	4.1	2.0	1.5
Willow warbler	*Phylloscopus trochilus*	7.1	6.1	9.2	12.2	9.2	10.7	7.7	7.1	1.0	
Long-tailed tit	*Aegithalos caudatus*	1.5	2.6	2.6	2.6	1.5	2.0	3.1	2.0	1.5	2.0
Marsh tit	*Parus palustris*			1.5					0.5	0.5	
Willow tit	*Parus montanus*	0.5				0.5					
Coal tit	*Parus ater*		0.5			1.0	1.5		1.0	1.5	0.5
Blue tit	*Parus caeruleus*	5.6	6.1	6.1	3.6	2.6	2.6	3.1	5.1	4.6	3.6
Great tit	*Parus major*	3.6	3.1	2.0	2.0	2.0	1.5	0.5	2.6	1.5	0.5
Nuthatch	*Sitta europaea*	0.5	1.0						0.5		
Treecreeper	*Certhia familiaris*			0.5				0.5		0.5	1.0
Chaffinch	*Fringilla coelebs*	0.5	0.5	2.0	3.1	2.6	2.6	3.6	1.0	3.1	0.5
Redpoll	*Carduelis flammea*	0.5									
Bullfinch	*Pyrrhula pyrrhula*	1.0	0.5	1.5	1.5		2.0	1.0	1.0	1.5	
Yellowhammer	*Emberiza citrinella*		2.0	3.1	1.0						
Non-songbirds											
Kestrel	*Falco tinnunculus*			*							
Pheasant	*Phasianus colchicus*					*			*		
Woodcock	*Scolopax rusticola*					*					
Stock dove	*Columba oenas*	*	*	*			*	*	*	*	
Turtle dove	*Streptopelia turtur*		*	*	*	*	*	*			
Cuckoo	*Cuculus canorus*	*		*	*		*				
Tawny owl	*Strix aluco*		*			*	*			*	*
Green woodpecker	*Picus viridis*			*	*				*	*	
Great spotted woodpecker	*Dendrocopos major*	*	*	*	*	*	*	*	*	*	*
Jay	*Garrulus glandarius*	*	*	*	*	*		*	*	*	*
Magpie	*Pica pica*									*	*
Jackdaw	*Corvus monedula*	*		*	*	*	*	*	*	*	*
Carrion crow	*Corvus corone*					*	*		*	*	
Starling	*Sturnus vulgaris*	*				*		*			

Appendix 3: Estimated abundance (territories/10 ha) of songbirds in the singled coppice. Numbers of non-songbirds were not estimated but asterisks indicate years in which they were recorded. Nomenclature follows Voous 1977

		1984	1985	1986	1987	1988	1989	1990	1991	1992	1993
Songbirds											
Wren	*Troglodytes troglodytes*	11.4	9.4	5.4	7.0	8.7	14.4	14.8	8.7	10.7	13.4
Dunnock	*Prunella modularis*	1.7	1.0	1.0	0.7	1.3	1.3	2.7	0.7	1.0	0.3
Robin	*Erithacus rubecula*	5.0	4.4	2.7	6.0	4.7	8.4	8.7	5.0	3.4	6.0
Blackbird	*Turdus merula*	5.0	4.4	3.0	3.0	4.0	3.7	5.7	4.7	3.4	3.4
Song thrush	*Turdus philomelos*	1.3	0.7	0.3	0.3	0.3	1.3	3.0	0.7		2.3
Mistle thrush	*Turdus viscivorus*			0.7	0.3		0.3	0.7	0.7	0.7	0.7
Garden warbler	*Sylvia borin*	0.3	0.7	1.3	1.7	1.3	0.7	1.0	0.3		1.0
Blackcap	*Sylvia atricapilla*	2.7	4.4	1.3	3.4	2.3	4.7	4.0	1.3	2.3	2.0
Wood warbler	*Phylloscopus sibilatrix*								0.3		
Chiffchaff	*Phylloscopus collybita*		1.3	1.3	1.3	3.0	1.3	4.0	1.3	0.7	1.3
Willow warbler	*Phylloscopus trochilus*	0.3	0.7			0.3					
Goldcrest	*Regulus regulus*		0.3		0.7		1.0	0.3	0.7		
Spotted flycatcher	*Muscicapa striata*									1.0	
Pied flycatcher	*Ficedula hypoleuca*								0.3		
Long-tailed tit	*Aegithalos caudatus*		1.0	0.7	0.3			0.3	1.0	1.0	
Marsh tit	*Parus palustris*				0.7		0.3		1.0		0.7
Willow tit	*Parus montanus*	0.3									
Coal tit	*Parus ater*		0.3					1.3	0.7	0.3	1.0
Blue tit	*Parus caeruleus*	1.3	2.3	4.0		0.7	3.4	1.7	3.4	1.7	2.0
Great tit	*Parus major*	2.0	1.7	0.7	2.0	2.0	1.0	0.7	1.0	0.3	2.0
Treecreeper	*Certhia familiaris*	0.3	0.3	0.7			1.3	0.3	1.3	1.3	1.0
Chaffinch	*Fringilla coelebs*	1.7	3.4	3.4	4.7	4.0	3.0	4.7	5.4	1.7	2.7
Bullfinch	*Pyrrhula pyrrhula*	0.3		0.7	0.7				0.7	0.3	
Non-songbirds											
Pheasant	*Phasianus colchicus*				*	*	*	*	*	*	*
Woodcock	*Scolopax rusticola*				*			*			
Stock dove	*Columba oenas*									*	
Cuckoo	*Cuculus canorus*			*							
Tawny owl	*Strix aluco*	*			*			*	*		
Green woodpecker	*Picus viridis*		*								*
Great spotted woodpecker	*Dendrocopos major*	*		*	*		*	*	*	*	*
Jay	*Garrulus glandarius*	*	*	*			*	*	*	*	*
Carrion crow	*Corvus corone*				*				*	*	*

Changes in the bird life during 1984-1993

The facsimile paper describes the bird populations and their breeding habitat in particular parts of Shrawley Wood in May during 1984-1993 and the changes in populations during those ten years. It is worth restating that the predominant tree species in all plots was (and still is) small-leaved lime *Tilia cordata*. In summary bird numbers and density were lowest in the old coppice (plot 1) and highest in the young coppice (plot 2) until they declined in the last few years of the study. The singled plot 3 had a low diversity of birds dominated by wrens with a notable lack of hole nesting birds – the tits.

The difference in the bird populations in the three plots is mainly explained at the simplest level by woodland structure which is illustrated by the photographs earlier in this chapter.

Plot 1 was heavily shaded with a closed lime canopy and the ground was mainly covered by bluebells or ramsons. There was no shrubby or bramble understorey suitable for nesting and foraging birds, especially warblers.

Plot 2 at the start of the survey was rapidly growing young coppice mixed with bramble and herbaceous plants. In the first 3-4 years of the survey this provided nest sites and an abundant invertebrate food supply suitable for large numbers of summer-visiting breeding warblers especially garden warbler, blackcap, willow warbler, chiffchaff. In the second half of the survey period bird numbers declined as the canopy closed and the low bramble and other plants were heavily shaded and disappeared leaving a ground flora mainly of bluebells.

In plot 3, consisting of singled lime trees, the ground was covered mainly by an extensive cover of low-growing bramble with scattered holly bushes. The most abundant birds were wrens nesting and feeding within the bramble tangle. There were very few hole-nesting birds as the singled lime trees lacked holes and there were no old standard oak or lime trees as in Plots 1 and 2.

The other main change during the survey was the reduction in numbers of resident species particularly wrens and robins caused by hard winters and their subsequent recovery

The appendices in the facsimile paper provide more extended lists of birds recorded in each plot giving an overall picture of the birds using the study plots in May. The lists include species excluded from the territories-based analysis being either transient individuals or those that generally range over a wider area rather than being confined to relatively small territories. They were mainly non-passerines such as pheasant, woodcock, woodpeckers, cuckoo and stock dove.

Changes in the bird life over the last 70 years

Historical records, although sparse, provide a glimpse of spring and early summer bird communities in Shrawley Wood over time and can be compared with the 1984-1993 survey. However there has never been a comprehensive survey of all parts of the wood in any one year

All available records for the periods 1948 to 2015 are set out in Tables in the appendix to this chapter. They differ greatly in the way they were collected so detailed comparison is impossible. With the exception of the 1985 CES plot and the 10-year census of plots 1 and 2, the records were almost certainly all made on the land now owned by the FC. This area was subject to extensive wartime felling followed by attempts by the Forestry Commission to kill the lime and all deciduous regeneration of trees and shrubs to make way for planting of large areas with Douglas Fir. From wartime to around 1980 much of the northern part of Shrawley Wood was of regenerating scrub and young conifers, habitats excellent for birds breeding in scrub habitats.

The bird lists from the 1984-93 surveys in the south part of the wood are included in the comparative lists in the tables in the appendix to the bird chapters. Overall the tables list records of 54 species, all birds that could be expected in an English woodland with a small influence of standing water, echoing the comment mentioned at the beginning of this chapter by Kendrick Watson, writing an account of the parish of Shrawley in 1840: *"All the birds which are commonly met with in the midland districts of the kingdom are found here".*

The notes by Fred Fincher were jotted down on natural history recording visits which he later copied to his handwritten Journals, usually on the same day, from which the tables are derived. He made further records in other years at different times and these are listed in the appendix to the bird chapters.

The 1979 and 1980 records made by Simon Walker are based on mist netting for bird ringing mainly in scrub, re-growing lime coppice, young conifer plantation in the north part of the wood. He also included casual observations made elsewhere in the wood together with a few historical records. His records for 1985 are from carefully planned mist netting as described above.

The 2015 records made by Steve Davies are from a circular walk through the northern FC owned section of Shrawley Wood.plot.

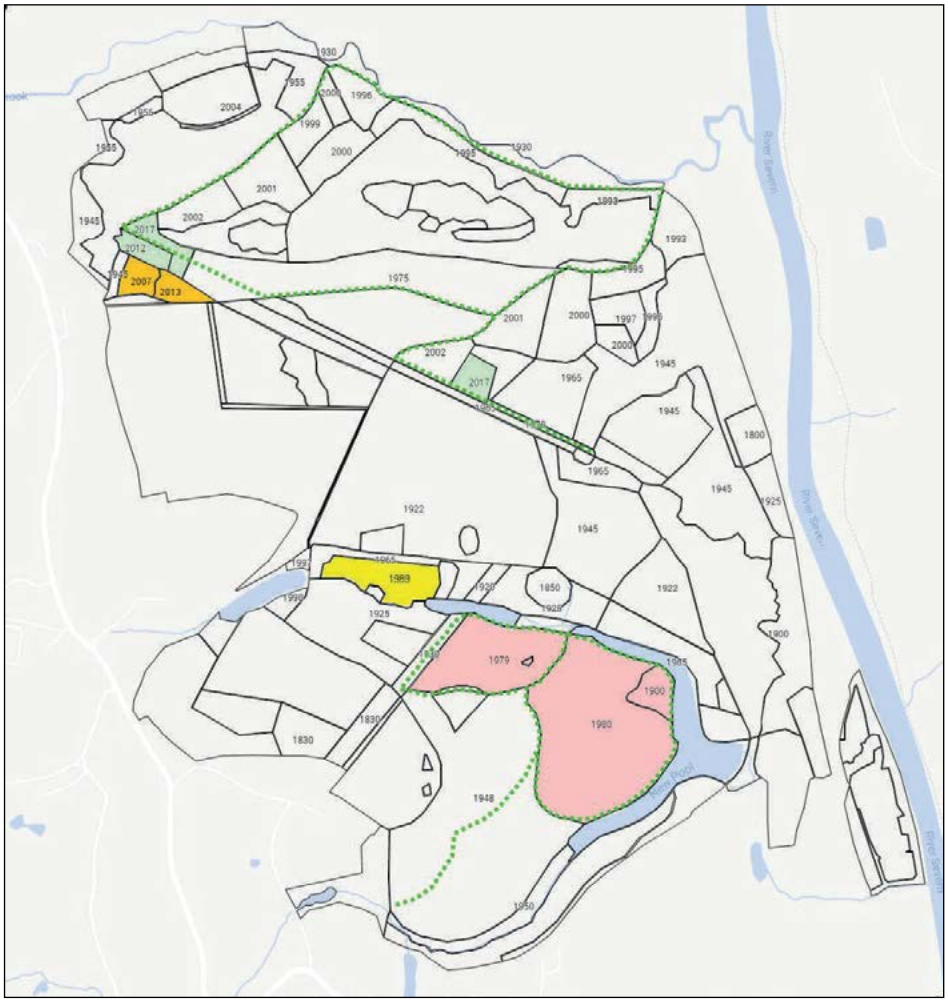
These records give a rough idea of the commonest species found in Shrawley Wood during spring and early summer over the period covered by the tables (1948-2015) by noting the frequency with which each species occurs. The ten sets of records show that blackcap, blue tit and great tit were recorded on all ten visits; coal tit and song thrush on nine visits; chiffchaff, garden warbler on eight visits; dunnock, long-tailed tit, marsh tit, robin, willow warbler and wren on seven visits. Based on the habitat needs of several of these bird species (notably the warblers and dunnock), these results reflect a habitat containing a large amount of scrub.

The 2019 survey

In 2019 surveyors (Charlie Bird & Katie Lloyd) working for Natural England (NE) undertook bird surveys as part of the SSSI condition assessment. These surveys comprised three (April, May and June) transect walks in each of the southern (private) and northern (Forestry Commission) units. The transects were about 2.8km long in the north unit (FC owned) and about 2.3km in the south unit (privately owned) and followed well-used tracks and paths. The routes are shown on the map (15). The map also shows the young lime coppice of Plot 2 present in the 1984-93 survey and cut in 1979 and 1980 and (coloured yellow) a plot cut in 1989. Plots of young lime coppice present in 2019 are also shown. These transects will be used for repeatable long-term monitoring.

One aim of the NE survey was to record birds using lime coppice habitats within the SSSI. Notably there were only three small areas of young lime coppice in the northern unit (coloured green on the map) and none in the southern unit where there has been no coppicing since 1989. The small sweet chestnut coppice plots cut in 2007 and 2013 are also shown. The chestnut stools re-grew more rapidly than lime coppice creating heavily shaded habitat within 3-4 years.

The counts are shown in Table 02 where the most frequently recorded species between 1948 and 2015 are given alongside the 2019 results.



15. The two Natural England transect routes used for bird surveys in 2019 dotted green, one to the south in the privately owned area and one to the north in the FC area. The 1984-93 plot 2 of young lime coppice is coloured reddish. The small young plots of lime coppice cut in 2012 and 2017 are coloured green. The plot coloured yellow was coppiced in 1989. The only plots in the wood of sweet chestnut were coppiced in 2007 and 2016 and are coloured orange. The figures in other plots indicate the year of lime coppicing. Those without figures are plantations of Douglas Fir and not included in SSSI. Overall, the map illustrates a lack of young lime coppice over a long period

Table 02. Surveys in May. The thirteen most often recorded species 1948-2015 compared with top 13 species recorded in transect surveys in 2019. The 2019 surveys are in descending order of number of birds recorded.
The figure following the species name in the older surveys column indicates the number of record sets out of ten in which the species was recorded.
Warblers in red text

All older surveys (10) 1948-2015 generally is spring or early summer	Steve Davies 8 May 2015. ✓ indicates "present".	Natural England 2019 Southern 15th May	Natural England 2019 Northern 15th May
Blackcap 10	✓	Blue Tit	Wren
Blue Tit 10	✓	Blackbird	Blackbird
Great Tit 10		Wren	Blue Tit
Song Thrush 9	✓	Great Tit	Blackcap
Coal Tit 9	✓	Wood Pigeon	Goldcrest
Garden Warbler 8	✓	Song Thrush	Robin
Chiffchaff 8	✓	Chaffinch	Song Thrush
Long-tailed Tit 7	✓	Treecreeper	Chaffinch
Marsh Tit 7	✓	Robin	Chiffchaff
Robin 7	✓	Mallard	Treecreeper
Dunnock 7	✓	Goldcrest	Wood Pigeon
Willow Warbler 7		Coal Tit	Great Tit
Wren 7	✓	Great Spotted Woodpecker	Willow Warbler

Structural change of the study plots of the 1984-1993

In 2017 the structure of the study plots of the 1984-1993 were resurveyed and the results are in the appendix to this chapter. The structure of Plot 2 (young coppice in 1984) was approaching that seen in Plot 1 in 1984 with tall coppiced lime. .

Conclusions

The detailed surveys 1984-1993 in May emphasise the importance of young lime coppice for warblers especially garden warbler. Simon Walker's bird ringing in the FC area 1979 and 1980 and his 1985 CES survey in plot 2 shows a similar picture.

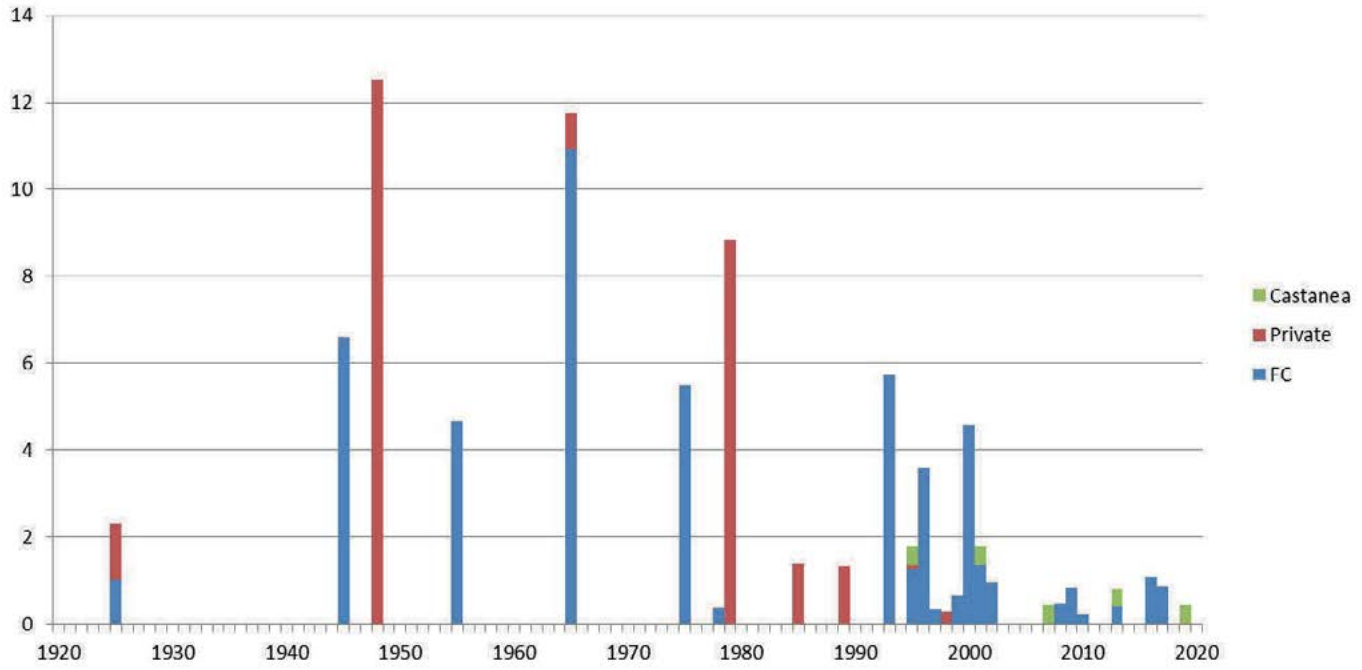
The NE surveys in 2019 show a different picture. The Southern section (which included the 1984-1993 Plot 2) had grown to tall lime coppice, either around 30 years or 70 years old, with very little shrub or bramble habitat beneath the closed canopy. There are no warblers amongst the commonest thirteen species recorded and most birds were those associated either with trees (tits, chaffinch, goldcrest, treecreeper and great spotted woodpecker), or generalists requiring some cover (blackbird, song thrush, robin), or mallards associated with the nearby lakes, or wood pigeons which spend much of their time outside the woodland and use the trees as nest sites. The northern section, where the transect route mainly followed paths near lime coppice of various ages did include several warblers (blackcap, chiffchaff, willow warbler) within a community otherwise similar to the southern section. A few garden warblers were recorded associated with the small blocks of young lime coppice cut in 2012 and 2017 (see map 15).

The chapters on coppice regeneration and trees show that in the past the whole of Shrawley Wood along with nearby Shotgrove was managed in large binds (coppice plots) probably of around 15 acres on a 17 year rotation. There were also many oak trees indicating a woodland principally of oak standards over lime coppice with a few patches of hazel coppice. There was a scattering of other tree species (see chapter on trees) and the regrowth of birch following coppicing was a commonly used product.

The practice of 17-year lime coppicing probably faltered and slowed in the early 1900s and timing of lime coppicing became haphazard thereafter. After the extensive felling throughout the whole wood in the 1940s lime coppice regenerated and remained un-cut in the southern part of the wood leading to habitat as in Plot 1 of the 1984-93 bird study. In 1961 237 acres (96 ha) of the northern part of the wood was purchased by the FC. This area was of regenerating lime coppice and scrub re-grown following both WW2 felling and clearance by FC for conifer planting.. Simon Walker and colleagues used it for bird ringing in the late 1970s as described earlier in this chapter. From the 1960s to the 1990s there was probably more scrub and coppice in Shrawley Wood than for hundreds of years.

In view of the information gathered it seems that in the past, very large breeding populations of warblers and scrub birds could have been supported by the wood, in keeping with the extensive coppice cycle. The garden warbler population alone could potentially have reached well over 100 breeding territories. However, the coppice workers of the past may have been diligent in clearing the growth of bramble and tall herbaceous plants in the years immediately following coppicing and, if so, warblers and scrub bird populations would have been lower than might be imagined.

More recently some areas have been re-coppiced though on a small scale (15) in accordance with a management plan agreed between FC and Natural England although the plot size chosen was more akin to typical hazel coupes in woods elsewhere (around 1 ha) without the knowledge of the original size of the lime coppice binds in Shrawley Wood. The spasmodic nature of lime coppicing over the last 100 years is shown in the following chart.



17. The spasmodic nature of lime coppicing (in hectares) during the last one hundred years following on from a long period of a 17-year cycle of cutting. Data derived from the Vernon estate wood books and other studies – see chapters on Trees and coppice regeneration.

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108/ii/1-232 C.19 account books entitled "Shrawley Wood book". With c.150 receipts and accounts.

Appendix

This appendix contains **Notes on structure and composition of the lime-dominated plots at Shrawley Wood and a summary of changes 1984 – 2017 by R.J. Fuller** an assessment of changes between the 1980s and 2017 in the vegetation of the three plots studied by Fuller and Green (1998).

The appendix to both chapters on birds contains tables showing the major collections of records made over the years since around 1946.



Garden Warbler. This image is from an old print found in a collection of photographs by A. J.Harthan given to the author of this chapter by his widow. The photograph was probably taken in SE Worcestershire in the 1930s. Tony Harthan was author of *The Birds of Worcestershire* published in 1946 – see the reference list in the chapter on selected birds of Shrawley Wood.

Notes on structure and composition of the lime-dominated plots at Shrawley Wood and a summary of changes 1984 – 2017.

by R. J. Fuller

The three plots mentioned in the following notes are those studied by Fuller & Green (1998, *Forestry* 71: 199-218) – see facsimile paper – and figures at the beginning of this chapter. In 2017 these plots were re-visited and the tree and shrub structure assessed for comparison with the original survey. The tables show for each plot separately the quantitative measurements of canopy cover, shrub cover, bramble cover, canopy height, stem diameters and tree composition. The measurements are from May 1984, May 1990 and 17/18 May 2017. Notes on the methods used to assess structure are shown in the facsimile paper tables and updated in the following table. All measurements were made by Rob Fuller with the help of Gerry Barnes in May 2017.

Notes on methods used for woodland structural assessment.
All measurements made in mid May in each year and all data presented in the tables are based on four circles (see below) to ensure consistent sampling effort.
In each plot four randomly selected circles of 10m radius were set up. These were not at the same locations in each year but sampling effort was the same.
To allow comparability between years, in 2017 data have not been included from plots 1 and 2 from areas that were modified by planting since the mid-1990s.
In PLOT 1 in 2017 a fifth sample was taken in the east of the plot where there had been considerable tree planting but not included in the data.
In PLOT 2 all samples in 2017 were taken from the unmodified eastern part of the plot to avoid replanting affecting measures of vegetation change.
In PLOT 3 all samples were in that part of the plot which had been thinned (singled) the previous winter. Note that two samples were also made in the unthinned area but are not included in the data.
Canopy cover, shrub layer cover and bramble cover were estimated to the nearest 5%.
Canopy cover was for foliage >10 m above ground.
Shrub layer cover was foliage <10 m above ground.
Canopy height estimates were made with a hypsometer.
Within the recently cut coppice (1984 and 1990) standards were not included in canopy height measures and estimated coppice height is shown for the max height of coppice regrowth.
Means of cover and height values are shown for the four circles in each plot.
Total numbers of stems within the 10m radius circles are shown by d.b.h. size classes. Stems less than 10 cm d.b.h. were not counted.
Total numbers of single-stemmed and multi-stemmed trees (i.e. standards plus coppice stools) within the four 10 m radius circles are shown. Only trees with at least one stem >10 cm d.b.h. are included.
In plots 1 and 2 do not assume there has been any reduction in oak; the apparent absence in the 2017 is probably a sampling artefact.

PLOT 1 (unmanaged old coppice - private woodland)
Current state (May 2017)
The plot was probably last coppiced in the 1940s. It has received no systematic management since then though there appears to have been non-systematic recent removal of stems, probably for firewood. The 2017 visit found that on some lime stools one, (rarely two) limbs had been sawn off. There has also been some planting of broadleaves (oak and even copper beech) at edges and along at least one internal track since 1990. Almost complete cover of bluebells, very limited bramble and virtually no understorey. There is no holly and very little ivy.

Quantitative changes since 1984 (see table)
Increase in canopy height (mean height increased from 17 to 27 m) and in stem diameter (78% of stems ≤20 cm in 1984 compared with 24% in 2017).
Decrease in number of stems, possibly due to self-thinning, though recent selective removal could also be important (104 stems ≥ 10 cm diameter at breast height (dbh) in 1984, compared with 48 in 2017).

Increased dominance of lime which could be partly a consequence of removal of other trees (e.g. birch) but is probably more likely to be due to maturation and the shading out of early successional species (in 1984 77% of trees were lime, compared with 94% in 2017).

PLOT 2 (unmanaged medium aged-coppice - private woodland)
Current state (May 2017)
The plot was last coppiced in 1979 and 1980. The area to the west of the track running down to the lake was cut in 1979 and the larger area to the east of the track was cut in 1980. The latter area appears to have been left untouched since 1980 and consists of old lime coppice. However, the western area has been partially cleared and replanted and now contains a mixture of old lime stools, planted broadleaves and planted conifers. To maintain comparability with earlier years, this modified western part of the plot was avoided for sampling in 2017. More widely, there is very little bramble and understorey across the plot. The field layer is dominated by bluebells and ferns). Some holly has seeded into the plot since the 1980s and ivy is also present more strongly than in the past (any future coppicing would need to consider whether ivy would become a problem and might need controlling..

Quantitative changes since 1984 (see table for full data)
As expected, there has been massive growth of trees, accompanied by obliteration of the understorey and bramble cover through canopy shading. Mean stand height in 2017 was 22 m compared with 4 m in 1984. Mean shrub layer cover was 44% and 89% in 1984 and 1990 respectively compared with 1% in 2017.

More birch was present in 2017 – this merely represents the fact that any birch present in 1984 or 1990 would have been small trees <10 cm dbh. Interestingly, the birch was present at a very similar abundance to PLOT 1 in 1984 indicating that birch persists in the lime coppice at least for the first 30 years after coppicing but may not persist for more than 60 or 70 years. Surprisingly, sycamore was not recorded in the samples in 2017 although it was frequent (15% of trees) in 1984.

The structure in 2017 (canopy cover, canopy height and stem size distribution) was very similar to that of PLOT 1 in 1984 and 1990 which was then at approximately the same age after coppicing. In 1984 PLOT 1 was c. 40 years post cutting and in 2017 PLOT 2 was c. 37 – 38 years post cutting. Whilst convergence in structure is not entirely surprising it suggests that structural changes with coppice growth are predictable.

PLOT 3 (singled old coppice - Forestry Commission woodland)
Current state (May 2017)
The plot is old lime coppice initially singled probably in the mid 1970s. At the time of singling, the coppice was likely to have been at a similar age of regrowth as PLOT 1. The plot was thinned in autumn 2016. The track running from SE to NE across the plot marked the boundary of the latest singling which was confined to the north of this track. All the 2017 measurements summarised in the table are from this recently thinned area, though two additional samples were taken in the un-singled part of the plot. Two general changes since the 80s and 90s are that there is more holly, especially in the east of the plot, and more ivy too.

Quantitative changes since 1984 (see table for full data)
Substantial growth of trees since 1984, both in height and stem diameter. Comparisons with PLOT 1 are of interest because both stands derive from coppice that was cut at a similar time. Canopy height in PLOT 3 is similar to PLOT 1 but stem thickness is greater, presumably a consequence of the thinning. The bramble cover and

shrub layer is far more developed in PLOT 3 than PLOT 1, presumably because the thinning has created a more open canopy structure.
Notwithstanding the previous point, bramble cover was somewhat lower in 2017 than in 1984 or 1990, presumably because with passage of time since the first thinning, the canopy shading increased. One anticipates a resurgence of bramble over the next few years.

Virtual dominance of lime is probably due to thinning and selection for lime.

PLOT 1: Unmanaged old coppice (probably last cut in the 1940s)			
	1984	**1990**	**2017**
Canopy cover (%, mean and range)	93 (90-95)	95 (95-95)	94 (90-95)
Shrub layer cover (%, mean and range)	1 (0-2)	2 (0-4)	0 (0-0)
Bramble cover (%, mean and range)	0 (0-0)	0 (0-0)	5 (0-15)
Canopy height (m., mean and range)	17 (16-18)	19 (18-20)	27 (25-30)
Numbers of stems by dbh classes (%)			
10 - 20 cm	199 (78%)	n.c.	28 (24%)
21 - 30 cm	51 (20%)	n.c.	48 (41%)
31 - 40 cm	2 (1%)	n.c.	35 (30%)
>40 cm	3 (1%)	n.c.	7 (6%)
Numbers of trees			
Tilia cordata	80 (77%)	nc.	45 (94%)
Betula spp.	17 (16%)	nc.	3 (6%)
Acer pseudoplatanus	1 (<1%)	n.c	0
Salix spp.	3 (3%)	n.c.	0
Quercus spp.	3 (3%)	n.c.	0
Populus spp.	0	n.c.	0

PLOT 2: Unmanaged medium-aged coppice (last cut in 1979 and 1980)			
	1984	**1990**	**2017**
Canopy cover (%, mean and range)	2 (0-5)	4 (0-10)	94 (90-95)
Shrub layer cover (%, mean and range)	44 (30-55)	89 (70-95)	1 (0-2)
Bramble cover (%, mean and range)	9 (5-15)	13 (5-20)	0 (0-0)
Canopy height (m., mean and range)	4 (3-4)	8 (7-10)	22 (21-23)
Numbers of stems by dbh classes (%)			
10 - 20 cm	10 (83%)	n.c.	167 (70%)
21 - 30 cm	0	n.c.	68 (28%)
31 - 40 cm	0	n.c.	4 (2%)
>40 cm	2 (17%)	n.c.	0
Numbers of trees			
Tilia cordata	54 (78%)	nc.	44 (73%)
Betula spp.	0	nc.	15 (25%)
Acer pseudoplatanus	13 (19%)	n.c	0
Salix spp.	0	n.c.	0
Quercus spp.	2 (3%)	n.c.	0
Populus spp.	0		1 (2%)

PLOT 3: Singled old coppice (thinned mid 1970s and 2016)			
	1984	**1990**	**2017**
Canopy cover (%, mean and range)	71 (65-75)	85 (75-95)	83 (75-90)
Shrub layer cover (%, mean and range)	15 (5-30)	28 (15-40)	13 (5-35)
Bramble cover (%, mean and range)	89 (80-95)	93 (80-100)	54 (30-75)
Canopy height (m., mean and range)	20 (20-21)	22 (20-23)	28 (27-29)
Numbers of stems by dbh classes (%)			
10 - 20 cm	18 (38%)	n.c.	1 (2%)
21 - 30 cm	26 (54%)	n.c.	7 (14%)
31 - 40 cm	3 (6%)	n.c.	37 (76%)
>40 cm	1 (2%)	n.c.	4 (8%)
Numbers of trees			
Tilia cordata	53 (100%)	n.c.	44 (100%)
Betula spp.	0	n.c.	0
Acer pseudoplatanus	0	n.c.	0
Salix spp.	0	n.c.	0
Quercus spp.	0	n.c.	0
Populus spp.	0	n.c.	0

These results and comments should be considered alongside coppice growth and structure studies set out in the Chapter on that subject.

The birds of Shrawley Wood: selected species accounts.

Harry Green



Garden Warbler. A species closely associated with young lime coppice in Shrawley Wood. Picture by Chris Gomersall..

Birds breeding in woodland fall into roughly three groups, each group having somewhat similar ecological requirements. One group nest on or within about one metre or so of the ground. A second are birds that usually construct open nests in taller bushes, trees and tree crowns. The third group are hole-nesters, usually in tree holes but occasionally in the ground. Similarly, groups can be based on feeding behaviour: ground-feeders, field layer and low shrub layer foragers, and tall shrub or canopy foragers. Placing species in particular groups is but a generality as some will nest and feed in shrubs or trees at very different heights above ground and some, such the tits, use completely different components of the woodland structure for nesting and foraging.

Most of the relatively common species in Shrawley Wood use trees and shrubs for nesting. The wood has always been important, but probably more so in the past, for species that nest and forage in low vegetation in the field and shrub layers.

Several common birds nest in most woodland habitats albeit in varying densities: song thrush, blackbird, robin, dunnock, chaffinch, bullfinch, blue tit, great tit,wood pigeon and jay. These all occur in Shrawley Wood varying in distribution according to habitat structure suitable for their nesting territories at a particular time. Gordon Simmons noted that blackbirds and song thrushes occurred in large numbers in the coppiced lime 1963-64 and Simon Walker noted that blackbirds were particularly common in young coppice in the late 1970s. Tree canopy nesters in Shrawley Wood are carrion crow, magpie and raven. Ravens have increased in Worcestershire over the last 20 years and a pair has have nested in the tall Wellingtonia trees in Shrawley Wood for several years (Metcalf 2020). Goldcrests and coal tits have probably increased in Shrawley Wood following conifer plantations which they prefer.

Woodpeckers are regarded as keystone species in woodlands. They excavate nesting holes that are subsequently used by other birds: nuthatches, tits and starlings; and also bats. The holes also give access to the inner tree allowing fungi and invertebrates to invade which over time assist in creating natural decay cavities used by many more species. As the cavities enlarge they are used by larger birds as nesting sites: stock dove, jackdaws, kestrel, tawny owl. Their nests, droppings and prey remains all provide food for yet more fungi and invertebrates. Woodpeckers excavate holes through bark to reach invertebrate food living in the wood. Detached bark makes spaces for treecreepers to build nests. Over 1800 invertebrate species are associated with decaying wood so a woodpecker could be the starting gun in the development of this assemblage.

Mature trees with holes are scattered through Shrawley Wood and are usually oaks, occasionally small-leaved lime. As other chapters discuss, there were large numbers of oaks in the past, some grown on long coppice cycles. Besides the creation of holes by woodpeckers, especially great spotted and green woodpeckers, naturally occurring holes in these trees provide nest sites for the species listed in the previous paragraph. In recent times mandarin ducks have been seen on the lakes in the wood and have probably nested in trees with large deep holes.

Selected Species accounts

This section gives further information on some of the characteristic birds of Shrawley Wood and others which are of historical interest or for which Shrawley Wood lies at the edge of their current national distribution. Much of the general national information is based on the BTO Bird Atlas 2007-11 (Balmer *et al*. 2013). The following account focuses on breeding birds and concludes with a small section on winter birds. Breeding summer visitors are dealt with first, followed by resident species, starting with the tits and including great spotted woodpecker about which detailed observations have been made in Shrawley Wood.

The key sources of information referred to in this chapter are described in the previous chapter that focuses on relationships between birds and the coppicing. The appendix to the two bird chapters contains information derived from these sources.

Nightingale

Worcestershire lies on the NW edge of the European range of this species. For many years this summer migrant occupied a zone mainly to the SE of a line from the Severn Estuary to the Wash. In the last 40 years it has declined by 90% and is now thinly distributed in the same area (Balmer *et al*. 2013) with most birds in SE England.

Nightingales were once plentiful in the valleys of rivers Avon, Severn and Teme and in 1934 Harthan counted 40 singing males in an area 5×4 miles mostly in thorny scrub habitats north of Evesham. In 1976, as part of the national survey organised by the BTO, 88 singing males were recorded in Worcestershire. In 1998 only 42 were found. By 2019 only a couple of birds could be found at the southeast edge of the county (Harthan 1934, 1946 & 1961; Green 1998).

Nightingales are usually birds of dense, often thorny, scrub with clear ground beneath where they nest – 'scrub caves'. Young coppice can give suitable habitat but the Shrawley Wood lime coppice regime may not have produced ideal conditions. Only three records have been located: Hodgkinson (1945) *"One pair nested at Astley* [adjacent woodland] *and one at Shrawley" "and one heard in May"* is listed by Walker in his compiled list 1979-80. Both are from the time when extensive scrub habitat was present in Shrawley Wood following WW2 felling and young conifer plantations.

Nightjar

Harthan (1946) notes that Nightjars were once very common summer migrants to Worcestershire in the 1930s and earlier bred in the Lickey Woods of north Worcestershire and also further south being most abundant in Monkwood, Trench Wood and Shrawley Wood. Only four had been found in 1947 when most of the county was searched and these were near Kidderminster, in Wyre Forest and on the Malvern Hills (Harthan 1961). In his 1934 survey of nightingales Harthan also notes that amongst thorny thickets there were also about a dozen nightjars and grasshopper warblers. The great change between 1934 and 1947 was probably related to the increase in wartime agricultural production and consequent disappearance of scrubbed-up fields in the area. Since then, fewer birds have been recorded in the county, mostly in the same areas with occasional records elsewhere. The only, and most recent known record for Shrawley Wood, is by Gordon Simmons in 1963-64. The species is not listed by Walker in his compiled list 1979-80.

Tree Pipit

Tree pipits require open sparsely vegetated ground on which to nest with scattered shrubs or trees used as song posts although open ground adjacent to woodland edge may suffice. Nationally it was widely distributed in suitable habitats but in the last 50 years the range has contracted towards the north and west. There has also been a sharp decline in numbers since the 1980s, starting in the English Midlands.For Shrawley Wood the West Midlands Annual reports give records only for 1979, 1980 (five pairs), 1982, and 1985. Walker in his 1979-80 list notes that ten pairs bred in the young plantation and recently coppiced areas. In the 1984-93 May surveys one territory was recorded in young coppice plot (Plot 2) in 1986. Since then, there are no records and the developing woodland with taller trees, few open spaces and little young coppice is probably unsuitable for the species. Similar declines have been seen elsewhere as plantations grew and open spaces disappear.

Pied Flycatcher

Nationally a summer migrant to Wales, parts of west England and Scotland that has declined in numbers and range since 1990 (BTO Atlas). In Worcestershire Harthan (1946) states it to be a spring migrant that has bred and mentions that Tomes (1901) writes *"near Worcester, Spetchley and Malvern"*. Single territories of Pied Flycatchers were recorded in Shrawley Wood during the detailed 1984-93 May surveys: 1990 in Plot 1 (unmanaged tall lime coppice) and in 1991 in Plot 3 (tall singled lime). No other records for the wood have been found. The species has always been scarce in most of Worcestershire with nesting aggregations encouraged by nest boxes in woodland on the Malvern Hills and in Wyre Forest. It is more typical of open oak woodlands to the west of the county. Numbers breeding in woods on the Malvern Hills and in Wyre Forest have declined in recent years.

Wood Warbler

Nationally the wood warbler is a summer migrant to west England, Wales and Scotland that has declined in numbers and distribution since 1980 (BTO Atlas). It is a species of open oak woodland with sparse ground cover and found mainly in north and west of Worcestershire. One territory was recorded during the detailed May surveys 1984-93 in Plot 3 of tall singled lime woodland in 1991. No other records have been found. Generally, it is a scarce species in Worcestershire following a severe decline in colonies in Wyre Forest and woods on the Malvern Hills since the 1980s.

Grasshopper Warbler

A summer migrant with characteristic continuous reeling song, the only records from Shrawley Wood follow the extensive felling in the 1940s and in the establishment stages of conifer plantations. Simon Walker in his 1979-80 combined list records about 10 ten singing males. As this low scrub and tall herbaceous habitat disappeared so did Grasshopper Warblers. A similar pattern has been recorded nationally with decline and retraction of distribution related to loss of habitat (BTO Alas).

Garden Warbler

Nationally this summer migrant is widely distributed in England, Wales and southern parts of Scotland and is always associated with scrub, young woodland and woodland with shrubby margins. In recent years there has been some expansion of range in Scotland and Ireland. National population levels have varied with some evidence of a recent small decline.

Garden Warblers could be regarded as one of the key species of Shrawley Wood with high bird populations in young lime coppice.Garden Warblers are amongst the top 13 species recorded on various May visits from 1948-2015. Simon Walker in his 1979-80 compiled list found them common in young coppice, 41 caught for ringing in the northern FC part of the wood and 39 adults caught in his CES survey in 1985. The 10-year survey mapped 13 territories in Plot 2 (based on singing males) in 1984 dwindling to two territories in 1993 when the coppice had re-grown and a closed canopy had formed, creating unsuitable habitat – see photographs in the chapter on coppice birds.

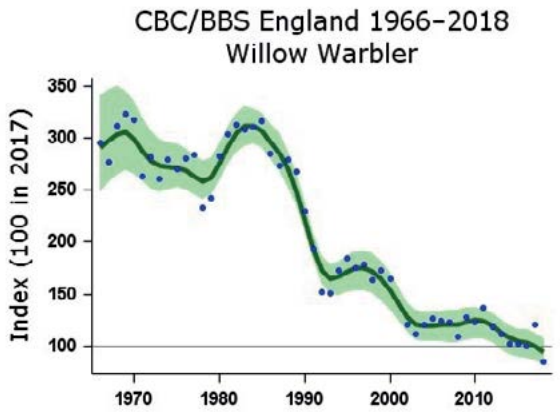
General observation in the last ten years have detected few singing male garden warblers but only in small young coppice plots as shown on the map in the chapter on coppice birds. The small numbers in the wood are clearly revealed by the 2019 NE transect surveys when only one was heard in the three surveys in the southern sector where there was no young coppice and six, two and two on the three visits to the northern sector. This decline is not due to any national or regional change but to local habitat change within the wood.

Blackcap
Nationally this species has increased in recent years both as a summer breeding migrant and as a winter bird. They use somewhat similar nesting habitat as garden warbler although less common in very young coppice and coppice with little understorey. They also occur as summer birds in many woodland habitats with a reasonably well developed shrub layer.

In the detailed study in Shrawley Wood 1984-93, plot 2 contained few blackcaps in the first stages of coppice re-growth, increasing as the coppice grew and then declined as the canopy closed. Plot 1, the old coppice with little understorey, contained very few blackcaps. Plot 3 of tall singled lime contained a few pairs throughout associated with the sparse bramble and holly understorey. Blackcaps were recorded on all ten of spring and early summer visits to Shrawley Wood 1948-2015 indicating that suitable habitat has been available for many years.

Willow Warbler
A common summer migrant throughout Britain and Ireland although there has been a large decline in both distribution and number in much of southern England in the last 25 years and a great increase in Scotland, all probably driven by climate change and possibly by deteriorating habitat in England. Willow warblers were very common in scrub and young woodland habitats in Worcestershire but are now scarce. They sing from trees and nest near the ground amongst young scrub or tall herbaceous vegetation often along woodland rides. Willow warblers were recorded on seven of ten spring and early summer visits 1948-2015 even though numbers elsewhere in Worcestershire have declined in recent years.

Simon Walker noted them as *"Abundant breeding migrant in low coppice area!"* in his 1979-80 list and he caught 104 by mist netting for ringing in the FC site, far more than any other species (see tables in the appendix to the chapters on birds). They were abundant in Plot 2 of young coppice during the 1984-93 survey until the coppice was about eight years old and in 1984 Simon Walker caught 34 adults in this plot during his CES survey. They were scarce in both Plot 1 of old coppice and plot 3 of tall singled lime. Notably, very few were found on the NE transect surveys in 2019. This is in keeping with the decline of Willow Warblers in Worcestershire although suitable habitat was scarce in the wood in 2019.



The decline of Willow warbler in England. *BTO/JNCC Bird Trends Report.*

Chiffchaff
Chiffchaffs breed throughout much of Britain and less frequently in Ireland. In recent years the distribution had spread towards the north of Scotland. Most of the breeding birds winter around the Mediterranean. However, there has been an increase in over-wintering birds in recent years with birds finding sufficient invertebrate food around sewage works and in gardens.

Chiffchaffs nest in somewhat similar habitat to Willow Warblers but with a greater association with tall trees, from which they sing, alongside low scrub as found along woodland rides or in clearings in woodland. The nest is also near the ground. In the detailed 1984-93 study chiffchaffs were scarce in plots 1 and 3 where there was little suitable habitat but commoner in plot 2 of young coppice until the canopy closed in the last two years of the survey.

Chiffchaffs were recorded on eight of ten of the spring or early simmer visits 1948-2015 (see table) indicating suitable habitat but also because they are obvious birds singing frequently from high in trees. The NE 2019 recorded more chiffchaffs than willow warblers reflecting the scarcity of the latter in Worcestershire and that the survey was conducted by walking along rides and paths where suitable habitat was most likely to be found.

Common Whitethroat
In 1970 the once very common whitethroat was absent from many parts of the country due to high mortality during severe drought in its wintering areas south of the Sahara. For many years there was little sign of recovery. By 2010 numbers were higher and small gains have continued. Whitethroats are distributed throughout Britain and Ireland. They are birds of hedgerows and low scrub. They rarely occur in woodland unless there are large areas of scrub as happened following clearance in WW2 in Shrawley Wood.

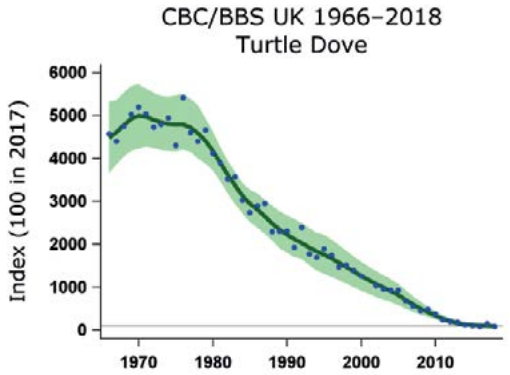
Despite the declines, Simon Walker noted them as *"Fairly common breeding migrant in areas of short coppice"* in his 1979-80 list and he caught 12 by mist netting in the FC site, far fewer than blackcaps, garden warblers, willow warbler and chiffchaff. In 1985 he only mist-netted one in Plot 2, the young coppice of the detailed study site, where the survey itself only recorded 2-3 singing males in 1984 the first year of the 1984-93 survey and none thereafter. Whitethroats were rarely noted on the spring and early summer visits 1948-2015 and not recorded by the NE 2019 survey.

It seems likely that Whitethroats were, in the days before the population crash 1968-69, infrequent in Shrawley Wood, occurring only in the first few years of larger areas of young coppice and they are generally absent from the wood nowadays.

Lesser Whitethroat
Nationally this species occurs mostly in England although the range has extended north during the last 20 years or so. It occurs mainly in the lowlands and favours tall hedges and similar scrub. Overall populations declined in the 1980s but have recovered somewhat since. Unlike common whitethroats, lesser whitethroats follow a south-east migratory route to winter south of the eastern Sahara and did not suffer the same catastrophe as the south-westward migrating Whitethroats did in the winter of 1969.

There are few records from Shrawley Wood. Simon Walker noted *"scattered pairs in short coppice"* in his list compiled in 1969-70 referring to the extensive area of WW2 felling and subsequent conifer planting. The only other record is by Fred Fincher in 1965 in the same conditions. There are no records since then.

Turtle Dove
The turtle dove is a summer migrant, arriving in late April or early May. It underwent a considerable breeding range expansion during the 19th century, moving out from East Anglia to occupy most of southern England and east Wales with smaller numbers reaching further afield including the Scottish borders. It requires weedy open ground for feeding and hedges, trees and scrub for nesting. Weedy arable farmland with big hedges suits it very well. It probably reached its maximum range and breeding numbers in the 1930s and 1940s. The range has since contracted back to eastern England although it has declined sharply in south-eastern counties. Nationally numbers have crashed by 90% since the early 1970s.



The decline of Turtle Dove in UK. *BTO/JNCC Bird Trends Report.*

In Worcestershire Harthan (1946) stated Turtle Doves as being well distributed in open country where it nested in tall hedges and bushes on the fringes of coppices and woods. In his revised list of Worcestershire's birds Harthan (1961) writes *"Not uncommon in open country, but less plentiful as the tall hedges in which it likes to nest disappear"* so reflecting the agricultural changes starting to sweep through the county at that time. He also includes a retrospective note that *"over 50 were counted in a field at Pedmore in 1892"* – yes, 1892. Interestingly, Kendrick Watson, writing an account of the parish of Shrawley in 1840, mentions turtle doves present in the parish.

Simon Walker in his 1979-80 report writes that turtle doves breed commonly throughout the coppiced area on the FC land in Shrawley Wood. It was noted in Plot 2 of the detailed survey 1984-93 for six years 1985-90 with at least one nest being found. There are no modern records. Observations by Hodgkinson in the 1920s and 1930s are noted at the end of this chapter.

Tits - general comments
Many of the lists of birds and surveys from Shrawley Wood mention great tits, blue tits and long-tailed tits. Coal and marsh tits feature less often and in the past willow tits were noted. Of these, Long-tailed tits are strongly associated with scrub as they usually nest in low bushes and forage in taller scrub. After the young fledge, family groups also forage high in trees. Although often seen in mixed flocks with other tits in winter, the species has rather different nesting sites and does not use holes in trees. The others all depend on holes for nest sites, especially in trees.

Great Tits and Blue Tits
Both these species are common woodland birds and woodland residents throughout Britain and Ireland. In winter they often move around in foraging flocks. They occupy a wide range of habitats usually associated with trees. Numbers may be temporarily reduced by hard winters but both species have generally increased in recent years.

Great tits and blue tits were recorded in Shrawley Wood on all ten visits listed in older surveys 1948-2015. They were commonly caught during Simon Walker's ringing activities 1979-80 and recorded in all the plots of the detailed surveys 1984-93. They also featured in both the NE 2019 surveys.

Although foraging in, and moving through, scrub habitats they are primarily associated with trees and nest in tree holes. They use big trees scattered throughout the wood and are unlikely to nest in plots of pure lime coppice without large trees unless this remains uncut for many years and holes are formed in the big stems.

Coal Tit
Coal Tits occur in woodland throughout Britain and Ireland and although common in deciduous woods bigger populations occur in conifer woods. They often nest in holes in the ground as there can be a shortage of tree holes in conifer woods.

Population levels have been fairly stable with some recent increases. In Shrawley Wood they are listed in nine of the ten surveys 1948-2915 and occurred in small numbers in Simon Walker's 1979-80 activities. Small numbers were present in each of the detailed survey plots 1984-93. The NE 2019 surveys all recorded them. Although no surveys are lacking the current Douglas fir plantations are likely to contain good populations of the species.

Marsh Tit
Nationally marsh tits occur in woodlands throughout most of England and Wales. Populations have been slowly declining over a long period possibly because of deterioration in the habitat they require. Marsh tit territories are of mature trees with a low canopy and well-developed understorey of shrubs rather than young trees. Nests are constructed in rot holes in mature trees and generally quite near the ground, lower than those used by great and blue tits
Their breeding territories average around 3-4 ha, larger than great and blue tit territories. Their winter range is usually up to about 40 ha around the core breeding territory but they do tend to remain there while the other tits wander more widely. They also make food stores which they defend. It follows that marsh tits are generally widely distributed but in small numbers in woods and the territory requirements may be scarce (Broughton et al. 2006, 2014). Marsh tits appear in the majority of the lists of Shrawley Wood birds from 1948 to 2019 but only in small numbers.

Willow Tit
The national distribution of the willow tit is now a roughly crescent-shaped zone running from NE England to South Wales. They are a very sedentary species so summer and winter distributions are similar. Since the 1980s it has vanished from SE England and the national population decline is over 80%. They occur (or used to do so) in a wide range of woodland types, though wet woodland and old scrub is often regarded as prime habitat. Sufficient decayed wood for excavation of nest holes is an essential habitat feature. In appearance they are similar to marsh tits so field identification often relies on differing call notes and song.

In Shrawley Wood willow tits are most likely to occur along the Dick Brook valley and in the old brick pits between the wood and the river Severn which are now filled with wet willow woodland. The species is in Fred Fincher's lists for 1947, 1954 and 1965 and is mentioned in West Midland Bird Club reports 1996, 1997 and 2002. Simon Walker list 1979-80 mentions one carrying food indicating nesting. None of these records indicate where the birds were seen in the wood. During the 1984-93 survey some territories were noted on the edges of Plot 2 and the birds were probably nesting in the nearby willow and alder beds occupying much of the valley between the pools at the time. Similarly, there was a territory on the edge of plot 3. They were not seen during the NE 2019 survey. Willow Tits are now very scarce in Worcestershire.

Long-tailed Tit
Nationally long-tailed tits occur throughout Britain and Ireland and numbers have been increasing steadily for many years. Even though populations crash in very cold winters they quickly recover. First egg dates are now about 14 days earlier than 50 years ago and more young are now produced, suggesting that milder weather due to climate change is of benefit to the species. The species is one of deciduous woodland, hedge and scrub, constructing nests low down amongst bramble and shrubs. On fledging, family parties join up to form small flocks (up to about 20 birds) that feed and roost together throughout the winter. Overall, they are sedentary in a relatively small breeding and wintering range.

The species appears in many of the lists of Shrawley Wood birds from 1946 to 2019 and many were caught during Simon Walker's 1979-80 ringing activities, both in the scrub on the FC land and in the CES site in Plot 2 of the detailed 1984-93 survey.

Green Woodpecker
This woodpecker is found across most of southern England with more patchy distributions to the north and west. Nationally,

numbers have shown a small increase in recent years. They occur throughout Worcestershire and have often been recorded in Shrawley Wood including on five out of ten of the spring visits 1948-2015 and by Simmons 1963-64. Simon Walker in his 1979-80 compiled list writes *"Present throughout the year. Almost certainly breeds"*. It was recorded occasionally during the detailed surveys 1984-93.

A major part of their food is ants, usually taken from open ground and anthills. Birds excavating a tree nest hole in woodland will often leave the wood to feed on open ground nearby.

Lesser spotted woodpecker

The distribution of the lesser spotted woodpecker has been restricted to the southern two-thirds of England and parts of Wales for many years. Numbers were highest at the peak of Dutch elm disease in the 1960-70s when a massive increase in insect food (beetle larvae) became available in decaying small branches and twigs and rotten wood was plentiful for the excavation of nest holes. Since the 1970s the distribution has decreased by around 30% and become more fragmented. Breeding productivity has reduced with nestlings often starving in the nest. Nestlings are mainly fed on small insects gleaned from leaves so possibly fewer are now available or the potential supply has become out of synchronisation due to the effects of climatic change.

In Worcestershire Tomes (1901) noted that lesser spotted woodpeckers were commoner in the county than the great spotted and that it *"is partial to orchards ... The nest is in a hole made by the bird in a dead branch high up in an apple, plum or cherry tree, in an orchard or garden"*. Harthan (1947) notes that it was commonest in old orchards and in his updated list of 1961 notes *"a pair or two in most parts of the county*". Personal local observations showed that orchards were often used in the 1960-70s. Many old orchards have been removed from Worcestershire in the last 50 years and lesser spotted woodpeckers are now scarce in the county and now often associated with wet woodland with decaying trees.

In Shrawley Wood, Simmons noted it as present 1963-64 and Simon Walker in his compiled list for 1969-70 notes *"Irregular sightings. Breeding probable"*. The species was not recorded in the detailed surveys 1984-93 or by the NE survey in 2019.

Great Spotted Woodpecker

Since the 1970s great spotted woodpeckers have been increasing and expanding their range throughout Britain and colonised Ireland from 2005 onwards. They occur throughout Worcestershire in woodland and were once common in old orchards before they were removed. Remaining old orchards are still used and nowadays great-spots are frequent visitors to garden feeding stations. In Shrawley Wood they were noted on five of ten spring visits 1948-2015, by Simmons in 1963-64 and Simon Walker in his 1969-70 list writes *"Fairly common breeding resident"*. They were recorded during the detailed 1984-93 survey on all three plots in several but not all years and by the NE 2019 surveys. Nowadays in spring, the sound of their territorial drumming resounds through the wood.

Great spotted woodpeckers excavate nest cavities in many tree species, frequently in dead trunks of birch and in dead or decaying limbs of other trees. Even in apparently solid trees the nest is often associated with decay within the tree (Smith 1997). They also obtain most of their invertebrate food from decaying wood. Hence an abundance of decaying wood is required to support a good population of these woodpeckers. Casual observations in Shrawley Wood suggest nests are most often associated with the birch scattered amongst the lime.

Throughout the small-leaved lime stands in Shrawley Wood there are many trees with horizontal lines of peck marks on the trunks, on some trees extending from near ground level to small branches high in the tree. Each line contains from 4-10 pecks around 2-4 cm apart and about 1 cm deep, and is sometimes called tree ringing. As the tree diameter increases with growth the marks expand sideways and on big trees that have been repeatedly used for many years the bark is rough rather than the normal smooth. On the first year (1984) of the ten year detailed study, our attention was caught by hearing a series of definite woodpecker blows high up in a tall lime in the singled plot (Plot 3) and we saw a great spotted woodpecker peck a row of punctures in the lime bark as we watched. This was the first and only time we have observed the activity but having become aware of it we noticed many peck-marked trees and, coincidentally, Gibbs (1983) wrote a paper in *British Birds* aimed at bringing ring pecking to the attention of bird watchers and asking for more observations but little seems to have been published in Britain since then.

Tree ringing by great spotted woodpeckers in Britain was first reported by Wynne-Edwards (1933) on a lime tree in Leigh Woods, Somerset. He also quoted similar cases from Germany and compared them with the holes or wells made by sap-suckers in North America as follows:

Through the kindness of the Rev. F. C. R. Jourdain my attention has been drawn to a case similar in every detail in Silesia, E. Germany, described by Herr Juhnke (Berichte des Vereins Schlesischer Ornithologen, 18 Jahrg., 1933, pp. 42-44). Here six trees, also limes, were so marked; all were of the American species usually called "basswood " (Tilia americana), and native European lime trees close by were entirely free also. Herr Juhnke was told by the forest rangers, who had had their trees under observation for eleven years, that the pits were worked chiefly in spring, and occasionally at other seasons, by the Great Spotted Woodpecker in particular, and to a smaller extent by the Middle Spotted, Green and Black Woodpeckers (Dryobates medius, Picus viridis and Dryocopus martius). If this is correct, their habits agree exactly with those of the Sapsuckers, which not only drink sap when it flows in the spring, but also eat the cambium layer underlying the bark, which they sometimes seek also in autumn. Herr Juhnke of course found no sap-flow in July

When Gibbs (1983) reviewed the occurrence of ringing, he referred to observations by Jennings (1965) in the Forest of Dean, and by Broadhead (1963) at Wentbridge, Yorkshire. Jennings (1965) implies the woodpeckers did take sap oozing from the peck lines on limes but it is not clear whether this was a direct observation or an unobserved expectation. He does note that the activity was often high in leaf-covered trees and difficult to see. Broadhead reported ringing of young sycamores early March 1963 during hard weather and that the birds tried a few pecks high up the trunk then descended the trunk and tried again until they found a point where sap oozed at which point they almost ring-barked the tree. He thought the birds were seeking water to drink when water elsewhere was frozen.

In a study of oaks Gibbs (1983) noted that if the stem was cut through the peck line it could be seen that the pecks had been made in both the dormant and growing seasons and cross sections often showed a dark mark on the annual ring (xylem) indicating the year in which the peck was made. Although Gibbs quoted reports from Europe of several species of woodpeckers obtaining sap or at least moisture from the peck marks and drew a comparison with North American sap-suckers it was not clear whether this occurred in Britain. He concluded that more observations of the birds at work are required.

In 1982 Gibbs wrote a paper entitled *An Oak Canker Caused by a Gall Midge*. This was mainly about cankers that formed in young oak stems, developing from woodpecker peck lines and other damage but forming only in particular circumstances. He noted that in most [tree] genera the woodpecker damage is of little significance, the peck mark in the bark merely being matched by a corresponding fleck in the xylem ring of the year in which the pecking occurred. However the summary to the paper states *"Evidence is presented that the cause of canker formation is a gall midge,* Resseliella *sp. which lays its eggs in recently formed peck marks during the months of July and August"* The cankers described formed large vertical folds in the bark with large patches of dead tissues in the stem behind them. Several species of fungi were isolated from the

cankers but the evidence was that the lesions were reactions to a gall-fly, Cecidomyiidae, larvae and the fungi were secondary invaders. In a few instances pupae of another dipteran, identified as *Megamerina dolium,* were present. Little was known of this latter insect but the appearance of the larval mouth parts suggested the larva probably predated other fly larvae. The Cecidomyiid larvae were identified to the genus *Resselliella*.

Klaus Dengler studied ring pecking by woodpeckers in Germany for many years including the interactions between forest trees, woodpeckers and the gall midge *Resseliella quercivora*. He showed that larvae of *R. quercivora* develop in the cambium of many species of forest trees damaged by birds and induce cambium necroses, which on oaks are known as "oak canker" or "T-disease" and that it was likely that this species causes similar disease on other trees, such as elms, beech and lime. He published a detailed study of the biology, ecology, distribution and harmfulness of this species (Dengler 2004 from a summary published by Skuhravá *et al* 2014**)**.

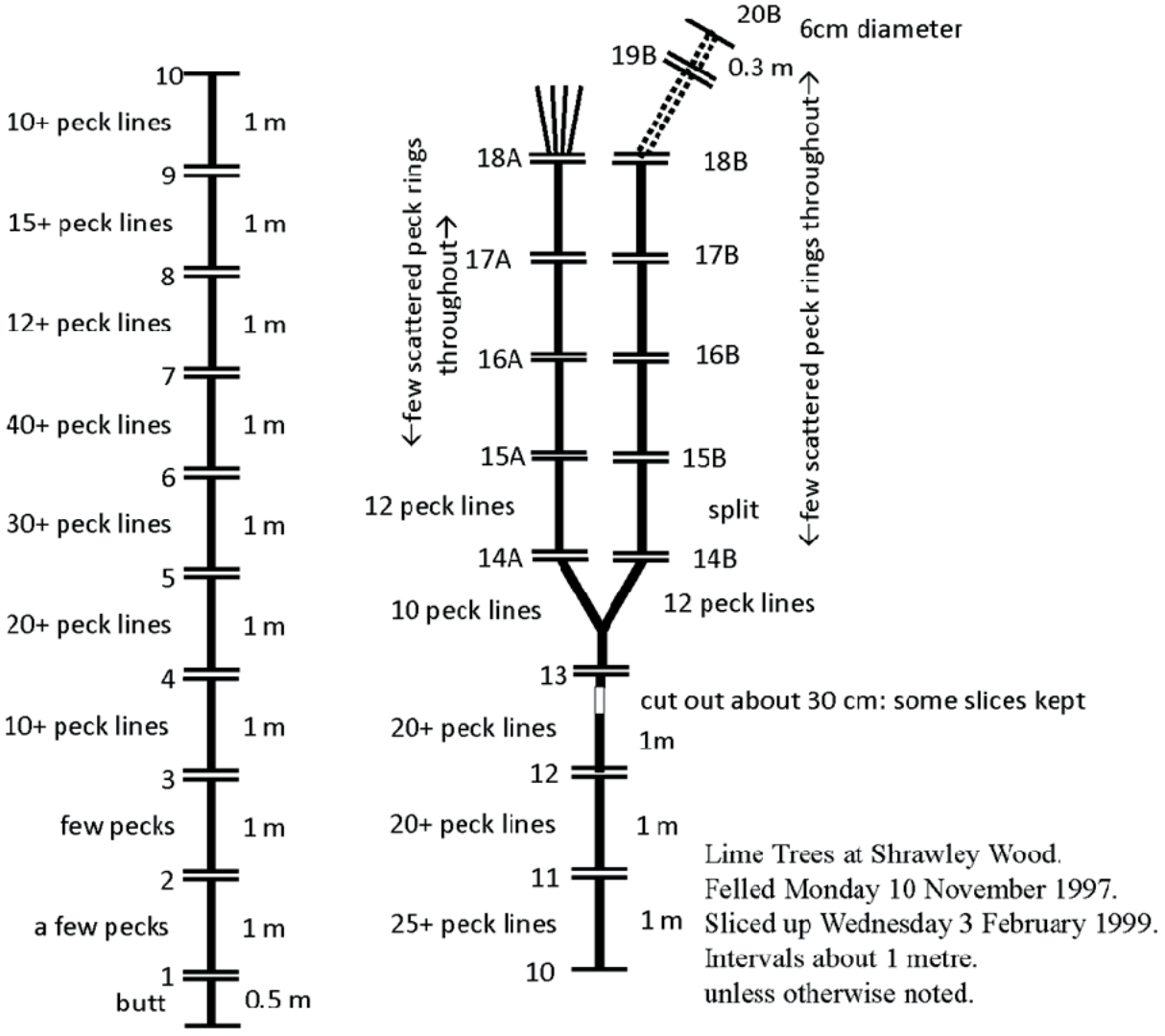
Unfortunately the author of this chapter cannot read German and although some of Dengler's publications are available on the internet they are not easily understandable following Google translations.

One speculation is that an insect lays eggs in the peck marks and the subsequent larvae are later taken as food by the woodpeckers re-visiting the holes but no data supporting this in Britain has been found. Gibbs (1982) stated that the *Resselliella* he found lays its egg in recently formed peck marks in oak during July and August and larvae are present until the following June. Conceivably woodpeckers might search old peck marks from autumn through to the following spring but this has not been observed.

Having seen pictures and read of the internal dark marks on an annual ring related to the peck marks the author of this chapter arranged for a Shrawley Wood lime carrying a large number of peck lines to be felled on 10th November 1997. The plan was to cut sections through the trunk and discover the age of the tree when a peck line was made by correlating with dark flecks on the annual rings. We hoped to discover how many peck lines were made in a particular year. Slicing a whole tree was of course a massive undertaking and in the end sample sections were taken at every metre.

The number of ring lines within each metre length were counted (01) and we had an arrangement for the discs cut at one metre intervals to be examined in detail but unfortunately this came to nothing because of changed circumstances. Some discs from elsewhere in the tree were retained and polished and one is shown in (02).

It is clear that the reasons for woodpeckers pecking lines on lime and other trees in Britain remain undiscovered. Possibly they are at times used to obtain water. Detailed observations are needed. Although many trees carry peck lines in Shrawley Wood the actual number has not been estimated.



01. Diagram of small-leaved lime tree felled 10 November 1997 showing an estimate of the total number of great spotted woodpecker peck lines in one metre sections. There are approximately 300 peck lines and comparatively this is a moderately pecked tree. The diagram shows

about 17 metres of the main trunk to a small distance above the first fork. Discs from the 12 metre section of the main trunk were retained and a sample cross section is shown in 02.

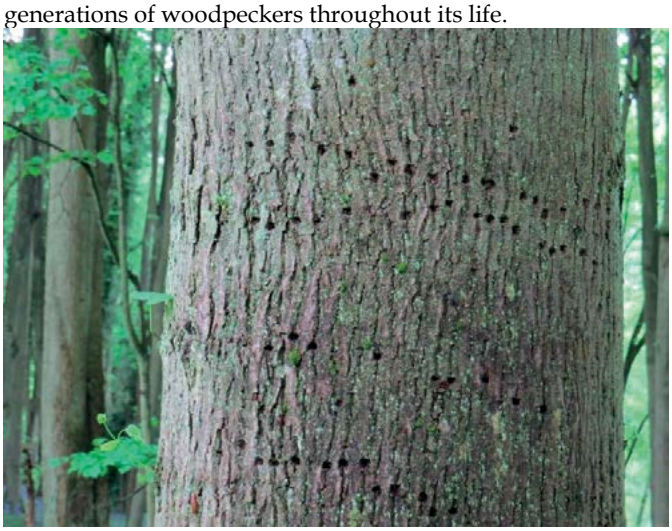


02. Cross section from the 12 metre section of the small-leaved lime tree felled 10th November 1997. The tree was in Plot 3 (the singled plot) of the detailed bird survey 1984-93. The maximum diameter is 28 cm. On annual ring 25 there are small dark marks which are scars from great spotted woodpecker pecks made in that year. There is also a larger dark mark on that ring which may be the remnants of a canker caused by gall midge larvae developing in a peck hole – see text. Indentations in the bark are peck sites which probably made marks on annual rings above and below this cross-section. It is difficult to count the annual rings accurately but the trunk appears to be about 45 years old which matches coppice re-growth following the extensive felling in the area in the 1940s.

The following pictures show both a heavily and moderately pecked small-leaved lime trees, and details of fresh pecks marks and old marks stretched horizontally as the tree increased in girth. (03, 04, 05, 06).



03. Small-leaved lime with many peck marks indicating that the tree was used from a young age. Peck marks continued into the main branches of the canopy. The tree was used by generations of woodpeckers throughout its life.



04. Small-leaved lime showing moderate peck marks made by great spotted woodpeckers. R. Winnall



05. Small-leaved lime showing fresh peck marks made by great spotted woodpecker.

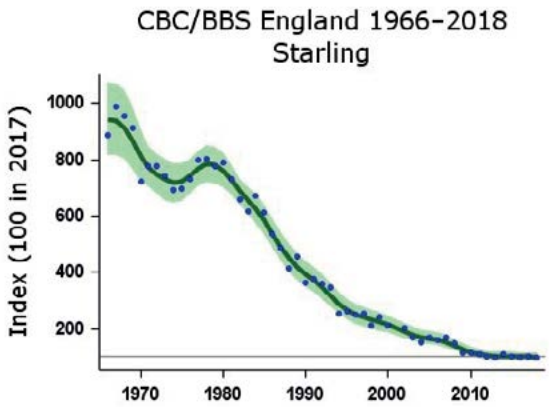


06. Old peck marks made by great spotted woodpecker. The marks have increased in width as the tree grew while remaining around the same height from the ground.

Other birds nesting in tree holes

Starlings were very common breeding birds in England that have undergone a massive decline since the 1970s. This is probably related to the loss of the important food source of invertebrates in grassland through intensive agriculture and the decline in livestock grazing in some regions. Starlings were well-known as woodland breeding birds using tree holes and especially for evicting great spotted woodpeckers from their nest holes or using the holes after a brood had fledged. Simon Walker 1979-80 noted there were very few nest sites in the wood and at that time the woodland had been extensively felled during WW2.

In the past nesting starlings may have been regular breeding birds but at the present time, as elsewhere, Starlings are scarce in Shrawley Wood.



The decline in Starlings in England. *BTO/JNCC BirdTrends Report.*

Nuthatches are mainly common birds of deciduous woodland or parkland with big trees. They use natural holes as nesting sites and usually plaster mud round the entrance to decrease the sixe to one that suits them. They occur in Shrawley Wood where there are big mature trees, notably near Wood House.

Treecreepers are common woodland birds noted by Simon Walker 1979-80 to occur throughout Shrawley Wood as they still do, including mature lime coppice. They usually nest behind detached bark.

Jackdaws and Stock Doves are regularly seen or heard in Shrawley Wood and probably take advantage of larger tree hole for nesting when these are available.

Birds of prey

Barn owl, tawny owl, little owl, sparrowhawk, kestrel, buzzard and goshawk have all been recorded in Shrawley Wood by various visitors and surveys from 1946 to 2019.

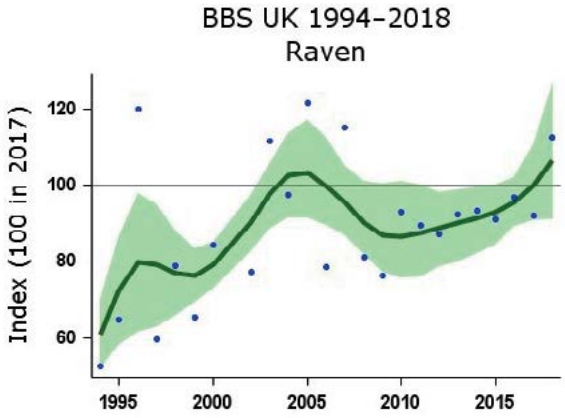
Simon Walker recorded a tawny owl nest with young 1979-80 and noted they occurred throughout the wood. This owl was recorded in the detailed study plots in most years 1984-93.

Goshawks have been spreading in Worcestershire for many years and are at times present in Shrawley Wood

Raven
Ravens were not recorded by Fred Fincher in his journals of 1946-1969 or listed in Simon Walker's 1979-80 report nor in the annual censuses 1984-1993 (Fuller & Green 1998). In more recent times, however, they have been noted on various visits as nesting in the tall Wellingtonias in the FC area of the wood (see chapter on the Trees of Shrawley Wood p. 280) and have nested there annually in the last decade at least.


Young ravens in the top of a Wellingtonia in Shrawley Wood 2019. Mike Metcalf.

Ravens have increased as breeding birds along the English-Welsh border and colonised extensive new areas of the south coast, western and midland England during the last 30 years and have also increased elsewhere in UK. This increase had been very noticeable in Worcestershire rising from a few pairs in the 1950s to a major increase from around 1980 and continuing to the present day. The exact reasons for the increase are not known but may be due to a decline in persecution. Mike Metcalf has been collecting breeding records of Ravens in Worcestershire for some years and his latest annual summary was published in 2019.



The increase in Ravens in UK. *BTO/JNCC BirdTrends*


Raven – a painting by Raymond M. Bishop ©

Finches and buntings.
Chaffinches are common resident woodland breeding birds regularly occurring in Shrawley Wood. Bullfinches favour scrub and coppice and were common during Simon Walker's mist netting in the 1970s and 1980s in the FC area of regenerating coppice and youg conifer plantation. Yellowhammer were also reported as common by Simon Walker.

In the 1970s and 1980s Repolls increased in Worcestershire often nesting in young coppice and scrub as Simon Walker reported from Shrawley Wood in the 1980s. The small breeding population was boosted by winter visitors. Redpolls have now declined as breeding birds in Worcestershire and have not been recorded as breeding birds at Shrawley in recent years. They probably occur as winter visitors. Flocks of up to 200 siskins were recorded in winter by Simon Walker in the 1980s and they probably still do so.

Water birds
Simon Walker 1979-80 noted several pairs of grey wagtails breeding along the Dick Brook and nesting birds have been seen near the lake dam in recent years. He also noted dippers nesting along the Dick Brook where they have continued to occur.

Mallard, tufted duck, coot and moorhen have long been noted as breeding birds on the pools within Shrawley Wood. In recent years a large winter roost of cormorants has been noted in trees near the dam to the main pools. Grey herons have nested periodically in the trees at Oliver's Mound.

Wilfred P. Hodgkinon and his books
W. P. Hodgkinson was an artist, naturalist and author who lived in Shrawley as a boy. In the 1940s he wrote two books, *The Eloquent Silence* in 1946 and *The Kingdom is My Garden* in 1948. He disguised the village by calling it Ridding along with Ridding Brook and Ridding Wood actually the Dick Brook and Shrawley Wood. He observed and listened to the countryside and its people and in the essays that are his books' chapters he admits he has not made exact descriptions of time and people.

He was born on April 30th 1912 and the first chapter in *The Eloquent Silence* is about his escapades and adventures as a boy in the countryside when he learns to identify wildlife as part of his natural life. His word-pictures are of the countryside in Severn Vale in and around Shrawley between the two World Wars. He tells of a countryside bustling with birds and sparkling with flowers. A time of natural bio-abundance before the onslaught of intensive farming.

Even without exact dates there is information of many birds.

For example in the chapter on *Birds and Bird-nesting* he notes that the following *are fairly common here, less so elsewhere*: Redstart, Goldcrest, Spotted and Barred Woodpeckers , Nuthatch, Tree-creeper, Wood Warbler all found in Riddings Wood. He found ten Redstart nests and nests of Willow Warbler and Chiffchaff and observed Woodcock in roding flights. Nightingales sang in the wood and in the village. Bullfinch, Chaffinch, Goldfinch, Greenfinch were all common. He found Long-tailed Tits nests and saw Dippers at the brook. In winter he watched flocks of Fieldfares. Redwings, Siskin and Redpoll and in the wood flocks of hundreds of tits with scores of Goldcrests and Long-tailed Tits.

He wrote *"In the spring the wood is alive with birds; hardly a tree but has in it a blackbird's, thrush's, bullfinch, wood pigeon's or turtle dove nest Owls, hawks and magpies and jays thrive in the depths."*

In a chapter on Doves he writes of the great abundance of Wood Pigeons (also called Ringed-doves or, locally, Quice), lesser numbers of Stock-Doves and summer Turtle Doves. The last are often mentioned in his books – purring in early summer.

In *The Kingdom is a garden* there is a chapter named *Garden guests* referring to his garden in Ridding (Shrawley) village. There he sees a Hedgehog, a family of Magpies, rabbits and Jackdaws, Spotted Flycatchers nesting, Garden Warblers and Blackcap singing and he describes the difference between their songs. Willow Warblers, sparrows and Great Tits singing. Also two pairs Goldfinches, three pairs Chaffinches and Lesser Whitethroats nesting. And, astonishingly, *"Woodlark singing from the ground and in air all summer".*

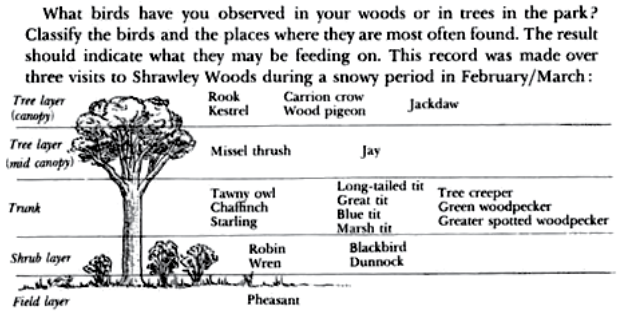
In Ridding (Shrawley) Wood in early spring he hears the drowsy calls of greenfinches. By a yew tree he sees Tree Creeper and Garden Warbler, finds a Wood Warbler's nest, a Pheasant nest and hears Tawny Owl calling. Along the brook are Common Sandpipers, a Dipper's nest, the place where a Bittern had been seen and Buzzard soaring, woodpecker s drumming, Chaffinch singing, and Chiffchaffs. He hears the laughing calls of Green Woodpeckers.

Most of the birds he mentions still occur in the area but in much smaller numbers. Turtle Doves, Redstarts and Wood Warblers are very scarce; Nightingales have vanished. Woodlarks are scarce in the county and there are no modern reports from the Shrawley area.

Hodgkinson's descriptions of the countryside and its natural history chime with the author's the experiences when a boy in north Oxfordshire.

Winter birds.
Apart from Hodgkinson's note above there are very few records available for winter birds in Shrawley Wood although doubtless common species have been seen by many people on random visits. There are scattered records of migrant winter thrushes – Redwings and Fieldfares.

One interesting historical observation was made by Gordon Simmons (1968) who organised his students to record the niches that birds were using in Shrawley Wood in a cold winter period in the 1960s. This chapter concludes with a diagram that neatly summarises what they found.



Appendix
The appendix to the chapters on birds contains lists of the major sources of records of birds in Shrawley Wood.

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Appendix to chapters on birds.
Main collections of bird records for Shrawley Wood since 1946.

TABLE 1. Records of birds extracted from Fred Fincher's hand written journals from his first visit to Shrawley Wood in 1946 to his last in 1980.

26/05/1946	**Little Grebe**
26/05/1946	Moorhen
03/10/1946	Barn Owl
03/10/1946	Blackcap
03/10/1946	Blue Tit
03/10/1946	Carrion Crow
03/10/1946	Coal Tit
03/10/1946	Goldcrest
03/10/1946	Great Tit
03/10/1946	Grey Wagtail
03/10/1946	Jay
03/10/1946	Long-tailed Tit
03/10/1946	Mallard
03/10/1946	Marsh Tit
03/10/1946	Moorhen
27/08/1947	Green Woodpecker
27/08/1947	Marsh Tit
27/08/1947	Stock Dove
27/08/1947	Willow Tit
27/08/1947	Willow Warbler
27/08/1947	Wood Pigeon
13/04/1948	Blackbird
13/04/1948	Blackcap
13/04/1948	Blue Tit
13/04/1948	Carrion Crow
13/04/1948	Chaffinch
13/04/1948	Chaffinch
13/04/1948	Chiffchaff
13/04/1948	Coal Tit
13/04/1948	Dunnock
13/04/1948	Goldfinch
13/04/1948	Great Spotted Woodpecker
13/04/1948	Great Tit
13/04/1948	Greenfinch
13/04/1948	Jackdaw
13/04/1948	Kestrel
13/04/1948	Magpie
13/04/1948	Marsh Tit
13/04/1948	Mistle Thrush
13/04/1948	Moorhen
13/04/1948	Nuthatch
13/04/1948	Pheasant
13/04/1948	Robin
13/04/1948	Song Thrush
13/04/1948	Sparrowhawk
13/04/1948	Stock Dove
13/04/1948	Willow Warbler
13/04/1948	Wood Pigeon
13/04/1948	Wren
10/08/1948	Chiffchaff
10/08/1948	Common Sandpiper
10/08/1948	Garden Warbler
10/08/1948	Kingfisher
10/08/1948	Nuthatch
10/08/1948	Redstart
10/08/1948	Sparrowhawk
10/08/1948	Stock Dove
10/08/1948	Wood Pigeon
05/10/1948	Buzzard
05/10/1948	Chiffchaff
05/10/1948	Great Spotted Woodpecker
05/10/1948	Grey Wagtail
05/10/1948	Mistle Thrush
05/10/1948	Moorhen
05/10/1948	Nuthatch
05/10/1948	Tree creeper
05/10/1948	Pied Wagtail
05/10/1948	Wood Pigeon
07/10/1948	Great Spotted Woodpecker
04/09/1951	Blackcap
04/09/1951	Blue Tit
04/09/1951	Carrion Crow
04/09/1951	Chaffinch
04/09/1951	Chiffchaff
04/09/1951	Garden Warbler
04/09/1951	Goldcrest
04/09/1951	Great Spotted Woodpecker
04/09/1951	House Sparrow
04/09/1951	Grey Wagtail
04/09/1951	Marsh Tit
04/09/1951	Mistle Thrush
04/09/1951	Nuthatch
04/09/1951	Pied Wagtail
04/09/1951	Song Thrush
04/09/1951	Sparrowhawk
04/09/1951	Spotted Flycatcher
04/09/1951	Starling
04/09/1951	Stock Dove
04/09/1951	Wood Pigeon
12/05/1954	Blackcap
12/05/1954	Blue Tit
12/05/1954	Carrion Crow
12/05/1954	Chiffchaff
12/05/1954	Garden Warbler
12/05/1954	Great Spotted Woodpecker
12/05/1954	Great Tit
12/05/1954	Mallard
12/05/1954	Moorhen
12/05/1954	Song Thrush
12/05/1954	Whinchat
12/05/1954	Willow Tit
12/08/1954	Chiffchaff
12/08/1954	Garden Warbler
12/08/1954	Greenfinch
12/08/1954	Moorhen
12/08/1954	Nuthatch
12/08/1954	Spotted Flycatcher
12/08/1954	Stock Dove
12/08/1954	Swallow
12/08/1954	Willow Warbler
12/08/1954	Wood Pigeon
02/10/1955	Blue Tit
02/10/1955	Buzzard
02/10/1955	Chiffchaff
02/10/1955	Great Spotted Woodpecker
02/10/1955	Great Tit
02/10/1955	Grey Heron
02/10/1955	Long-tailed Tit
02/10/1955	Marsh Tit
02/10/1955	Moorhen
02/10/1955	Nuthatch
02/10/1955	Robin
02/10/1955	Wren
19/09/1959	Blackbird
19/09/1959	Chiffchaff
19/09/1959	Garden Warbler
19/09/1959	Great Spotted Woodpecker
19/09/1959	Moorhen
25/06/1960	Blackcap
25/06/1960	Coal Tit
25/06/1960	Grey Heron

25/06/1960	Marsh Tit
25/06/1960	Mistle Thrush
25/06/1960	Robin
25/06/1960	Turtle Dove
13/04/1961	Blackbird
13/04/1961	Blackcap
13/04/1961	Blue Tit
13/04/1961	Coal Tit
13/04/1961	Great Tit
13/04/1961	Magpie
13/04/1961	Mistle Thrush
13/04/1961	Song Thrush
13/04/1961	Nuthatch
13/04/1961	Pheasant
13/04/1961	Song Thrush
21/10/1961	Grey Wagtail
21/10/1961	Mallard
21/10/1961	Moorhen
21/10/1961	Robin
21/10/1961	Wren
08/09/1962	Chaffinch
08/09/1962	Garden Warbler
08/09/1962	Mistle Thrush
08/09/1962	Wood Pigeon
08/09/1962	Wren
14/08/1963	Blackcap
14/08/1963	Coal Tit
14/08/1963	Dunnock
14/08/1963	Green Woodpecker
14/08/1963	Jay
14/08/1963	Robin
14/08/1963	Starling
14/08/1963	Tawny Owl
14/08/1963	Willow Warbler
14/08/1963	Wood Pigeon
14/08/1963	Wren
05/11/1964	Nuthatch
12/05/1965	Blackcap
12/05/1965	Blue Tit
12/05/1965	Chaffinch
12/05/1965	Coal Tit
12/05/1965	Garden Warbler
12/05/1965	Great Tit
12/05/1965	Long-tailed Tit
12/05/1965	Pheasant
12/05/1965	Spotted Flycatcher
12/05/1965	Swallow
12/05/1965	Willow Tit
12/05/1965	Willow Warbler
12/05/1965	Wood Pigeon
12/05/1965	Yellowhammer
20/08/1968	Swift
30/07/1969	Blackcap
30/07/1969	Grey Heron
30/07/1969	Marsh Tit
30/07/1969	Mistle Thrush
30/07/1969	Robin
22/08/1980	Marsh Tit

TABLE 2. Simon Walker's compiled list of Shrawley Wood bird from report to the Forestry Commission 1980

Grey Heron	Many sightings, especially around pools. Rumoured to breed but no evidence found (their used large nests would be very easy to locate in winter). Nested in small numbers in the past.
Bittern	One killed by dog some years ago in reeds at the New Pool.
Mallard	Quite a common breeding resident especially near brook and pools.
Teal	Winter sightings at marshy area near river.
Tufted Duck	Irregular sightings on pools.
Sparrowhawk	Probably breeds. One sub-adult caught and ringed during breeding season.
Kestrel	Seen on very few occasions but probably breeds nearby.
Red Legged Partridge	Two seen in field by Dick Brook.
Pheasant	Common breeding resident.
Moorhen	Nests on all pools.
Coot	Three or four pairs nest on new pool.
Lapwing	Many sightings on nearby pools.
Redshank	One seen at marshy area by river.
Woodcock	Fairly common breeding bird in coppiced areas.
Snipe	Winter sightings at marshy area by river.
Back-headed Gull	Many seen flying above river.
Lesser Black-backed Gull	Many seen flying above river.
Herring Gull	Singles seen by river.
Wood Pigeon	Abundant breeding resident.
Stock Dove	Status unknown but certainly a few breeding pairs.
Collared Dove	Breeds in Shrawley vil1age.
Turtle Dove	Breeds commonly throughout coppiced area.
Cuckoo	Present during May and June.
Tawny Owl	One nest containing two young found, present throughout the wood.
Kingfisher	Present along Dick Brook where it almost certainly breeds.
Green Woodpecker	Present throughout the year. Almost certainly breeds.
Great Spotted Woodpecker	Fairly common breeding resident.
Lesser Spotted Woodpecker	Irregular sightings. Breeding probable.
Hoopoe	One briefly seen on lawn in nearby garden.
Swallow	Breeds at nearby farmyards.
House Martin	Nests in Shrawley village.
Tree Pipit	Five to ten pair s breed in young plantation and recently coppiced areas.
Grey Wagtail	Two pairs breed along this stretch of Dick Brook.
Pied Wagtail	Breeds in village and at farms.
Dunnock	Common breeding resident.
Grasshopper Warbler	Probably more than ten breeding pairs in areas of short coppice.
Reed Warbler	One or two pairs breed at marshy area near river with possibly one pair in reeds at New Pool.
Sedge Warbler	One singing male present in June at marshy area near river.
Whitethroat	Fairly common breeding migrant in areas of short coppice.
Lesser Whitethroat	Scattered pairs in areas of short coppice.
Garden Warbler	Common breeding migrant in areas of short coppice.
Blackcap	Fairly common breeding migrant in areas of short coppice.
Willow Warbler	Abundant breeding migrant in areas of short coppice.
Chiffchaff	Fairly common breeding migrant in areas of short coppice.
Goldcrest	Irregular sightings, all in winter.
Spotted Flycatcher	Only two sightings but probably breeds in village.

Robin	Common breeding resident.
Nightingale	One heard in late May.
Blackbird	Common breeding resident.
Fieldfare	Winter sightings in nearby orchards.
Redwing	Many seen with Fieldfares in nearby orchards and feeding on hawthorn berries.
Song Thrush	Fairly common breeding resident.
Mistle Thrush	Distribution unknown but certainly one breeding pair in coppiced area.
Long Tailed Tit	Certainly breeds with family groups seen in winter.
Coal Tit	Present during breeding season in conifer areas.
Great Tit	Common breeding resident.
Blue Tit	Common breeding resident.
Marsh Tit	Scattered pairs.
Willow Tit	One seen in June carrying food.
Nuthatch	Only present in the more mature woodland.
Treecreeper	Present throughout woodland.
Wren	Common breeding resident.
Dipper	At least one breeding pair along stretch of Dick Brook.
Corn Bunting	Present at nearby farmland.
Yellowhammer	Fairly common breeding resident.
Reed Bunting	Two or three pairs near river.
Chaffinch	Fairly common breeding resident.
Goldfinch	Irregular sightings.
Bullfinch	Common breeding resident.
Greenfinch	Common in nearby gardens.
Siskin	Winter flock exceeding two-hundred with Redpoll on birch and alders.
Redpoll	Breeds in area but many more arrive in late autumn.
Linnet	Regular sightings with a few breeding pairs.
Tree Sparrow	Irregular sightings.
House Sparrow	Very common in nearby Shrawley village.
Starling	Only a few suitable nest hole sites in wood itself.
Jay	Common breeding resident.
Magpie	Common breeding resident.
Rook	Many sightings throughout year.
Carrion Crow	Scattered breeding pairs.

TABLE 3. Simon Walker's list of birds ringed 1979-80 from report to the Forestry Commission 1980

Total numbers of birds caught for ringing on Forestry Commission land in spring and early summer 1979 and 1980. Habitat mainly young scrub, young coppice, and young conifer plantation. The Dippers bred along the nearby Dick Brook.

Willow Warbler	104
Garden Warbler	41
Chiffchaff	39
Blackbird	37
Blackcap	36
Wren	36
Long-tailed Tit	35
Dunnock	35
Bullfinch	34
Great Tit	26
Robin	23
Blue Tit	18
Song Thrush	14
Yellowhammer	14
Whitethroat	12
Willow Tit	6
Linnet	4
Tawny Owl	3
Goldcrest	3
Swallow	2
Coal Tit	2
Tree Pipit	2
Mistle Thrush	2
Redpoll	2
Sparrowhawk	1
Grasshopper Warbler	1
Marsh Tit	1
Chaffinch	1
(Dipper)	(3)
Total	537
29 species	

TABLE 4 Simon Walker's Constant Effort Site (CES)

Adult birds caught for ringing by Simon Walker 5th May 1985-7th July 1985 on Plot 2 of the detailed study area as a Constant Effort Site (CES) for the BTO. Four year old small-leaved lime coppice with scattered oak standards surrounded by mature lime and pools.

Species	Adults caught
Tree Pipit	1
Wren	7
Dunnock	11
Robin	3
Blackbird	19
Song Thrush	8
Whitethroat	1
Garden Warbler	39
Blackcap	16
Chiffchaff	9
Willow Warbler	34
Goldcrest	2
Long-tailed Tit	21
Coal Tit	3
Blue Tit	35
Great Tit	13
Nuthatch	1
Treecreeper	1
Bullfinch	33
Yellowhammer	4
Green Woodpecker	1
Kestrel	2
Totals	23 species 262 adults
13 nets 727 ft	

TABLE 5. Shrawley Wood List compiled by Steve Davies from a circular walk in the Forestry Commission area between 07.50 and 10.05 a.m. on 08 May 2015

Species found generally throughout all woodland habitats	Number recorded and activity
Wood Pigeon	22
Dunnock	5
Chiffchaff	10
Song thrush	8
Nuthatch	2
Swift	2 flying overhead
Goldfinch	2
Garden Warbler	2
Long-tailed Tit	5
Chaffinch	10
Mistle Thrush	1
Carrion Crow	1
Marsh Tit	2 at SO805669
Buzzard	1
Skylark	1
Cuckoo	1 singing male at woodland edge so804668
Jackdaw	2
Swallow	1 flying overhead
Lesser black-backed Gull	1 flying overhead
Birds with strong association with areas of short coppiced lime	
Blackcap	15
Wren	37
Blackbird	38 nest building observed
Robin	23
Great Tit	5
Treecreeper	6
Jay	3
Bullfinch	3
Green Woodpecker	2
Birds with strong association with areas of taller coppiced lime	
Coal Tit	14 seen where there are coniferous trees a such as yew within stands.
Goldcrest	17 as for coal tit
Blue Tit	12
Raven	2 nest with young in Wellingtonia at SO810661

TABLE 6. Spring records of birds in Shrawley Wood 1948 to 2015. The species in this list were recorded on 7 to 10 of these visits, that is on most visits.

Species in alphabetical order. Species recorded on 7-10 visits 1948-2015.	13 April 1948 Fred Fincher Journal	12 May 1954 Fred Fincher Journal	13 April 1961 Fred Fincher Journal	12 May 1965 Fred Fincher Journal	1979 &1980 Spring and Summer mist netting in scrub on FC land. Simon Walker	Constant Effort Site, survey Plot 2, Mist netting six visits 5 May to 29 June 1985. Simon Walker	Bird survey 1984-1993 in May. Plot 1. c40 year old unmanaged coppice Fuller & Green (1998)	Bird survey 1984-1993 in May. Plot 2. Recent coppice Fuller & Green (1998)	Bird survey 1984-1993 in May. Plot 3. Singled coppice cut in 1960s. Fuller & Green (1998)	8 May 2015 Steve Davies Transect walk in FC plot.	Number of occasions recorded out of 10 sets of records
Blackcap	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	10
Blue Tit	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	10
Chiffchaff	✓	✓			✓	✓	✓	✓	✓	✓	8
Coal Tit	✓		✓	✓	✓	✓	✓	✓	✓	✓	9
Dunnock	✓				✓	✓	✓	✓	✓	✓	7
Garden Warbler		✓		✓	✓	✓	✓	✓	✓	✓	8
Great Tit	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	10
Long-tailed Tit				✓	✓	✓	✓	✓	✓	✓	7
Marsh Tit	✓				✓	✓	✓	✓	✓	✓	7
Robin	✓				✓	✓	✓	✓	✓	✓	7
Song Thrush	✓	✓	✓		✓	✓	✓	✓	✓	✓	9
Willow Warbler	✓			✓	✓	✓	✓	✓	✓		7
Wren	✓				✓	✓	✓	✓	✓	✓	7

TABLE 7. Spring records of birds in Shrawley Wood 1948 to 2015. The species in this list were recorded on 1-6 of these visits, that is on fewer visits

Species in alphabetical order. Species recorded on 1-6 visits 1948-2015	13 April 1948 Fred Fincher Journal	12 May 1954 Fred Fincher Journal	13 April 1961 Fred Fincher Journal	12 May 1965 Fred Fincher Journal	1979 &1980 Spring and Summer mist netting in scrub on FC land. Simon Walker	Constant Effort Site, survey Plot 2, Mist netting six visits 5 May to 29 June 1985. Simon Walker	Bird survey 1984-1993 in May. Plot 1. c40 year old unmanaged coppice Fuller & Green (1998)	Bird survey 1984-1993 in May. Plot 2. Recent coppice Fuller & Green (1998)	Bird survey 1984-1993 in May. Plot 3. Singled coppice cut in 1960s. Fuller & Green (1998)	8 May 2015 Steve Davies Transect walk in FC plot	Number of occasions recorded out of 10 sets of records
Buzzard										✓	1
Bullfinch					✓	✓	✓	✓	✓	✓	6
Carrion Crow	✓	✓					✓	✓	✓	✓	6
Chaffinch	✓			✓	✓			✓	✓	✓	6
Cuckoo							✓	✓	✓	✓	4
Dipper					✓						1
Goldcrest					✓	✓			✓	✓	4
Goldfinch	✓									✓	2
Grasshopper Warbler					✓						1

Great Spotted Woodpecker	✓	✓					✓	✓	✓		5
Green Woodpecker						✓	✓	✓	✓	✓	5
Greenfinch	✓						✓				2
Jackdaw	✓						✓	✓		✓	4
Jay							✓	✓	✓	✓	4
Kestrel	✓					✓		✓			3
Linnet					✓						1
Magpie	✓		✓					✓			3
Mallard		✓							✓		2
Mistle Thrush	✓		✓		✓		✓	✓		✓	6
Moorhen	✓	✓									2
Nuthatch	✓		✓			✓	✓	✓		✓	6
Pheasant	✓		✓	✓			✓	✓	✓		
Pied Flycatcher							✓		✓		2
Raven										✓	1
Redpoll					✓			✓			2
Sparrowhawk	✓				✓		✓				
Spotted Flycatcher				✓					✓		2
Starling							✓	✓			2
Stock Dove	✓						✓	✓	✓		4
Swallow				✓	✓					✓	3
Tawny Owl					✓		✓		✓		2
Treecreeper						✓	✓	✓	✓	✓	5
Tree Pipit					✓	✓		✓			3
Turtle Dove								✓			1
Whinchat		✓									1
Whitethroat					✓	✓		✓			3
Willow Tit		✓		✓	✓			✓	✓		5
Woodcock							✓	✓	✓		3
Wood Pigeon	✓			✓						✓	3
Wood Warbler									✓		1
Yellowhammer				✓	✓	✓		✓			4

TABLE 8. Shrawley Wood SSSI Breeding Bird Survey 2019 undertaken by Natural England surveyors. Numbers are of individual birds, not estimated territories. Summer visitors are shown in red.

Thursday 25th April2019		**Wednesday 15th May 2019**		**Thursday 6th June 2019**	
Southern Unit - Visit 1		**Southern Unit - Visit 2**		**Southern Unit - Visit 3**	
Species	**Count**	**Species**	**Count**	**Species**	**Count**
Blue Tit	30	Blue Tit	25	Blue Tit	33
Wren	19	Blackbird	19	Wren	29
Great Tit	14	Wren	17	Blackbird	23
Blackbird	13	Great Tit	15	Great Tit	20
Song Thrush	7	Wood Pigeon	13	Goldcrest	17
Coal Tit	7	Song Thrush	7	Chaffinch	17
Mallard	7	Chaffinch	7	Robin	13
Wood Pigeon	7	Treecreeper	7	Wood Pigeon	12
Robin	7	Robin	6	Coal Tit	7
Canada Goose	6	Mallard	5	Treecreeper	7
Goldcrest	6	Goldcrest	5	Nuthatch	7
Moorhen	3	Coal Tit	3	Blackcap	5
Long-tailed Tit	3	Great Spotted Woodpecker	3	Song Thrush	3
Carrion Crow	3	Long-tailed Tit	3	Buzzard	2
Nuthatch	2	Mistle Thrush	2	Chiffchaff	2
Tufted Duck	2	Grey Wagtail	2	Jay	1
Grey Wagtail	2	Chiffchaff	2	Mistle Thrush	1
Chaffinch	1	Buzzard	2	Great Spotted Woodpecker	1
Coot	1	Carrion Crow	1	Garden Warbler	1
Blackcap	1	Nuthatch	1	Grey Wagtail	1
Chiffchaff	1	Grey Heron	1	Grey Heron	1
Buzzard	1	Jackdaw	1	Canada Goose	1
Treecreeper	1	Blackcap	1		
Jackdaw	1				
Jay	1				
Total birds:	146	Total birds:	148	Total birds:	204
Species Count:	25	Species Count:	23	Species Count:	23

Continued next page

Table 8 continued

Northern Unit - Visit 1		**Northern Unit - Visit 2**		**Northern Unit – visit 3**	
Species	**Count**	**Species**	**Count**	**Species**	**Counts**
Wren	40	Wren	53	Blue Tit	37
Blue Tit	29	Blackbird	37	Blackbird	33
Blackbird	17	Blue Tit	25	Wren	31
Goldcrest	16	Blackcap	22	Great Tit	22
Chiffchaff	14	Goldcrest	21	Chaffinch	20
Robin	13	Robin	18	Wood Pigeon	19
Coal Tit	13	Song Thrush	15	Blackcap	14
Great Tit	10	Chaffinch	12	Coal Tit	12
Chaffinch	6	Chiffchaff	12	Goldcrest	11
Treecreeper	6	Treecreeper	11	Long-tailed Tit	11
Wood Pigeon	6	Wood Pigeon	10	Robin	10
Blackcap	6	Great Tit	9	Song Thrush	10
Garden Warbler	6	Willow Warbler	6	Chiffchaff	6
Song Thrush	6	Long-tailed Tit	4	Willow Warbler	6
Jay	5	Buzzard	2	Mistle Thrush	4
Long-tailed Tit	5	Coal Tit	2	Treecreeper	3
Nuthatch	4	Garden Warbler	2	Buzzard	3
Carrion Crow	3	Jay	2	Garden Warbler	3
Skylark	3	Grey Wagtail	2	Nuthatch	3
Mistle Thrush	2	Goldfinch	2	Jay	2
Raven	2	Bullfinch	1	Dunnock	2
Bullfinch	1	Carrion Crow	1	Marsh Tit	2
Marsh Tit	1	Mistle Thrush	1	Magpie	1
Dunnock	1	Nuthatch	1	Greater Spotted Woodpecker	1
		Raven	1		
		Tawny Owl	1		
		Marsh Tit	1		
		Skylark	1		
		Mallard	1		
		Cuckoo	1		
Total Birds:	**215**	**Total Birds:**	**277**	**Total Birds:**	**266**
Species Count:	**24**	**Species Count**	**29**	**Species Count**	**24**

TABLE 9 Summary of surveys in May. The thirteen most often recorded species 1948-2015 compared with top 13 species recorded in transect surveys in 2019. The 2019 surveys are in descending order of number of birds recorded.
The figure to the right of the species name in the older surveys column indicates the number of record sets out of ten when the species was recorded. Summer visitors in red text

All older surveys (10) 1948-2015 generally is spring or early summer		**Steve Davies 8 May 2015. ✓ indicates "present".**	**Natural England (NE) Southern area 15th May 2019**	**Natural England (NE) Northern area 15th May 2019**
Blackcap 10	**10**	✓	Blue Tit	Wren
Blue Tit 10	**10**	✓	Blackbird	Blackbird
Great Tit 10	**10**	✓	Wren	Blue Tit
Song Thrush 9	**9**	✓	Great Tit	Blackcap
Coal Tit 9	**9**	✓	Wood Pigeon	Goldcrest
Garden Warbler 8	**8**	✓	Song Thrush	Robin
Chiffchaff 8	**8**	✓	Chaffinch	Song Thrush
Long-tailed Tit 7	**7**	✓	Treecreeper	Chaffinch
Marsh Tit 7	**7**	✓	Robin	Chiffchaff
Robin 7	**7**		Mallard	Treecreeper
Dunnock 7	**7**	✓	Goldcrest	Wood Pigeon
Willow Warbler 7	**7**		Coal Tit	Great Tit
Wren 7	**7**	✓	Great Spotted Woodpecker	Willow Warbler

Alphabetical list of bird species mentioned in the bird chapters.

Nomenclature follows British Ornithologists' Union British list using British vernacular names.

Barn Owl *Tyto alba* (ch2)
Bittern *Botaurus stellaris* (Appendix only)
Blackbird *Turdus merula*
Blackcap *Sylvia atricapilla*
Black-headed Gull *Chroicocephalus ridibundus* (Appendix only)
Blue Tit *Cyanistes caeruleus*
Bullfinch *Pyrrhula pyrrhula*
Buzzard *Buteo buteo*
Carrion Crow *Corvus corone* (ch2)
Chaffinch *Fringilla coelebs*
Chiffchaff *Phylloscopus collybita*
Coal Tit *Periparus ater*
Coot *Fulica atra* (ch2)
Collared Dove *Streptopelia decaocto* (Appendix only)
Cormorant *Phalacrocorax carbo* (ch2)
Corn Bunting *Emberiza calandra* (Appendix only)
Cuckoo *Cuculus canorus* (ch1)
Dipper *Cinclus cinclus* (ch2)
Dunnock *Prunella modularis*
Fieldfare *Turdus pilaris* (ch2)
Garden Warbler *Sylvia borin*
Goldcrest *Regulus regulus*
Goldfinch *Carduelis carduelis* (ch2)
Goshawk *Accipiter gentilis* (ch2)
Grasshopper Warbler *Locustella naevia* (ch2)
Great Spotted Woodpecker *Dendrocopos major*
Great Tit *Parus major*
Greenfinch *Chloris chloris* (Appendix)
Green Woodpecker *Picus viridis*
Grey Wagtail *Motacilla cinerea*
Heron *Ardea cinerea* (ch2)
Herring Gull *Larus argentatus* (Appendix only)
Hoopoe *Upupa epops* (Appendix only)
House Martin *Delichon urbicum* (Appendix only)
House Sparrow *Passer domesticus* (Appendix only)
Jackdaw *Coloeus monedula* (ch2)
Jay *Garrulus glandarius* (ch2)
Kestrel *Falco tinnunculus* (ch2)
Kingfisher *Alcedo atthis* (Appendix only)
Lapwing *Vanellus vanellus* (Appendix only)
Lesser Black-backed Gull *Larus fuscus* (Appendix only)
Lesser Spotted Woodpecker *Dryobates minor*
Lesser whitethroat *Curruca curruca*
Linnet *Linaria cannabina* (Appendix only)
Little Owl *Athene noctua* (ch2)
Long-tailed Tit *Aegithalos caudatus*
Magpie *Pica pica* (ch2 and Appendix)
Mallard *Anas platyrhynchos*
Mandarin Duck *Aix galericulata* (ch2)
Marsh Tit *Poecile palustris*
Mistle Thrush *Turdus viscivorus* (ch1)
Moorhen *Gallinula chloropus*
Nightingale *Luscinia megarhynchos*
Nightjar *Caprimulgus europaeus*
Nuthatch *Sitta europaea*
'Partridge' *Perdix perdix* (ch1) - presumably *Perdix* but you may not need to list this?
Pheasant *Phasianus colchicus* (ch1)
Pied Flycatcher *Ficedula hypoleuca* (ch2)
Pied Wagtail *Motacilla alba* (ch1)
Raven *Corvus corax* (ch2)
Red-legged Partridge *Alectoris rufa* (Appendix only)
'Redpoll' *Acanthis flammea /cabaret*
Redshank *Tringa tetanus* (Appendix only)
Redstart *Phoenicurus phoenicurus* (Appendix only)
Redwing *Turdus iliacus* (ch2)
Reed Bunting *Emberiza schoeniclus* (Appendix only)
Reed Warbler *Acrocephalus scirpaceus* (Appendix only)
Robin *Erithacus rubecula*
Rook *Corvus frugilegus* (ch2)
Sedge Warbler *Acrocephalus schoenobaenus* (Appendix only)
Siskin *Spinus spinus* (ch2)
Snipe *Gallinago gallinago* (Appendix only)
Song Thrush *Turdus philomelos*
Sparrowhawk *Accipiter nisus* (ch2)
Spotted Flycatcher *Muscicapa striata* (Appendix only)
Starling *Sturnus vulgaris* (ch2)
Stock Dove *Columba oenas*
Swallow *Hirundo rustica* (Appendix only)
Tawny Owl *Strix aluco*
Teal *Anas crecca* (Appendix only)
Treecreeper *Certhia familiaris*
Tree Pipit *Anthus trivialis*
Tree Sparrow *Passer montanus* (Appendix only)
Tufted Duck *Aythya fuligula* (ch2)
Turtle Dove *Streptopelia turtur*
Water Rail *Rallus aquaticus* (ch1)
Whinchat *Saxicola rubetra* (Appendix only)
Whitethroat *Curruca communis*
Willow Tit *Poecile montanus* (ch2)
Willow Warbler *Phylloscopus trochilus*
Woodcock *Scolopax rusticola* (ch1)
Wood Warbler *Phylloscopus sibilatrix* (ch2)
Woodpigeon *Columba palumbus*
Wren *Troglodytes troglodytes* (ch1)
Yellowhammer *Emberiza citrinella* (ch2)

The invertebrates of Shrawley Wood

with reference to Small-leaved Lime *Tilia cordata* Miller and its developmental history

Paul F. Whitehead

"*Yet there is in the neighbourhood of Worcester, on the authority of Mr Edwin Lees, a wood, remote from any old dwelling or public road, of about 500 acres in extent, the greater part of the undergrowth of which is composed of the Small-leaved Lime."* Reverend C. A. Johns.

Introduction

The *Urwaldrelikt*[1] invertebrate fauna (defined for Coleoptera by Müller *et al*., 2005) of Shrawley Wood, Worcestershire (52º29'N 2º28'W) has had to adapt to radical change over time and although knowledge of this fauna is significantly incomplete, studies to date enable something of a pathway to be constructed through these changes and their impacts. This account throws some light on the entomofauna of Shrawley Wood's lime trees but in addition highlights species that may have particular adaptations to lime in the context of the woodland, the woodland floor, its management regimes and its history. A further objective is to provide a baseline for future planned research at the site and a comprehensive bibliography is provided to assist with this.

This is not a checklist of species and it does not discuss every identified insect or its status. It would be premature to attempt to gauge the qualitative significance of the invertebrate fauna of the wood for the simple reason that not enough research has been conducted on it and many groups remain radically understudied. Consider for example the systematic trapping results of Haase, Topp & Zach (1998) who estimated 18000 insects per cubic metre of dead wood in a German oak-beech woodland.

At Shrawley Wood significant recent discoveries have been made (Bloxham, 2003, 2004; Blythe, 2018; Broad, 2005; Drane, 2003; Whitehead, 2019, 2022a, this volume) and will continue to be made. The biodiversity and inter-connectedness of taxa demonstrated by the 2017 cavity trapping programme (Blythe 2022, this volume 477-491; Whitehead 2022a, this volume) demonstrate the enormous potential of the woodland. Conversely the occurrence of certain species of invertebrate not yet observed can be anticipated. In this account, reference to lime-associated insects from elsewhere in Britain and Europe is occasionally provided to demonstrate aspects of historical ecology and their fidelity to habitat, to lime or to other trees and to reflect ways in which particular geological, edaphic, geographic, topographic or managed features may combine to create site-specific distinctiveness that help to define the biota. Use of the word lime always implies the tree genus *Tilia* Linnaeus. Binomial authorities are generally provided at the first citation and nomenclature generally follows current catalogues. Habitat categorisations are intentionally simplified; Koch (1994) provides more refined ecological classifications for beetles.

Shrawley Wood and the prehistory of European lime woods

The Pleistocene history of Small-leaved Lime *Tilia cordata* Miller in Britain "in some countries called bast" (Ray, 1724) and its temporal relationship to the post-glacial climatic climax was clarified by Godwin (1975). Pigott (1991) outlined the Holocene history of *Tilia* in Europe and this work remains essential reading for anyone seeking background knowledge of lime woods and the factors limiting their development in Britain and in the wider Palaearctic region. It can be observed how closely Shrawley Wood aligns with Pigott's ascriptions. According to Rackham (1994) Shrawley Wood represents a *remanié* fragment of an English lime wood 'province' that formed part of the Holocene climatic climax British national woodland of which 99% was believed to be lost (Rackham, 1994). Bronze Age lime tree macrofossils derived from this 'province' were documented by Kelly & Osborne (1965) from the alluvium of the midland River Bourne.

There can be no doubt that Shrawley Wood is an enduring temporal relict. The palynological study of Richer (2017; 2022, this volume 351-354) on the riverine edge of Shrawley Wood yielded a generalised radiocarbon date of 890 BP (SUERC-63639) or AD1125 at a depth of 1.25m–1.27m close to the base of the sample core. These findings demonstrate the historical continuity of both lime and oak at Shrawley Wood. It cannot be claimed that lime arrived at Shrawley suddenly some little time prior to AD1125 and it must surely be a true prehistorian there. Direct archaeoentomological evidence for the historical continuity of the English lime wood 'province' was provided by Buckland (1979), Girling (1989), Kelly & Osborne (1965), Osborne (1996) and Smith *et al*. (2005). Together they identified the specialist lime scolytine beetle *Ernoporicus caucasicus* (Lindemann, 1792) in Neolithic, Bronze Age and Romano-celtic alluvial sediments in the English midlands. The latter historic site was in the Severn valley at Stourport not far distant from Shrawley and it was assumed that *E. caucasicus* was extinct in Britain. It was eventually found living at Moccas Park in Herefordshire by Mr A. A. Allen in 1954 but not formally identified until much later (Allen, 1970).

Of relevance to this discussion is the significant contribution of Reid (2004). By using Domesday data he calculated that in AD1087 50% of Worcestershire was wooded, that today 5% of it is, and that in the central spine of the county Shrawley Wood constitutes a significant remnant of that more extensive medieval woodland (Fraser, Green, Lake & Neale, 1998). Post-Neolithic woodland fragmentation is a matter of concern not only to entomologists due to negative biotic impacts (New, 2010) but also more widely (McNeely, 1994). As we now observe, the almost miraculous persistence of Shrawley Wood demonstrating high multi-integrated biodiversity and system cohesiveness fully justifies its designated status. Knowledge of such intricately expressed invertebrate relationships may hallmark ancient woodlands more effectively than stressing the significance of individual species.

According to Peterken (1981) "*Tilia cordata* is strongly associated with ancient woodland" and the invertebrate biodynamic of Shrawley Wood supports this contention. Amphlett & Rea (1909) regarded *Tilia cordata* as native "especially at Shrawley Wood." According to Jeffrey (1921), George Jorden, the Bewdley naturalist, stated that: *"The Tilias are truly aboriginal trees in this county……distributed in hedges, woods and ravines leading to the Severn and its rocky precipices……the pollards of the Tilias are still very numerous on the precipitous banks of the streams running into the Severn."* This description also conveys refugial status and the fact that Small-leaved Lime flourishes at Shrawley Wood may be due in large part to its usefulness to humankind over several millennia.

Hadfield (1967) notes that Anglo-Saxon warriors used lime wood for the orbs of their shields, a finding attributed originally to Virgil. Hight (2011) observes that the word 'Lind' is the Saxon equivalent of the modern 'shield.' Virgil (*Georgics* **1** BC29) refers to lime wood being used for yokes in ploughing, presumably by ox teams and in *Georgics* **II** we read: "*nec tiliae leves aut torno rasile buxum non formam accipiunt ferroque cavantur acuto*." The name *Tilia* is itself derived from the Latin *tela* 'woven' (Vedel & Lange, 1971) and according to Johns (1903) *"the shepherds of Carniola weave a coarse cloth of it, which serves them for their ordinary clothing."* Wigforss (2014) illustrates the traditional manufacture of lime bast artefacts amongst which Vesey-Fitzgerald (1963) includes mats, and

[1] *Urwaldrelikt*: The term was introduced to the literature by the German entomologist Karl Dorn in 1935 and translates most simply into "an inhabitant of primary woodland i.e. woodland with no or minimal human intervention." The German word encapsulates what English words can't.

it is certain that Shrawley Wood's lime trees were utilised extensively by man for multiple functions throughout their history (Hadfield, 1963).
European Holocene lime woods fingerprint the climatic climax of that time period (Latałowa *et al.,* 2013). In Britain they are an excellent barometer of climate change (Day, 1993) with fortunes that like elm *Ulmus* spp., wax and wane conspicuously and somewhat abruptly. A number of factors combine at Shrawley to sustain its lime woods. The woodland is developed on tracts of warm dry sediments (Clooney, 2022, this volume 252-7) that drain freely but allow water to be retained by the root and mycorrhizal weft and is also situated in a somewhat elevated position overlooking a major river valley into which cold air may descend. Some authors have contended that the Holocene lime decline could be explained by a range of anthropogenic impacts. However, the thermophilous ascomycotine Brittle Cinder Fungus *Kretzschmaria deusta* (Hoffm.) P.M.D. Martin (Ascomycota: Xylariaceae) (Fig. 01) has been shown to be a significant wood pathogen both in Britain (Pigott, 1991, as *Ustulina deusta* Fr.) and across Europe (Latałowa *et al.,* 2013) and to have waxed and waned as the woodlands did. This relationship almost certainly pertained at Shrawley and further work may demonstrate its past and present status and impacts, which of course, coppicing would greatly reduce. It is conceivable that this fungus was a driver of prehistoric coppice technology.



01. Mature open grown Small-leaved Lime *Tilia cordata*, Sliač, central Slovakia, 25 June 2018, the xylic tissues excavated by loss of cellulose and lignin caused by Brittle Cinder fungus *Kretzschmaria deusta*. The tree is self-compensating by inducing coppice formation; such trees may support a developed mycoxylophilous insect fauna. P. F. Whitehead.

Shrawley Wood today
According to the National Vegetation Classification of Britain (Rodwell, 1991) Shrawley Wood is a W10 oak-bracken-bramble woodland and Rodwell (1991, p. 181) makes the following statement: "*Quercus-Pteridium-Rubus* woodland is characteristic of base-poor brown soils throughout the temperate lowlands of southern Britain……but the floristics and physiognomy of the community have been widely affected by sylvicultural treatments." The site is acknowledged in the Worcestershire Biodiversity Action Plan 2018 (H5 Woodland HAP) (https://www.worcestershire.gov.uk/downloads/file/10873/h5_woodland_habitat_action_plan). Rodwell (1991) could scarcely have given a more perfect assessment of Shrawley Wood, for it is essentially a changed wood, notwithstanding all the biotic elements that combine to imply habitat continuity almost certainly for as long as the present interglacial has permitted.

A number of factors combine to sustain the ancient lime woods at Shrawley. The woodland is developed on tracts of warm dry lime-free sediments developed over Triassic sandstones that drain freely but allow water to be retained by the root and mycorrhizal weft. The wood is situated in a somewhat elevated position overlooking a major river valley (02) into which cold air may descend. Originally an ancient English Oak and Small-leaved Lime wood it has undergone major changes of state. Primarily these involve the removal of oak, some of it evidently of high quality, over an extended period of time and the management and cultivation of Small-leaved Lime for traditional sustainable purposes. Documentary evidence for sale of wood from Shrawley exists as early as AD1390 and evidence of coppicing extends back to at least AD1439 (King, 2022a, this volume). Major episodes of oak clearance occurred between 1760 and 1768 and the 1870s saw more significant oak clearance (Pumphrey, 2022, this volume). Further great oaks were felled in 1945 to furnish the House of Commons, when it was refurbished after wartime bomb damage; the Manchester Guardian reported that those trees were 250 years old. These may have been the standards left to grow when William Child had felled oak trees to pay his sequestration fine in the 1650s (King, 2022b, this volume) suggesting that they grew from acorns that sprouted in about 1640, some 300 years earlier.

The Forestry Commission probably cut more oaks in the 1960s when it established large areas of conifer plantation, dominantly composed of Douglas Fir *Pseudotsuga menziesii* (Mirbel) Franco (Fig. 02) following its acquisition of part of Shrawley Wood. Fuller & Green (1998) give the year of acquisition as 1959 but the transaction was not completed until 1961 when Mrs Ruth Horton relinquished 237 acres of Shrawley Wood, retaining the southern portion as the grounds for her Shrawley Wood House. The plan was to fell the wood by stages, starting in 1964, when some Sweet Chestnut *Castanea sativa* Miller was cut for fence posts. The main clearance and replanting, of 208 acres, was scheduled for 1966. However, the Forestry Commission was aware of the conservation status of the woodland, the SSSI having been designated for 103ha in 1955 so that sylviculture did not completely override biological conservation. Nevertheless the impact of modern sylviculture is clearly demonstrated in 02 and this will no doubt engage the mind of the reader.



02. Oblique aerial view of Shrawley Wood with the River Severn running in the background, April 2017. Andy Young.

Although Shrawley Wood was noted for its great oak trees it has no visible evidence of great high canopy lime trees despite their ability to endure and attain veteran status and significant dimensions when freed from human intervention and mycopathogens. The height and girth of a Small-leaved Lime at Oakley Park, Shropshire was given as 30 m x 5.4 m by Mitchell (1979) and as 34.7 m high by Wilks (1972). According to Grindon (1868): *"At Trous, in the Grisons, there existed in 1798, a lime which was celebrated as far back as 1424, and the age of which, in 1798, could not have been less than 580 years."* Boulger (1906-1907) cited a tree at Harste near Göttingen regarded as old in 1425 and with a girth of 8.5 m in 1871. Coppiced lime stools are frequently regarded as being up to 1000 years old but some, like the vast 15 metre diameter stool at Silkwood, Westonbirt, Gloucestershire, may be up to 6000 years old (Bell *et al*., 2008; Lewington & Parker, 1999; More & White, 2003) and would rank amongst the oldest living organisms in Europe.

Arboreal invertebrates

Lime coppice and its entomological impact

According to Warren & Key (1989) coppicing has been practised in Britain for 6000 years. Time-honoured lime coppice woodland makes a strong visual and ecological impact at Shrawley Wood (03) and for this reason its invertebrate significance is here discussed discretely; its fauna overlaps with the ensuing discussion of xylophilous invertebrates. This unusual habitat sustains a wide range of invertebrates, including leaf feeders, leaf miners and borers in both green and delignified fallen and standing stems and poles, root feeders, detritivores and saprophiles. Ancient coppice stools, a hitherto rather poorly documented habitat (Ferris-Khan, Lonsdale & Winter, 1993), blend terrestrial and arboreal invertebrate faunules.



03. Outgrown lime coppice stools, decayed stools, mechanically-induced basal cavity formation and fallen out-competed coppice poles, Shrawley Wood, 22 April 2017. P. F. Whitehead.

Following bud burst coppicing channels large amounts of energy and resources into massed juvenile growth. This creates dense stands of lush verdant foliage and opportunities for many invertebrates that are positively favoured by early-stage coppicing (05, 06). The reflected heat and light from a blanket of foliage often directly exposed to the sun promotes vigorous growth and provides unique opportunities for both specialised and eurytopic species that accept shelter and an enhanced microclimate. Coppicing also greatly retards the tree's flowering ability which limits opportunities for flower-visiting insects. Green & Westwood (1991) and Fuller & Green (1998) describe the impact of pollarding on the passerine avifauna of Shrawley Wood observing that in eight year old coppice lime nesting density reached 8.34 pairs/ha. This is undoubtedly a reflection of the impact of coppicing on the invertebrate biomass and its occupancy of space.

The invertebrate fauna of coppiced lime trees and the synecology of that fauna is therefore totally different to that of high-canopy lime trees and the creation of multiple high-canopy woodland block edges also creates conditions attractive to another suite of invertebrates (04) (Drane, 2003; Whitehead, 2019).



04. The asilid fly *Neoitamus cyanurus* (Loew, 1849) prefers warm sheltered woodland rides, Shrawley Wood, 11 June 2017. P.F. Whitehead.



05. The *Urwaldrelikt* cerambycid beetle *Stenostola dubia* on Small-leaved Lime coppice foliage, Shrawley Wood, 11 June 2017. P.F. Whitehead.

Amongst the species that characterise lime coppice, two beetles are noteworthy one being strongly tied to lime, the other with a restricted British distribution. The longhorn beetle *Stenostola dubia* (Laicharting, 1784) (05) has (as *Stenostola ferrea*) for long been known at Shrawley Wood (Willis-Bund & Doubleday 1901) as a characteristic spring to early summer species of early-stage lime coppice (Piper, 2008b). Mr John Meiklejohn observed it at Shrawley Wood on 19 May 1993 and the species remains extant there although with the length of coppicing rotations somewhat extended in time its fortunes vary. Although Shrawley Wood has for long provided a focus for this species it has only recently been confirmed as a genuine British *Urwaldrelikt*. Cerambycid beetles are relatively uncommon in the archaeoentomological record (Elias, 1994) but Smith *et al*. (2005) report a single example of *S. dubia* linked to Neolithic climatic climax woodland. In Worcestershire today its distribution is patchy. There is evidence of a population on the former Earl of Coventry's ancient woodlands at Drakes Broughton (SO9148) (*teste* P. F. Whitehead, 30 May 2003; K. McGee, 6 May 2006) (McGee, 2006). A good range of other longhorn beetles occur routinely in Shrawley's coppice woodland including representatives of *Pogonocherus, Rhagium, Alosterna* and *Pachytodes* (18). The attractive nationally rare leaf-mining buprestid beetle *Trachys minuta* (Linnaeus, 1758) is a well-known inhabitant of warm early-stage lime coppice foliage (Bingham, 2012); lime is not cited as a larval host by Levey (1977) but in Europe it has been recognised as a host tree for some time (Roubal, 1936). On 1 August 2018 a freshly emerged example (06) was observed consuming its own meconium, possibly the first occasion on which this behaviour has been observed in Buprestidae (Professor Svatopluk Bílý, *in litt*.,15 August 2018). Insects utilise early stage coppice growth that demonstrates quite specific conditions, to some extent regardless of the tree species. These conditions derive from high intensity illumination, direct insolation and radiant heat coupled with subsequent reflection and convection which combine to favour particular species (06, 07). Increased woodland floor litter following coppicing procedures prove attractive for a range of carabid and staphylinid beetles.



06. A freshly eclosed buprestid beetle *Trachys minuta* ingesting its own meconium. First year coppice foliage of Small-leaved Lime, Shrawley Wood, 1 August 2018. P. F. Whitehead.

Other distinctive early stage coppice growth insects include the widespread cecidiomyiid fly *Contarinia tiliarum* (Kieffer, 1890) (Csóka, 1997). It was observed during 2017 that its sub-spherical galls proved highly attractive to the Forest Shield Bug *Pentatoma rufipes* (Linnaeus, 1758) which routinely imbibe from them (07), described here apparently for the first time. *Pentatoma rufipes* may occur in large numbers on lime trees throughout Central Europe. The tenthredine sawfly *Parna apicalis* (Klug, 1816) is a comparatively recent addition to the British fauna which also mines early stage coppice foliage at Shrawley Wood. Leaf mining incurvariid moths are numerically well-represented and the characteristically perforated leaves of *Incurvaria pectinea* Haworth, 1828 are a conspicuous feature of lime coppice growths. The related more localised congener *Incurvaria oehlmanniella* (Hübner, 1796) is also sometimes observed on lime foliage in the company of, or vacated by, *I. pectinea*.



07. Last nymphal instar Forest Shield Bugs *Pentatoma rufipes* probing galls of the cecidomyiid fly *Contarinia tiliarum* on first year lime coppice growths, Shrawley Wood, 11 June 2017. P.F. Whitehead.



08. The widespread localised click beetle *Athous vittatus*, an unusually pigmented female on a lime coppice stool, Shrawley Wood, 11 June 2017. P.F. Whitehead.

As the coppice growth develops a number of important changes take place. The foliage increases in mass and space, the wood begins to lignify and since direct insolation is increasingly intercepted by the tree canopy the distinctive microclimate of early stage coppice growth changes; humidity inside the canopy may increase. A key issue is that of competition between rapidly developing stems which are prone to mechanical damage due to the impacts of weather and climate. These stresses induce a self-shedding process which ultimately reduces and limits the number of coppice stems or poles. As the stems increase in size mechanical fractures become more common and the ground below lime coppice, especially at coppice block edges, may be littered with fallen stems. Cut stems are sometimes simply piled on the ground. Dead and moribund poles, constituting the so-called coarse woody debris resource (Yan, Wang & Huang, 2005) are favoured by the arboreal weevil *Acalles misellus* Boheman, 1844, by longhorn beetles such as *Pogonocherus* spp. and by monophagous species such as the nationally rare weevil *Ernoporus tiliae* (Panzer, 1793) (Drane, 2003). Coppice poles are by definition ephemeral and for many species their colonisation is subject to numerous constraints including stem competition and failure impacts (01) which may ultimately determine pole size. *Pogonocherus hispidus* (Linnaeus, 1758) routinely breeds in lime coppice poles; during 2017 adult beetles ranged significantly from 3.8 mm to 5.2 mm in overall length.

The diversity of invertebrates that colonise fallen coppice wood depends on where it fell in relation to insolation and humidity on the ground. The wood of five to seven year old stems often becomes pithy, rather dry and delignified; some becomes fungoid and degrades more rapidly. A range of invertebrates utilise this pabulum including limoniid and tipulid flies and staphylinid, elaterid and curculionid beetles. A distinctive wood-colonising fungus often conspicuous on fallen poles is *Chlorociboria aeruginascens* Kanouse ex C.S. Ramamurthi, Korf & L.R. Batra (Helotiales, Helotiaceae). Larvae of the limnophiline cranefly *Epiphragma ocellare* (Linnaeus, 1761) and the click beetle *Denticollis linearis* (Linnaeus, 1758) have been observed enclosed within this fungoid wood (09, 10). It is not clear whether this usage is preferential and larvae of both *Denticollis linearis* and the related *Dalopius marginatus* (Linnaeus, 1758) accept coppice poles in their growth positions.



09. Pupa and larval exuvia of the click beetle *Denticollis linearis* enclosed in fallen lime pole wood colonised by the fungus *Chlorociboria aeruginascens*, Shrawley Wood, 22 April 2017. P.F. Whitehead.



10. Larva of the limoniid fly evidently *Epiphragma ocellare* working fallen lime pole wood colonised by the fungus *Chlorociboria aeruginascens*, Shrawley Wood, 22 April 2017. P.F. Whitehead.

Larvae of *Otiorhynchus* weevils are usually regarded as root or root-nodule feeders (Morris, 1997). It was therefore of interest on 22 April 2017 to observe adult and larval *Otiorhynchus singularis* (Linnaeus, 1767) enclosed within fallen intact coppice poles feeding on delignified wood (11); there was some doubt as to whether in this closed environment the adult beetles ever left their breeding sites since they are generally parthenogenetic in the British Isles. Large detached coppice poles are favoured by a range of terrestrial molluscs including the normally arboreal *Lehmannia marginata* (Müller, 1774) and the millipede *Tachypodoiulus niger* (Leach, 1815) both of which may occur in large numbers; 36 *T. niger* were observed in delignified poles on 22 April 2017.



11. Larval and adult *Otiorhynchus singularis* consuming delignified wood of fallen lime coppice pole, Shrawley Wood, 22 April 2017. P.F. Whitehead.

Flowers of lime

Lime flowers are insect pollinated and the characteristic buzz of pollinating bees is redolent of flowering lime trees in the early

summer; lime blossom honey is an associated pleasure. Lime trees do not flower sequentially so there may be a great profusion of pollinating aculeate Hymenoptera and syprhid flies at the flowers at any one time. The author has numerous records of nitidulid beetles visiting flowers of a variety of lime trees, and occasional records of the xylophilous oedemerid beetle *Ischnomera cyanea* (Fabricius, 1792); oedemerids are well-known pollinating agents. A single example of the rare cryptophagid beetle *Atomaria strandi* Johnson, 1967 was at the nectaries of *Tilia platyphyllos* Scopoli on Bredon Hill, Worcestershire on 20 July 1991 and the elaterid beetle *Athous vittatus*, which shares the lime tree's preference for warm, neutral, well-drained soils is sometimes observed in numbers on the foliage of lime trees in the same area.

No formal studies have been made of flower-visiting or flower-inhabiting insects at Shrawley Wood but some distinctive species are known to occur. Larvae of the geometrid moth Fletcher's Pug *Eupithecia egenaria* Herrich-Schäffer, 1848 consume the flower parts of lime and have a stronghold in the Wye valley lime woods. It was not recorded at Shrawley Wood until 2000 (Harper & Simpson, 2001) and is now evidently expansive probably through the agency of climatic warming. Amongst Thysanoptera the thripid *Thrips calcaratus* Uzel, 1895 is monophagous on lime and occurs in the buds (Mound, Morison, Pitkin & Palmer, 1976; Pitkin, 1976).

Foliage of lime

Amongst the many species of Lepidoptera recorded from Shrawley Wood only a small number are monophagous on lime. The Lime Hawk Moth *Mimas tiliae* (Linnaeus, 1758) is widely distributed in the wood and uses coppice stem-base litter and litter-covered dry cavity fills as pupation sites. The incurvariid *Incurvaria pectinea* (Haworth, 1828) feeds in leaf mine and then in leaf case eating leaf litter on woodland floor. The localised summer-flying bucculatricid moth *Bucculatrix thoracella* (Thunberg, 1794) sometimes known as the Lime Bent-wing, frequently mines the leaves of Shrawley's Small-leaved Limes (Harper & Simpson, 2003).

The localised gelechiid *Dichomeris ustalella* (Fabricius, 1794) (12) remains unique to Worcestershire at Shrawley Wood (Simpson, 1989) and like *Salebriopsis albicilla* (Herrich-Schäffer, 1849) is rarely observed elsewhere (Hand & Hand, 2020). According to Dr A. N. B. Simpson (*in litt*., 19 January 2019) *S. albicilla* was first found at Shrawley Wood during 1999 and occurs also in the Avon gorge woodlands of Somerset, suggestive of a British temporal relict. It is a leaf-rolling inhabitant of the foliage (Goater, 1986) and the moths fly at night; during the day they have been found within dry lime tree cavities (13). The Shrawley limes support a substantial number of polphagous Lepidoptera across the major families Geometridae, Noctuidae, Erebidae, Tortricidae and Adelidae. Five species of erebid moth were recovered from the 2017 Shrawley Wood cavity sampling programme (Whitehead, 2022a, this volume). Many of the 46 species of lime-associated Lepidoptera cited by Pigott (1991) are polyphagous.



12. The lime-breeding gelechiid moth *Dichomeris ustalella*, Shrawley Wood, 11 June 2017. P. F. Whitehead.



13. A male lime-breeding pyralid moth *Salebriopsis albicilla*, Shrawley Wood, 11 June 2017. P. F. Whitehead.

Amongst Hemiptera the auchenorrhynchans *Issus coleoptratus* (Fabricius, 1781) and *Issus muscaeformis* (Schrank, 1781) are sympatric at Shrawley Wood, the latter species new to the English midlands (Whitehead, 2022b, this volume). They occur on both coppice and high canopy woodland most usually along the edges and in exposed sunny situations the implication being that they prefer to access the phloem of vigorously developing growths. The trophic relationship between these two species, here at one of their few

cohabitation sites in Britain, would warrant further research. *Pediopsis tiliae* (Germar, 1831) is another highly localised auchenorrhynchan in the English midlands and is monophagous on limes *Tilia* spp. and their hybrids. At Shrawley Wood nymphs have been observed on the insolated sides of the canopy, including of late stage coppice growth. At Hailes in Gloucestershire on 23 July 2001 the author found *P.tiliae* breeding on open grown Common Lime *Tilia x europaea* Linnaeus, one parent of which is *Tilia cordata*. The striking aphid *Eucallipterus tiliae* (Linnaeus, 1758) is also monophagous on *Tilia* spp. According to Blackman & Eastop (1994) it is known from seven distinct species and hybrids of lime; on Bredon Hill in the south of the county it occurs on Common Lime *T. x europaea*. The aphid overwinters in the egg stage and occurs in large numbers at Shrawley Wood in both coppice woodland and high canopy woodland. Associated predators are the coccinellid *Harmonia axyridis* (Pallas, 1773), the distinctive mirid bug *Miris striatus* (Linnaeus, 1758) and especially in the aphid's early stages, another mirid *Blepharidopterus angulatus* (Fallén, 1807)

Arboreal beetles with root-feeding larvae are well represented at Shrawley Wood especially brachyderine, phyllobiine and polydrusine weevils across a number of widespread genera. The recently expansive *Polydrusus formosus* (Mayer, 1779) may be anticipated at Shrawley Wood and was observed on *Tilia platyphyllos* at Ashton Court Estate, Bristol during May 2019 (Whitehead, 2020).

The discovery that *Strophosoma capitatum* (DeGeer, 1775) swarms nocturnally on Shrawley's lime trees, often in vast numbers, was a major finding of the 2017 lime cavity trapping project (Whitehead, 2022a, this volume). Although a great deal remains to be discovered about these night-trekking weevils, individual observations are also revealing. Terrestrial species of *Notaris* ascend herbage after rainfall at night and there imbibe water droplets (*teste* P. F. Whitehead); that may be one of many reasons why *S. capitatum* ascend lime trees *en masse*. A normal *S. capitatum* (14) was found on the low foliage of *Tilia cordata* at Shrawley Wood after persistent rain during the early morning of 11 June 2017. The beetle was observed motionless for some time persistently evaporating water from its surface possibly as a thermoregulatory mechanism. Holecová & Zach (1999) listed 465 species of beetle associated with oak trees in the western Carpathian area of central Europe; *S. capitatum* was not included in the list of 123 weevils, even though it has a regional presence there. It seems probable that at Shrawley Wood *S. capitatum* is a genuine *Urwldrelikt*, for in south Wales its pedigree can be back-traced for some 11000 years into the late last glacial (Walker *et al*., 2003).



14. A motionless *Strophosoma capitatum* persistently evaporating rain water on the foliage of Small-leaved Lime, Shrawley Wood, 11 June 2017. P.F. Whitehead.

The herb-associated chrysomelid beetles *Aphthona euphorbiae* (Schrank, 1781), *Longitarsus parvulus* (Paykull, 1799) and *Psylliodes chrysocephala* (Linnaeus, 1758) may occur in the canopy as a cohort of refugees from without, usually in late summer. Post-breeding apionid weevils may occur on the foliage in numbers. In a heatwave on 1 August 2018 over 200 *Psylliodes chrysocephala* were counted along a shaded ride. In England the foliage of various species of lime trees appears to have an inherent attraction for certain groups of insects which presently seems to be unexplained. For example on 4 September 2014 a few *Tilia x europaea* at Overbury (VC37 SO9537 58m a.s.l.) held >180 weevils *Protapion fulvipes* (Geoffroy in Fourcroy, 1785) and 215 mirid bugs *Deraeocoris lutescens* (Schilling, 1837). At Hailes Abbey, Stanway CP (VC33 SP0529 110m a.s.l.) a single *Tilia x europaea* held >300 mirid bugs *Pinalitus cervinus* (Herrich-Schaeffer, 1841) on 23 July 2001.

A notable feature of the entomofauna of Shrawley Wood is the presence of very large numbers of the orsodacnid leaf beetle *Orsodacne cerasi* (Linnaeus, 1758) gathering on flowering Apiaceae in high summer. Its larval biology seems still to be unknown; Cox (2000) suggested that the apical shoots of oak trees could be utilised. Mention should also be made of the finding (Bingham & Bingham, 2016) on Aspen *Populus tremula* L. of the leaf beetle *Zeugophora subspinosa* (Fabricius, 1781) which has a decidedly restricted distribution in Worcestershire, mostly in its more southern wet woodlands.

Bark

Few invertebrates depend on the outer bark surface of lime trees but many groups use the bark as a conduit to access other parts of the trees. Grass-cased larvae of the Bagworm Moth *Psyche casta* (Pallas, 1767) frequently use lime bark for pupation sites. Six species of Psocoptera or Bark Lice have been recorded from the boles of lime trees at Shrawley Wood as have six species of harvestman Opiliones. The leiobunid *Dicranopalpus ramosus* (Simon, 1909) and the phalangiid *Oligolophus tridens* (C.L. Koch, 1836), in particular the immature stages, may occur in notably large numbers on the trees during the summer and range widely over them. The Whirligig Mite *Anystis* sp. is a frequent denizen of bark and the woodland snail *Zenobiella subrufescens* (Miller, 1822) occasionally ascends mature lime trees. Various species of centipede *Lithobius* spp. hunt over the bark of lime trees at night.



15. The rove beetle *Phloeostiba plana* a characteristic species of narrow interstices beneath exfoliated lime bark, Shrawley Wood, 22 April 2017. P. F. Whitehead.



16. The rove beetle *Atheta dadopora*, a localised mycetophilous species, Shrawley Wood, 11 June 2017. P. F. Whitehead.

Subcortical niches

Dead wood

Pigott (1991) cites 24 species beetle that utilise lime wood many of which routinely use other tree genera, frequently oak *Quercus* spp. and in a mixed woodland such as Shrawley such processes of accommodation are widely demonstrated. The work of Jonsell (2012) has greatly extended knowledge of the beetle fauna of north European Swedish Small-leaved Lime woodlands.

The naturalised weevil *Euophryum confine* (Broun, 1881) is a ubiquitous colonist of decayed wood and may occur in large numbers. The familiar *Melanotus castanipes* (Paykull, 1800) and *Rhizophagus dispar* (Paykull, 1800) occur in and on dead wood but both of these species are wide-ranging in their choice of host trees using both conifer plantations and broadleaved woodlands. The intensely specialised saproxylic lymexylid beetle *Elateroides dermestoides* (Linnaeus, 1761) cultivates fungi in its larval galleries and may possibly have benefitted from the planting of conifers at Shrawley Wood. Examples of this species are occasionally seen in the woodland during May; it is more widespread than the sparse records imply.

The study of invertebrates is not without surprises and even occasional humour. The localised eucnemid beetle *Epiphanis cornutus* Eschscholtz, 1829 is a deadwood inhabitant first reported from Shrawley Wood by Mr J. W. Meiklejohn on 4 July 2009 where foresters thoughtfully cut a large monobloc seat from a bole of Douglas Fir and positioned it in a main ride for the benefit of walkers. On 11 June 2017 *Epiphanis cornutus* was observed emerging from fissures in that seat and happily resting on it, thus affording a further example of its association with Douglas Fir and with processed wood, both of which have already been confirmed (Whitehead, 2012).

The entomofauna of small diameter coppice wood has already been outlined but the small diameter crown wood of unmanaged trees may show subtle differences to that of coppice woodland. Two highly significant species of *Urwaldrelikt* lime-inhabiting ernoporine bark beetles occur in Shrawley Wood, namely the rare *Ernoporus tiliae* (Panzer, 1793) and the scarce *Ernoporicus caucasicus* (Lindemann, 1792) having been discovered there on 9 May 2002 (Drane, 2003). These are key species in the historical ecology of Shrawley Wood and as inhabitants of small diameter crown wood (Allen, 1970; Cooter, 1980) effectively 'time-patinate' the ancient Holocene lime wood 'province' (Buckland & Dinnin, 1993). *Ernoporus tiliae* was found at Shrawley Wood only in fallen branches along the high canopy woodland edge whereas *E. caucasicus* extended into coppice woodland implying that *E. tiliae* is the more fastidious. Drane (2003) also reports on *E. caucasicus* in Lancashire including at Eaves Wood (SD4676) on 4 September 2002, on the the north-western fringe of the Holocene lime wood 'province'. *Ptinomorphus imperialis* (Linnaeus, 1767) is a localised distinctive ptinid beetle known to breed regionally in the higher crown periphery of *Tilia x europaea* and its presence at Shrawley Wood can be anticipated.

Only rarely at Shrawley Wood is the inner wood of single-stemmed standing lime trees found to be significantly exposed and decayed. The causative organisms are presently unknown and could be either ascomycotine or basidiomycotine; discussion with Mr John Bingham (*in litt*., 30 November 2017) could not extend the matter but Brittle Cinder fungus *Kretzschmaria deusta* (01) remains a possibility. Decayed fungoid lime wood is generally scarce in relation to that of other trees, possibly because exposed lime wood may desiccate rapidly. A well-developed xylophilous entomofauna is most apparent when the woodland edge is fragmented and where moribund ancient trees are subject to insolation (Kaila, Martikainen & Punttila, 1997; Whitehead, 2000, 2005); this remains an area for future research at Shrawley Wood.

Knowledge of the relationship between arboreal fungi and mycophilous invertebrates (16) at Shrawley Wood is also deficient. The parasitic fungus *Armillaria mellea* (Vahl) P.Kumm., 1871 is known but it appears not to have the same woodland impact as it may have on amenity lime trees. The erotylid beetle *Triplax aenea* (Schaller, 1783) and the tetratomid beetle *Tetratoma fungorum* Fabricius, 1790 have been found on specimen *Tilia platyphyllos* infested with *A. mellea* elsewhere in Worcestershire (*teste* P. F. Whitehead).

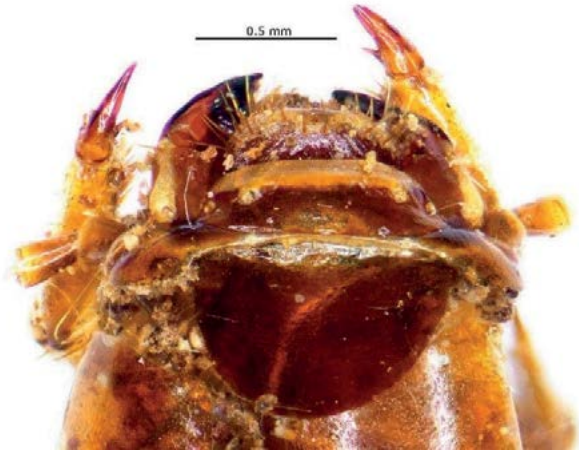
Cavities

Cavities take many forms and the outgrown pollards or open grown lime trees at Shrawley Wood reflect this, although in general cavities are uncommon. The lime trees at Shrawley Wood show a wide range of conformations depending on how they originated and what management if any has been applied to them. High canopy limes have often developed from old coppice stems. During the course of their development some coppice stems have been suppressed leaving two or three to recreate a high canopy tree. Later in life such trees

may shed stems as a response to gravitational impacts and a large basal cavity may develop slowly; these are not commonly found at Shrawley Wood. Typically they will contain some decayed wood or a basal scatter of wood-rich sediment and in-blown debris and may contain pupae of Lime Hawk Moths.

It is clear from the 2017 trapping programme (Blythe, 2018, 2022 this volume; Whitehead, 2022a, 2022b this volume) that lime bole tree cavities at Shrawley Wood are of enormous biological significance in an equally enormous variety of ways. This work cast light on the intricate life-web in cavities but overall current knowledge is probably only superficial. According to Ellis (1926) the hygromiid snail *Zenobiella subrufescens* may ascend tree trunks during the summer and single juveniles were encountered in each of the two cavities sampled during 2017. Trap B held copious water and had a vigorous population of breeding scirtid beetles *Prionocyphon serricornis* (Müller, P.W.J., 1821), a specialist of water-containing tree cavities which also utilises lime in Sweden (Jonsell, 2012). The same cavity trapping programme captured four localised or scarce species of saproxylic rove beetles of the genus *Quedius,* all of which have been linked to *Tilia cordata* in Sweden (Jonsell, 2012). These are subtly reflective of woodland habitat continuity and some of the author's background data is provided for each of them.

In Britain *Quedius brevicornis* (Thomson, 1860) is a rather rare species usually of organic bole fills and hollow bole corvid nests in ancient woodland and traditional orchards; its predilection for enclosed situations was demonstrated dramatically by Jansson *et al*. (2009). *Quedius maurus* (Sahlberg, 1830) occurs in organic litter and debris in a variety of ancient woodland types ranging from 33 m a.s.l. in southern Sweden to 500 m a.s.l. in central Slovakia. In Britain *Quedius microps* Gravenhorst, 1847 occurs mostly in humid lowland woodlands ranging from 26 m a.s.l. in Monmouthshire up to 200 m a.s.l. on the Cotswold Hills and 228 m a.s.l. on the Malvern Hills. *Quedius truncicola* Fairmaire & Laboulbène, 1856 occurs widely in traditional orchards and in a variety of woodland types from 27 m a.s.l. at Croome D'Abitot, Worcestershire to 450 m a.s.l. in central Slovakia, most frequently in suppurating cavities and fluxes.



17. Final instar larva of the scarce tenebrionid beetle *Pseudocistela ceramboides*, Shrawley Wood, 11 June 2017, showing the head, maxilla, labium, mandibles and palpi. P. F. Whitehead.

Relatively dry low-level cavities support the scarce saproxylic tenebrionid beetle *Pseudocistela ceramboides* (Linnaeus, 1758) (17) and evidence of its existence can sometimes be found in the form of ovoid pupal cells constructed from soil. The related tenebrionid *Prionychus ater* (Fabricius, 1775) prefers drier often more elevated cavities and is another likely candidate for occupancy of Shrawley Wood; it has been associated with *Tilia cordata* in Sweden (Jonsell, 2012) and has been observed breeding on street-tree *Tilia platyphyllos* to the south of Bielsko-Biała, southern Poland (*teste* P. F. Whitehead). The lucanid *Sinodendron cylindricum* certainly occurs in cavities at Shrawley Wood if there is enough soft wood available and larvae of the ubiquitous click beetle *Athous haemorrhoidalis* (Fabricius, 1801) occur commonly. These basal cavities are often dry and the invertebrate fauna may be limited. They also provide shelter for day-shunning species like the specialist pyralid moth *Salebriopsis albicilla* (13).

Beetles associated with Small-leaved Lime trees in southern Sweden's traditional lime woods have been described by Jonsell (1992) and the remarkable list of fastidious and ecologically sensitive species remains a key contribution to the global knowledge base of lime woodland biology. Table 01 lists 25 species of lime-associated beetles that occur in both southern Sweden's ancient lime woods (*sensu* Jonsell, 2012) and at Shrawley Wood; it demonstrates what further study at Shrawley Wood may reveal.

Family	Shrawley Wood	UK national status	IEC grade	Habitat Shrawley	Habitat Sweden
Ptiliidae	*Ptenidium gressneri*	NS	2	cavity	cavity
Staphylinidae	*Phloeonomus punctipennis*			tree fallen under bark	bark, wood
Staphylinidae	*Euplectus karstenii*			cavity	bark, wood
Staphylinidae	*Haploglossa villosula*			cavity	cavity
Staphylinidae	*Quedius brevicornis*	NS	[3]	cavity	cavity
Staphylinidae	*Quedius maurus*		3	cavity	sap run

Staphylinidae	*Quedius microps*	NS	3	cavity	cavity
Staphylinidae	*Quedius truncicola*	NS	3	cavity	cavity
Staphylinidae	*Gabrius splendidulus*			under bark	bark, wood
Lucanidae	*Sinodendron cylindricum*			wood mould	wood
Scirtidae	*Prionocyphon serricornis*	NS	3	cavity	cavity
Elateridae	*Denticollis linearis*		1	wood	wood
Elateridae	*Melanotus castanipes*			eurytopic	wood
Cantharidae	*Malthodes marginatus*			cavity	bark, wood
Monotomidae	*Rhizophagus dispar*			tree fallen under bark	bark, wood
Silvanidae	*Silvanus bidentatus*	NS	2	under bark	bark
Cerylonidae	*Cerylon ferrugineum*			tree fallen under bark	bark, wood
Latridiidae	*Cartodere nodifer*			cavity	cavity
Latridiidae	*Enicmus rugosus*	NS	2	cavity	bark, wood
Tenebrionidae	*Pseudocistela ceramboides*	NS	2	cavity	cavity
Cerambycidae	*Rhagium mordax*			cavity, foliage	wood
Cerambycidae	*Pogonocherus hispidus*			cavity, under bark	bark, wood
Cerambycidae	*Stenostola dubia*	NS	[3]	foliage	bark, wood
Curculionidae	*Trachodes hispidus*	NS	3	on log	bark, wood
Curculionidae	*Ernoporus tiliae*	NR	2	under bark	bark, wood

Table 01. Beetles recorded from ancient Small-leaved Lime woodland at both Shrawley Wood Worcestershire, England and Lake Mälaren environs, *ca*59°20'N 17°00'E, southern Sweden (Jonsell, 2012) showing British national status and British woodland Index of Ecological Continuity, a scheme pioneered by Harding (1976, 1977) and Harding & Rose (1986) to demonstrate the strength of commitment of beetles to the woodland biotope over time. Figures in parentheses may require reassessment.

Coppice stools

Coppice stools are the remains of the tree after the cyclic removal of the coppice stems. They are a largely overlooked habitat of major invertebrate importance at Shrawley Wood which blur the boundaries of terrestrial and arboreal entomofaunas. In some cases the coppice stools are high-pruned leaving an elevated stem base or more usually a multi-stemmed stool. The long extended history of lime coppicing at Shrawley Wood has created an equally long-extended continuity of available habitat around the stools and the pole bases into which, often over hundreds of years, organic and inorganic debris may accumulate (18). The key pabulum is a humified mass of organic sediment enriched by leaf fall and debris from the tree that accumulates between and around the stem bases. This forms a stable enduring mass for a range of invertebrates and their predators.

Larvae of elaterid beetles *Agriotes acuminatus* (Stephens, 1830) and *Athous haemorrhoidalis* (Fabricius, 1801) occur in contrast to those of *Athous vittatus* (Fabricius, 1792) (08) which prefer insolated lighter more friable inorganic sediments in freshly coppiced compartments. Predatory carabid beetles such as *Stomis pumicatus* (Panzer, 1795) occur here and it is the larval niche of the cerambycid beetle *Pachytodes cerambyciformis* (Schrank, 1781) (19). The diverse myriapod fauna includes polydesmids, *Geophilus easoni* Arthur, Foddai, Kettle, Lewis, Luczynski & Minelli, 2001 and *Cylindroiulus punctatus* (Leach, 1815). *G. easoni* is a faintly hygrophilous species; on the Malvern Hills it extends through open woodland, woodland edges, and tussocky exposed grassland through altitudes of 153 m to 398 m a.s.l. survived 32°C in August 2018 at 288 m. a.s.l.



18. A time honoured lime stool, Shrawley Wood, 22 April 2017, with interstitial organic fills, epiphytes and mosses. P. F. Whitehead.



19. The root-feeding longhorn beetle *Pachytodes cerambyciformis* on *Heracleum sphondylium* L., Shrawley Wood, 22 April 2017. P. F. Whitehead.



20. The flightless terrestrial weevil *Trachodes hispidus* preparing to copulate beneath high canopy lime woodland, Shrawley Wood, 11 June 2017. P. F. Whitehead.

The millipede *Ommatoiulus sabulosus* (Linnaeus, 1758) is usually associated with warm weakly structured well-drained sediments and is likely to have a long-extended history at the site. It is evidently well adapted to the woodland biotope having been found amongst litter at the bases of the stools and interestingly two to three metres high in the canopy of large Small-leaved Lime trees. A good range of molluscs occur including the calcifuge snail *Zonitoides excavatus* (Alder, 1830) especially where water accumulates. Another localised snail *Zenobiella subrufescens* (Miller, 1822) occurs around ancient stools in humid spots and the machilid *Dilta hibernica* (Carpenter, 1907) is occasionally observed in the basal stool litter.

The pabulum itself varies according to external factors such as ingress of rainwater so that while particular elements of its invertebrate fauna may resemble wood mould faunas, others do not. Larvae of scarce saproxylic species such as *Gnorimus nobilis* (Linnaeus, 1758) and possibly *Mycetochara humeralis* (Fabricius, 1787) are able to accept external tree decay pabula in certain circumstances (Whitehead, 2006; 2007a). The Lime Hawk Moth *Mimas tiliae* (Linnaeus, 1758) also uses stem base litter as a pupation site.

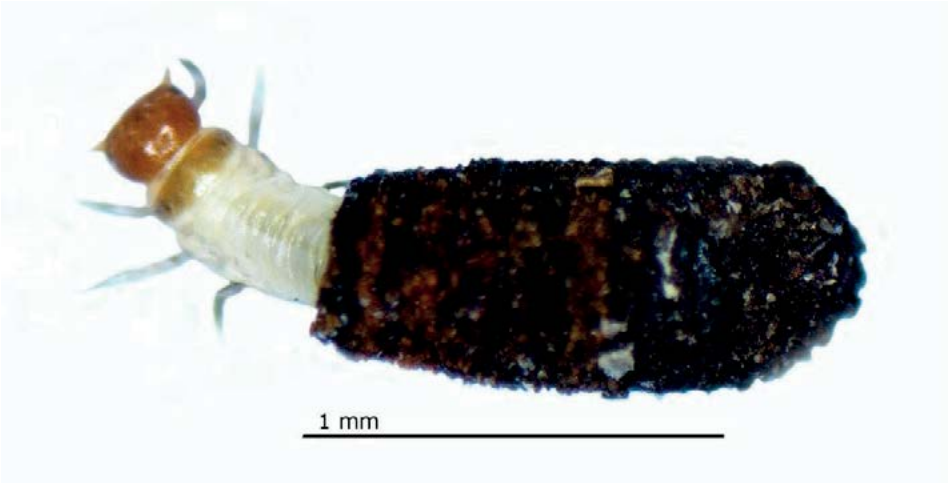
Notable terrestrial invertebrates

Shrawley Wood supports the expected range of terrestrial woodland invertebrates but there are a number of key species of historical pedigree that set the woodland apart. These include the flightless brachyderine weevils that hallmark the woodland (Whitehead, 2022a) and related inhabitants of the floor litter such as the nationally scarce flightless *Trachodes hispidus* (Linnaeus, 1758) (20) regarded by Crowson (1972) as an ancient woodland indicator species, utilising especially freshly fallen branches (Koch, 1994). Subsequently Crowson was proved correct, for Howard, Smith, Garton, Hillam & Pearce (1999) described a Bronze Age fossil from the valley of the River Trent. Certain key species are favoured by specific conditions on the ground, in particular naturally well-drained sediments and surface aeration aided by the lime tree root web beneath a closed canopy. In such conditions plant decomposition may be slowed thus providing an abundance of comminuted surface litter through which case-bearing invurvariid moths such as *Nemophora degeerella* (Linnaeus, 1758) habitually forage.

The availability of sand grains, derived from the solid geology, favours case-bearing species in particular the Land Caddis *Enoicyla pusilla* (Burmeister, 1839). *Enoicyla pusilla* and its bionomics have been well studied in Worcestershire (Green & Westwood, 2005; Harding, 1995; 1998; Whitehead 2007b) where it has been recognised for more than 150 years. Larvae of *Cryptocephalus* spp. are also case-bearing specialists and for this reason are commonly known as pot-beetles; many are declined in Britain (Piper & Hodge, 2002; noting that the find-site of *Cryptocephalus frontalis* Marsham, 1802 cited therein for 'Kemerton' is in Worcestershire, vice-county 37 (Whitehead, 1996)). At Shrawley Wood they include *Cryptocephalus labiatus* (Linnaeus, 1758) (22) and the nationally rare *Cryptocephalus sexpunctatus* (Linnaeus, 1758) (21) rediscovered after an absence of 87 years (Ashe, 1922) comparatively recently (Piper, 2008) and with a population now known to be stable. It is likely that other species of *Cryptocephalus* remain to be discovered at Shrawley. The contribution of these specialised insects to woodland systems is considerable; according to Lombardero (2013) Land Caddis larvae may recycle between 5% and 19% of the floor litter in a stand of oak, voiding 93% of their intake by weight.



21. The rare chrysomelid 'pot beetle' *Cryptocephalus sexpunctatus*, Shrawley Wood, 31 May 2018. P. F. Whitehead.



22. Encased larva of *Cryptocephalus cf. labiatus*, Shrawley Wood, 11 June 2017. P. F. Whitehead.

Like the myriapod *Ommatoiulus sabulosus*, root-feeding larvae of the scarabaeid beetle *Serica brunnea* (Linnaeus, 1758) also prefer well-drained sediments and they are well represented in Shrawley Wood, the beetles frequently figuring in the diet of spiders *Clubiona* spp. The large limacid slug *Limax cinereoniger* Wolff, 1803 may reach an extended length of 30 cms in continental Europe (Pfleger & Chatfield, 1988) and with its nocturnal cohort *Malacolimax tenellus* (Müller, 1774) is generally regarded as an ancient woodland indicator species (Kerney, 1999). *Limax cinereoniger* is distributed across the woodland under both high canopy and coppice growth.

Worcestershire is very much a stronghold for *M. tenellus* having been recognised in Wyre Forest for more than a century (Ellis, 1926) but observations at Shrawley Wood came later, an early recorder being Mr I. D. Finney on 25 October 1970. Both of these limacid slugs were thought to be declining in Britain (Cameron & Killeen, 2003). The clausiliid door snail *Macrogastra rolphii* (Turton, 1826) seems not to have been recorded at Shrawley Wood (M.P. Kerney, *in litt.,* 11 July 1985; https://records.nbnatlas.org/occurrences/d0bbdf43-4bd3-4774-bd30-a14fd9a1b28b accessed 24.10.2020) and has a rather limited distribution in the north-west Worcestershire with a single 1985 record in hanging escarpment woodland further south on Bredon Hill (*teste* P. F. Whitehead). It was however found in Shrawley Wood in 2021 (see chapter on molluscs p. 584).

Pigott (1991) cites a wide range of ascomycotine and basidiomycotine mycorrhizal fungi that have been found in association with lime trees and refers also to the temporal ability of rootlets to resist fungal colonisation. One conspicuous beetle is an indicator of mycorrhizal development. The large geotrupid *Anoplotrupes stercorosus* (Scriba, 1791) is a key species in confirming the mycorrhizal status of ancient woodlands and some British oak woods support large populations of this species. At Shrawley Wood *A. stercorosus* is often conspicuous during the summer months and is able to climb trees; spider kills have been found almost three metres from the ground, and a single example turned up in the 2017 lime cavity trapping study (Whitehead 2022a, this volume). Amongst beetles, some throscids and some aderids are also associated with mycorrhizal fungi and the former group is known from Shrawley Wood but a great deal remains to be learnt about the terrestrial mycofauna of the wood.

Conclusion

Hopefully enough has been said here to enable readers to judge Shrawley Wood for themselves and to arrive at their own conclusions. It is a matter of national good fortune that such a remarkable woodland has persisted for millennia, even if it has been subject to great change at the hand of humankind. One might hark back for a moment to the essential simplicity of woodlands which is easily lost within their complexity.

With *Trachodes hispidus* in mind it has been stated that: "*Some species of weevil, mostly those that live on the forest floor, can no longer fly because they have become accustomed to the slow rhythms of the forest and its practically eternal existence. The farthest they can travel is 30 feet a year and they don't need to travel any farther than that. If the forest was cleared in the Middle Ages and later replanted you won't find these insects, because it would simply have been too far for them to walk to the next old forest*." Peter Wohlleben, *The Secret Life of Trees*

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The invertebrate fauna of two bole cavities
in Small-leaved Lime *Tilia cordata* Miller at Shrawley Wood, Worcestershire

Paul F. Whitehead

Introduction

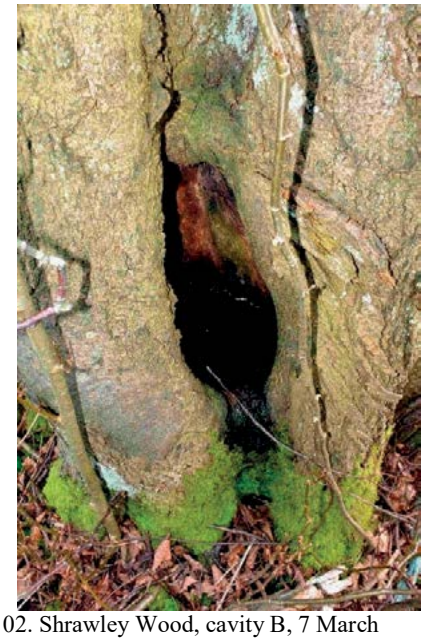
Two improvised Malaise traps were set up over 'rot holes' or bole cavities in two Small-leaved Lime trees, *Tilia cordata* Miller, in Shrawley Wood, Worcestershire on 13 April 2017. The fabric shrouding the trap was firmly stapled to the trunk (03) and the catch was collected in a flask of 15% aqueous monopropylene glycol with a spot of washing-up liquid. The receiver was emptied every 10 to 15 days (the mean emptying interval throughout was 14 days) and the invertebrates sorted into 70% isopropanol. In this account the two cavities are referred to as cavity A and cavity B and their corresponding traps as trap A and trap B.

Cavity A (01) was in a tree situated at 52°29'N 2°28'W SO80606623 75 m a.s.l. and was nine centimetres wide and 125 cms from the ground. It was surrounded by occluded callus tissue with a shallow vertical depression above; the cavity evidently originated from the loss of a competing stem. The cavity extended 19 cms into the bole and had a flat inclined base which contained sparse debris and no free water. The back of the cavity had an arcuate slit that opened into what appeared to be a vertical shaft. The depth and contents of this shaft could not be ascertained and although it was unlikely to have received rainwater that cannot be discounted. Once the trap was set up ingress of rainwater was prevented.

Cavity B (02, 03) was in a tree situated at 52°29'N 2°28'W SO80656621 68 m a.s.l. The cavity was 55 cms from the ground and 26 cms in length to the cavity lip. Like cavity A it was marked by a vertical depression in the trunk above it and was partly blocked by callus tissue surrounding it. This cavity contained a pool of water up to 18 cms deep filled with saturated organic debris which graded upwards from a fine reddish sludge to almost intact dead leaves (14). The water surface was 11 cms below the cavity rim and was the colour of tea, scummy and fringed with minute bubbles. The location of the traps is shown in 04 and 05.



01. Shrawley Wood, cavity A, August 2018



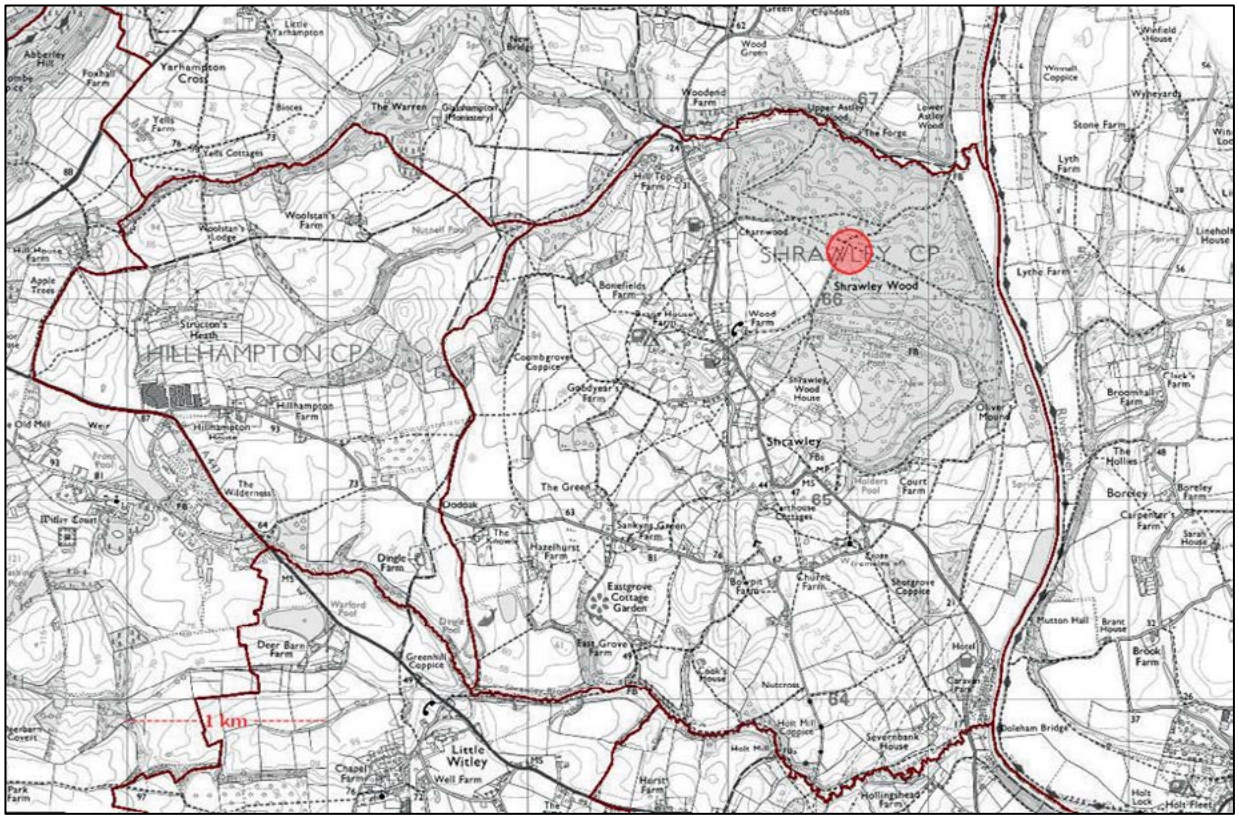
02. Shrawley Wood, cavity B, 7 March 2017.



03. Shrawley Wood, trap in place over cavity B, 13 April 2017.

The surrounding herbage was dominated by bluebells with stunted brambles and numerous Small-leaved Lime saplings. Piles of brash remained from earlier forestry activity. In both cases the bark was rather deeply ridged (01) making sealing the trap tightly to it difficult. It is likely that small invertebrates could enter the trap, attracted by chemical signatures from the decaying wood, fermenting fluid or the monopropylene glycol.

Mr Michael Blythe (*in litt*., 11 November 2017) felt that this could explain the gender bias observed in the trapped flies, particularly amongst *Forcipomyia* biting midges. As the season progressed spiders tended to colonise the upper chamber of the receiver in both traps and a few webbed the lower collecting chamber. The traps were removed on 22 September 2017 which concluded the work but Mr Blythe removed a sample of the basal deposit from cavity B on 7 November 2017 for incubation in a custom-made breeding device.



04. Shrawley Wood, Worcestershire, position of cavity traps A and B in relation to cartography. Contains OS data © Crown copyright and database rights 2020



05. Shrawley Wood, Worcestershire, 23 July 1985, position of cavity traps A and B in relation to the vegetation matrix. The coppiced and standard lime trees can be distinguished from planted conifers by their paler more botryoidal crowns.

Summary of findings

Samples received by the author covered the time period 14 April 2017 to 22 September 2017. They comprised 5947 invertebrates extending over 20 taxonomic orders (Table 01). The purpose of this account, in which any inconsistencies are entirely the responsibility of the author, is not to describe every species in detail but to attempt to highlight the great variety of species that may use bole cavities, their diversity and the remarkable processes of accommodation that must exist to support them all. Some of these findings have been presented elsewhere in this volume (Whitehead, 2022a, this volume).

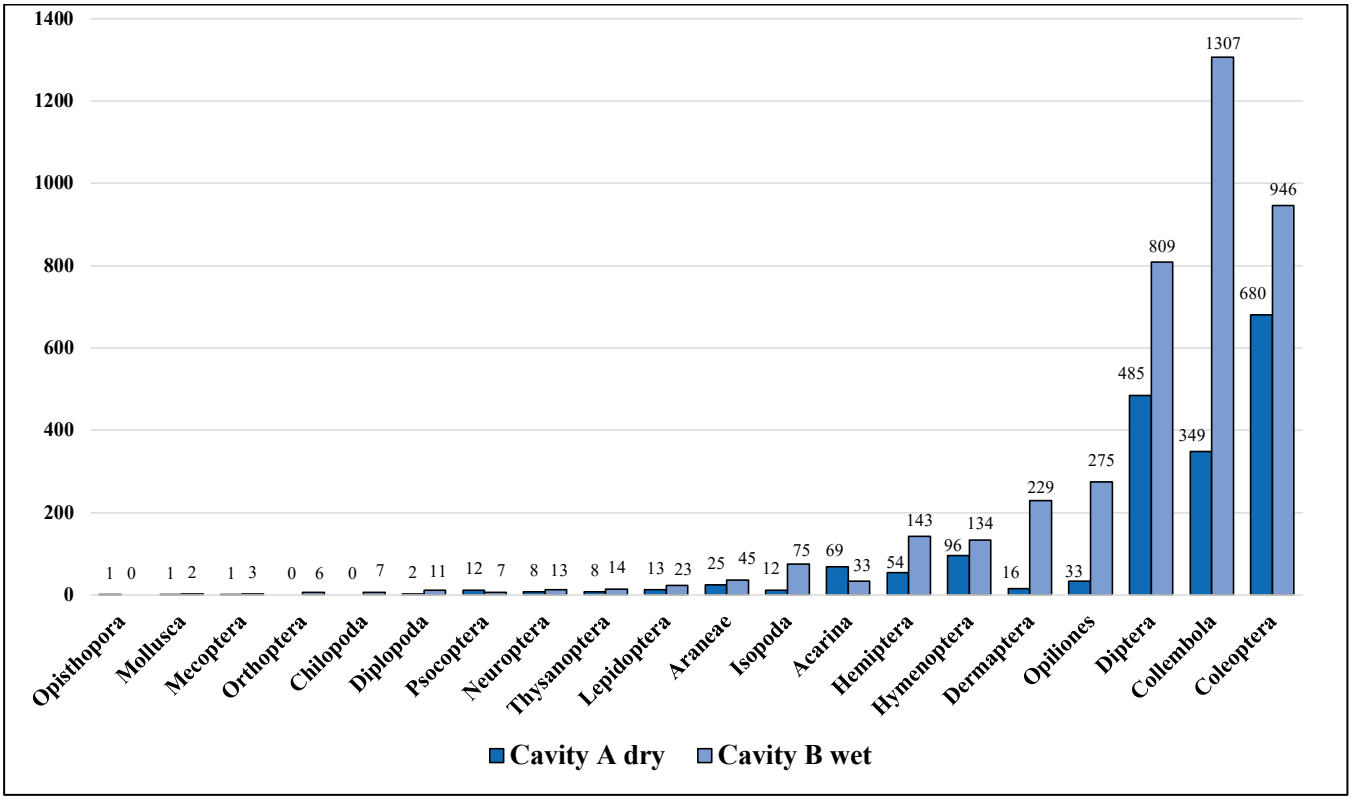


Table 01. Shrawley Wood, *Tilia cordata* cavity traps A and B, May to September 2017. Numbers of invertebrates trapped arranged in phylogenetic sequence in increasing order of frequency.

Table 01 indicates that the rot holes were dominated by true bugs, wasps, earwigs, harvestmen, flies, beetles and springtails. There were clear differences between the numerical contribution made by particular groups to each of the traps although small Hymenoptera: Parasitica, which together numbered >100 individuals, showed little discriminance between the two. Only mites were significantly more numerous (+109%) in the drier cavity A. In the wetter cavity trap B earwigs *Forficula auricularia* L. increased in number by 1331%, harvestmen by 733%, springtails by 280%, beetles by 83% and flies by 67% in relation to the numbers in cavity trap A. The immaturity of many of the earwigs (90 nymphs in trap B between May and August) and harvestmen (220 immature in trap B) suggests that cavities are favoured by particular groups as shelters during their early developmental phases, although Collembola demonstrated an overall preference for humidity. For many early developmental phases of a wide range of soft bodied invertebrates it seems that humidity and shelter exert a marked influence and there are clear grounds to presume that cavity B acted as a refugium for a wide range of early stage insects.

The above observations take no account of the relative ease with which particular groups or sizes of invertebrates could access each of the traps although since the fixing techniques were the same for each trap any variation between the traps in this regard is not significant. It would appear that some weevils made concerted efforts to enter the cavities after the traps were set up; some invertebrates and their early developmental stages could have been incarcerated inside the cavities by the traps.

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Observations on selected invertebrates from Shrawley Wood *Tilia cordata* bole cavity traps 2017

The following observations disregard flies Diptera which are dealt with separately by Blythe (2022, this volume p. 477).

Collembola Springtails

Collembola figure prominently in the entomofauna and very prominently in cavity B (Table 01) and are second only to Coleoptera in terms of numbers of individuals. *Entomobrya albocincta* (Templeton, 1835), well-known as a bole cavity species in Britain, dominated cavity A (Table 02) with 130 on 4 August declining afterwards. The humid cavity B was favoured by the widespread *Orchesella cincta* (Linnaeus, 1758) with 940 trapped between 19 July and 2 September in contrast to a total of 53 throughout in trap A. All had declined by the end of September. *Lepidocyrtus lanuginosus* (Gmelin, 1788) (06), distinctively coloured (Mateos, 2012), bred in both cavities but the 177 trapped in cavity B between May and August greatly outnumbered the 11 from cavity A. Based on this evidence alone *L. lanuginosus* would be regarded as positively hygrophilous. Immature stages tended to occur in the earlier months, which explains the earlier frequency of *L. lanuginosus*, whereas the summer peaks reflected increased activity generally



06. *Lepidocyrtus lanuginosus* (Collembola: Entomobryidae), Shrawley Wood, trap B, 23 June 2017. The distinctive violet colouration of the antennae and interocular area can be observed.

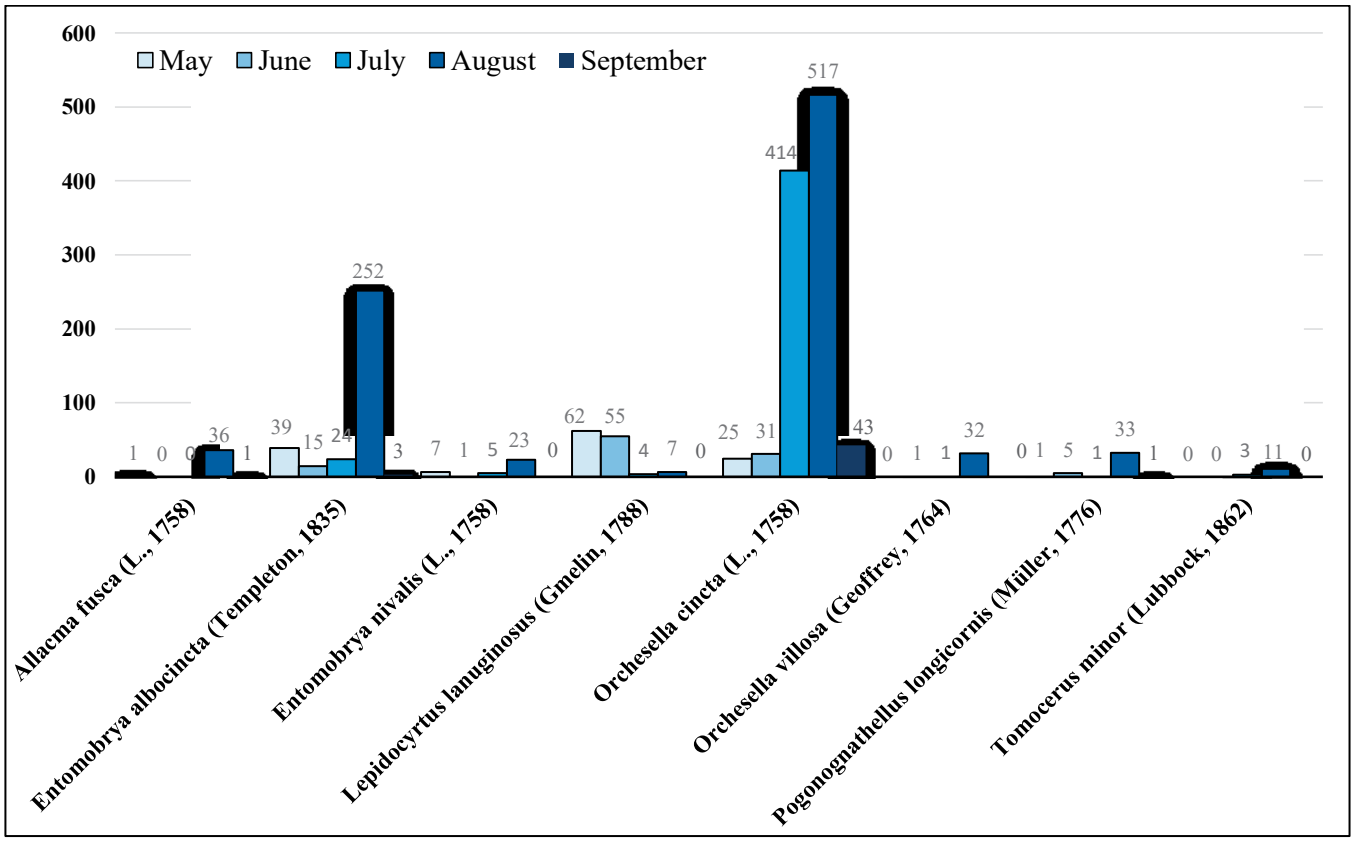


Table 02. Collembola, numbers of individuals, *Tilia cordata* traps A and B, Shrawley Wood, May to September 2017 (single examples of *Brachystomella parvula* (Schäffer, 1896) and *Pogognathellus flavescens* (Tullberg, 1871) from trap B are excluded).

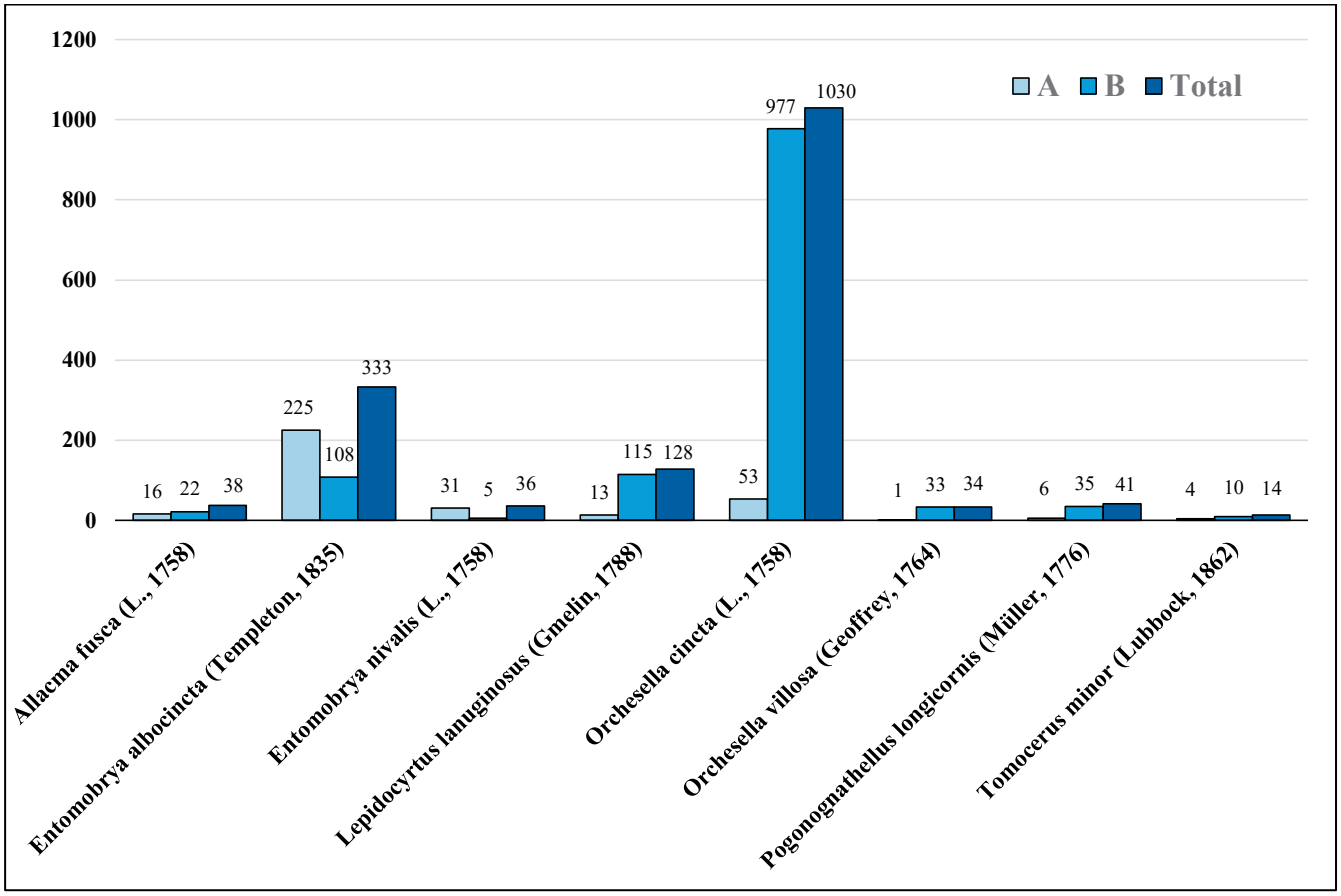


Table 03. Collembola, frequency of the eight most common species, *Tilia cordata* traps A and B, Shrawley Wood, May to September 2017 (single examples of *Brachystomella parvula* (Schäffer, 1896) and *Pogognathellus flavescens* (Tullberg, 1871) from trap B are excluded).

Psocoptera Barklice

Nineteen psocids were recovered, 12 from cavity A and seven from cavity B of which the following species were identified. *Ectopsocus briggsi* McLachlan, 1899; *Ectopsocus petersi* Smithers, 1978; *Loensia variegata* (Latreille, 1799) (07); *Reuterella helvimacula* (Enderlein, 1903); *Trichadenotecnum sexpunctatum* (L., 1758) and *Valenzuela flavidus* (Stephens, 1836). This is a coherent assemblage of species characteristic of the woodland environment and in particular of the trunks and bark of broadleaved trees (Lienhard, 1998).



07. *Loensia variegata* (Psocoptera: Psocidae), female, Shrawley Wood trap A, 24 August 2017. The subgenital plate has been isolated.

Thysanoptera Thrips

Only 22 thrips were recovered from both traps representing Aeolothripidae, Thripidae and Phlaeothripidae the counts as follows. Aeolothripidae: *Aeolothrips melaleucus* Haliday, 1852 four. Thripidae: *Limothrips cerealium* Haliday, 1836 nine; *Thrips calcaratus* Uzel, 1895 one; *Thrips major* Uzel, 1895 two; *Thrips vulgatissimus* Haliday, 1836 one. Phlaeothripidae: *Hoplothrips semicaecus* (Uzel, 1895) three; *Phlaeothrips coriaceus* Haliday, 1836 one.

Further information on these thrips can be gleaned from Mound, Morison, Pitkin & Palmer (1976) although many species will remain under-recorded generally. *Aeolothrips melaleucus* is a predator of small soft-bodied invertebrates, *Hoplothrips semicaecus* represents a genus that is frequently xylomycophagous and *Phlaeothrips coriaceus* is saproxylophilous usually on hardwood trees.

Thrips calcaratus is monophagous on Lime *Tilia* spp., occurring in the developing buds.

Hemiptera True bugs

True bugs (Table 04) represent a wide spectrum of mostly predatory species from a range of habitats on the tree. Anthocorids were well represented in cavity B and a notable feature here was the presence of the predatory mirid *Blepharidopterus angulatus* (Fallén, 1807) in some numbers. Trap B recovered 26 early stage mirids almost all of which represented *B. angulatus* (Table 04). This implies some attraction for the focussed concentration of immature invertebrates in that cavity and also ecological differentiation between the nymphal and adult habitat of *B. angulatus* at Shrawley Wood which seems to have been observed rarely.

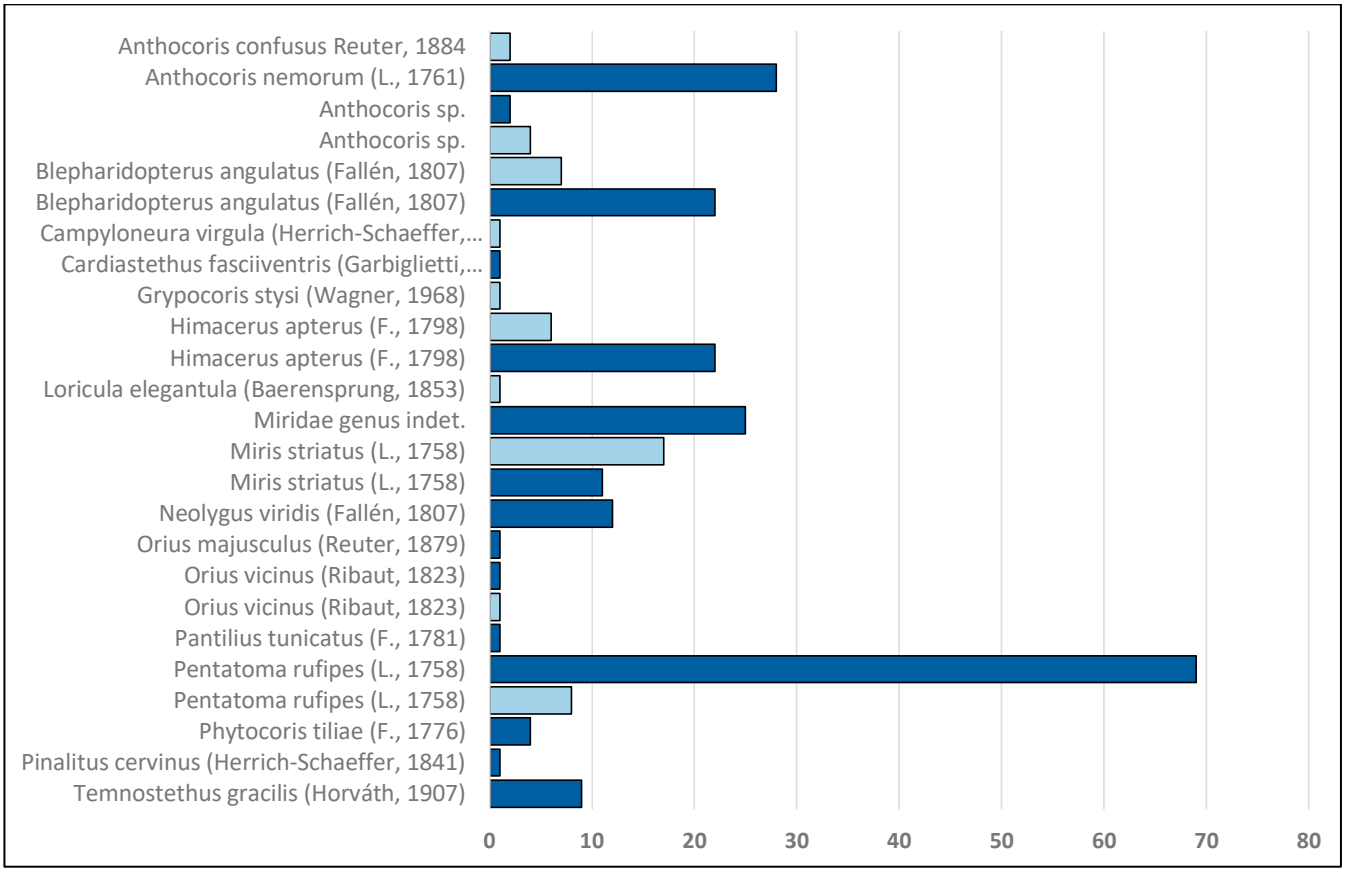
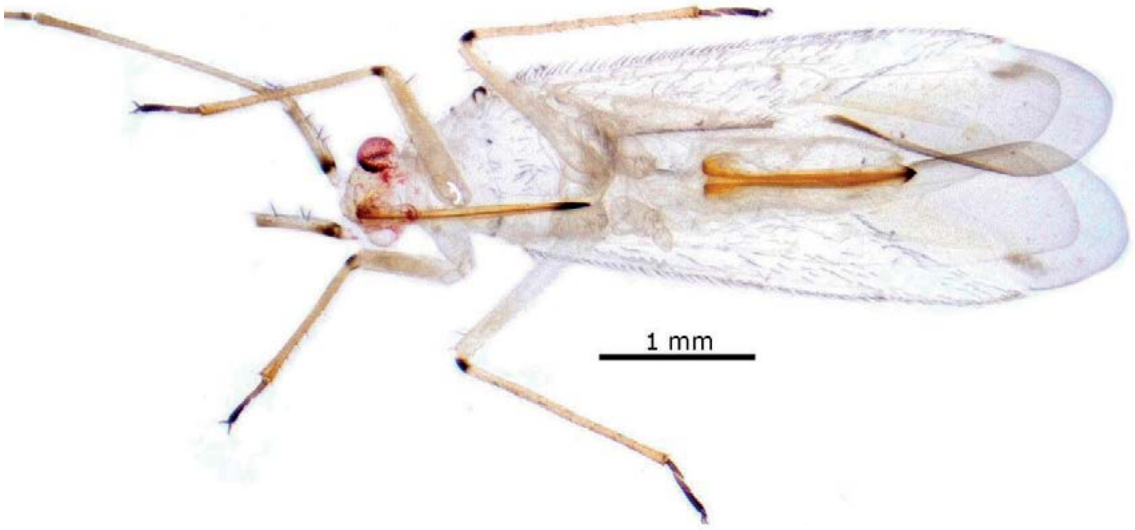


Table 04. Hemiptera from two cavity traps, Shrawley Wood, May to September 2017. Trap A pale blue, trap B dark blue.

Mature adult *B. angulatus* are usually green overall but a mature female recovered from trap A on 10 September 2017 (08) is an exception. Bleaching by immersion in the trapping fluid was ruled out because others in the same sample retained normal colouration. Close inspection suggested that it represented a genuinely white or leucistic individual. Variation in pigmentation is not unusual in Hemiptera and occasional distinctive colour morphs are observed, e.g. in Pentatomoidea, but an almost complete lack of pigment is evidently rare in insects living in open exposure. This individual is held to be genuinely aberrant and in the absence of further examples, not leucistic as a consequence of extended time spent in the comparative darkness of a tree cavity.

Shrawley Wood supports a large population of the pentatomid *Pentatoma rufipes* (Linnaeus, 1758) which ranges widely over its host trees. Table 04 shows how *P. rufipes* dominates the trapped Hemiptera due to the large number (69 or 89.6% of the total number trapped throughout) of fifth instar nymphs recovered from cavity B throughout June 2017. It seems that these nymphs not only enter a wandering phase but have an ability to discriminate finely between particular situations.

This assemblage of Hemiptera, which includes species widespread in the woodland biotope, provides evidence of species ranging widely over the entire tree and many of them, e.g. *Miris striatus* (Linnaeus, 1758) represented only by L2 to L5 stage nymphs, would actively seek out ova and larvae in bark niches and bole cavities.



08. *Blepharidopterus angulatus*, leucistic female, Shrawley Wood, cavity A, 10 September 2017.

Hemiptera Auchenorrhyncha Leaf-hoppers

Trap B yielded 26 Auchenorrhyncha and trap A yielded eight. They include representatives of Aphrophoridae, Cicadellidae: Typhlocybinae, Cixiidae and Issidae (09, 10). Numbering 18 specimens, Issidae represent more than half of the total number of all Auchenorrhyncha trapped. All the issids were nymphal including 14 first instars or L1 stages which are discussed in greater detail by Whitehead (2022b, this volume). Recent study (Whitehead, 2019b) has demonstrated that L1 stage nymphs of *Issus coleoptratus* (Fabricius, 1781) and *Issus muscaeformis* (Schrank, 1781) cannot presently be distinguished visually; after the L1 stage *I. coleoptratus* becomes progressively paler (10) rendering identification more secure.



09. *Issus muscaeformis* L3 stage nymph Shrawley Wood trap A, 22 September 2017



10. *Issus coleoptratus* L4 stage nymph Shrawley Wood, *Tilia cordata* coppice stand, 22 April2017.



11. *Alnetoidea alneti* female with encysted larva of endoparasitic dryinid wasp attached to abdomen. Shrawley Wood trap B, 12 August 2017.

Lepidoptera Butterflies and moths

Thirteen larvae were recovered from cavity A and six from cavity B. Six early instar larvae resembled those of the erebid *Spilosoma* spp. Single larvae of the erebids *Calliteara pudibunda* (L., 1758), *Spilosoma lutea* (Hufnagel, 1766), *Diaphora mendica* (Clerck, 1759) and *Orgyia antiqua* (Linnaeus, 1758) were identified from cavity A. *Diaphora mendica* feeds on low growing herbaceous plants. The others are generally polyphagous and known to use lime *Tilia* spp. (Carter & Hargreaves, 1986; Porter, 1997) and doubtless wander widely over the host trees. 17 micromoths were trapped of which 16 (94%) were from cavity B, perhaps attracted by chemical signals from its decaying content. These moths were all damaged and descaled and none were identified.

Coleoptera Beetles

Beetles are the group of invertebrates represented most frequently in the traps. The numerical contributions of each of their taxonomic families are shown in Table 05. They total 1626 individuals, including larvae, of which 680 were in trap A (41.8%) and 946 (58.2%) were in trap B (Table 05). The beetles include one autochthonous (*i.e.* its entire development completed *in situ*) phytotelmata specialist from the aqueous fill of cavity B, namely the scirtid *Prionocyphon serricornis* (Müller, P.W.J., 1821). Fraser, Green, Lake & Neale (1998) attempted to define the regional statuses of the scarcer of these beetles.

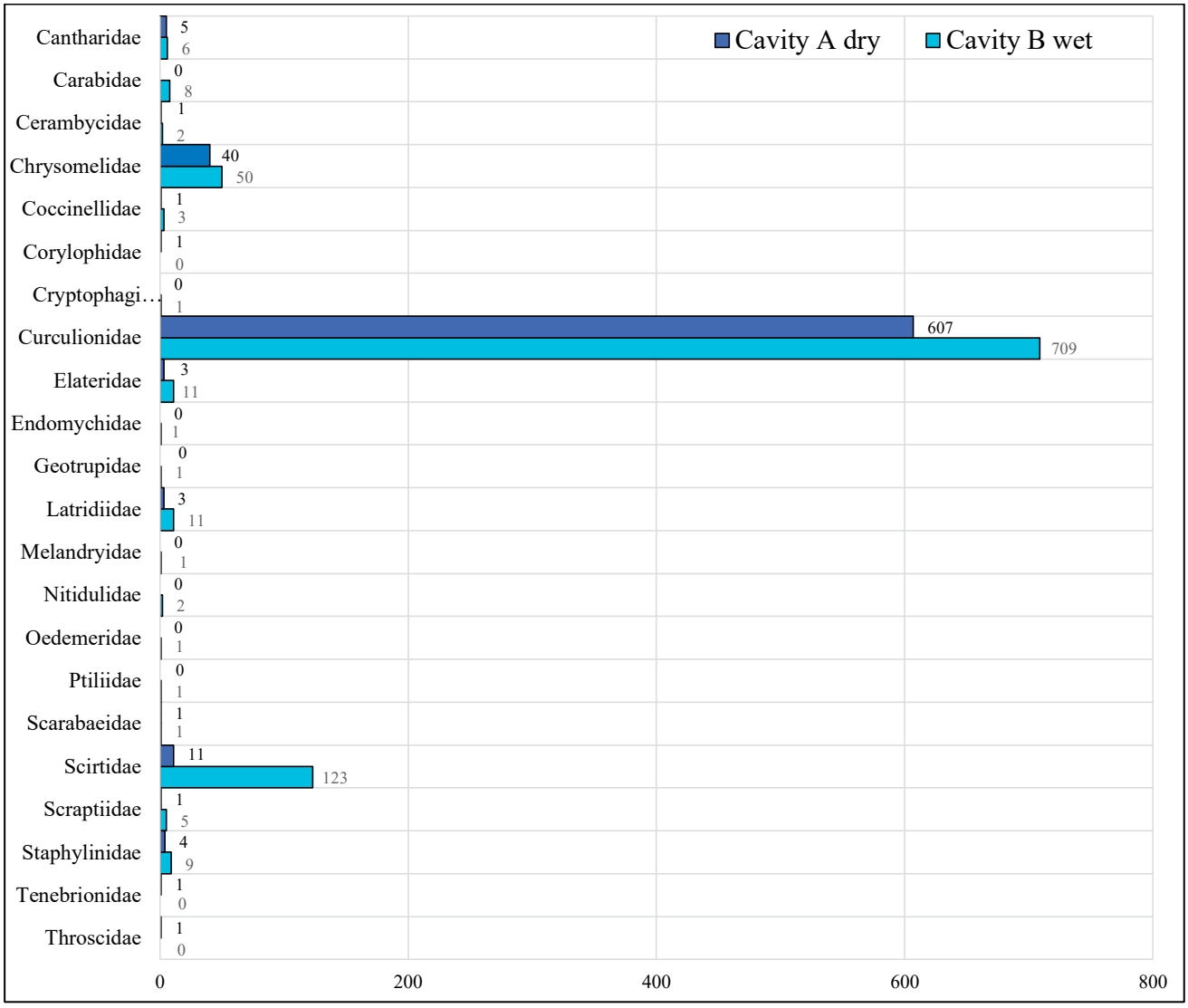


Table 05. Numbers of individuals in each of 22 taxonomic families of Coleoptera, arranged alphabetically by family name, recovered from *Tilia cordata* cavity traps A and B, Shrawley Wood, Worcestershire, April to September 2017.

Carabidae Ground Beetles

No carabid beetles were recovered from trap A. The following species were recovered from trap B: *Carabus problematicus* Herbst, 1786 ssp. *harcyniae* Sturm, 1816, male, 22 September; *Cychrus caraboides* (L., 1758) one on 19 July and one on 4 August; *Leistus ferrugineus* (L., 1758) one on 10 September; *Leistus rufomarginatus* (Duftschmid, 1812) one on 23 June; *Pterostichus madidus* (F., 1775) one 31 May and two on 24 August. This is a fairly typical regional suite of woodland carabids.

Staphylinidae Rove Beetles.

Quedius brevicornis (Thomson, 1860), one in trap A on 23 June. A Nationally Scarce woodland and traditional orchard species scattered across the region usually in drier older tree hollows and cavities.

Quedius maurus (Sahlberg, 1830), one in trap B on 19 July. A rather scarce localised species usually found singly in decayed tree stumps and organic ground litter in ancient woodland, e.g. north Cotswold Hill escarpment and Bredon Hill woodlands.

Quedius microps Gravenhorst, 1847, one in trap B on 23 June. A Nationally Scarce species of humid woodlands often in damp wood mould, e.g. on the Malvern Hills, Cotswold Hills and Bredon Hill up to 228m altitude.

Quedius truncicola Fairmaire & Laboulbène, 1856, one in trap B on 4 August. A Nationally Scarce woodland and traditional orchard species, usually found in wetter or flux-fed tree cavities with organic fills on a wide range of tree species.

Euplectus karstenii (Reichenbach, 1816), one in trap A on 19 July (12). A widespread localised pselaphine associated with wood decay processes in ancient trees and woodlands.

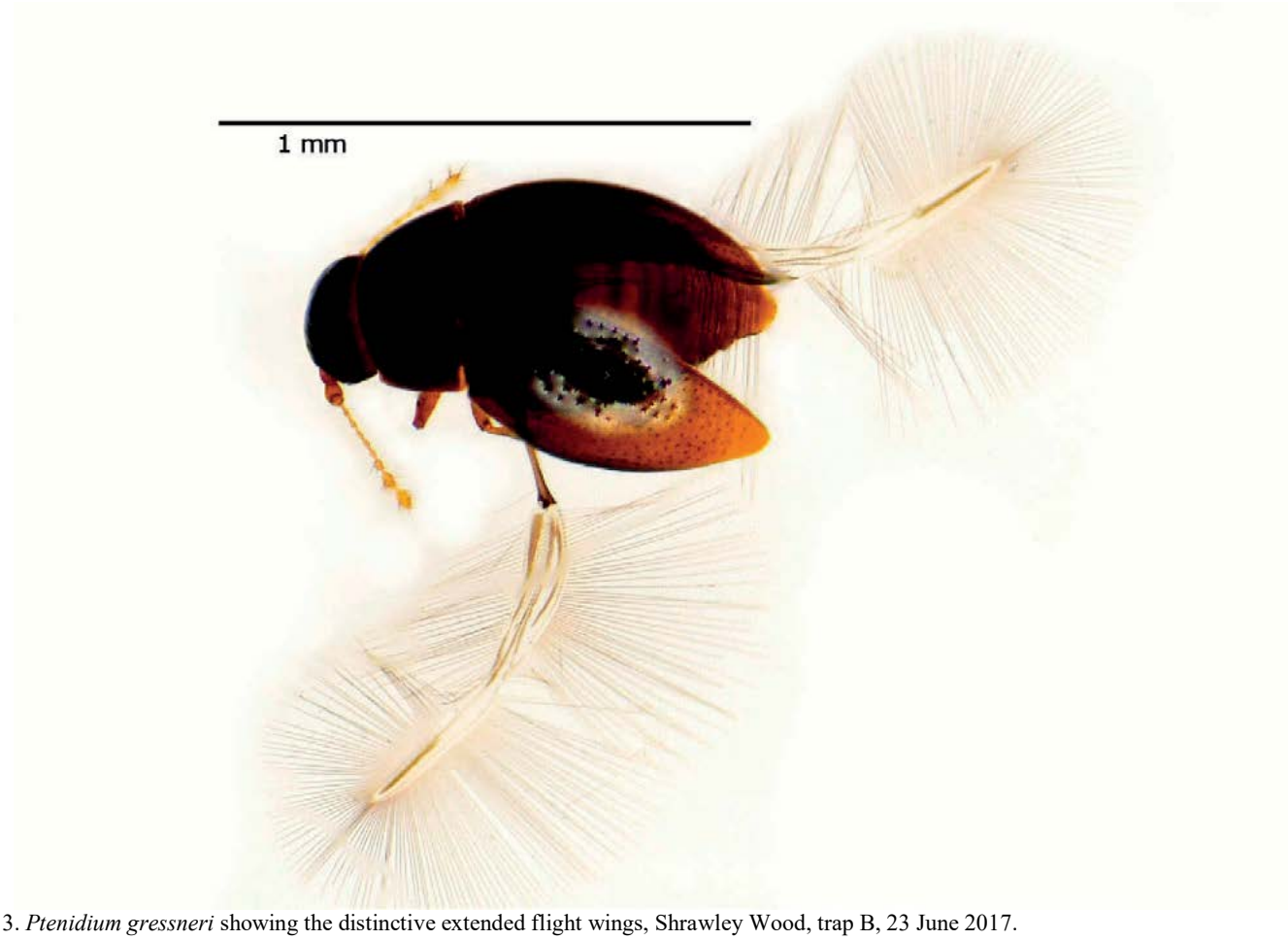
Haploglossa villosula (Stephens, 1832), one in trap A on 19 May. A scarce localised species associated with nests of passerine birds and ants (Franc, 1992) which is probably under-recorded.



12. *Euplectus karstenii,* Shrawley Wood trap A, 19 July 2017.

Ptiliidae Feather-winged Beetles

Ptenidium gressneri Erichson, 1845, on in trap B on 23 June (13). A rather rare ancient woodland indicator species usually indicative of better quality habitats, e.g. *Fraxineta* on Bredon Hill.



13. *Ptenidium gressneri* showing the distinctive extended flight wings, Shrawley Wood, trap B, 23 June 2017.

Scirtidae
Prionocyphon serricornis (Müller, P.W.J., 1821) is a rot-hole specialist that will not accept man-made rot holes (Srivastava & Lawton, 1998). It comprises 13.0% of all Coleoptera in trap B and is the only beetle confirmed as breeding in the aqueous and subaqueous fill of cavity B (14). Between 4 August and 12 August 2017 11 adults were recovered from trap A representing 1.61% of the total number of beetles recovered from it. All of the *P. serricornis* in trap A were adult whereas in trap B larvae (14) comprised 13.8% of the total number of *P. serricornis* trapped between 23 June and 4 August implying significant larval activity at that time. The larvae evidently move widely within the cavity and on occasion leave the aqueous environment, observing that the trap aperture was situated at the top of the bole cavity. Might they have embarked on pre-pupation sorties or might they have been attracted to the trapping fluid i.e. monopropylene glycol?

Adult beetles were recovered from trap B from 23 June to 22 September peaking in August and were recovered from trap A from 4 August to 12 August implying that dispersion to other cavities in the woodland coincided with the trap B peak. In the field *P. serricornis* larvae were observed active in the upper layers of the cavity fill composed of almost intact leaves of the previous year (14), and there was evidence that the fill was in a state of mild fermentation. *Prionocyphon serricornis* represented only 12.97% of beetles recorded in the cavity traps; the remainder comprising visitors from a range of niches a selection of which is given below.



Photo © G.H. Green M.B.E.
14. Larvae of *Prionocyphon serricornis* amongst twigs and skeletonising leaves of lime *Tilia cordata* Miller, Shrawley Wood, cavity B, 7 March 2017.

Throscidae
Trixagus dermestoides (L., 1767) one in trap A on 7 July. Larvae occur in mycorrhizal mats in old woodland, widespread in the better quality regional woodlands or pasture woodland mosaics, e.g., Bredon Hill and Tiddesley Wood, Pershore.

Corylophidae Hooded Beetles
Orthoperus aequalis Sharp, 1884 singly in trap A on 4 May. A rather rare, probably under-recorded species, dominantly associated with wood degradation processes in the woodland biotope, e.g. 10 in galleries of *Hylesinus varius* (Fabricius, (1775) in sawn ash wood, Kemerton, Worcestershire (VC33), 3 March 1993.

Latridiidae Scavenger Beetles
Enicmus rugosus (Herbst, 1793) singly in trap B on 19 July and on 4 August. A Nationally Scarce mycophagous species scattered in the region most frequently at higher quality sites.

Chrysomelidae Leaf Beetles
The following leaf beetles were recovered from both traps: *Aphthona euphorbiae* (Schrank, 1781) 18; *Phyllotreta vittula* (Redtenbacher, 1849) four; *Longitarsus luridus* (Scopoli, 1763) two; *Longitarsus parvulus* (Paykull, 1799) 64; *Longitarsus pellucidus* (Foudras, 1860) one; *Longitarsus pratensis* (Panzer, 1794) one. This is a typical suite of widespread herb-associated Shrawley Wood leaf beetles some of which use the biotope for seasonal shelter.

Tenebrionidae Darkling Beetles
Tribolium castaneum (Herbst, 1797) is represented by the remains of one individual in trap A 4 May. This is a cosmopolitan Indo-Australian species of stored products which has recently become sporadically expansive (*vide infra*) in the English woodland biotope (Whitehead, 1999a).

Curculionidae Weevils
In total 1316 weevils were trapped (Table 05). The fauna was dominated by two species, *Euophryum confine* (Broun, 1881) and *Strophosoma capitatum* (De Geer, 1775) which together form 98% of all weevils trapped. *Euophryum confine* (Broun, 1881) is a

naturalised xylophagous originally antipodean weevil (Buck, 1948) which is now widespread in the British Isles. It was trapped in large numbers with 200 imagines recovered from drier cavity A and 72 from cavity B with a clear peak in mid-June. The remaining 2% are represented by five species, and include 10 examples of *Otiorhynchus singularis* (Linnaeus, 1767) now known (Whitehead, 2022a, this volume) to be directly associated with lime trees at Shrawley Wood. A single example of the widespread terrestrial herbivorous weevil *Leiosoma deflexum* (Panzer, 1795) from trap B on 10 May demonstrated its ability to climb trees. *Strophosoma capitatum* (De Geer, 1775) has root-feeding larvae and tends to prefer well-drained woodlands; its impact on the tree rhizosphere must be considerable.

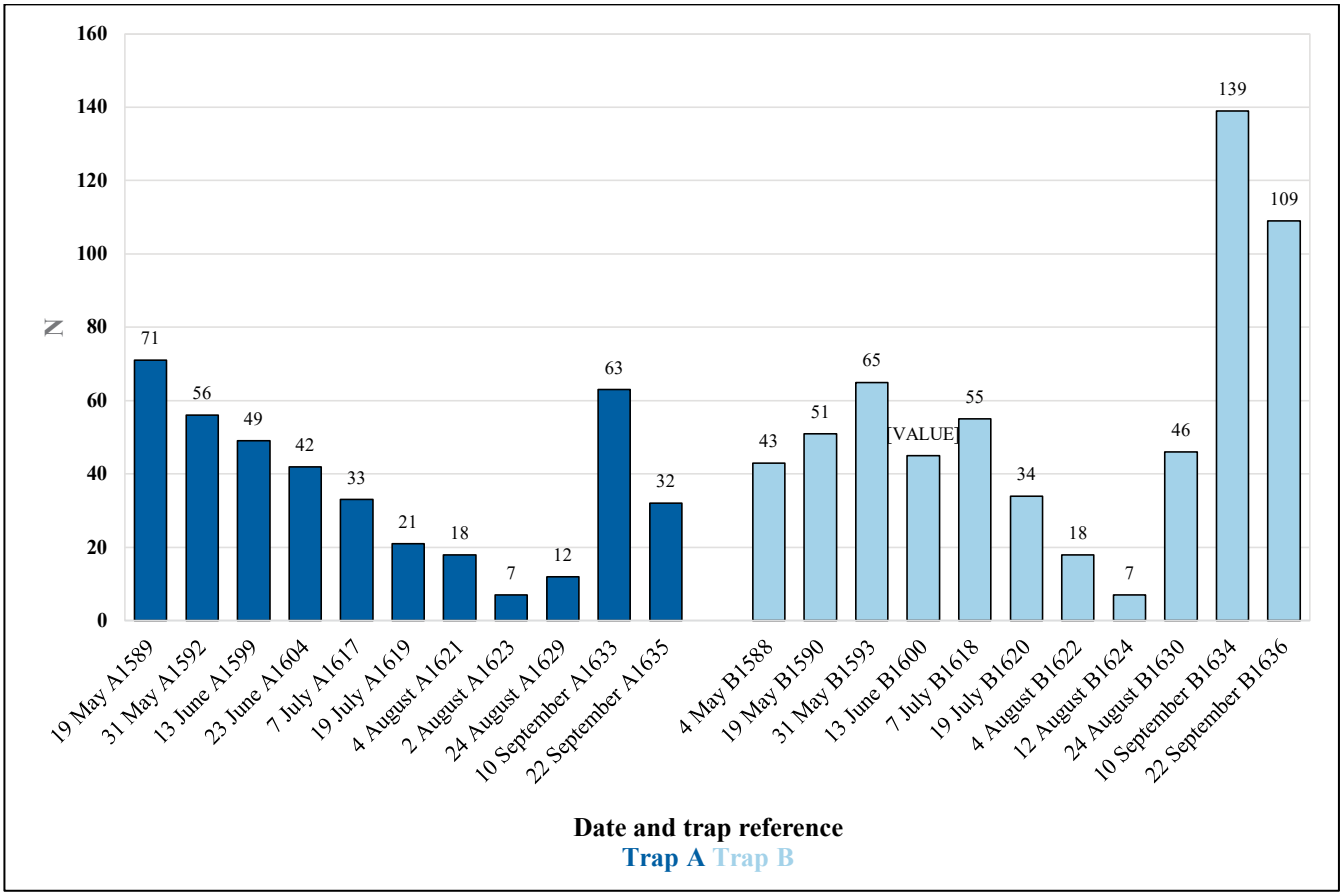


Table 06. *Strophosoma capitatum*. Frequency and periodicity of 1016 imagines arranged chronologically by trap number and trap on boles of *Tilia cordata*, Shrawley Wood, May to September 2017.

Table 06 indicates that the relative frequency of *S. capitatum* in each trap shows broad agreement over time. After a spring peak numbers decline more or less progressively until the autumn when there is a further massed appearance of beetles. This implies that the first generation adults ascend the trees perhaps as a pre-requisite to copulation and that larvae graze in the root zone during the summer producing a second generation of beetles in the late summer and early autumn.

A single *S. capitatum* recovered from trap B on 10 September has been predated (15). The two front legs have been forcibly removed together with their coxae and the abdomen has been opened up distally. Despite this the beetle was apparently still able to access the trap independently!



15. The weevil *Strophosoma capitatum*, the only example amongst 1016 trapped individuals that showed direct evidence of predation. Shrawley Wood, trap B, 10 September 2017.

Hymenoptera Bees, wasps and ants

Apart from the well-known social and solitary bees, vespid wasps and ants the Hymenoptera include representatives of numerous other families traditionally aggregated under Parasitica. These include Braconidae, Diapriidae, Encyrtidae, Eulophidae, Ichneumonidae, Platygastridae and Pteromalidae. Eulophids and pteromalids alone account for more than 1000 British species and their identification can be a daunting process. Of the 230 specimens trapped 58 have been identified, mostly to species level, in some instances with the assistance of specialists. Some specimens have been run through a range of keys; some of these may prove to be outdated so there could be some misconceptions in this account.

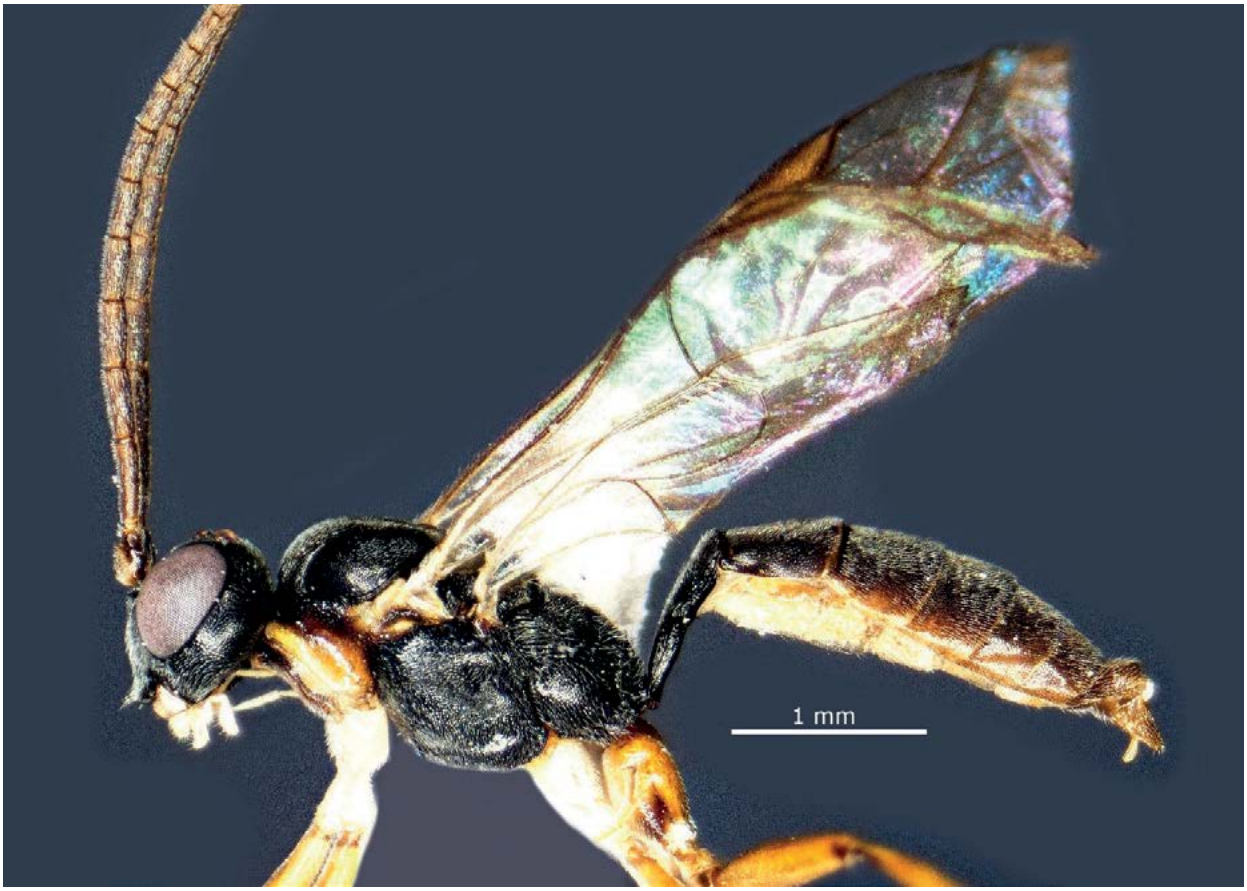
Tenthredinidae Sawflies

Shrawley Wood has a diverse fauna of Symphyta (Bloxham, 2003) so it is a curiosity that only two sawflies, both being the widespread *Pachyprotasis rapae* (L., 1767), were recovered from the traps during June.

Ichneumonidae Ichneumon wasps

Eight ichneumonid genera were identified from both traps namely *Ctenochira* (Tryphoninae) and *Eudelus*, *Aclastus*, *Dichrogaster*, *Gelis* and *Isadelphus* (Cryptinae). *Acrodactyla* and *Pimpla* (Pimplinae) were mostly trapped singly. The more frequently trapped species were *Dichrogaster aestivalis* (Stephens, 1829) five, *Gelis areator* (Panzer, 1804) three and *Isadelphus inimicus* (Gravenhorst, 1829) three.

The host relationships of the identified ichneumonids are as follows.
Ctenochira validicornis (Brischke, 1871) (keyed from Kasparyan, 2013) is a parasitoid of gall-forming Symphyta (Shaw & Kasparyan, 2005) which feature prominently at Shrawley Wood.
Eudelus mediovittatus (Schmiedeknecht, 1897) (16). This rather rare British species is almost certainly a spider parasitoid and was described new to Britain from Shrawley Wood (Broad, 2005). According to Dr G. Broad (*in litt*., 12 August 2019) the taxonomic position of this species may require clarification.
Aclastus micator (Gravenhorst, 1807) is a parasitoid of *Amaurobius* spider egg-sacs (Schwarz & Shaw, 2000).
Dichrogaster aestivalis (Stephens, 1829) is a parasitoid of lacewings (Neuroptera: Chrysopidae) (Schwarz & Shaw, 2000). 23 lacewings recovered from the traps were dominated by *Chrysopa* spp., *Chrysoperla* spp. with a single *Hemerobius* sp. from trap A.
Isadelphus inimicus (Gravenhorst, 1829) is a primary parasitoid of Lepidoptera.
Gelis areator (Panzer, 1804) is a widespread often arboreal species with a wide host range as both a primary parasitoid and a pseudohyperparasitoid. Schwarz & Shaw (1999) provide an extended host list.
Gelis longicauda (Thomson, 1884) is a woodland species which has been found on the trunks of trees and has been reared from moths of the genus *Ypsolopha* (Schwarz & Shaw, 1999).
Gelis rufogaster Thunberg, 1827 is a widespread spider parasitoid (Schwarz & Shaw, 1999).
Acrodactyla cf. degener (Haliday, 1839) (17) (species attribution is suggested only based on known host breadth *teste* Dr M. R. Shaw in *litt.*, 5 June 2018). These koinobiont ectoparasitoids of spiders form a small group of 32 species worldwide (Song, Choi & Lee, 2017).



16. The ichneumonid wasp *Eudelus mediovittatus*, Shrawley Wood, trap B, 19 May 2017.



17. The ichneumonid wasp *Acrodactyla cf. degener*, developing imagine in cocoon on abdomen of the spider *Tenuiphantes tenuis* (Blackwall, 1852), Shrawley Wood, trap B, 24 August 2017.

Braconidae Braconid wasps

Ascogaster klugii (Nees von Esenbeck, 1816). A single braconid wasp of striking appearance (18) was recovered from trap B on 19 July 2017. Huddleston (1984), although writing more than 30 years ago, stressed how poorly known the genus was and in global terms that observation still holds good. Huddleston (1984) commented on the wide infraspecific colour variation in the genus.

In the Palaearctic *Ascogaster* fauna only *A.klugii* and *A. gonocephala* have predominantly light-coloured heads although they may be darker in some examples. *Ascogaster* spp. are usually regarded as solitary endoparasitoids of microlepidoptera. *Ascogaster klugii* is cited as a parasitoid of oecophorid moths; its status and distribution in Britain is unclear.



18. The braconid wasp *Ascogaster klugii*, Shrawley Wood, trap B, 19 July 2017.

Diapriidae Diapriid wasps

Sixteen examples representing five genera were recovered from both traps as follows: *Aneurhynchus galesiformis* Westwood, 1832 one; *Basalys abrupta* Thomson, 1858 four; *Basalys cf. erythropus* Kieffer, 1911 one; *Basalys collaris* Kieffer, 1911 one; *Basalys tuberculata* (Kieffer, 1911) two; *Belyta elegans* Kieffer, 1909 two; *Coptera inaequalifrons* (Jansson, 1942) three; *Trichopria nigripes* (Marshall, 1868) one; *Trichopria* sp. one.

The majority of these are probably widespread in Britain as endoparasites of Diptera but throw further light on the complex ecology of tree bole cavities and 'rot holes'. Nixon (1980) recorded *A. galesiformis* reared from *Fannia* pupae in wet detritus and *C. inaequalifrons* bred from *Lonchaea fugax* Becker, 1895 (as *L. cariecola*) (Dip., Lonchaeidae) under elm bark at Newbury, Berkshire during 1975.

Proctotrupidae Proctotrupid wasps

According to Broad (2016) very little work has been done on the British proctotrupoid fauna; the species cited here are probably fairly generally distributed in Britain. Eight individuals were identified mostly following the work of Wall (2012). From both traps these are as follows: *Codrus niger* (Panzer, 1803) one; *Exallonyx brevicornis* (Haliday, 1839) one; *Exallonyx pallidistigma* Morley, 1922 one (19); *Exallonyx quadriceps* (Ashmead, 1893) three; *Exallonyx trifoveatus* Kieffer, 1908 one and *Exallonyx wasmanni* Kieffer, 1904 one. *Exallonyx* spp. are parasitoids of staphylinid beetles with Quediini cited; this group of beetles is represented in the cavities. The four species of *Exallonyx* recovered from trap B may imply some degree of host specialisation.



19. The proctotrupid wasp *Exallonyx pallidistigma*. Shrawley Wood, trap B, 24 August 2017.

Formicidae Ants

Curiously only a single worker Tree Ant *Lasius brunneus* (Latreille, 1798) was recovered from trap B on 4 May 2017. This appears to be a scarce species at Shrawley Wood, a matter requiring further investigation. In continental Europe lime frequently hosts *L. brunneus* and its rare myrmecophilous beetle associates (Franc, 1992).

Acari Mites

The traps captured 112 examples of the Whirligig Mite *Anystis* sp. (Anystidae) (20) of which 79 were in trap A and 33 were in trap B.

According to Dr Mark Judson (*in litt*., 9 February 2018) *Anystis* spp. require taxonomic revision. These distinctive mites swirl like dervishes over the bark of a wide range of trees with lime trees often favoured; they may also be terrestrial. Lime trees are often favoured and the author has observed them on lime trees in many regions of England. Cuthbertson, Qui & Murchie (2014) regarded *Anystis* as beneficial predatory species in orchard ecosystems. A single larva of *Leptus* sp. (Erythraeidae) (21) was recovered from trap B on 4 August 2017.



20. The Whirligig Mite *Anystis* sp. from bole of lime tree *Tilia x europaea* L., Clovelly, Devon, 2 April 2019.



21. Larva of erythraeid mite *Leptus* sp., Shrawley Wood, trap B, 4 August 2017.

Araneae Spiders

The two traps yielded a total of 70 spiders (Table 01) which demonstrate no preferences for either of the cavities or for cavity condition. Of these 13 are represented by four species of *Clubiona* (Clubionidae) and 14 by two species of *Tenuiphantes* (Linyphiidae) which typify the woodland environment and the routine use of tree boles by spiders. Clubionids are nocturnal hunters and linyphiids spin sheet webs, including habitually around the boles and bases of trees. Thomisids are hunting spiders which do not construct webs and which would readily investigate tree cavities. Of the 23 identified species 14 are represented by one individual; these species must be wide-ranging in the woodland biotope using cavities facultatively as part of their normal behaviour.

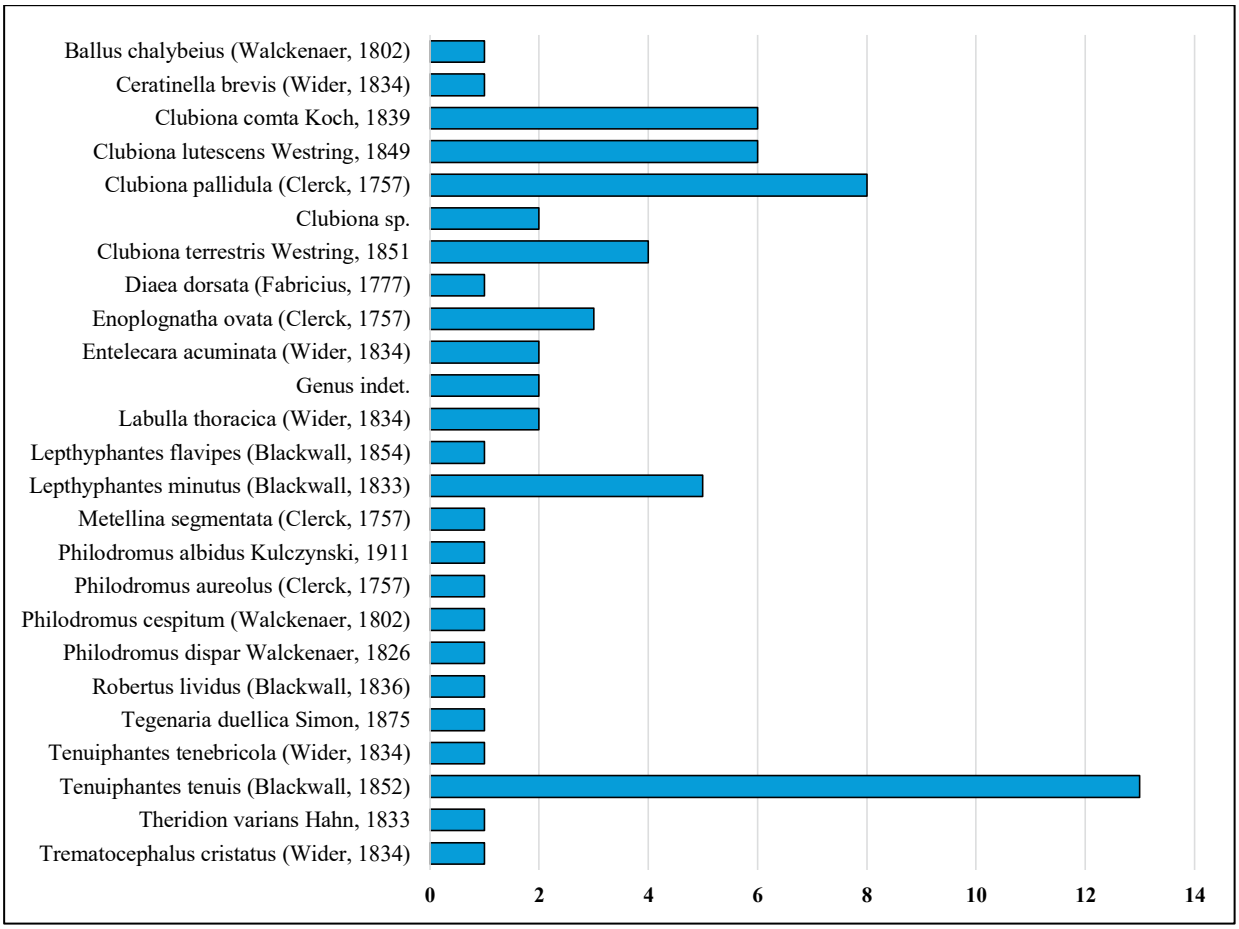


Table 07. Numbers of spiders from traps A and B arranged alphabetically by genus name. Shrawley Wood, *Tilia cordata* bole cavities, May to September 2017.



22. Male pedipalp of the anyphaenid spider *Anyphaena accentuata*, Shrawley Wood, trap B, 31 May 2017.

Observations on selected species of spiders listed alphabetically by genus name.

Anyphaena accentuata (Walckenear, 1802) (Anyphaenidae). In Britain this is a widespread foliicolous species of woody plants and was represented in both cavity traps (22).

Ballus chalybeius (Walckenaer, 1802) (Salticidae). A single male (23) was recovered from trap A on 4 August 2017. According to Roberts (1995) this is a rather localised foliicolous species in Britain with a preference for oak *Quercus* spp. According to the NBN atlas (accessed 3 January 2020) this is a scarce species with few English midland records.

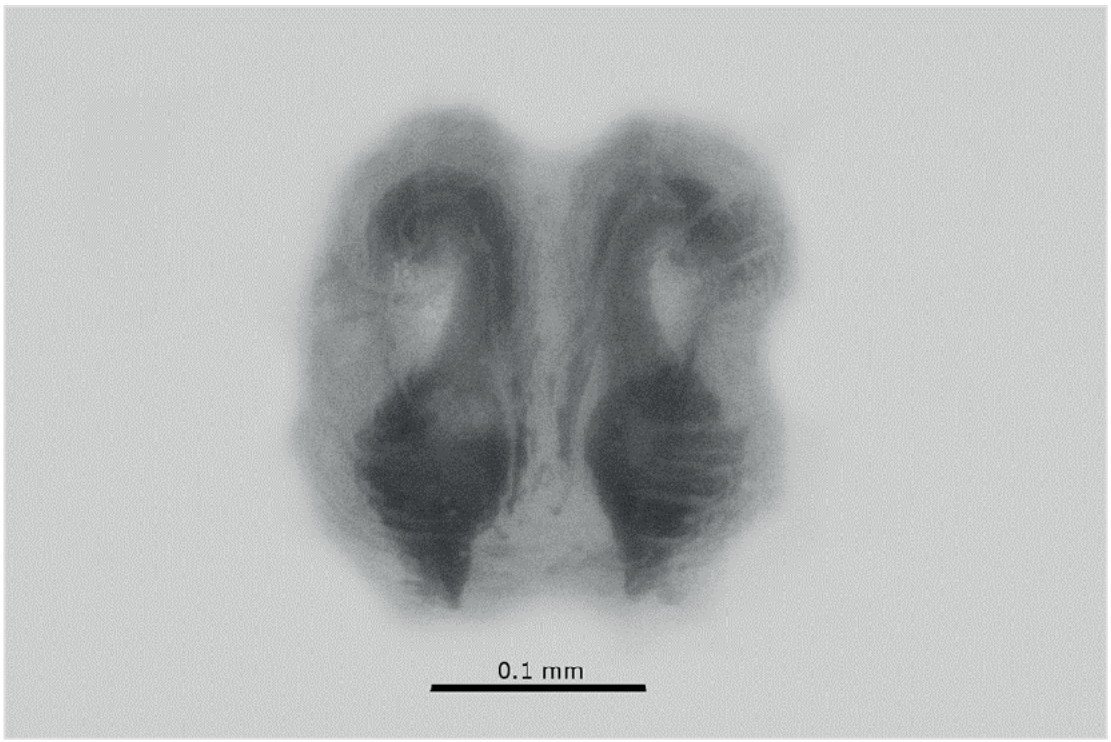


23. The salticid spider *Ballus chalybeius*, Shrawley Wood, trap A, 4 August 2017.

Ceratinella brevis (Wider, 1834) (Linyphiidae). A single female (24) of this somewhat eurytopic species was recovered from trap B on 24 August. It is reasonably widespread in England and Wales according to the NBN Atlas (accessed 9 October 2020) although it is evidently scarce in the English midlands.



24. The linyphiid spider *Ceratinella brevis*, Shrawley Wood, trap B, 24 August 2017.



25. Epigyne of female thomisid spider *Philodromus albidus*, Shrawley Wood, trap A, 4 August 2017.

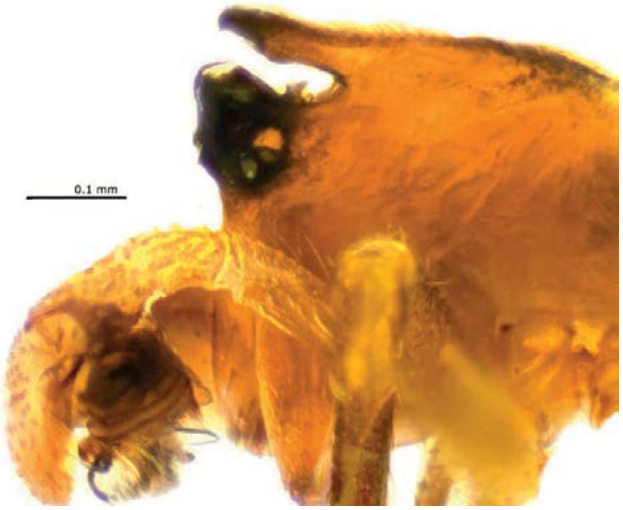
Philodromus albidus Kulczynski, 1911 (Thomisidae). A female abdomen only (25) was recovered from trap A on 4 August 2017. This is a spider of open woodland here near the north-western limit of its British range which is evidently edging regionally north-westwards.

Tegenaria duellica Simon, 1875 (Agelenidae). A single female (26) was recovered from trap B on 22 September 2017. This binomial is employed here pending clarification of nomenclature (Bolzern, Burckhardt & Hänggi, 2013; Oxford & Bolzern, 2018). *T. duellica* is associated with human habitation especially in the north of its range but also occurs in high canopy woodland with sheltered niches.

Trematocephalus cristatus (Wider, 1834) (Linyphiidae). A single male (27) of this nationally scarce foliicolous species was recovered from trap B on 13 June 2017. This species appears to be extending its range northwards in Britain from south-eastern strongholds.



26. Epigyne of female agelenid spider *Tegenaria duellica*, Shrawley Wood, trap B, 22 September 2017.



27. The linyphiid spider *Trematocephalus cristatus*, front of male cephalothorax in lateral view showing the characteristic profile, Shrawley Wood, trap B, 13 June 2017.

Opiliones Harvestmen

Five species of Opiliones (28) were recorded in total in both traps. Their total number was 298; of these *Dicranopalpus ramosus* (Simon, 1909) (Leiobunidae) comprised 96 (32.2%) and *Oligolophus tridens* (C.L. Koch, 1836) (Phalangiidae) comprised 193 (64.7%). Virtually all of these were juvenile demonstrating the importance of tree cavities in Shrawley Wood for the early developmental stages of the group and implying that egg-laying may occur there. Immature Opiliones showed a clear preference for the wetter cavity B to the extent that 93% of all juvenile Opiliones recovered occurred there.



28. *Mitopus morio* (Fabricius, 1799) (Phalangiidae) showing chelicerae, labrum and pedipalps. Shrawley Wood, trap B, 4 August 2017.

Discussion

Published accounts often refer to tree hollows in a broad generic sense; they may include almost anything from hollow veteran or other trees (Micó, 2018) to water filled phytotelmata. Some accounts (Srivastava & Lawton, 1998) focus on the aqueous biology of water-filled tree hollows, some focus on their disease vectors. Walker, Lawson, Merritt, Morgan & Klug (1991) found that water in tree holes was rich and dynamic in nutrients, including nitrite, nitrate, ammonium, phosphate and sulphate and that ammonium was the dominant form of inorganic nitrogen. Not unexpectedly, variation in nutrient concentrations depended on exogenous inputs such as leaf fill and aqueous inflow, as well as ammonium excretion by mosquito larvae (Fish & Carpenter, 1982).

Some authors found that biodiversity of tree cavities increased with their volume (Sota 1998, Fincke 1999, Yanoviak, 1999) and decreased with their height above the ground (Yanoviak, 1999). Warren & Key (1991) found that the height of a tree cavity from the ground was critical for its selection by discriminating species of Diptera:Syrphidae and Key (1996) amplified the matter of resource partitioning in water-filled cavities. The present study finds that tree cavities are used by a huge range of species, some that develop *in situ*, some that are more usually terrestrial, some that are terrestrial as larvae but arboreal as imagines, and some that range widely over the trees. Some groups such as Collembola, Psocoptera and Acari may exist in cavities as part of their normal function albeit with particular ethological or other adaptations that are unknown, others may use cavities during their early developmental stages as outlined in the family accounts.

The present study deals with two cavities, a phytotelma and a dry cavity which could in time develop into a phytotelma. The trapping was so effective that over a five month period it assembled 5947 invertebrates (the total number of flies is here excluded and remains unknown because Mr M. Blythe (*in litt*.) found that sciarids were so prolific as to be "uncountable") representing 241 species, the flies contributing 51 species (M. Blythe, *in litt.,* 24 October 2017). These results are evidently without clear parallel in relation to temperate climates and to *Tilia* in particular although Speight (1989) recognised that tree cavities could be sophisticated and finely-tuned insect support systems. According to Micó (2018) 14 orders of insects have been recorded from "tree hollows" but knowledge remains incomplete. Greeney (2001) was more specific and recorded about 40 families of insects from phytotelmata in Ecuador and provided a classification system based on plants that held phytotelmata on their foliage or stems.

Perhaps an improved system for defining tree cavities is required, observing that at Shrawley Wood both cavities are partially external, so that their biota will include species that occupy the exterior of the tree some of which may already have been in place when the traps were set up. As we have seen, they also attract insects that are widely regarded as saproxylic, most usually as opportunistic visitors. That the full invertebrate potential of external tree cavities may not up to now have been fully grasped is evinced by the limited treatment they have sometimes received (Gimmel & Ferro, 2018; Morris, 1974). It is premature to suggest that the coenosis described here is or is not peculiar to lime *Tilia* spp., since there is a lack of comparative background data. Most probably however these data do throw light on a generalised but ancient time-honoured aspect of historic broad-leaved woodland synecology.

Considerable emphasis has been placed on the role of saproxylic beetles in assessing woodland habitat quality (Müller *et al*., 2005), however there remain plenty of other insect species which may be otherwise linked to historic and ancient woodlands. This matter was aired by Warren & Key (1991) and Fowles (1997) some time ago and little progress seems to have been made with it. External cavities such as those described here directly link saproxylic, in this case for example Coleoptera: Quediini, and non-saproxylic woodland elements and suggest that sensitive species such as the issid *Issus muscaeformis* have an extended co-evolved history with ancient woodlands through their ability to use tree shelters to sustain their early developmental stages (Whitehead, 2022b, this volume).

The present study confirms the use of tree cavities as shelters and as food resources by a wide range of invertebrate groups and many complex interactions and inter-relationships are demonstrated by analogy. The possibility that cavities are selectively targeted by parasitoids of flies, true bugs, beetles, spiders and isopods (two examples of the rhinophorid fly *Paykullia maculata* (Fallén, 1815) occurred in trap A) which are well represented cannot be dismissed, especially if particular species are recognised as assembling in them at specific times. The Hymenoptera recorded from the cavities demonstrate the significant role played by this group in the wider biocoenosis of tree cavities in ancient woodland. Previous publications imply that Shrawley Wood may be of national importance for its ichneumonid fauna (Bloxham, 2004; Broad, 2005; Whitehead 2019a); the present study highlights the invertebrate potential of one aspect of the woodland biotope knowledge of which probably still remains somewhat superficial.

At the species level affinities may be complex and not all ancient woodland invertebrates are time-honoured members of their community. The discovery of the foreparts of a tenebrionid beetle *Tribolium castaneum* (Herbst, 1797) in trap A on 4 May 2017 provides further evidence of an originally tropical species intruding into native woodland; it usually behaves as a cosmopolitan pest of stored products. In 1991 Mr J. W. Meiklejohn observed about 70 infesting peanuts *Arachis hypogaea* L. in a house in Kidderminster, Worcestershire. Since then *T. castaneum* has benefitted from climatic warming in Britain and I began to see it in the open countryside from 1998 since when it has appeared in pasture woodlands and traditional orchards in Worcestershire and Herefordshire. *T. castaneum* usually disperses on warm summer nights at 52°N in England when conditions are optimal. For example on 4 August 2003 one flew to a tungsten filament bulb in an ambient temperature of 26°C at 2300 hrs; on 9 August 2003 one landed on me at 2045 hrs at 28°C; on 30 June 2006 one landed on me at 22°C at dusk and on 17 July 2006 one landed on me at dusk in 32°C. Some of these were attracted by chemical signals from human perspiration. On 10 September 2006 one landed on me at 265 m a.s.l. in open countryside on Bredon Hill, Worcestershire in 25°C. In orchards and woodlands *T. castaneum* often behaves as a subcortical scavenger and there are several records from ash *Fraxinus excelsior* L. as well as one from the fungus *Inonotus hispidus* (Bull.) P. Karst. on apple *Malus domestica* (Suckow) Borkh. These observations are mirrored by the recent discovery of another synanthropic tenebrionid *Alphitobius diaperinus* (Panzer, 1796) associated with a range of tree decay processes (Whitehead, 1997) more especially with both planted and native poplar in Europe (Zach & Krištin, 1997; Whitehead, 2005) and also with traditional orchards (Whitehead, 1999b).

By far the most remarkable event recorded by the Shrawley Wood trapping programme was the large number of broad-nosed weevils *Strophosoma capitatum* trapped; this is a flightless species (Morris, 1997) with a scattered distribution in the English midlands usually occurring on well-drained sediments. Trap A yielded 404 (39.8%) and trap B 612 (60.2%) *S. capitatum* respectively. In total they represent 62% of all the beetles trapped and their frequency and seasonality are shown in Table 06. How is it that two invertebrate traps on Small-leaved Lime trees each 54 metres apart could assemble a total of 1016 *S. capitatum* in one season? It must surely be that the relationship between this woodland and this beetle is very long-established. It may even be that the relationship is so ancient as to be co-evolved and that here *S. capitatum* is confirming its presence as a discriminating ancient woodland relict species in an ancestral regional stronghold.

However, a second matter requires consideration. Shrawley Wood is, or was, a *Quercetum roboris sensu* Tansley (1911) now regarded as a W10 oak woodland plant community (Rodwell, 1991). Although Small-leaved Lime has an extended history at Shrawley Wood (Richer, 2022, this volume p. 351) in its present manifestation it behaves as an artefact of human selection following clearance of oak during the historic period. The question should therefore be asked: "Does the high population of *S. capitatum* at Shrawley Wood result from human activity?" The high *Strophosoma* biomass at Shrawley Wood seems now to be linked to the presence of Small-leaved Lime *per se* and as the presumed larval host plant it presumably did benefit from oak clearance.

The numbers of *S. capitatum* at Shrawley Wood must be astonishing and it is presumed that the beetles ascend the trees at night possibly to feed on the foliage or to minimise predation on the woodland floor. It would appear that the weevils did target the cavities but access cannot have been straightforward. Other considerations are whether males were attracted to females which had entered the cavities or whether the trapping fluid itself, *i.e*. monopropylene glycol, was directly attractive. This explanation is not favoured because other species of *Strophosoma* which occur in the woodland did not appear in the traps. Pheromone attraction can be very strong. By way of analogue the author observed 31 *Ips typographus* (Linnaeus, 1758) (Coleoptera: Scolytinae) in a woodland pheromone trap at Kamienica in the Polish Beskid Ślaski mountains on 25 August 2009 (Whitehead, 2010). Not only had the pheromone attracted the target species but also a single example of a tenebrionid beetle *Corticeus linearis* (Fabricius, 1790) which as a predator of *I. typographus* has a marked fidelity to it and its close relatives. The Shrawley Wood trapping programme described here has thrown up compelling evidence but has also created abundant questions.

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Issus muscaeformis (Schrank, 1781) (Hemiptera, Issidae)
New to Worcestershire with observations on the early nymphal stages

Paul F. Whitehead

Synopsis
The geographic range of *Issus muscaeformis* (Schrank, 1781) in Britain is amplified by its discovery during 2017 at Shrawley Wood, Worcestershire. Novel survival strategies for early nymphal stages of the genus are discussed.

Introduction
In collating British records of *Issus muscaeformis* (Schrank, 1781) Whitehead & Key (2010) attempted to rationalise its British historical ecology. It was regarded as an archaic species in the recent post-glacial sense with a possibly obligate association with western oak woods. It was not that the association was with oak *Quercus* spp. *per se* but rather that the equable climate of British western oak woods in regular contact with Atlantic weather systems favoured the species.

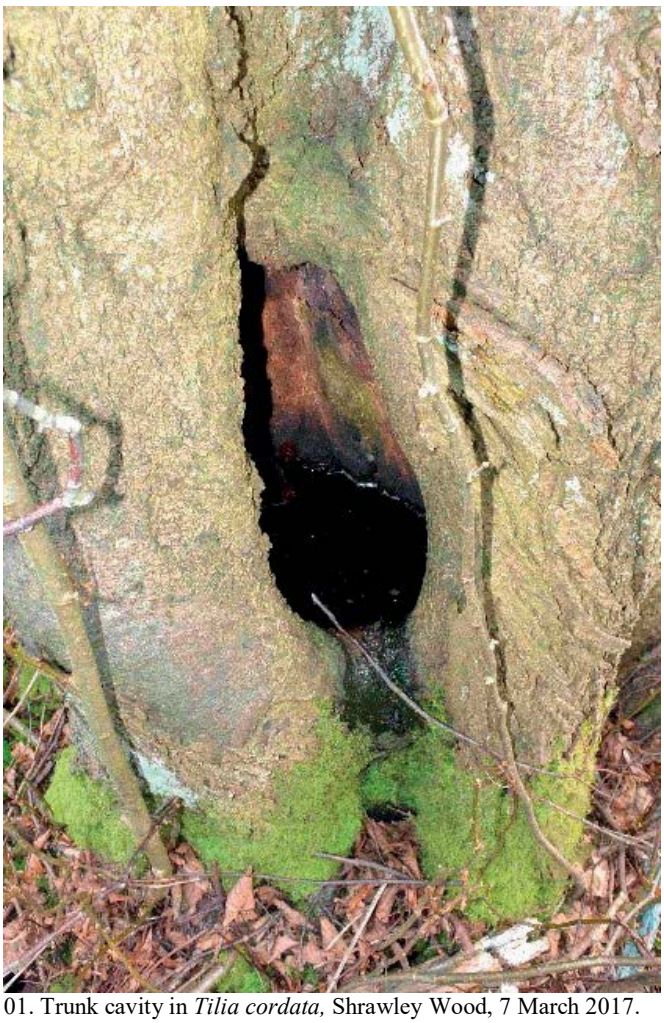
It is perhaps a failing of perception that ecological fidelity is something demonstrated by an adult insect whereas it may equally or more so be determined by its entire life cycle, even if that is little-known. New evidence from Worcestershire, from where L1 stage *Issus* nymphs are figured, strengthens this likelihood considerably.

***Issus muscaeformis* at Shrawley Wood, Worcestershire**
Issus muscaeformis was discovered new to the English midlands by the author at Shrawley Wood, Worcestershire (52°29'N 2°28'W VC37 SO86 67m altitude) on 22 April 2017 when a male L5 stage nymph was observed on piles of Small-leaved Lime (*Tilia cordata* Miller) coppice brash stacked in a sheltered clearing (02). On the same day an L4 stage nymph was observed on foliage of an outgrown coppiced Small-leaved Lime tree at the woodland edge. On 1 August 2018 an adult male *I. muscaeformis* (03) was found on a Small-leaved Lime tree close by. The monumental architecture of the outgrown coppiced lime stools is distinctive (02).

***Issus* nymphs utilising lime tree cavities at Shrawley Wood, Worcestershire**
During a simultaneous study of the invertebrate fauna of two trunk cavities in Small-leaved Lime trees at Shrawley Wood, 18 nymphal *Issus* were trapped in custom-made traps designed specifically to collect the invertebrate fauna of the cavities. The key object of the study was to determine Diptera associated with the cavities (Blythe, 2022, this volume: 477-481); the remaining invertebrates were dealt with by Whitehead (2022, this volume: 431-448). The traps had the functionality of standard Malaise Traps except that the prime objective was to funnel invertebrates into the collecting vessel, containing 15% Monopropylene Glycol, from within the cavity. Fabric was stapled to the tree around the cavity aperture the objective being to limit invertebrate ingress. The 18 nymphs comprised 14 L1, one L2, one L3, one L4 and one L5 stage; all the later stages represented *Issus coleoptratus* (Fabricius, 1781). This significant finding throws new light on the bionomics of *Issus* and is believed to be the first occasion on which L1 stage nymphs have been available for study.

Nine of these L1 stage nymphs came from the drier of the two cavities; the other cavity gathered and retained rain water to the point of overflow (01).

L1 stage *Issus* nymphs were recovered from the traps emptied during July, August and September 2017, the extreme dates being 19 July and 22 September. A single L3 nymph was present on 22 September 2017. This study has also enabled the morphometry and periodicity of *Issus* nymphal instars to be updated (Tables 01, 02).



01. Trunk cavity in *Tilia cordata,* Shrawley Wood, 7 March 2017. G. H. Green.



02. Outgrown Small-leaved Lime coppice monoblocs, Shrawley Wood, the habitat of *Issus muscaeformis* in Shrawley Wood, Worcestershire. P. F. Whitehead.



03. *Issus muscaeformis* adult male, frontal aspect, Shrawley Wood, 1 August 2018. P. F. Whitehead.

	0-1 mm	1-2 mm	2-3 mm	3-4 mm	4-5 mm	5-6 mm	6-7 mm
Issus muscaeformis							
L2 nymph							
L3 nymph							
L4 nymph							
L5 nymph							
Adult							males females
Issus coleoptratus							
L1 nymph							
L2 nymph							
L3 nymph							
L4 nymph							
L5 nymph							
Adult						males	females

Table 01. Morphometry of developmental stages of *Issus* in Britain. *I. coleoptratus* n = 48, *I. muscaeformis* n = 10.

	Jan	February	March	April	May	June	July	Aug	Sept	Oct	Nov	Dec
Issus* sp. *indet												
L1							C	C	C			
Issus muscaeformis												
L3									C			
L4												
L5												
Adult												
Issus coleoptratus												
L1								C				
L2									C			
L3												
L4												
L5					C							
Adult												

Table 02. Periodicity of developmental stages of *Issus* in Britain as at March 2021. *I. coleoptratus* n = 48, *I. muscaeformis* n = 11, *Issus* sp. n = 12 including data from Kirby (1992). C = cavity presence in Small-leaved Lime at Shrawley Wood, Worcestershire, 2017.

Separating L1 stage nymphs of *Issus coleoptratus* and *Issus muscaeformis*

Criteria for separating *I. coleoptratus* and *I. muscaeformis* were outlined by Whitehead & Key (2010). For adults and many examples of later nymphal instars, separation is not difficult but distinguishing early nymphal instars of the two species (05-08) by conventional means is now held to be impractical. This was confirmed on 28 July 2019 when a L1 stage nymph 1.2 mm in length (excluding the caducous waxy anal filaments) was found beneath ivy on a timber fence in a suburban garden at Evesham, Worcestershire (Whitehead, 2019a). This occurred both at the same site and on exactly the same plant where various instars of *I. coleoptratus* have been recorded in the past; on this basis it can only be *I. coleoptratus*. *Issus muscaeformis* has no current synanthropic affinity in Britain and can therefore be disregarded in the context of suburbia.

The Evesham nymph was compared directly with 14 L1 stage nymphs from the Shrawley Wood lime tree cavities and it was regrettably concluded that by conventional means **nothing could be found to differentiate them securely**. The internal wing pad pits of some of the Shrawley Wood L1 stage nymphs (05) numbered two as opposed to one in the specimen from Evesham but this could not be regarded as a secure taxonomic distinction. There was some agreement between the pale legs of the Evesham nymph and those nymphs from Shrawley Wood provisionally regarded as *I. coleoptratus*. After the L2 stage (09) *I. coleoptratus* and *I. muscaeformis* can be identified reliably as the variegation and patterning of *I. muscaeformis* becomes much more pronounced, a matter confirmed by direct comparison with named examples in NHMUK (Whitehead & Key, 2010). The Evesham L1 stage nymph of *I. coleoptratus* is highly variegated leading to potential confusion with *I. muscaeformis* and the unexpected conclusion that this variegation is lost after ecdysis fairly early on in immaturity; by the L3 nymphal stage *I. coleoptratus* is as easy to separate from *I. muscaeformis* as the adult is. These observations are very much at the boundaries of knowledge and it may be that eventually L1 stage nymphs will yield to systematic taxonomic separation.

Variegation does not imply darkness. Correspondents supporting Whitehead & Key (2010) stated that dark examples of *I. coleoptratus* may occur which could complicate colour-separation of adults and sub-adults in the field. 04 depicts a dark L4 stage nymph of *I. coleoptratus* using holly (*Ilex aquifolium* L.) at Penallt in Monmouthshire; this example is distinct from variegated L4 stage *I. muscaeformis*. In life these distinctions are clearer still.



04. *Issus coleoptratus* dark L4 stage nymph on holly *Ilex aquifolium* infected with the pyrenomycete fungus *Calonectria ilicicola* Boedijn & Reitsma, Penallt, Monmouthshire, 20 April 2017. P.F. Whitehead.

Periodicity of *Issus* spp.

It seems clear from this study that L1 stage nymphs overwinter and require adequate protection from predators and a range of external factors. It must be that during their life-cycle *I. muscaeformis* and *I. coleoptratus* overwinter twice prior to becoming adult but development of the individuals may be staggered, a matter already raised by Kirby (1992). *Issus coleoptratus* has solved this problem through synanthropy (Whitehead & Key, 2010) and successfully overwinters in the shelter of urban and suburban gardens.

The use of tree cavities by numbers of *Issus* spp., described here for the first time, invites questions. Does oviposition occur within them or nearby? Do early stage nymphs maintain affinity for such cavities and how obligate is that? Are they diurnal retreats and as seems certain, are they nymphal overwintering refugia and if so, do the nymphs become torpid?

These questions need to be viewed against the vulnerability of L1, and probably L2, stage nymphs and the extent to which tree cavities can maintain constancy of their internal microclimates.

There is some evidence at Shrawley Wood that trunk cavities are also visited from time to time by later nymphal instars of both *I. coleoptratus* and *I muscaeformis*. Given that *I. muscaeformis* is the more climatically sensitive of the two British species tied more closely to the broadleaved woodland environment it is likely that at least some of the L1 stage nymphs in the lime tree cavities represent this species: for the reasons given above this cannot presently be confirmed. According to Nickel, Holzinger & Wachmann (2002) *I. muscaeformis* is a xerothermic forest and scrub element of central Europe.



05 left. *Issus* sp. probably *I. muscaeformis* L1 stage nymph, dorsal, Shrawley Wood, Worcestershire, 16 September 2017. P. F. Whitehead.
06 right. *Issus* sp. probably *I. muscaeformis* L1 stage nymph, ventral, Shrawley Wood, Worcestershire, 16 September 2017. P. F. Whitehead.



07 left**.** *Issus* sp. probably *I. coleoptratus* L1 stage nymph, dorsal, Shrawley Wood, Worcestershire, 12 August 2017. P.F. Whitehead.
08 right. *Issus* sp. probably *I. coleoptratus* L1 stage nymph, ventral, Shrawley Wood, Worcestershire, 12 August 2017. P. F. Whitehead.



09. *Issus* spp, L2 stage nymphs, trunk cavity in Small-leaved Lime tree, Shrawley Wood, Worcestershire, 22 September 2017. Abdominal telescoping is due to fluid submersion. P. F. Whitehead.

Conclusion

The Shrawley Wood population of *I. muscaeformis* is nationally significant providing some geographical linkage with a population near Usk, Monmouthshire (Whitehead & Key, 2010). Shrawley Wood is an ancient woodland supporting *Urwaldrelikt* invertebrates and species largely unique to it (Broad, 2005; Whitehead, 2019b), a matter which further work will extend. Palynology demonstrates that substantial lime woodland has existed there since the medieval period (Richer, 2022, this volume: 351-354) and almost certainly for long before. This nationally exceptional woodland has however been subject to intense anthropo-impacts which include the mass removal of oak trees in the historic period and the more recent widespread planting of conifers for sylvicultural purposes. *Issus muscaeformis* is not widely dispersive and in the past would have responded well

to habitat continuity; the known British woodland sites are now evidently disjunct.

A special feature of Shrawley Wood is that the wooded outcrop that defines the woodland edge and the back of the modern floodplain of the River Severn is incised laterally by short steep-sided valleys which would have provided adequate shelter for *I. muscaeformis* during the Little Ice Age that ended in recent post-medieval time. With increasing climatic amelioration *I. muscaeformis* has become more expansive at Shrawley Wood colonising outgrown coppice monoblocs of Small-leaved Lime (02). The winter vulnerability of nymphal *Issus* has already been referred to; at 52°29'N north in midland England tree cavities may be used extensively by overwintering nymphs to mitigate for this. In Britain *I. muscaeformis* presently extends from 50°60'N in the south (Whitehead, 2020) to 54°40'N in the north. This latitude is exceeded in Scandinavia (https://artfakta.artdatabanken.se/taxon/101149/pdf) where it may extend to 60°N but the fine details of its ecology there seem not to be well clarified other than that oak trees are favoured. A presence in western Scotland is therefore not impossible.

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The Flies of Shrawley Wood

Mick Blythe

Studies of Diptera (True flies) in Shrawley Wood are far from complete. The data available to date comprises flies collected by using an emergence trap for sampling two rot holes for several months in 2017 and random sampling on occasional visits to the Wood. For invertebrates from rot holes other than Diptera see chapter by Paul Whitehead.

The Rot Hole Sampling

Mick Blythe

Two improvised Malaise traps were set up over rot holes in Small-leaved Lime *Tilia cordata* in Shrawley Wood, Worcestershire, on 13 April 2017. These trees had grown from coppice stools singled in the 1960s. The fabric of the trap was stapled to the trunk and the catch was collected in a flask of 15% monopropylene glycol in water with a dash of washing-up liquid added. The receiver was emptied every 10-14 days and the catch sorted into 70% isopropanol.

Rot hole A was 9 cm wide and 125 cm from the ground on the trunk of the tree. It was surrounded with a callus, with a shallow groove above and appeared to have resulted from the decay and loss of a side branch. The hole was 19 cm to its back wall with a callus roof above and a flat shelf below. It contained sparse debris and no free water. At the back of the hole an arciform slit opened into what appeared to be vertical shaft. The depth and contents of this shaft could not be ascertained. It seemed poorly placed to receive rainwater but this possibility could not be discounted. Once the trap was in place over the hole the collection of rainwater in the vertical shaft was likely to be impossible. SO80606623.

Rot hole B was in the base of a different tree, 55 cm from the ground and 26 cm in vertical depth to the lip of the hole. Like rot hole A it was marked by a vertical groove in the trunk above, the groove partly blocked by the ring of callus surrounding the hole. The bottom contained a pool of water and sodden debris up to 18 cm deep. The basal deposit graded upwards from fine reddish sludge to almost intact dead leaves. The water surface was 11 cm below the rim of hole. It was scummy, the colour of tea and fringed with tiny bubbles. SO80656621.

Pictures of the rot holes and emergence traps are in the reprinted paper at the end of this chapter. The surrounding vegetation was rather low-growing, dominated by flowering bluebells earlier in the year; with an admixture of stunted brambles which became predominant later and numerous lime seedlings. There was also a certain amount of fine and coarse brash left behind from forestry activities.

The tree bark in both cases was rather deeply ridged making sealing the trap difficult. It is therefore likely that insects could enter the trap, perhaps for egg-laying, attracted by chemical signatures from the decaying wood or debris or even perhaps monopropylene glycol. This is a possible explanation for the extreme sex ratios found, particularly amongst the *Forcipomyia* biting midges. Also as the season progressed spiders tended to colonise the upper chamber of the receiver in both traps and even web the entrance to the lower collecting chamber. As a result clumps of catch specimens were found webbed together making the subsequent sorting rather tedious. The traps were removed on 22 September 2017 after which forestry activities made continuation difficult. However a sample of the deposit from rot hole B was taken on 7 Novembe 2017 and set to incubate in an NHBS Insect/Mosquito Breeder marketed by the Natural History Book Shop. This experiment is ongoing.

These traps collected a large number of invertebrates and most groups are discussed by Paul Whitehead in a separate chapter in this book. In this chapter Mick Blythe provides an annotated list of Diptera with some observations on the flies of the Wood in general. Work in progress. Note in places m=male and f=female

The Fly Species from the Rot Hole Traps: Shrawley Wood

Family	Species	Notes
Anisopodidae	*Sylvicola cinctus* (Fabricius, 1787)	1 male from trap A (4/5/17) and 14 males and 4 females collected from 4 samples from trap B (31/5/17 to 9/7/17). Has been bred from a sap run (Hancock), bark collected near a sap run and from leaf litter at the base of a tree (Wolton and Luff, 2016).
Bibionidae	*Bibio marci* (Linnaeus, 1758)	2 males from a single sample from trap B, 4/5/17 Bibionid larvae are usually associated with decaying organic matter and plant roots, but Godfrey records rearing bibionids from rot hole material from veteran trees. (in Alexander, 2017).
Bibionidae	*Dilophus febrilis* (Linnaeus, 1758)	1 female from trap A and 1 male and 1 female from different samples from trap B, 24/8/17 to 10/9/17.
Cecidomyiidae		The gall midges were regularly present in small numbers in both traps. They are not currently identifiable. Many, perhaps most of the gall midges have nothing to do with the production of galls. Some may be associated with decaying wood and/or have predaceous larvae. Perhaps someone in theNatural History Museum, London, can identify them, but nobody else is available.

Ceratopogonidae	*Culicoides obsoletus* (Meigen, 1818)	1f from trap A (19/7/17) and 7m and 6f from 8 samples from trap B. 4/5/17 to 22/9/17. All the males were the true *obsoletus* (from the genitalia); the females most probably were (from the wing patterning). *C. obsoletus* is a persistent biter, usually attacking the hands and forehead.
Ceratopogonidae	*Culicoides pulicaris (*Linnaeus, 1758)	1f from trap A (7/7/17) and 2f collected from different samples from trap B, 7/7/17 and 12/8/17. *C. pulicaris* is larger and a more irritating biter than *C. obsoletus*.
Ceratopogonidae	*Dasyhelea flavifrons* (Guérin-Ménéville, 1833).	*Dasyhelea* biting midges were appearing in both traps near the end of May, peaked significantly at the end of July and disappeared from trap A by 12 August, though trap B produced occasional specimens into September. Overall trap A produced 28m and 48f between 19/5 and 4/8 while trap B produced 57m and 99f between 19/5 and 22/. There appeared to be only one species present, *D. flavifrons,* and this identification was supported by Patrycja Dominiak (*pers. com.)*who also provided material for identifying the females from their genitalia. *Dasyhelea* is a non-biting biting midge. The females do not have biting mouthparts and probably do not feed.
Ceratopogonidae	*Forcipomyia* Meigen, 1818, sp	Ceratopogonidae are identified usually by the male genitalia, and for *Forcipomyia* the males were in short supply. Trap A over the season produced 54 females and 12 males. Trap B over the same period produced 105 females and 5 males. (Perhaps the imbalance was due to females breaking into the traps from outside to lay their eggs!) Several species were noted but the most numerous females had a black and yellow pattern suggesting that they were *F. pulchrithorax* Edwards, 1924. This was supported by the genitalia of 4 males from trap B, 10/9/17. 1 male from trap A and 2 from trap B have the yellow patterning restricted to the postpronotal lobes, and might well be the closely related F. *bipunctata* (Linnaeus, 1767). However the genital complex of this species is indistinguishable from that of *F. pulchrithorax*. The early males from trap A appear to be *F. nigra* (Winnertz, 1852), but this remains to be confirmed. The female biting midges of the genus *Forcipomyia* in Britain feed mainly on the blood of other insects and spiders. Their specific prey relationships are little known.
Chironomidae		The small black species of the chironomid subfamily Orthocladiinae (the non-biting midges) often have aquatic larvae, though many are found in damp soil. .Chironomids were never found in the dry trap A. However they were found in all but one of the samples from the flooded trap B, yielding 156 specimens in all. They have not been further examined at the moment but specimens have been retained for further investigation.
Clusiidae	*Clusiodes gentilis* (Collin, 1912)	1 female from trap B (13/6/17). Probably of this species but male genitalia would be needed to confirm. *Clusiodes* is a genus associated with decaying wood.
Culicidae	*Dahliana geniculata* (Olivier, 1791)	55 males and 45 females were collected from 9 samples from trap B (31/5/17 to 10/9/17). This mosquito is a wet rot hole specialist.
Dolichopodidae	*Chrysotimus flaviventris* (von Roser, 1840)	2 males collected from different samples from trap B (7/7/17, 12/8/17). A minute but beautiful predaceous fly. Biology little known.
Dolichopodidae	*Medetera abstrusa* Thuneberg, 1955	A single male collected from trap B (13/6/17). *Medetera* are predaceous species usually found running over the bark of trees.
Dolichopodidae	*Medetera truncorum* Meigen, 1824	A single female specimen collected from trap B on 22/09/17. This is one of the commonest *Medetera* species, usually seen running over the bark of trees.
Dolichopodidae	*Sciapus platypterus* (Fabricius, 1805)	3 males and 2 females collected from 2 samples from trap B (23/6/17, 4/8/17). A predaceous species often seen on low vegetation but which was collected in extremely large numbers from the oak tree canopies during the fogging experiments in 2015 in Wyre Forest.
Dolichopodidae	*Systenus pallipes* (von Roser, 1840)	1 male from trap A (4/8/17) and 1 male and 3 females collected from 3 samples from trap B (4/8/17 to 10/9/17). Speight and Meuffels (1989) split *pallipes* into two species, and these specimen is very clearly the second species (*pallidus*). However Kassebeer (1998) and Dyte (1990) combined them again. Here we follow the check list, but we should make a note of the difference for when they are separated again. Its known associations are with sap runs and rot hole debris, particularly elm (Fonseca 1978). Previously RDB3 but now more locations have been identified.

Dolichopodidae	*Systenus scholtzii* (Loew, 1850)	Nationally Scarce. 5 males and 3 females from 4 samples from trap A and 5 males and 10 females collected from 5 samples from trap B. (13/6/17 to 4/8/17)
Empididae	*Empis aestiva* Loew, 1867	A single female specimen from trap A (7/7/17). One of the small empid species.
Ephydridae	*Philygria interstincta* (Fallén, 1813)	One female collected from trap B (31/5/17). The ephydrids are usually associated with mud and waterside habitats; perhaps the flooded trap B could be regarded as such a habitat.
Fanniidae	*Fannia aequilineata* Ringdahl, 1945	Nationally Scarce. two females collected from different samples from trap B (4/8/17, 10/9/17). Previous records are most often recorded from sap runs (Wolton and Luff, 2016).
Fanniidae	*Fannia similis* (Stein, 1895)	A single female specimen from trap A (19/5/17)
Hybotidae	*Bicellaria nigra (Meigen, 1824)*	1 male collected from trap B (19/5/17).
Hybotidae	*Drapetis assimilis* (Fallén, 1815)	3 males and 9 females collected from 5 samples from trap B (19/5/17 to 10/9/17) A small predaceous fly usually seen running over the bark of tree trunks.
Hybotidae	*Tachypeza nubila* (Meigen, 1804)	3 males from 3 different samples from trap A and 2 males and 1 female collected from 3 different samples from trap B. (19/5/17 to 22/9/17) A small predaceous fly usually seen running over the bark of tree trunks or fallen logs. It has been bred several times from rotting wood or from debris from a hollow tree (Chvála, 1975).
Lauxaniidae	*Tricholauxania praeusta* (Fallén, 1820)	1 female collected from trap B (23/6). This small yellow species was extremely abundant in the surrounding environment beneath the light shade of the trees.
Limoniidae	*Limonia nubeculosa* Meigen, 1804	2 males collected from a single sample from trap B (4/5/17). This species is one of the most abundant limoniid craneflies and is associated with woodland and streamside situations. Here it was abundant in the surrounding environment.
Limoniidae	*Rhipidia ctenophora* Loew, 1871	Vulnerable. 1 female collected from trap B (23/6/17). Confirmed by John Kramer. The larvae are found in a range of dead wood situations including rot holes, sap runs and rotting stumps (Stubbs in Boardman, 2016). The date of our specimen matches the flight period quoted by Boardman (late June). The species has been recorded from horse chestnut and elm.
Muscidae	*Helina depuncta* (Fallén, 1825)	1 female collected from trap B (12/8/17).
Muscidae	*Phaonia cincta* (Zetterstedt, 1846)	Nationally Scarce. 2 females collected from separate samples from trap B (7/7/17, 19/7/17). The predaceous larvae are usually associated with sap runs, e.g. in elm and horse chestnut (Gregor *et al,* 2002).
Muscidae	*Phaonia subventa* (Harris, 1780)	1 male and 1 female collected from different samples from trap B (7/7/17, 4/8/17) The larvae are found in rotting wood and fungi, humus soil, carrion and dung (Gregor *et al,* 2002)
Mycetophilidae	*Acnemia amoena* Winnertz, 1863	Near Threatened (but better Nationally Scarce; see Chandler in Alexander, 2014). 6f from 4 samples from trap B, (23/6/17 to 22/9/17) The larva has been recorded around dead wood from ungrazed woodlands, parklands and traditional orchards. It appears to require decaying wood of broadleaved origin. (Alexander, 2014).
Mycetophilidae	*Brevicornu* Marshall, 1896 sp.	1 female specimen from trap A (7/7/17). A male is required for a species identification.
Mycetophilidae	*Coelosia flava* (Staeger, 1840)	1 male collected from trap B (13/6/17). This species was abundant in the environment surrounding the traps.
Mycetophilidae	*Docosia flavicoxa* Strobl, 1900.	Nationally Scarce. 1 female from trap B (7/7/17). Identified by Peter Chandler.
Mycetophilidae	*Synapha vitripennis* (Meigen, 1818)	1 female from trap B (31/5/17).
Mycetophilidae	*Tetragoneura sylvatica* (Curtis, 1837)	1 male from trap B (23/6/17). The larvae are usually found living in a mucilaginous tube among bark encrusting fungi. A slight dry cocoon is spun for pupation. (Hutson *et al*, 1980)
Phoridae		The small black scuttle flies. 18 specimens noted from 9 samples from trap A and 45 specimens from 10 samples from trap B. Currently only R. H. L. Disney can identify these so no attempt was made. However some specimens were retained for further investigation.
Psychodidae	*Psychoda cinerea* Banks, 1894	Numerous males from traps A and B in the early part of the season. The

		identification of females was not attempted. Tolerant of stagnant and polluted conditions; also from fungi. (Phil Withers)
Psychodidae	*Psychoda erminea* Eaton, 1898	Numerous males from traps A and B during the early and middle part of the season (4/6/17 to 7'7'17). Again the identification of females was not attempted. Identity confirmed by Phil Withers. Previously bred from otter spraint (Phil Withers *pers. com*).
Psychodidae	*Psychoda minuta* Banks, 1894	A single male from trap B, (19/5.17). Potential females of course not identified. Bred from carnivore dung, pigeon and chicken dung and from fungi (Phil Withers *pers. com*)
Psychodidae	*Telmatoscopus advenus* (Eaton, 1893)	A single male from trap A and another from trap B (19/5/17). Identification of female *Telmatoscopus* not attempted. A rot hole specialist moth fly (Phil Withers *pers. com*).
Psychodidae	*Telmatoscopus tristis* (Meigen, 1830)	49 males from trap A and 63 males from trap B, present throughout the season to the end. (31/5/17 to 24/8/17). By far the most abundant species present. The identification of the females was not attempted. Confirmed by Phil Withers. A rot hole specialist moth fly (Phil Withers *pers. com*).
Psychodidae	*Trichomyia parvula* Szabó, 1960	Status not assessed. A single female specimen collected from trap B, (4/8/17). A little-known species of moth fly, only previously recorded in the UK from a rot hole in a horse chestnut from Moccas Park, Herefordshire. Confirmed by Phil Withers.
Psychodidae	*Trichomyia urbica* Haliday in Curtis, 1839	16m and 7f collected from 5 samples from trap A and 15m and 18f from 5 samples from trap B (31/5/17 to 4/8/17). A rot hole specialist moth fly.
Rhagionidae	*Ptiolina obscura* (Fallén, 1814)	Nationally Notable. 1 male and 1 female collected from the same sample from trap B (31/5/17). A woodland species, rarely encountered at lower levels but found in large numbers in the canopy of oak trees during the fogging surveys in 2015. Finding the species in a rot hole may be significant..
Rhinophoridae	*Paykullia maculata* (Fallén, 1815)	1 male and 1 female collected from different samples from trap B (4/8/17, 24/8/17). A parasite or parasitoid of woodlice. (Woodlice were abundant in the samples from both the rot holes.)
Scatopsidae	*Holoplagia richardsi* (Edwards, 1934)	1 male collected from trap A (31/5/17) and 2 males and 5 females collected from 4 samples from trap B (23/6/17 to 24/8/17). It has been reared from rotting wood including elm and beech (Freeman and Lane, 1985)
Sciaridae		The black fungus gnats (Sciaridae) showed a strange distribution. They did not appear in trap A until the end of June, but from then on the numbers steadily increased sample by sample until by the end of August there were effectively too many to count. The 10/9 sample still contained 109. By 22/9 the count had fallen back to 5. Trap B on the other hand produced a steady count throughout the sampling period. They were present in every sample with a small peak (16) at the start of August, giving a total count of 65. There are currently 267 species of the black fungus gnats recorded in the UK but no identification manual. Peter Chandler is possibly the only person who can identify them. A range of specimens was preserved in case of further investigation.
Sphaeroceridae	*Puncticorpus cribratum* (Villeneuve, 1918)	Nationally Scarce. A single female from trap B (10/9/17).
Sphaeroceridae	*Spelobia palmata* (Richards, 1927)	1 male and 1 female from a single sample from trap B (4/8/17).
Sphaeroceridae	*Terrilimosina schmitzi* (Duda, 1918)	1 female from trap B (24/8/17).
Syrphidae	*Myathropa florea* (Linnaeus, 1758)	1 male and 9 females collected from 5 different samples from trap B.(31/5/17 to 10/9/17). This species is a wet rot-hole specialist with a rat-tailed maggot, though it is also associated with wet decaying heartwood and sap runs beneath the bark (Rotheray, 1993).
Syrphidae	*Myolepta dubia* (Fabricius, 1805)	Nationally Scarce. 3 females collected from a single sample from trap B (7/7/17). The maggot of this species is also moderately long-tailed and is a specialist in rot-holes in deciduous trees. (Rotheray, 1993).
Syrphidae	*Xylota sylvarum* (Linnaeus, 1758)	2 females collected from different samples from trap B (19/7/17, 4/8/17) This species is associated with rot holes and with decayed heartwood, often deep underground (Rotheray, 1993). It has a short-tailed maggot.

Flies from Shrawley Wood

(Not from rot holes)

Anisopodidae	*Sylvicola cinctus* (Fabricius, 1787)	7/6/17 1f Tall conifers and brash. Has been bred from a sap run (Hancock), bark collected near a sap run and from leaf litter at the base of a tree (Wolton and Luff, 2016)..
Anthomyiidae	*Botanophila fugax* (Meigen, 1826)	19/6/17 1 male Open shaded area. 26/6/17 1m Bracken understorey; private zone. 5/7/17 1m Deep dappled shade over bluebells. Larva probably saprophagous (Michael Ackland, 2005).
Anthomyiidae	*Delia florilega* (Zetterstedt, 1845)	6/6/15 1 male Trackway, partly deep shaded. Larva possibly saprophagous; has been bred from the roots of Henbane (Michael Ackland, 2005)
Anthomyiidae	*Delia platura* (Meigen, 1826)	14/6/17 1 male Dappled lime shade over bluebells. Numerous females discarded. The bean Seed Fly. Larva probably saprophagous but may be a pest on the roots of certain crop plants (Michael Ackland, 2005)
Anthomyiidae	*Hylemya vagans* (Panzer, 1798)	26/6/17 1 male Ferns in deep shade beneath tall lime coppice; private zone. 26/6/17 1m Edge of the lake; bonfire site damp excavation; private zone. Larvae in dung (Michael Ackland, 2005)
Asilidae	*Dioctria baumhaueri* (Meigen, 1820)	26/6/17 1 male Bracken understorey; private zone. 26/6/17 1f Edge of the lake; private zone. A woodland edge predator feeding on flies and Hymenoptera (Stubbs and Drake, 2014)
Asilidae	*Dioctria linearis* (Fabricius. 1787)	19/6/17 1 female Dappled lime shade over fruiting bluebells. 26/6/17 1m Bracken understorey; private zone. 26/6/17 2f Edge of the lake; private zone. Usually a woodland species. Prey includes both Diptera and Hymenoptera. (Stubbs and Drake, 2014)
Asilidae	*Neoitamus cyanurus* (Loew, 1849)	6/6/15 1m Trackway, partly deep shaded. 26/6/17 1f Bracken understorey; private zone. Feeds on a range of insects but predominantly small moths. (Stubbs and Drake, 2014)
Atelestidae	*Atelestus pulicarius* (Fallén, 1816)	7/6/17 1 male. Tall conifers and brash. Biology unknown; most likely insect predator. Removed from the Empididae by Chvála, 1983.
Brachystomatidae	*Trichopeza longicornis*	6/6/15 2 male 1 female Trackway, partly deep shaded. 7/6/17 1f Tall conifers and brash. 19/6/17 1m 1f Dappled lime shade over fruiting bluebells. Biology unknown. (Transferred from the Empididae by Sinclair and Cummins, 2006)
Calliphoridae	*Calliphora vomitoria* (Linnaeus, 1758)	5/7/17 1 female Deep dappled shade over bluebells; amongst a number visiting a stinkhorn fungus.
Calliphoridae	*Lucilia caesar* (Linnaeus, 1758)	5/7/17 1 male Trackside vegetation basking in sunshine. The commonest *Lucilia* species, the larvae usually found on carrion. (Steven Falk, 2016)
Calliphoridae	*Melanomya nana* (Meigen, 1826)	19/6/17 1 female Open shaded area. Possibly a snail parasite (Steven Falk, 2016).
Calliphoridae	*Melinda gentilis* Robineau-Desvoidy, 1830	6/6/15 1 male Dick Brook section of the trackway. Parasitic on snails (e.g. *Cernualla*, *Helicella*) (Steven Falk, 2016.)
Calliphoridae	*Melinda viridicyanea* (Robineau-Desvoidy, 1830)	13/8/17 1 female Trackside nectar sources. Parasitic on snails (e.g. *Cernuella, Discus*) (Steven Falk, 2016)
Calliphoridae	*Pollenia angustigena* Wainwright, 1940	14/6/17 2 male Dappled lime shade over bluebells. 19/6/17 1m 1f Dappled lime shade over fruiting bluebells. Larvae probably parasitic in earthworms (Steven Falk, 2016)
Calliphoridae	*Pollenia labialis* Robineau-Desvoidy, 1863	13/8/17 1 female Trackside nectar sources. Larvae probably parasitic in earthworms (Steven Falk, 2016)
Calliphoridae	*Pollenia rudis* (Fabricius, 1794)	14/6/17 2 male Dappled lime shade over bluebells. The Cluster Fly. Larvae reared from a range of earthworm species (Falk, 2016)
Chaoboridae	*Chaoborus* Lichtenstein, 1800 sp	26/6/17 9 male 3 female Edge of the lake; private zone. Their "phantom midge larvae" are common predators in still water environments. Their prey includes copepods, cladocerans and diptera larvae.

Chloropidae	*Chlorops hypostigma* Meigen, 1830	1/6/17 3 female Trackway puddles. *Chlorops* larvae are miners of grass stems.
Chloropidae	*Dicraeus vagans* (Meigen, 1838)	6/6/15 1 emalef Shaded muddy bank of Dick Brook. *Dicraeus* larvae live in the developing seeds of grasses; in the case of *vagans* the host is *Arrhenatherum elatius*..
Chloropidae	*Elachiptera tuberculifera* (Corti, 1909)	13/8/17 1 female Exposed bracken at a pathway junction. Larvae probably saprophagous.
Clusiidae	*Clusiodes albimana* (Meigen, 1830)	1/6/17. 1 male. Around trap B, mainly bluebells in fruit. Saproxylic species.
Clusiidae	*Clusiodes gentilis* (Collin, 1912)	1/6/17 1 male Tall conifers and brash. Saproxylic species.
Conopidae	*Sicus ferrugineus* (Linnaeus, 1761)	14/6/17 1 male Trackside flowers. The commonest conopid attacking a range of bumblebee species.
Culicidae	*Dahliana geniculata* (Olivier, 1791)	1/6/17 1 male Tall conifers and brash. (ex *Ochlerotatus*; ex *Aedes*.) Rot hole specialist mosquito. Large numbers collected from the trap over water-filled trap B. Not recorded from the dry trap A.
Culicidae	*Ochlerotatus annulipes* (Meigen, 1830)	1/6/17. 1 female. Dappled lime shade around trap B, mainly bluebells in fruit. 14/6/17 1f Dappled lime shade over bluebells.. A persistent bloodsucking mosquito.
Diadocidiidae	*Diadocidia ferruginosa* (Meigen, 1830)	26/6/17 1m Ferns in deep shade beneath tall lime coppice; private zone. Larvae in silken tubes under the bark of rotting wood.
Ditomyiidae	*Symmerus annulatus* (Meigen, 1830)	6/6/15 1 male Trackway, partly deep shaded. Has been bred from rotting elm wood.
Dolichopodidae	*Campsicnemus curvipes* (Fallén, 1823)	4/7/09 5 male 2female A path through open woodland lined with flowering brambles. 4/7/09 1m A large puddle on the path in deep shade; duckweed present. 4/7/09 2m 1f Woodland track in deep shade of flowering limes. 14/6/17 1m Dappled lime shade near a trackway puddle. A common small predator of damp and waterside environments.
Dolichopodidae	*Chrysotimus molliculus* (Fallén, 1823)	7/6/17 1 male Tall conifers and brash
Dolichopodidae	*Chrysotus blepharosceles* Kowarz, 1874	7/6/17 1 female Tall conifers and brash.
Dolichopodidae	*Chrysotus gramineus* (Fallén, 1823)	4/7/09 1 male A large puddle on the path in deep shade; duckweed present. 5/7/17 1m Overgrown lane in dappled sunlight.
Dolichopodidae	*Chrysotus neglectus* (Wiedemann, 1817)	4/7/09 4 male 2f A path through open woodland lined with flowering brambles. 4/7/09 1m A large puddle on the path in deep shade; duckweed present.
Dolichopodidae	*Dolichopus campestris* Meigen, 1824	6/6/15 1 male Puddle and mud in the trackway. 6/6/15 1m Trackway, partly deep shaded.
Dolichopodidae	*Dolichopus discifer* Stannius, 1831	6/6/15 1 female Dick Brook section of the trackway.
Dolichopodidae	*Dolichopus plumipes* (Scopoli, 1763)	6/6/15 1 male 1female Trackway, partly deep shaded.
Dolichopodidae	*Dolichopus popularis* Wiedemann, 1817	4/7/09 3 male A path through open woodland lined with flowering brambles. 6/6/15 3 male Trackway, partly deep shaded. 14/6/17 1m Dappled lime shade over bluebells. 26/6/17 3 fV Ferns in deep shade beneath tall lime coppice; private zone.
Dolichopodidae	*Dolichopus ungulatus* (Linnaeus, 1758)	4/7/09 1m A path through open woodland lined with flowering brambles. 6/6/15 3m 1f Trackway, partly deep shaded. 6/6/15 1m Dick Brook section of the trackway. 14/6/17 1f Dappled lime shade over bluebells
Dolichopodidae	*Gymnopternus brevicornis* (Staeger, 1842)	4/7/09 10m 6f A path through open woodland lined with flowering brambles. 4/7/09 1m A shaded lane leading into the wood. 4/7/09 8m 33f A large puddle on the path in deep shade; duckweed present. 4/7/09 1m Woodland track in deep shade of flowering limes. 1/6/17. 1m 1f. Around trap B, mainly bluebells in fruit. Lightly shaded beneath a high canopy. 1/6/17. 1m. High bracken. 7/6/17 2m 1f Tall conifers and brash. 14/6/17 7m 3f Dappled lime shade over bluebells. 26/6/17 2f Bracken understorey; private zone. 26/6/17 3m Ferns in

		deep shade beneath tall lime coppice; private zone. 26/6/17 4m 9f Edge of the lake; private zone.
Dolichopodidae	*Gymnopternus cupreus* (Fallén, 1823)	6/6/15 3m 2f Trackway, partly deep shaded. 6/6/15 3m Dick Brook section of the trackway. 6/6/15 2f Shaded muddy bank of Dick Brook. 1/6/17 6m Trackway puddles. 7/6/17 2f Tall conifers and brash. 14/6/17 2m Dappled lime shade over bluebells
Dolichopodidae	*Gymnopternus metallicus* (Stannius, 1831)	6/6/15 1m 1f Trackway, partly deep shaded. 6/6/15 1m Puddle and mud in the trackway. 14/6/17 3m Dappled lime shade over bluebells
Dolichopodidae	*Poecilobothrus nobilitatus* (Linnaeus, 1767)	4/7/09 1f A large puddle on the path in deep shade; duckweed present. Predaceous fly often associated with duckweed. The adults feed on pond invertebrates such as cladocerans ad diptera larvae.
Dolichopodidae	*Rhaphium appendiculatum* Zetterstedt, 1849	4/7/09 2f A path through open woodland lined with flowering brambles. 4/7/09 2m A large puddle on the path in deep shade; duckweed present.
Dolichopodidae	*Scellus notatus* (Fabricius, 1781)	7/6/17 2f Tall conifers and brash.
Dolichopodidae	*Sciapus platypterus* (Fabricius, 1805)	6/6/15 1m 2f Trackway, partly deep shaded. 1/6/17 1f. Around trap B, mainly bluebells in fruit. 7/6/17 3m 1f Tall conifers and brash. 14/6/17 1f Dappled lime shade over bluebells. 19/6/17 2m 4f Dappled lime shade over fruiting bluebells 26/6/17 1f Ferns in deep shade beneath tall lime coppice; private zone. 26/6/17 1m Edge of the lake; private zone. 26/6/17 1f Edge of the lake; bonfire site damp excavation; private zone. 5/7/17 1f Deep dappled shade over bluebells. 5/7/17 1f Bracken with brash beneath mixed woodland. This species was found in very large numbers in the oak canopy during the canopy fogging experiments.
Dolichopodidae	*Teuchophorus nigricosta* (von Roser, 1840)	4/7/09 1m A large puddle on the path in deep shade; duckweed present.
Drosophilidae	*Scaptomyza pallida* (Zetterstedt, 1847)	19/6/17 2f Open shaded area.
Dryomyzidae	*Dryomyza anilis* Fallén, 1820	7/6/17 3f Tall conifers and brash.
Empididae	*Dolichocephala irrorata* (Fallén, 1815B)	4/7/09 1f Woodland track in deep shade of flowering limes.
Empididae	*Dolichocephala oblongoguttata* (Dale, 1878)	4/7/09 1m Woodland track in deep shade of flowering limes.
Empididae	*Empis aestiva* Loew, 1867	4/7/09 2m A large puddle on the path in deep shade; duckweed present. 14/6/17 1m Dappled lime shade over bluebells
Empididae	*Empis livida* Linnaeus, 1758	7/6/17 1m Tall conifers and brash.
Empididae	*Empis longipes* Meigen, 1804	6/6/15 2f Trackway, partly deep shaded. (This species was transferred from *Rhamphomyia* to *Empis* by Chvála and Pont in 2015.)
Empididae	*Empis praevia* Collin, 1927	1/6/17 2f. Around trap B, mainly bluebells in fruit. 1/6/17 1f Trackway puddles.
Empididae	*Empis stercorea* Linnaeus, 1761	7/6/17 1f Tall conifers and brash.
Empididae	*Hilara angustifrons* Strobl, 1892	4/7/09 1m A large puddle on the path in deep shade; duckweed present.
Empididae	*Hilara litorea* (Fallén, 1816)	6/6/15 1m Puddle and mud in the trackway. 26/6/17 1f Ferns in deep shade beneath tall lime coppice; private zone. 5/7/17 1m Bracken with brash beneath mixed woodland
Empididae	*Hilara manicata* Meigen, 1822	26/6/17 1m Edge of the lake; bonfire site; private zone.
Empididae	*Hilara maura* (Fabricius, 1776)	6/6/15 4m 1f Shaded muddy bank of Dick Brook.
Empididae	*Phyllodromia melanocephala* (Fabricius, 1794)	13/8/17 1f Exposed bracken at a pathway junction.. This species was found in remarkable numbers in the oak tree canopy in the canopy fogging experiments.
Empididae	*Rhamphomyia flava* (Fallén, 1816)	6/6/15 1f Dick Brook section of the trackway. 14/6/17 1m Dappled lime shade over bluebells

Empididae	*Rhamphomyia nigripennis* (Fabricius, 1794)	6/6/15 2m Dick Brook section of the trackway. 1/6/17 1m 1f. Around trap B, mainly bluebells in fruit. Lightly shaded beneath a high canopy. 7/6/17 1f High conifers and brash. 14/6/17 1m Dappled lime shade over bluebells. 19/6/17 1f Dappled lime shade over fruiting bluebells 26/6/17 1f Ferns in deep shade beneath tall lime coppice; private zone..
Ephydridae	*Ditrichophora calceata* (Meigen, 1830)	6/6/15 1m 5f Shaded muddy bank of Dick Brook. 1/6/17 2m Trackway puddles.
Ephydridae	*Gymnoclasiopa collini* Cazoneri and Meneghini, 1977	6/6/15 1f Shaded muddy bank of Dick Brook.
Ephydridae	*Hydrellia maura* Meigen, 1838	6/6/15 10m Females discarded. Trackway, partly deep shaded. 6/6/15 1m Puddle and mud in the trackway. 1/6/17 1m 1f Trackway puddles. 19/6/17 1m Open shaded area.
Ephydridae	*Parydra coarctata* (Fallén, 1813)	6/6/15 1 Shaded muddy bank of Dick Brook.
Fanniidae	*Fannia armata* (Meigen, 1826)	1/6/17 1f. Around trap B, mainly bluebells in fruit. Lightly shaded beneath a high canopy. 5/7/17 2f Deep dappled shade over bluebells.
Fanniidae	*Fannia polychaeta* (Stein, 1895)	26/6/17 1m 2f Edge of the lake; private zone. 5/7/17 1f Overgrown lane in dappled sunlight. 13/8/17 1f Stunted brambles about trap A.
Fanniidae	*Fannia rondanii* (Strobl, 1893)	6/6/15 2f Trackway, partly deep shaded. 1/6/17 1f. Around trap B, mainly bluebells in fruit. Lightly shaded beneath a high canopy. 5/7/17 1f Deep dappled shade over bluebells. 13/8/17 1f Stunted brambles about trap A.
Fanniidae	*Fannia serena* (Fallén, 1825)	6/6/15 1f Trackway, partly deep shaded. 6/6/15 1f Dick Brook section of the trackway. 5/7/17 1m Overgrown lane in dappled sunlight.
Fanniidae	*Fannia similis* (Stein, 1895)	6/6/15 1f Trackway, partly deep shaded. 6/6/15 1f Dick Brook section of the trackway. 1/6/17 4f. Around trap B, mainly bluebells in fruit. Lightly shaded beneath a high canopy. 7/6/17 2f Tall conifers and brash. 26/6/17 1f Ferns in deep shade beneath tall lime coppice; private zone.. 5/7/17 2f Deep dappled shade over bluebells. 13/8/17 4f Stunted brambles about trap A.
Fanniidae	*Fannia umbrosa* (Stein, 1895)	6/6/15 1f Dick Brook section of the trackway. 13/8/17 2f Stunted brambles about trap A.
Heleomyzidae	*Suillia affinis* (Meigen, 1830)	7/6/17 2m Tall conifers and brash.
Heleomyzidae	*Suillia atricornis* (Meigen, 1830)	6/6/15 1m Dick Brook section of the trackway.
Heleomyzidae	*Suillia humilis* (Meigen, 1830)	26/6/17 1f Ferns in deep shade beneath tall lime coppice; private zone..
Heleomyzidae	*Suillia variegata* (Loew, 1862)	13/8/17 2m Stunted brambles about trap A.
Hybotidae	*Bicellaria intermedia* Lundbeck, 1910	4/7/09 4f A large puddle on the path in deep shade; duckweed present.
Hybotidae	*Bicellaria nigra* (Meigen, 1824)	1/6/17 1f. Around trap B, mainly bluebells in fruit. Lightly shaded beneath a high canopy. 19/6/17 1m 1f Open shaded area.
Hybotidae	*Bicellaria pilosa* Lundbeck, 1910	6/6/15 1m Trackway, partly deep shaded.
Hybotidae	*Bicellaria vana* Collin, 1926	6/6/15 1f Dick Brook section of the trackway.
Hybotidae	*Hybos culiciformis* (Fabricius, 1775)	13/8/17 1m Trackside nectar sources
Hybotidae	*Leptopeza flavipes* (Meigen, 1820)*s*	4/7/09 1m A path through open woodland lined with flowering brambles. 7/6/17 1m Tall conifers and brash. 14/6/17 2f Dappled lime shade over bluebells. 19/6/17 5f Dappled lime shade over fruiting bluebells
Hybotidae	*Ocydromia glabricula* (Fallén, 1816)	6/6/15 2f Dick Brook section of the trackway. 14/6/17 1m 1f Dappled lime shade over bluebells. 5/7/17 1f Deep dappled shade over bluebells.
Hybotidae	*Platypalpus longicornis* (Meigen, 1822)	1/6/17 1f. Around trap B, mainly bluebells in fruit. Lightly shaded beneath a high canopy
Hybotidae	*Platypalpus pallidiventris* (Meigen, 1822)	6/6/15 1f Trackway, partly deep shaded. 5/7/17 1f Overgrown lane in dappled sunlight.

Hybotidae	*Platypalpus pectoralis* (Fallén, 1815)	19/6/17 1f Open shaded area. 26/6/17 2f Edge of the lake; private zone.
Keroplatidae	*Macrocera phalerata* Meigen, 1818	6/6/15 1f Dick Brook section of the trackway. 26/6/17 1m Edge of the lake; bonfire site damp excavation; private zone
Keroplatidae	*Macrocera vittata* Meigen, 1830	14/6/17 1f Dappled lime shade over bluebells
Keroplatidae	*Macrorrhynchia flava* Winnertz, 1846	5/7/17 1m Deep dappled shade over bluebells. Checked vs *hugoi*. Suspected of rotten wood associations.
Lauxaniidae	*Calliopum aeneum* (Fallén, 1820)	7/6/17 1m Tall conifers and brash.
Lauxaniidae	*Calliopum simillimum (Collin, 1933)*	6/6/15 1m Dick Brook section of the trackway.
Lauxaniidae	*Meiosimyza platycephala* (Loew, 1847)	6/6/15 1m Trackway, partly deep shaded. 7/6/17 1f Tall conifers and brash. 19/6/17 2f Dappled lime shade over fruiting bluebells. 5/7/17 1f Deep dappled shade over bluebells.
Lauxaniidae	*Meiosimyza rorida* (Fallén, 1820)	6/6/15 2f Trackway, partly deep shaded. 6/6/15 3f Dick Brook section of the trackway. 1/6/17 1m 2f. Around trap B, mainly bluebells in fruit. 7/6/17 1m 2f Tall conifers and brash. 14/6/17 1m Dappled lime shade over bluebells. 5/7/17 4f Deep dappled shade over bluebells. 5/7/17 1f Bracken with brash beneath mixed woodland. 13/8/17 1f Stunted brambles about trap A.
Lauxaniidae	*Minettia longipennis* (Fabricius, 1794)	6/6/15 1f Trackway, partly deep shaded. 1/6/17 1f. Around trap B, mainly bluebells in fruit. Lightly shaded beneath a high canopy. 26/6/17 1f Bracken understorey; private zone. 5/7/17 1f Overgrown lane in dappled sunlight.
Lauxaniidae	*Sapromyza sexpunctata* Meigen, 1826	13/8/17 1f Trackside nectar sources
Lauxaniidae	*Tricholauxania praeusta* (Fallén, 1820)	6/6/15 3m 4f Trackway, partly deep shaded. 6/6/15 2m 2f Dick Brook section of the trackway. 1/6/17 1f. Around trap B, mainly bluebells in fruit. 7/6/17 3m 9f Tall conifers and brash. 14/6/17 1m 3f Abundant. Dappled lime shade over bluebells. 19/6/17 9m 12f Dappled lime shade over fruiting bluebells 19/6/17 1m Open shaded area. 26/6/17 1m 4f Edge of the lake; private zone. 5/7/17 10m 8f Deep dappled shade over bluebells. 5/7/17 1m Trackside vegetation exposed to sunshine. 5/7/17 2m Bracken with brash beneath mixed woodland
Limoniidae	*Austrolimnophila ochracea* (Meigen, 1804)	6/6/15 1m 3f Trackway, partly deep shaded. 6/6/15 1f Dick Brook section of the trackway. 19/5/17 3m 1f. Rank bluebells beneath the shade of lime coppice. 1/6/17 2m 2f. Around trap B, mainly bluebells in fruit. 7/6/17 1f Tall conifers and brash. 14/6/17 3m 2f Dappled lime shade over bluebells. 19/6/17 1f Dappled lime shade over fruiting bluebells 26/6/17 1m 2f Bracken understorey; private zone. 26/6/17 1f Ferns in deep shade beneath tall lime coppice; private zone.. 26/6/17 1f Edge of the lake; private zone. Saproxylic species. 26/6/17 1m 1f Edge of the lake; bonfire site damp excavation; private zone. 5/7/17 1m Trackside vegetation exposed to sunshine.
Limoniidae	*Epiphragma ocellare* (Linnaeus, 1761)	1/6/17 1f. Around trap B, mainly bluebells in fruit. Lightly shaded beneath a high canopy
Limoniidae	*Helius flavus* (Walker, 1856)	26/6/17 1f Edge of the lake; private zone.
Limoniidae	*Limonia nubeculosa* Meigen, 1804	6/6/15 2m 1f Trackway, partly deep shaded. 6/6/15 1f Dick Brook section of the trackway. 19/5/17. 8m 4f. Rank bluebells beneath the shade of lime coppice. 1/6/17 2m 1f. Around trap B, mainly bluebells in fruit. 7/6/17 1f Tall conifers and brash. 26/6/17 1m 2f Ferns in deep shade beneath tall lime coppice; private zone. 5/7/17 1f Overgrown lane in dappled sunlight.
Limoniidae	*Limonia phragmitidis* (Schrank, 1781)	6/6/15 1f Shaded muddy bank of Dick Brook.
Limoniidae	*Molophilus Curtis, 1833* sp	26/6/17 1m Ferns in deep shade beneath tall lime coppice; private zone.. Male needed for specific ID.
Limoniidae	*Neolimonia dumetorum* (Meigen, 1804)	7/6/17 6m Tall conifers and brash. 14/6/17 1m Dappled lime shade over bluebells. Associated with dead wood.
Lonchaeidae	*Lonchaea* Fallén, 1820 sp	7/6/17 1m Tall conifers and brash

Lonchopteridae	*Lonchoptera bifurcata* (Fallén, 1810)	6/6/15 1f Trackway, partly deep shaded. Males of this species never seen.
Lonchopteridae	*Lonchoptera lutea* Panzer, 1809	6/6/15 2f Trackway, partly deep shaded. 6/6/15 1f Dick Brook section of the trackway. 1/6/17 1m. Around trap B, mainly bluebells in fruit. Lightly shaded beneath a high canopy.. 26/6/17 1m 4f Ferns in deep shade beneath tall lime coppice; private zone.. 26/6/17 1f Edge of the lake; bonfire site; private zone. 5/7/17 2m 2f Deep dappled shade over bluebells.
Micropezidae	*Neria cibaria* (Linnaeus, 1761)	6/6/15 1f Dick Brook section of the trackway.
Muscidae	*Coenosia humilis* Meigen, 1826	6/6/15 1f Dick Brook section of the trackway.
Muscidae	*Coenosia tigrina* (Fabricius, 1775)	6/6/15 1m Trackway, partly deep shaded. Adult fiercely predaceous, feeding mainly on other Diptera.
Muscidae	*Eudasyphora cyanella* Meigen, 1826)	26/6/17 1f Edge of the lake; private zone. Larvae found in cow dung (Gregor *et al*, 2002).
Muscidae	*Hebecnema nigricolor* Fallén, 1825)	7/6/17 1f Tall conifers and brash. Larvae probably in soil humus and/or decaying vegetable matter (Gregor *et al*, 2002)
Muscidae	*Helina depuncta* (Fallen, 1825)	6/6/15 1m 1f Trackway, partly deep shaded. 14/6/17 1m Dappled lime shade over bluebells. 19/6/17 2f Dappled lime shade over fruiting bluebells 19/6/17 2m 1f Open shaded area. 26/6/17 1f Bracken understorey; private zone. 5/7/17 1f Overgrown lane in dappled sunlight. 13/8/17 3f Stunted brambles about trap A.
Muscidae	*Hydrotaea irritans* (Fallén, 1823)	7/6/17 6m 4f Tall conifers and brash. 14/6/17 1f Dappled lime shade over bluebells. 19/6/17 2f Open shaded area. 5/7/17 1f Overgrown lane in dappled sunlight. 13/8/17 12f Stunted brambles about trap A. 13/8/17 2f Exposed bracken at a pathway junction (could have caught dozens more!). Larvae predaceous, even cannibalistic in soil (Gregor *et al*, 2002) Adults the most persistent of sweat drinkers.
Muscidae	*Hydrotaea meteorica* (Linnaeus, 1758)	6/6/15 1f Trackway, partly deep shaded. 6/6/15 2f Dick Brook section of the trackway. 6/6/15 1f Shaded muddy bank of Dick Brook. 7/6/17 5f Tall conifers and brash. 26/6/17 1f Edge of the lake; private zone. 13/8/17 4f Stunted brambles about trap A. Larvae carnivorous in cow dung, overwintering. Adult females persistently feeding on sweat and tears, or even blood drops. (Gregor *et* al, 2002)s
Muscidae	*Hydrotaea militaris* (Meigen, 1826)	6/6/15 1m 3f Trackway, partly deep shaded. 6/6/15 5f Dick Brook section of the trackway. 6/6/15 5f Resting on broad tree leaves in large numbers. 1/6/17 8f. Around trap B, mainly bluebells in fruit. 7/6/17 9f Tall conifers and brash. 13/8/17 1f Stunted brambles about trap A. Larvae in fresh cow dung. (Gregor *et al*, 2002)
Muscidae	*Limnophora triangula* (Fallén, 1825)	1/6/17 1f Trackway puddles.
Muscidae	*Phaonia palpata* (Stein, 1897)	6/6/15 1f Trackway, partly deep shaded. 6/6/15 1m 1f Dick Brook section of the trackway. Larvae predaceous in rotten wood of broad-leafed trees (Gregor *et al*, 2002)
Muscidae	*Phaonia rufiventris* (Scopoli, 1763)	6/6/15 1m Trackway, partly deep shaded. 6/6/15 1f Dick Brook section of the trackway. 19/5/17. 1m. Rank bluebells beneath the shade of lime coppice. Larvae predaceous in fungi and dead trees (Gregor *et al*, 2002)
Muscidae	*Phaonia serva* (Meigen, 1826)	14/6/17 1f Dappled lime shade over bluebells. Larvae under the bark of decaying trees and in the soil. (Gregor *et al*, 2002)
Muscidae	*Phaonia subventa* (Harris, 1780)	14/6/17 1m Dappled lime shade over bluebells. 19/6/17 1m Dappled lime shade over fruiting bluebells. Larvae in rotting wood and fungi, humus, soil, carrion and dung. (Gregor *et al*, 2002)
Muscidae	*Thricops semicinereus* (Wiedemann, 1817)	6/6/15 1f Trackway, partly deep shaded. 6/6/15 1f Dick Brook section of the trackway. 1/6/17 1f. Around trap B, mainly bluebells in fruit. 1/6/17 1f High bracken. 7/6/17 1f Tall conifers and brash. 26/6/17 1f Ferns in deep shade beneath tall lime coppice; private zone. 13/8/17 2f Exposed bracken at a pathway junction. Carnivorous larvae probably live in the soil (Gregor *et al*, 2002)
Muscidae	*Thricops simplex* (Wiedemann,	13/8/17 1m Stunted brambles about trap A.

	1817)	
Mycetophilidae	*Boletina basalis* (Meigen, 1818)	6/6/15 1f Dick Brook section of the trackway.
Mycetophilidae	*Coelosia flava* (Staeger, 1840)	1/6/17 5m 1f. Around trap B, mainly bluebells in fruit. Lightly shaded beneath a high canopy. 14/6/17 11m 6f Dappled lime shade over bluebells. 19/6/17 3m Dappled lime shade over fruiting bluebells 19/6/17 1m Open shaded area. 26/6/17 1m Ferns in deep shade beneath tall lime coppice; private zone. This species was present in very large numbers..
Mycetophilidae	*Mycomya* Rondani, 1856 sp	6/6/15 1f Dick Brook section of the trackway. 14/6/17 1f Dappled lime shade over bluebells. Male needed for species identification.
Mycetophilidae	*Rymosia fasciata* (Meigen, 1804)	6/6/15 1m Trackway, partly deep shaded.
Mycetophilidae	*Zygomyia humeralis gp*	6/6/15 1m Dick Brook section of the trackway. A complex of 4 spp. Probably *Z. pseudohumeralis* Caspers, 1980.
Opomyzidae	*Opomyza germinationis* (Linnaeus, 1758)	26/6/17 1m Ferns in deep shade beneath tall lime coppice; private zone.. 26/6/17 3m 3f Edge of the lake; private zone. 26/6/17 1f Edge of the lake; bonfire site damp excavation; private zone. 5/7/17 1m Deep dappled shade over bluebells.
Opomyzidae	*Opomyza florum* (Fabricius, 1794)	19/6/17 1f Dappled lime shade over fruiting bluebells 26/6/17 1f Edge of the lake; private zone. 5/7/17 2f Deep dappled shade over bluebells. 5/7/17 1f Trackside vegetation exposed to sunshine. 13/8/17 3m 3f Stunted brambles about trap A. 13/8/17 5m 3f Exposed bracken at a pathway junction.
Psilidae	*Chamaepsila rosae* (Fabricius, 1794)	6/6/15 1m Trackway, partly deep shaded.
Psychodidae	*Boreoclytocerus ocellaris* (Meigen, 1804)	26/6/17 1m Edge of the lake; private zone.
Psychodidae	*Pericoma fuliginosa* (Meigen, 1804)	6/6/15 1m Trackway, partly deep shaded.
Psychodidae	*Pericoma trivialis* Eaton, 1893	6/6/15 1m Trackway, partly deep shaded. 6/6/15 1m Dick Brook section of the trackway. 14/6/17 1m Dappled lime shade over bluebells
Psychodidae	*Telmatoscopus parvulus* Vaillant, 1960	6/6/15 1m Trackway, partly deep shaded.
Ptychopteridae	*Ptychoptera contaminata* (Linnaeus, 1758)	26/6/17 1m Edge of the lake; bonfire site damp excavation; private zone
Rhagionidae	*Chrysopilus asiliformis* (Preyssler, 1791)	26/6/17 1f Edge of the lake; private zone. 26/6/17 1m Edge of the lake; bonfire site damp excavation; private zone
Rhagionidae	*Chrysopilus cristatus* (Fabricius, 1775)	26/6/17 1f Edge of the lake; private zone.
Rhagionidae	*Rhagio lineola* Fabricius, 1794	5/7/17 2f Overgrown lane in dappled sunlight.
Scathophagidae	*Scathophaga furcata* (Say, 1823)	6/6/15 1m Trackway, partly deep shaded.
Scathophagidae	*Scathophaga stercoraria* (Linnaeus, 1758)	6/6/15 2m Trackway, partly deep shaded. 6/6/15 1f Dick Brook section of the trackway. 7/6/17 1f Tall conifers and brash. 19/6/17 1f Open shaded area. 5/7/17 1f Overgrown lane in dappled sunlight. 5/7/17 1m Trackside vegetation exposed to sunshine.
Sciomyzidae	*Elgiva solicita* (Harris, 1780)	26/6/17 4m Edge of the lake; private zone. Parasitoid of terrestrial snails.
Sciomyzidae	*Pherbellia albocostata* (Fallén, 1820)	6/6/15 1f Trackway, partly deep shaded. 6/6/15 1f Dick Brook section of the trackway. 1/6/17 1m 1f. Around trap B, mainly bluebells in fruit. Lightly shaded beneath a high canopy. A terrestrial species, parasitoid of *Cochlicopa* and *Discus*.
Sciomyzidae	*Pherbellia dubia* (Fallén, 1820)	5/7/17 1f Deep dappled shade over bluebells. Parasitoid of terrestrial snails.
Sciomyzidae	*Tetanocera elata* (Fabricius, 1781)	26/6/17 1f Edge of the lake; private zone. Parasitoid of slugs.

Sciomyzidae	*Tetanura pallidiventris* Fallén, 1820	26/6/17 1m Ferns in deep shade beneath tall lime coppice; private zone. Identified by Peter Chandler. Parasitoid of terrestrial snails.
Sepsidae	*Nemopoda nitidula* (Fallén, 1820)	6/6/15 1f Trackway, partly deep shaded.
Sphaeroceridae	*Crumomyia nitida* (Meigen, 1830)	26/6/17 1f Ferns in deep shade beneath tall lime coppice; private zone..
Sphaeroceridae	*Gigalimosina flaviceps (*Zetterstedt, 1847)	26/6/17 1m Edge of the lake; bonfire site; private zone. Shade-loving woodland species.
Sphaeroceridae	*Leptocera fontinalis* (Fallén, 1826)	6/6/15 2m 2f Trackway, partly deep shaded. 1/6/17 1m. Around trap B, mainly bluebells in fruit. 14/6/17 2m Dappled lime shade over bluebells near a trackway puddle 19/6/17 1m 1f Dappled lime shade over fruiting bluebells 19/6/17 1m Open shaded area. 26/6/17 1f Edge of the lake; bonfire site; private zone.
Sphaeroceridae	*Leptocera nigra* Olivier, 1813	6/6/15 2m 1f Trackway, partly deep shaded.
Sphaeroceridae	*Limosina silvatica* (Meigen, 1830)	26/6/17 2m 3f Edge of the lake; bonfire site; private zone. Associated with decaying vegetable material in woods.
Sphaeroceridae	*Opacifrons coxata (*Stenhammar, 1855)	6/6/15 2f Shaded muddy bank of Dick Brook.
Sphaeroceridae	*Pseudocollinella humida* (Haliday, 1836)	6/6/15 6m 8f Mud and puddles on the trackway. 6/6/15 2m 2f Shaded muddy bank of Dick Brook.1/6/17 2m 4f Trackway puddles. 7/6/17 1m Tall conifers and brash. 14/6/17 6m 4f Dappled lime shade over bluebells near a trackway puddle.
Sphaeroceridae	*Spelobia clunipes* (Meigen, 1830)	26/6/17 1m Edge of the lake; private zone.
Stratiomyidae	*Beris fuscipes* Meigen, 1820	7/6/17 1f Tall conifers and brash. Larvae terrestrial in wet places, feeding on decaying vegetable matter.
Syrphidae	*Brachypalpoides lentus* (Meigen, 1822)	6/6/15 1m Dick Brook section of the trackway. Larvae found in the decaying heartwood of beech and probably oak, especially in live trees with decay exposed at ground level. (Stubbs and Falk, 2002).
Syrphidae	*Cheilosia albitarsis* (Meigen, 1822)	6/6/15 1m Dick Brook section of the trackway. Larvae mine Creeping Buttercup. (Stubbs and Falk, 2002)
Syrphidae	*Episyrphus balteatus (De Geer, 1776)*	5/7/17 1f Overgrown lane in dappled sunlight. Migrant species found throughout the year (Stubbs and Falk, 2002)
Syrphidae	*Eristalis tenax* (Linnaeus, 1758)	14/6/17 1m Trackside flowers. 'Rat-tailed larva' found in organically rich and/or polluted effluents in ditches and farmyards. (Stubbs and Falk, 2002)
Syrphidae	*Helophilus pendulus (Linnaeus, 1758)*	19/6/17 1m Open shaded area; flower visiting. 13/8/17 1f Trackside nectar sources. 'Rat-tailed larvae' found in muddy puddles, ditches and pond margins. (Stubbs and Falk, 2002)
Syrphidae	*Melanostoma* Schiner, 1860 sp	6/6/15 2f Trackway, partly deep shaded. 13/8/17 2f Trackside nectar sources. Larvae are predators of aphids and/or other fly larvae in grassland and leaf litter (Wilkinson and Rotheray, 2017).
Syrphidae	*Myathropa florea* (Linnaeus, 1758)	1/6/17 1f Visiting hogweed. 'Rat-tailed larva' found in rot holes and other water filled tree cavities containing rotting leaves (Stubbs and Falk).
Syrphidae	*Volucella bombylans* (Linnaeus, 1758)	1/6/17 1m Visiting hogweed. Larvae are scavengers in the nests of wasps and bumblebees. (Stubbs and Falk, 2002)
Syrphidae	*Xylota sylvarum* (Linnaeus, 1758)	14/6/17 1m Trackside flowers. Association with decaying roots and rot holes. 'Short-tailed larvae' noted feeding on decaying tree roots, especially beech stumps or also oak and birch. (Stubbs and Falk, 2002). Recorded from rot holes in small-leaved lime in this survey.
Tabanidae	*Haematopota pluvialis* (Linnaeus, 1758)	26/6/17 12 Edge of the lake; private zone. 5/7/17 1f Bracken with brash beneath mixed woodland. Adult females are bloodsuckers. Larvae are found in the soil and are likely to be predaceous. (Stubbs and Drake, 2014)
Tachinidae	*Carcelia tibialis* (Robineau-Desvoidy, 1863)	6/6/15 1m Dick Brook section of the trackway. The eggs are glued to the hairs of hairy caterpillars. Hosts likely to include Arctiidae and Lymantriidae.

		(Belshaw, 1993)
Tachinidae	*Dexiosoma caninum* (Fabricius, 1781)	26/6/17 3m 3f Abundant (recent emergence?) Ferns in deep shade beneath tall lime coppice; private zone.. Parasitoid, but hosts uncertain, probably beetle larvae. (Belshaw, 1995)
Tachinidae	*Tachina fera* (Linnaeus, 1761)	14/6/17 1m Trackside flowers. Eggs are laid on oak leaves and the larva parasitizes oak-feeding caterpillar species.
Tipulidae	*Nephrotoma flavescens* (Linnaeus, 1758)	5/7/17 1f Overgrown lane in dappled sunlight.
Tipulidae	*Nephrotoma quadrifaria* (Meigen, 1804)	7/6/17 1m Tall conifers and brash.
Tipulidae	*Tipula fascipennis* Meigen, 1818	6/6/15 1m Trackway, partly deep shaded.
Tipulidae	*Tipula oleracea* Linnaeus, 1758	19/5/17 1f Rank bluebells beneath the shade of lime coppice. Grassland species.
Tipulidae	Tipula scripta *Meigen, 1830*	19/6/17 1m Dappled lime shade over fruiting bluebells

Shrawley Rot hole traps

Mick Blythe

Flies: First records for Worcestershire at Oct 2017.

Fly species. *Systenus pallipes* (Dolichopodidae): Found in Rot Hole A at Shrawley Wood. Speight & Meuffles (1989) split *S. pallipes* into two species and this specimen is very clearly the second species *S. pallidus*. However, Kassenbeer (1998) and Dyte (1990) combined them again. Here the checklist is followed but the difference should be noted of in the event they are separated again. Its known associations are with sap runs and rot hole debris, particularly elm *Ulmus* (Fonseca). First record for Worcestershire.

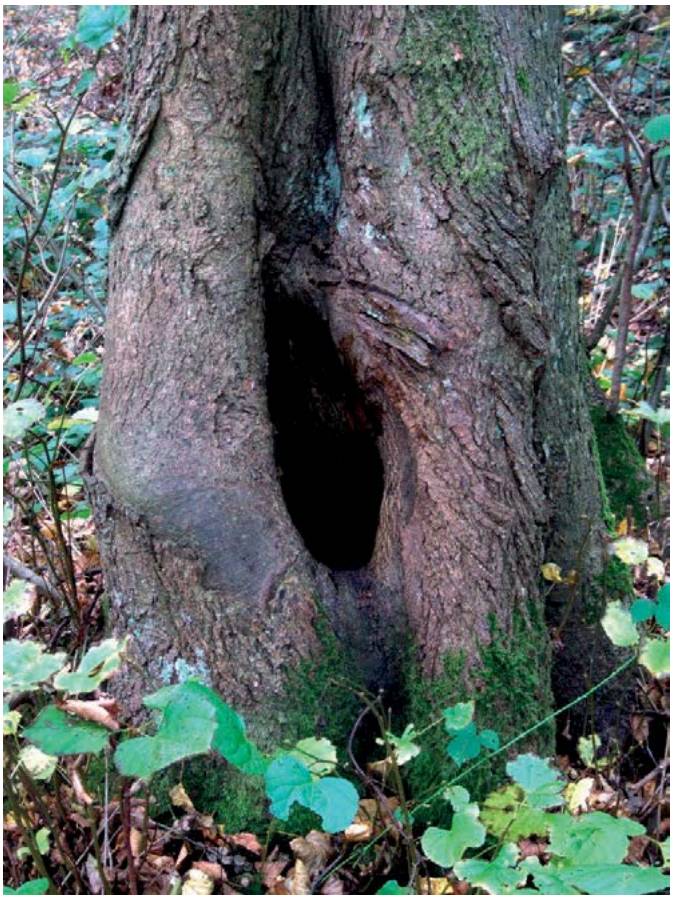
Moth-fly species. *Trichomyia parvula* (Psychodidae): The Shrawley rot holes have been regularly producing *Trichomyia urbica*, a known rot hole moth-fly species which feeds on rotting wood. This sample was collected from Trap B 4 August 2017 and was a female *Trichomyia* which appeared different; smaller with a differently shaped rear end. From the lengthening of the basal antennal flagellomeres it might have been *T. parvula* but references described characteristics for males only. Fortunately, Phil Withers had a female specimen of *parvula* collected from a rot hole in France and was able to declare that the Shrawley specimen was a "spot on" match. There has been a previous specimen of *T. parvula* from a rot hole in a Horse-chestnut *Aesculus hippocastsanum* in Herefordshire. NBN does not recognise this species. First record for Worcestershire.

Dung fly species. *Puncticorpus cribratum* (Sphaeroceridae): Found in Rot Hole B at Shrawley Wood. A "rare species" (Pitkin). First record for Worcestershire.

Myolepta dubia (Fabricius, 1805) Diptera: Syrphidae in Shrawley Wood, Worcestershire.

Reprinted from *Worcestershire Record* 45:23-24. Mick Blythe 2018

On 13 March 2017 an improvised emergence trap was set over a rot hole near the base of a small-leaved lime tree *Tilia cordata* in Shrawley Wood, SO80656621 (01). The hole contained a pool of tea-coloured water above a basal deposit up to 18cm deep which graded vertically from dead leaves above to a fine reddish sludge below (02). This trap (03) proved very productive of insects, especially Diptera, in contrast to a dry hole with a similar trap nearby.



01. Rot hole at base of *Tilia cordata*, Shrawley Wood. Mick Blythe.

On 7 July 2017 three female specimens of the hoverfly *Myolepta dubia* (Fabricius) were collected from the trap. This is a woodland species and a specialist in rot holes in deciduous trees (Rotheray 1993). It has a "rat-tailed maggot" larva in which the rear end of the body is extended into a siphon with a pair of spiracles for breathing at the tip. This is thought to be an adaptation for gas exchange at the surface of the water while the maggot lies buried in anaerobic sludge. The species has the status of Nationally Scarce, and Worcestershire is outside the previously recorded range of the species in the south and east of England.

Presumably the flies emerged from the hole at some time in the preceding 14 days since the trap was previously emptied on 23 June 2017

Myathropa florea (Linn) is the most abundant hoverfly of the wet rot-hole specialists. Compared with *Myolepta* its maggot has a very much longer tail. One male and nine females of this species were collected from the emergence trap between 31 May and 10 September.

Two females of *Xylota sylvarum* (Linn) were also collected from the trap on 19 July and 4 August. This species is also associated with rot holes and also with decaying heartwood, often deep underground (Rotheray 1993). The basal positioning of our rot hole may have favoured it. Unlike the other two species it has a "short-tailed" maggot.



02. Rot hole at base of *Tilia cordata*, Shrawley Wood. Mick Blythe.



03. Improvised trap set over rot hole. Mick Blythe.

Two females of *Xylota sylvarum* (Linn) were also collected from the trap on 19 July and 4 August. This species is also associated with rot holes and also with decaying heartwood, often deep underground (Rotheray 1993). The basal positioning of our rot hole may have favoured it. Unlike the other two species it has a "short-tailed" maggot.

Reference

Rotheray, E. G. 1993. *Colour guide to hoverfly larvae (Diptera, Syrphidae). Dipterists Digest* No 9. Published by Derek Whiteley, Sheffield, assisted by Royal Museum of Scotlkand.

Illustrations of two rot hole hoverflies.



Myolepta dubia. Kevin McGee.



Myathropa florae. Gary Farmer



Myathropa florae. Puparium from tree rot hole. Gary Farmer.

Land Caddis in Shrawley Wood

Harry Green

The Land or Terrestrial Caddis was first found in the British Isles by John Edward Fletcher at Worcester in the 19th century. His observations were published by Robert McLachlan, the leading authority on European and British Caddisflies (Trichoptera) of the day in a short note to the *Entomologists' Monthly Magazine* as follows:

Occurrence in England of the larvae of a terrestrial Trichopterous insect; probably Enoicyla pusilla, Burmeister. – I have several times called attention to the existence, on the Continent, of a Caddis-fly (Enoicyla pusilla) which, in the larval state, lives out of water amongst moss at the roots of trees; - the exception in these insects which proves the rule. I believe I can now assert that this is a British Insect. Mr Fletcher, of Worcester, has obligingly sent me several living larvae and their cases exactly resemble those of Enoicyla pusilla, from Bavaria, in my collection: they are of a very ordinary form – slightly curved cylinders of fine sand. It only remains to breed the insects (which should emerge late in the autumn) to enable us to add this most interesting species to the British Fauna. As might naturally be expected, the larva is destitute of the external respiratory filaments common to almost all caddis-worms, but the spiracles are not very evident. E. pusilla is also remarkable inasmuch as the female is wingless and little resembling the male. Several authors, before its transformations were shown, remarked on the occurrence of the perfect male insect, a small creature with little power of flight, in localities where water is absent. According to a letter received from M. Snellen van Vollenhoven, the larva occurs in "millions" in the wood of La Haye, in Holland. May I ask observers to keep a look-out for this peculiar insect? – R. McLachlan, 20 Limes Grove North, Lewisham, June 1868. *Entomologists' Monthly Magazine* 5:43-44.



01. Robert McLachlan, F.R.S.

Most caddisflies have aquatic larvae and both sexes on emerging are fully winged and can fly. *Enoicyla pusilla* (Burmeister, 1839) is one of the very few species that have eggs, larvae and pupae that are entirely terrestrial, usually living amongst leaf litter in ancient woodland but also in plant litter in other often moist habitats. The larva constructs a slightly curved cylindrical tapering case from tiny granules of soil or other material in which it lives as do many other caddis flies. The case is enlarged at each instar as the larva grows. The fully grown case is about 8 mm long and 2 mm maximum diameter (02, 03). Fletcher found the larvae feeding on mosses and lichens at the base of trees on the banks of small streams and ditches west of the River Severn at Worcester not far from his home in St John's. In the mid to late nineteenth century that area contained far more open countryside than nowadays. He later found them in nearby local woodlands.



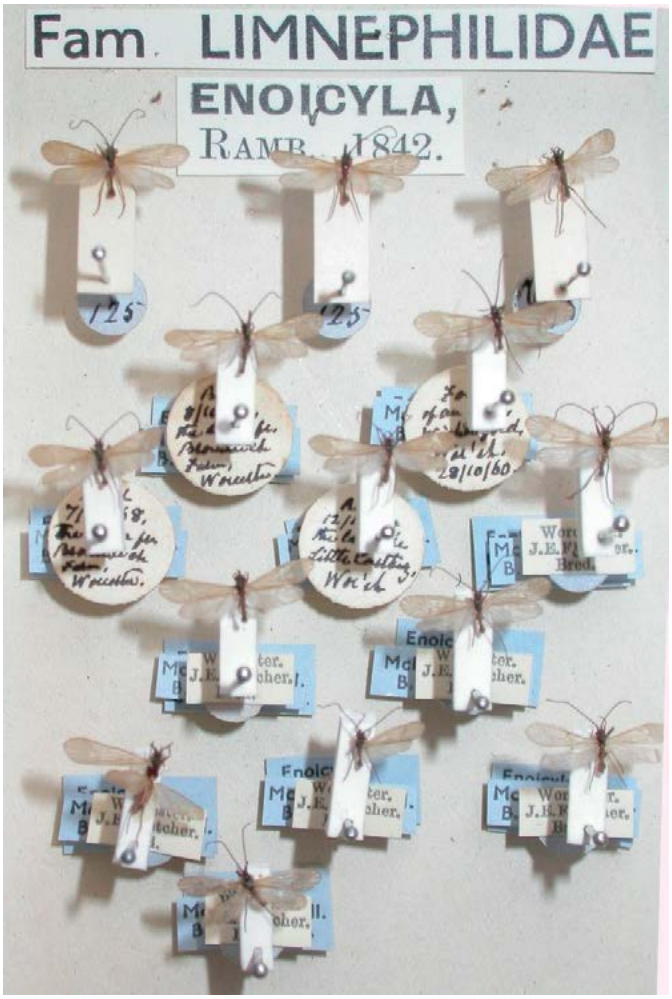
02. Land Caddis *Enoicyla pusilla*. Young larva about 4 mm long in case. G. H. Green



03. Land Caddis *Enoicyla pusilla*. Full-grown larva about 8 mm long in case. G. H. Green

The Land Caddis is one of the few caddisfly species with flightless females. Fletcher collected hundreds of larvae and reared adults of both sexes from them. He observed mating and egg laying. Specimens of the adults he raised are mounted on cards in both the Natural History Museum (NHM) in London and the Worcester Museum. Those in NHM are dated 1868 and some are the specimens he sent to McLachlan. McLachlan himself raised adults from larvae sent to him by Fletcher and exhibited these together with Fletcher's specimens at a meeting of the Entomological Society of London in 1868. The specimens in the Worcester Museum are dated between 1878 and 1882. Images from both collections are shown in 04, 05 and 06. Determining the date of Fletcher's first discovery is difficult as he rarely mentions dates in his brief published notes. The following indicates that he may have found adult flying males in 1858, possibly before he raised adults in captivity, although he did not identified his specimens specifically until later. The date when he first found larvae is not known.

Note on Enoicyla pusilla. *– I have two mutilated males of this species (put aside with other odd insects and neglected) which I remember having captured one autumn, some eleven years ago, several miles from Worcester. I can now reckon four localities in this county where I have found the species.* J. E. Fletcher, Worcester, 2nd July 1869. *Entomologists' Monthly Magazine* 6:61, 1869.



04. Land Caddis *Enoicyla pusilla* males in the Natural History Museum, London, collection contributed by J. E. Fletcher and Robert McLachlan. G.H. Green.



05. Land Caddis *Enoicyla pusilla* females in the Natural History Museum, London, collection contributed by J. E. Fletcher and Robert McLachlan. G.H. Green.

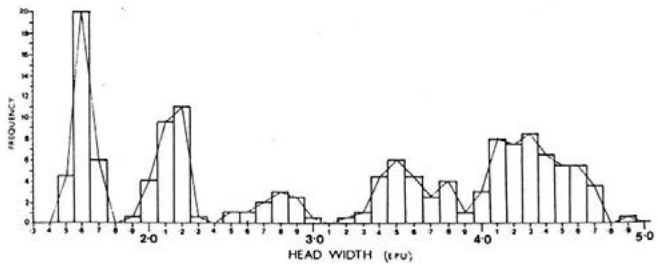


06. The remains of Land Caddis *Enoicyla pusilla* in the Worcestersr Museum provided by J E Fletcher in the 1800s. Females on left, males on right. Unfortunately a large part of Fletcher's extensive collection of insects suffered poor storage condition during WW2 and are damaged by museum beetle and industrial grime. G.H.Green

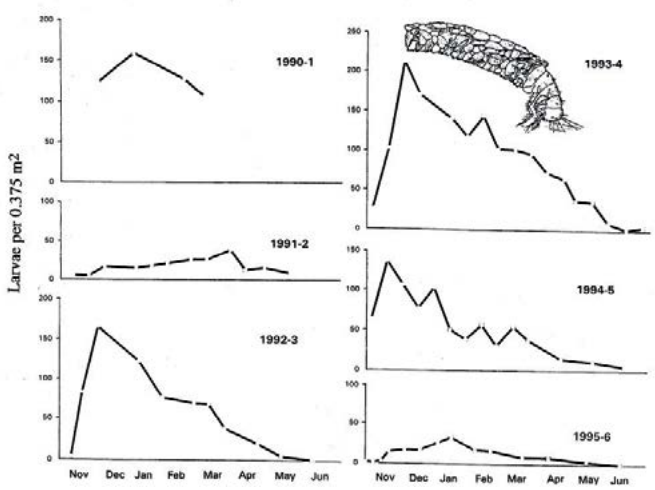
After Fletcher's work there are apparently no records anywhere in Britain until Norman Hickin found them in Wyre Forest. *"Near The Newalls, on the banks of Dowles Brook."* (Hickin, N. 1965 *Forest Refreshed* page 98-100). Hickin studiesd Trichoptera for many years and illustrated larval identification features in a series of publications eventually brought together in his book *Caddis Larvae* (1967). He was aware of Fletcher's old Worcestershire records and he had searched for Land Caddis for many years without success. The story, often repeated by whoever writes about Land Caddis, is that his daughter Sari found them in their tent when they were camping near his home at The Newalls in Wyre Forest. The date varies between his two books: either Whitsun 1958 or April 22nd 1957. David Harding (1995) favoured 1957 as it was a wet Easter Monday and Land Caddis often climb vegetation when it is very wet.

Hickin 1967 ***Caddis Larvae*** pages 332-337: ***Enoicyla pusilla*** (Burmeister) *was collected a number of times between 1868 and 1879 by McLachlan and Fletcher in localities near the City of Worcester. Since then it has-not been recorded from the British Isles until, on 22 April 1957, my daughter Sari and I collected several larvae from a small meadow on the Worcestershire edge of Wyre Forest. The first larvae were found in a tent which my daughter had pitched in the meadow, but subsequently they were found in large numbers at the bases of tufts of grass within 10 feet of the hedge, or forest edge, usually under dead oak leaves which surrounded each grass tuft and often within mouse tunnels. When the particular habitat had been recognized the larvae were found very easily - about 200 being observed within an hour.*

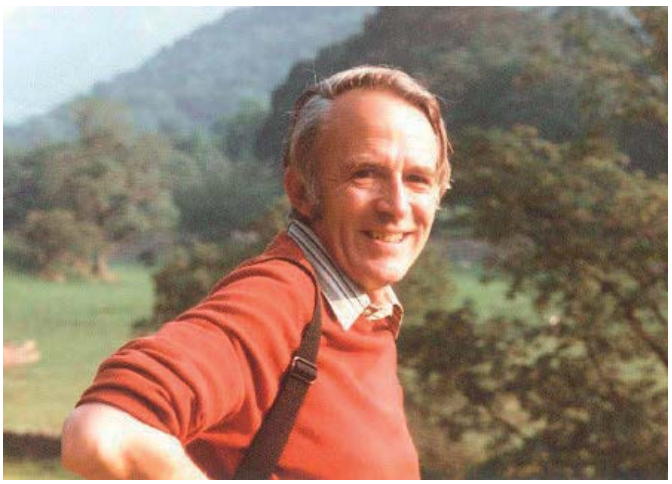
Hickin's books (1965 and 1971) stimulated interest amongst Worcestershire naturalists, encouraged by Noel King, Area Regional Officer (ARO) with the Nature Conservancy Council (NCC), based in Worcestershire at the time. David Harding of the University of Wolverhampton took up the challenge and explored a scattering of woodlands between the late 1970s and early 1990s ranging from Malvern Hills in the south to just north of Wyre Forest. He found Land Caddis in many of them so outlining their distribution in Britain. Working with students at Wolverhampton University he undertook detailed studies of the larvae in Chaddesley Wood and Shrawley Wood. Head measurements showed they passed through five instars before pupating (07). Regular sampling showed they were most abundant in Shrawley Wood during November and December (08) declining during the next six months or so although there was considerable variation between years. He suggested larvae cease feeding, close the rear opening of the case and pupate in late summer and early autumn. The adults emerge in October although Harding did not study the adult stages.



07. Head width frequency in larval Land Caddis *Enoicyla pusilla* sampled in Shrawley Wood by David Harding (1998). The diagram indicatess that the larvae pass through five instars. There is some overlap between the 4th and 5th instars possibly showing sexual dimorphism. Graph modified from Harding's paper.



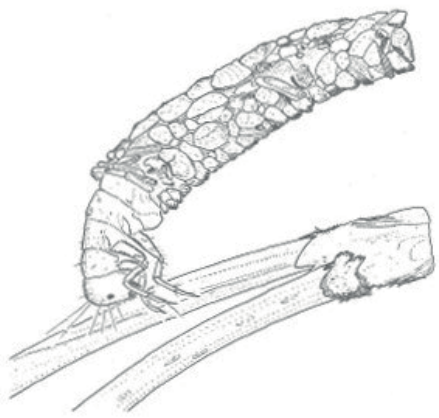
08. Harding undertook standardised counts of larvae for five years near five Small-leave Lime trees in Shrawley Wood using a 0.025 m² quadrat placed at 0cm, 50cm and 100cm from the tree base. This showed that larvae were usually most abundant in December with numbers declining to June. The reasons for the decline are not known but may relate of shortage of food or possibly desiccation in dry weather or drowning if there are very wet conditions.



09. David Harding. Picture provided by his son Tom Harding and daughter Sarah Andrews.

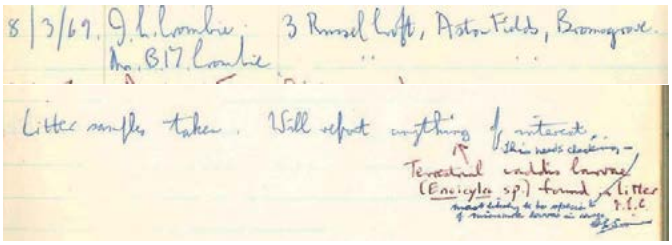


10. David Harding's poster used in his searches for land Caddis records. Provided by his son Tom and daughter Sarah Andrews



11. David Harding's drawing of Land Caddis larva provided by his son Tom and daughter Sarah Andrews.

In addition to David Harding's searches there are a few other records 1968-1980. I. Crombie (1985) found them in Monkwood 1968 and 1970 and at the Knapp & Papermill Worcestershire Wildlife Trust Reserve near Alfrick in 1969 noting his observation in the Visitors' Book.



12. I. Crombie's record of Land Caddis *Enoicyla pusilla* at the Knapp & Papermill wildlife reserve at Alfrick. The tiny writing comment by Gordon Simmons doubts the validity and suggests a case bearing moth. Simmons was an excellent naturalist who also worked in Shrawley Wood in the 1960s with students. He must have been unaware of Crombie's status as an excellent entomologist. Simmons, surprisingly, did not find Land Caddis at Shrawley Wood.

Mycologist M.C. Clarke, noted for his searches on his hands and knees in ditches and vegetation litter for microfungi, found them at Chaddesley Wood in 1973 and 1974, at Astley Mill and Southstone Rock in 1980 and at Hampton Lovett in 1982. Interestingly most of his records are from mats of grass and bramble and not from woodland leaf litter. John Day (1985) gathered together various reports from the 1980s and amongst them was one from Eyemoor Wood by Brett Westwood 1983.

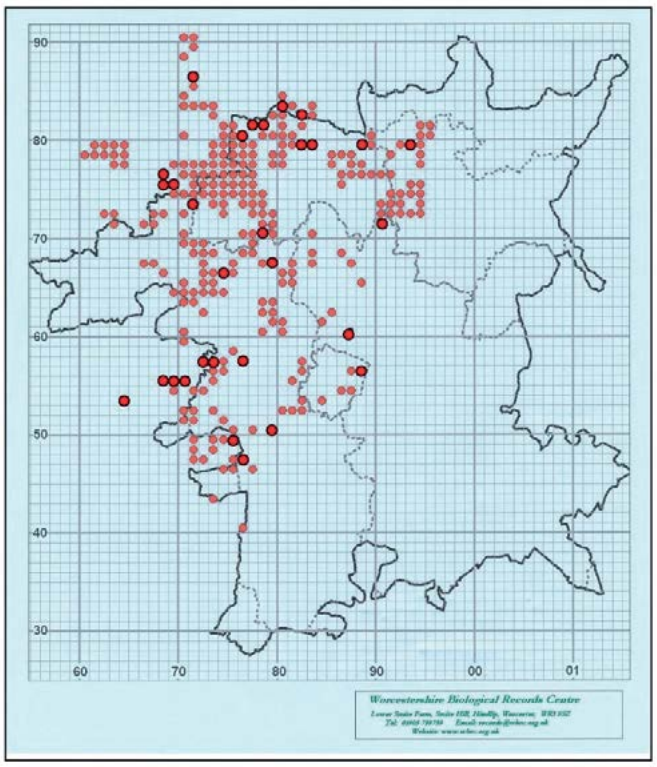
Many Land Caddis larvae were seen in both Shrawley and Chaddesley Woods during David Harding's studies from 1977 onwards for 20 years. According to a labelled photograph in my collection I first found Land Caddis larval cases in Shrawley Wood in June 1983 although unfortunately I do not remember the occasion or why I was there. I suspect I was following up a suggestion by Noel King who thought, correctly, that I would be interested to see the lime wood and its birds and he was well aware of David Harding's work. 1983 was the year before the start of a ten year study of birds in Shrawley Wood (see pp. 375-407).



13. The first land caddis the author of this chapter found in Shrawley Wood. Scanned from an old photo-transparency. G/H.Green

After a lapse, recording increased in the late 1990s possibly stimulated by an article in *Antenna* by David Harding (1995) and another in *Worcestershire Record* (Green 1997). Both authors also made many verbal and written requests for records. Mike Taylor recorded them as 'common' in Shrawley Wood in 1998 and he made extensive searches in Wyre Forest in 1997 and found Land Caddis throughout the Forest.

Starting in 1997 Green and Westwood set out to map Land Caddis distribution based on 1×1 km squares of the national grid. They searched many woodlands and other sites summarising their findings in a review paper in *British Wildlife* in 2005 (Green & Westwood 2005a). These searches have continued to the present day and are still on-going. From all the records available the national distribution based on all records up to August 2021 is shown in the map (11). There have been a few reports of possible Land Caddis elsewhere but so far all have been misidentifications, usually of clothes moth cases or of moths: bagworms and case-bearers *Luffia* spp., *Coleophora* spp. or *Psyche* spp..



14. National distribution of Land Caddis *Enoicyla pusilla*. The red dots indicate one or more records in a monad (1×1 km square of the National Grid). The map shows the county of Worcestershire and parts of neighbouring counties Herefordshire to the west and Shropshire and Staffordshire to the north-west and north. Map by Worcestershire Biological Records Centre.

Despite the modern studies of larvae and many successful searches for them there were no records of flying males or flightless females for many years after Fletcher's records. His specimen labels indicated he had seen them in October and this led to a plan to search for them on 14 October 2005 in Chaddesley Woods. Experts gathered, including Ian Wallace, the national recorder for Trichoptera. Flying males were soon found and careful searches of oak leaf litter revealed several flightless females (15 and 16). Flying males were found in Wyre Forest the following day and since then both sexes have been found in most years in both these woodlands whenever searches have been made at the right time of year. In 2005 we thought these were the first adults to be recorded since Fletcher's day but we then heard that Graham Vick had kept larvae in captivity and hatched two females and some males in 1988. David Harding also recollected he has seen males in 1977 and 1978. After our review article was published Peter Hiley emailed telling us that while researching for his PhD in 1975 he had visited Wyre, collected larvae of Land Caddis and the successfully reared the adult males and females. This last appears to be the actual first record of adults since Fletcher's time (Green & Westwood 2005b)

To date there have been no searches for them in Shrawley Wood in October or November.

Males and females usually emerge from their larval cases in October or November though precise dates are dependent on humidity and

temperature. Emergence takes place by day or night. The flightless females station themselves in prominent places, such as tufts of moss, and laboratory experiments suggest that they release a pheromone to lure males. Mating is brief and takes place with one or several males. The eggs are soon laid in an amber-coloured gelatinous mass. In Worcester in 1868 Fletcher observed a female laying her eggs on mossy tree trunks close to the ground and in France Kelner-Pillault (1960) observed laying at the tip of a moss leaf. Once laid, the egg-mass swells, and the females contract noticeably to thin shadows of their former selves! (Green & Westwood 2005b, Westwood *et al* 2015)

Further evidence of possible pheromone attraction was seen in Wyre Forest in October in both 2011 and 2012. Males were generally hard to find but in one spot several males were apparently reluctant to leave a small area, flying short distances between leaves or other low vegetation no more than 30cm above the ground. On both occasions careful parting on the leaf litter revealed a female. On 18th October 2012 while measuring an ancient oak near Astley Mill 20-30 adult Land Caddis males were seen flying close to a bed of oak and hazel leaf litter. An immediate careful search in the litter revealed a mating pair (17). The pair soon parted and the female mated with a second male for a short time before crawling into the litter. The males moved away – perhaps she had 'switched off' pheromone production. (Green & Westwood 2012).



15. Male Land Caddis *Enoicyla pusilla* .G. H. Green.



16. Land Caddis *Enoicyla pusilla*. Rosemary Winnall.



17. Land Caddis *Enoicyla pusilla* mating pair. Astley Mill 20 October 2012 G. H. Green

In Europe Land Caddis occur in very large numbers in some woodlands and play an important part in the breakdown of leaf litter (Boer 2015). They have also been reported from damp meadows (Hans-Joachim Flügel und Rolf Angersbach.2003) and other probably old undisturbed habitats. Kemp and Vick (see Green and Westwood 2005b) carried out counts along a transect in Wyre Forest running from woodland and across grassland and found Land Caddis cases in both habitats. Other searches in Worcestershire have found them in habitats outside woodland which have been undisturbed for a long time – 'ancient habitats'.

Why are land caddis only found in west Worcestershire and in the borders of neighbouring counties in the British Isles? David Harding (1997) pointed out that they could not have survived the Ice Ages so are not a relict population and could have invaded what is now the British Isles naturally from Europe via a post-glacial land bridge. Given time many flightless small invertebrates spread across the country following the retreat of ice age conditions including species with flightless females such as the Winter Moth *Operophtera brumata*. If so why are they apparently absent from many suitable woodland habitats such as the New Forest? Harding speculated they had been imported from Europe by human activities possibly in leaf litter or attached to the roots of small trees brought in for planting in the Worcestershire area.

One can alternatively speculate that the original Land Caddis population was wiped out over most of Britain by unusual weather that did not affect the west Worcestershire area. The larvae require a humidity of between 70% and 100% and appear to be prone to either drying out or drowning. Whitehead (2007) observed them climbing vegetation to drink from rain on plants on the well-drained Malvern Hills enabling survival and the larvae have often been reported climbing low vegetation in woodland habitats to, apparently, escape water-logging and returning to ground level as conditions became less saturated with water. One can speculate that prolonged periods of either very wet or very dry conditions could possibly decimate populations.

Conclusion

This chapter outlines the history and natural history of Land Caddis *Enoicyla pusilla* and the unusual national distribution which is on present evidence restricted to parts of west and north-west Worcestershire and the borders of adjacent counties. Important discoveries were made in Shrawley Wood

Parasitoids of Land Caddis

Mark R. Shaw

Two parasitoid species have been recorded from *E. pusilla*, but both records are doubtful, and in one case (the first detailed below) practically certainly in error.

Choeras gielisi (van Achterberg) (Hymenoptera: Braconidae, Microgastrinae) was described (van Achterberg, 2002) from a single female reared from a quantity of organic debris (moss, algae and lichens) that had accumulated in a semi-domestic situation at a site in the Netherlands within which *E. pusilla* larvae were present, and it was presumed that this was the host. However, no host remains were isolated, and the record was subsequently viewed with suspicion because all reliable rearing records of Microgastrinae have been from the "higher" Lepidoptera (Heteroneura) (Fernandez-Triana et al., 2020). Efforts to replicate the rearing under more controlled conditions from a large number of E. pusilla larvae collected in the Netherlands failed (M. R. Shaw, unpublished), and eventually it became clear that the real host of *C. gielisi* is the case-bearing psychid moth *Luffia lapidella* (Goeze), which presumably had also been present in the debris from which *C. gielisi* had been reared. This was unravelled by Shaw (2021), and the rearing record of *C. gielisi* from *E. pusilla* should now be discounted.

The second example is more difficult to dismiss, because the parasitoid concerned belongs to a subfamily with a wide host repertoire overall, concerning several orders of holometabolous insects besides Lepidoptera. However, the single specimen of *Diadegma trichopterorum* Horstmann (Hymenoptera: Ichneumonidae, Campopleginae) described by Horstmann (2004), and supposed by him to be from *E. pusilla*, was again reared from a mixed substrate (in fact the very same collection of organic detritus that yielded *C. gielisi*) without isolation of host remains, and again the rearing has not been repeated under controlled conditions involving a large sample of *E. pusilla* from the Netherlands (M. R. Shaw, unpublished). The parasitoid species concerned is very similar to another *Diadegma* species (cf. Horstmann, 2004) with hosts typically found in organic detritus, and its identity warrants further investigation. For now, the presumption that *E. pusilla* is genuinely a host of a *Diadegma* species should be treated with caution.

The above two parasitoid species would develop inside the body of a still-living host, which is an exacting environment generally corelated with a high degree of specialisation by the parasitoid. However, there are many other parasitoids that kill the host at the time of oviposition, and it would not be surprising if some of these often much less specialised species could use *E. pusilla* – probably developing outside the body of the host but in concealment within its case. Any immobile cases found in the field would be worth collecting as they might contain this category of parasitoid; members of several groups of Chalcidoidea and Ichneumonidae could conceivably do this, whether facultatively or as a specialist.

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Dedication

This chapter is dedicated to John Edward Fletcher who discovered Land Caddis in Britain.

Obituary.

John Edward Fletcher was born at Newtown, Worcester, on August 13th. 1836, and died at St. John's, Worcester, on February 24th. 1902. He is said to have commenced his entomological studies at the age of 15, and he continued them practically until his death. But severe internal injuries sustained some ten years ago had debarred him from out-door work. He was in comparatively humble circumstances, following the occupation of a working glover; but he was a man of rare intelligence, and, as his letters showed, of considerable education, albeit, probably largely sell-taught. Retiring and reserved in the extreme, he did not mix with others of similar tastes, even in his own locality, and his doings and acquirements were more known to the wider circle of British entomologists at large than at home. He amassed a considerable library, and he seldom sought extraneous aid in determining his captures until he had exhausted the works at his disposal: and he was seldom in error in supposing that this or that insect had not previously been recorded as British. His additions to the British Fauna were numerous and notable. There is scarcely an Order in which he did not make discoveries; in some circumstances perfectly new, and which were named after him. Not the least important amongst his additions was the remarkable terrestrial Trichopteron *Enoicyla pusilla,* Burm., which probably remains to be re-discovered. His collections of British insects of all Orders was extensive, and the local collection is very full, prepared with the greatest care and determined with great accuracy. We are delighted to hear that they are likely to be acquired by his native city, to which they would be invaluable. He did not publish much, but notes from his pen are dispersed over a long series of vols. of this Magazine; and he was practically responsible for the whole of the "Insecta" for Worcestershire in the new Victoria County series, he also left much matter in MS. Fletcher was of a type of Naturalist spread sparingly over the country; would there were more like him!

The information as to his early history, &c., has been obtained from his widow, through the kind intermediary of Mr. W.H. Edwards, of the Worcester Museum who we believe met him personally only once, some twenty years ago. Mt Fletcher joined the Entomological Society of London so long ago as 1865, but resigned last year.
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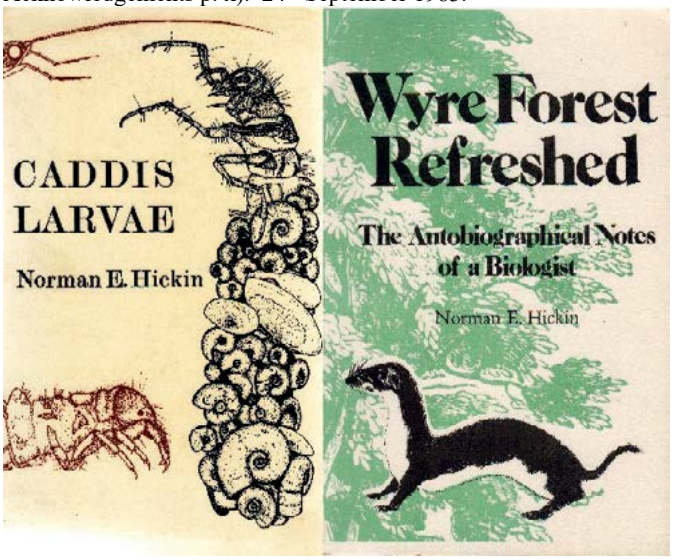
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Tailpiece

Norman Hickin stimulated modern searches for Land Caddis through his books.



Norman Hickin (left) with Fred Fincher.(see chapter Acknowledgements p. x). 24th September 1983.



The Fungi of Shrawley Wood

John Bingham



01 *Hypholoma fasciculare* within Shrawley Wood small-leaved lime coppice.

Introduction

Fungi play a vitally important role in the functioning of woodland ecosystems. Not only do they play a key role in decomposition of organic matter, but also provide a mutualistic role with trees and other vascular plants allowing uptake of key minerals and the transfer of nutrients from the soil to roots. Fungi are also an important source of nourishment for a variety of insects and other animals. The process of deadwood formation is key for many saproxylic species that in turn provide a food source for other species.

Shrawley Wood

Shrawley Wood has a long history of mycological recording dating back as far as 1837 with a record of *Lactarius piperatus* by an unknown recorder. (Day 2016). The bulk of the mycological records were provided by Carleton Rea *et al*. who recorded the site in the early part of the 20th Century. Rea was a leading mycologist in his field, co-founder of the British Mycological Society and editor of the journal. He was also author of **British Basidiomycetae** (Rea 1922) that became the standard reference work at the time. Records for Shrawley Wood concentrate on the macro fungi, as does this chapter as relatively little is known about micro fungi, typically rusts and moulds, although Shrawley appears to have a rich mycota of these smaller fungi.

How diverse Shrawley Wood is for fungi is difficult to determine as various factors have to be considered. Compared to botanical recording mycological records are more limited as field mycologists are far fewer on the ground than botanists. Records are therefore scarce and fungi are by their nature very unpredictable in their seasonal appearance. Whilst a comprehensive list of vascular plants for a location can be recorded in a year, or over a few years, fungi by comparison are elusive species making such lists near impossible to obtain. Some species can be regular in their fruiting appearance in all but the worst seasons, but many others appear once in five or ten years when conditions are optimal for them. To compound matters some species only appear over a longer time frame, perhaps once in 50 years and no single weather pattern suits all species, so a fungal mycota fails to reach any cumulative plateau in records as more species are recorded every year (Tofts & Orton 1998). It is not unusual to expect even a well-documented woodland to have a 10% increase of 'new' fungal species every year for a period of 30 or 40 years. Given the ephemeral nature of some species which last just a few days or less, the chance of finding a localised species in a large woodland can be near impossible or simply down to good luck! It is difficult to estimate the number of fungal species living in the UK since there is no comprehensive checklist. The Basidiomycota has been covered (Legon & Henrici 2005) but does not include the Ascomycetes. The best estimate for the UK is 12,000 species and for an individual site a factor of seven times more fungi than vascular plants is normally considered a good guide. (Spooner & Roberts 2005).

The habitat provided by the woodland also influences the production of sporophores, the stage when the mycelium of a fungus is able to produce spores: this is known as fruiting or fungal fruiting. Typically fungi do not compete very successfully with a dense cover of vascular plants but thrive under an open ground layer dominated by bare leaf litter, light bryophyte cover or scattered vernal flowering plants such as Bluebells *Hyacinthoides non-scripta*. Coppiced woodlands tend not to be favourable habitats due to the competition with vascular plants in the early part of the coppice cycle, but mature or over-stood coppice will suppress vascular plants by heavy shade and provides a more favourable fruiting environment. However, the increase in ground temperature in the open phase of coppice may induce mycelium growth essential for later fruiting. When stored coppice is thinned the increased light levels will often promote plant growth, in particular at Shrawley dense *Rubus fruticosu*s agg., that competes with fungi reducing the mycota present, or at least the ability to produce fruit-bodies. This cyclic effect will mean locations for prime fungal fruiting areas may move over time, dependent on the management or other natural events within the woodland. Other factors include the diversity of the tree and shrub species, the amount and quality of dying or dead trees, the amount of fallen deadwood and the succession of such habitats over time. In addition to this many other environmental parameters such as soils, aspect, local microclimate, and rainfall patterns make every site unique.

Fungal Importance
Some documentation has been undertaken by Plantlife with the publication of *Important Fungus Areas* (Evans *et al* 2001) applying criteria to sites with recorded fungi to assess the best known fungal locations. The top **Criterion A** sites are based on the number of significant species of fungi present and those listed on the provisional Red Data List (Ing 1992), UK Biodiversity list or Schedule 8 and the European Red Data List. **Criterion B** sites are those with an exceptionally rich and well recorded mycota in the UK context with at least 500 species. Shrawley Wood was originally listed as **Criterion D**: 'considered to be important but for which further information is needed'. Using the most recent information collated by John Day (2016) it would now, with over 1,130 species, meet **Criterion A**.

Recently the Joint Nature Conservation Committee (JNCC) published Guidelines for the Selection of SSSIs that included Non-Lichenised Fungi (Bosanquet et al 2018). The fungal guideline indicates the problems of selection based on the erratic and unpredictable appearance of fruit-bodies and their short duration. Information on *Hygrocybe* species as indicators of grassland is well documented and offers some information for site selection with 19 *Hygrocybe* species needed from the table provided for a site to reach SSSI status. Presently 15 species have been recorded from Shrawley, albeit most are not recent records. Also, many of these will be found outside the woodland within the grassland contained in the parkland where recent recording has been quite limited, so they are likely to be under-represented. Similar guidance on oakwood saprotrophs (oak deadwood fungi) was provided in the Guidelines but Shrawley would just fall short to qualify for SSSI status. Given its coppice history and lime dominance, lacking suitable old oak veteran trees, it is not really the most suitable of woodlands to qualify. Fungi associated with Atlantic woodland in general are unfortunately given a somewhat vague assessment for potential SSSI status. The report states: 'The fungi of montane heath and Atlantic woodland habitats lack equivalent methods of evaluation and therefore selection of their sites will depend on available evidence and expert judgement'.

Very few woodlands locally have been recorded to any extent and only Wyre Forest, 10 km to the north on the Worcestershire-Shropshire borders can be compared to Shrawley. Although much larger in extent at around 2,500 ha and with a more diverse mycota of over 2,200 species, it has the necessary number of rare species to qualify as a Non-Lichenised Fungi SSSI. Several Herefordshire woodlands have been recorded by the Herefordshire Fungus Survey Group and meet **Criterion A**, but none have more than 750 species (Plantlife 2006). At a National scale there are several well recorded sites but direct comparison is difficult as habitats and size differ considerably to that of Shrawley Wood. For example, the New Forest has an exceptional mycota with 2,600 species, but few actual named locations within the Forest have over 500 species recorded (Newton 2010). Epping Forest has 1,600 species, Esher Common, Surrey has over 3,300 species and Slapton Ley, Devon has over 2,500. Any site, especially a small woodland, with over 500 species would be considered to be well recorded. (Plantlife 2005). Ainsworth (2002) states that no sites have been subjected to sufficient survey intensity by sufficient specialists over a sufficient timescale (which seems unlikely to be less than a decade) to yield a confident estimate of the number of macro fungal species present. Perhaps a benchmark of 1,000 species or over should be considered a 'good site' for fungi.

In summary, for a small woodland, even including the area of adjacent parkland with its grassland, Shrawley Wood has a rich mycota comparable in species richness to the best found in any similar wooded site in the UK. This is partly a result of a long tradition of recording and also of having the attention of taxonomic experts such as Carleton Rea who recorded in the woodland frequently in the early part of the 20th Century. The sandy nature of the soils at Shrawley may provide a somewhat unusual substrate that favours the diversity of fungi, perhaps more so than a heavy clay soil.

The species listed include many uncommon fungi but little is known of the abundance of these species within Shrawley Wood. Often a fungus will appear just once in 50 years of recording and never be seen again. A good example is *Strobilomyces strobilaceus* which appeared in the 1980s for several years in quite good numbers in one area of woodland but has not been recorded since despite being a large and easily identifiable species. A considerable number of unusual species were recorded in the past, especially by Rea and have not been seen more recently. This could be a result of modification to the woodland composition or management or possibly climatic changes as fungal fruiting patterns have altered over the years. The typical peak fruiting period in late September is now much more extended and often has multiple peaks any time from July to December (Gange *et al* 2017). The other factor is the decline in the number and frequency of expert mycologists visiting the woodland and difficulty in accessing the private parkland. It would appear that Rea (whose identification skills were exceptional) visited Shrawley Wood frequently and considered it a special woodland. This may explain the abundance of fungi recorded during the early part of the 20th Century.

Fungi can be divided into various groups. The larger species can be considered as either decomposers, the saprotrophs, which obtain carbon compounds from the dead tissues, or ectomycorrhizal where partnerships form between living plant roots and fungal hyphae. The growth of both fungus and tree benefit from the mycorrhizal symbiosis (Ainsworth 2002). These latter species are linked more strongly to Ancient Semi-Natural Woodlands and many can be considered indicator species of such habitats. Research is being undertaken to find a pragmatic use of fungal indicator species to provide a conservation value for a woodland site, but to date this is only available for sites dominated by beech where the emphasis is mainly on beechwood saprotrophs rather than ectomycorrhizal species (Ainsworth 2004). Saprotrophic species are more diverse in woodlands that have a long continuous history of deadwood and/or ancient trees present; some indicator species (typically bracket fungi) have now been identified.

Fungi of Shrawley Wood
In 2016 John Day collated all the known fungal records for Shrawley Wood in an Excel Spreadsheet, and over 5,200 individual records were discovered consisting of some 1,130 species. (Day 2016). Records, especially those made in the early 19th Century, may include the adjacent grassland and parkland as recorders did not always give precise locations but merely refer to 'Shrawley Wood' as the site. Analysis of these database records was undertaken to produce this summary of the species diversity and ecology of the Mycota.

The ectomycorrhizal fungi of ShrawleyWood total 235 species with associations spread across the trees and shrubs present in the wood. Lime, *Tilia*, has few ectomycorrhizal species, perhaps no more than 40 species and only a few fungi of those recorded can be considered to have any ectomycorrhizal association with the *Tilia* trees. The agaric *Russula praetervisa* is considered a typical associate but has not been recorded at Shrawley. It does not appear in many field guides and its pale cap is similar to *Russula amoenolens* or *R. foetens* both recorded at Shrawley, so perhaps it remains hidden under a misidentification. Arbuscular mycorrhizal species are more frequent with *Tilia* but do not produce sporophores, the fungus fruiting bodies that can be recorded by field mycologists, but instead use *glomeromycetes* that are not visible.

The coricioid fungus *Peniophora rufomarginata* occurring on dead branches is considered a *Tilia* specialist but has yet to be recorded at Shrawley Wood. Several hypomycetes form dark-brown felty colonies on dead branches. They are difficult to identify and include *Corynespora olivacea* and *Exosporium tiliae.* (Spooner and Roberts

2005). Neither are recorded from Shrawley, perhaps more an indication of the recorders' knowledge than the absence of the fungi. Pigott (1991) lists the fungal species considered to have possible ectomycorrhizal associations with *Tilia*. He includes the very rare *Cenococcum geophilum* as a possible ectomycorrhizal on *Tilia* seedlings, but it has not yet been recorded at Shrawley. Many of the hypogeous species listed are rare, or at least rarely recorded and typically associated with *Fagus* or *Quercus* on more calcareous soils overlying chalk or limestone. None are known from Shrawley Wood. The hypogeous ascomycetes listed are: *Elaphomyces muricatus, Lactarius stephensii, Balsamia fragiformis, Glomus macrocarpum, Hymenogaster arenarius, H. griseus, H. olivaceus, H. sulcatus, H. tener, Pachyphlodes citrina, Tuber borchii, T. brumale, T. dryophilum, Genea klotzschii* and *Hysterangium clathroides*. *Hymenogaster sulcatus* is perhaps the more interesting record as it appears to be more strongly associated with *Tilia* species. Not on the list is *Elaphomyces granulatus* recorded at Shrawley Wood by Rea in 1909, a species associated with both broadleaf and coniferous trees, and *Hysterangium coriaceum*. Shrawley has the only British record for this species, made by Rea in May 1912 and 1931, but no indication of any tree association is given.

Pigott (1991) also lists agarics associated with *Tilia,* many of these are recorded from the wood but are also found growing in association with other trees, *Quercus sp.* especially. They are; *Leccinum aurantiacum (= L. quercinum), Russula cyanoxantha, R. foetens, R. grisea, R. pectinata, R. risigallina, R. nigricans, R. parazurea, R. ochroleuca, R. sororia, Amanita rubescens, Inocybe* sp. *Cantharellus cibarius* and *Cortinarius* sp. Species listed but not yet found at Shrawley are *Hebeloma versipelle* (a rare species typically associated with *Salix*), *Neoboletus pseudosulphureus,* (RDB listed), *Suillellus queletii* and *Russula cicatricata.* Of note is *Russula pectinata,* an uncommon species often associated with *Tilia* sp. recorded by Rea in 1931, the only record for the wood. Many of the *Russula* species may be found in the *Tilia* dominated woodland but can be associated with other tree species.



02. *Russula ochroleuca*

The tree species *Quercus, Betula* and *Corylus* have the most associated ectomycorrhizal fungi noted from Shrawley. The presence of more *Quercus* in the woodland in the past is indicated by many species often associated with this tree; 57 ectomycorrhizal species are known. Those common at Shrawley include *Amanita phalloides, Amanita citrina* - a possible *Tilia* associate, *Boletus pulverulentus, Hebeloma crustuliniforme, Lactarius quietus, L. subumbonatus, Russula sororia* and *R. vesca. Cantharellus cibarius* is typical under *Quercus* but appears also to be associated with *Tilia* at Shrawley, although it is difficult to be certain. *Cantharellus cinereus* and *Craterellus cornucopioides* also have a similar tendency to occur in the *Tilia* coppice areas but this may more to be due to reduced competition of vascular plants.

Saprotrophic species associated with *Quercus* include *Bulgaria inquinans, Chlorociboria aeruginascens, Gymnopus (Collybia) fusipes, Daedalea quercina, Fistulina hepatica, Hymenochaete rubiginosa* and *Mycena inclinata.*

In more recent years fungi associated with *Betula* and *Corylus* appear to have increased in the records for the woodland. *Betula* itself may have increased by regenerating in gaps in the canopy after thinning or clear felling of *Quercus* during the c.1920-40 inter-war years. The common species *Paxillus involutus* has more recent records than in the past possibly because it is a species easily identified by less expert recorders. But it may also have become more frequent in recent years due to an increase in *Betula. Betula* has numerous ectomycorrhizal species: those commonly found at Shrawley include *Amanita crocea, A. muscaria, Cortinarius hemitrichus, Lactarius glyciosmus, L. turpis, Leccinum scabrum, Russula betularum and Tricholoma fulvum*. Saprotrophic species are less common but *Piptoporus betulinus* is typical on old *Betula* trunks. *Corylus* provides *Lactarius pyrogalus* as a common ectomycorrhizal species with *Hymenochaete corrugata* and *Hypoxylon fuscum* as common saprophytes.

Fungi can be divided into two main groups that produce fruiting bodies that allow them to be recorded in the field. These two groups are far from the complete picture of the fungal mycota but are the easiest to record and those traditionally recorded on Fungus Forays. The first group considered are the more familiar Basidomycetes (Agarics and Boleti) whilst the second group, the Ascomycetes, consist of those species with the spore layer on the surface. They include the *Pezizales* such as cup fungi, *Helvella* and Truffles, and those with the spore surface sunk into the surface such as *Xylaria* and *Daldinia* species. Many of the Ascomycetes are small inconspicuous fungi species, requiring a hand lens or even microscope to see clearly. For this reason they are under recorded even though they contain many more species than the Basidomycetes.

***Cortinarius* species.**

Of particular interest is the genus *Cortinarius* with 61 species listed in the records for Shrawley Wood. *Cortinarius* species are strongly ectomycorrhizal and therefore linked to ancient woodland sites with species often dependent on one particular type of tree. *Cortinarius violaceus* is a *Betula* associate and UK Red Data Listed (RDL), Endangered, and is significantly rare in European terms. It has historical populations within the Welsh Marches area and is found in several woods in Herefordshire/Shropshire, but the stronghold for the species is located in Scotland. Rea recorded it in 1909 but no other records have been made, though it does appear in significant numbers in the Wyre Forest in most years so may occur somewhere in Shrawley Wood awaiting rediscovery. Rea's list contains some 44 species not recorded since his time (1890-1940) with only 14 species recorded since. This anomaly is difficult to explain but suggests either climatic conditions and/or the woodland structure has become less suitable for *Cortinarius* species or there has been a lack of recording or expertise since 1940. Rea was particularly expert in the larger agarics and *Cortinarius* was certainly one of his specialist genera.

There is some doubt about the species identified by Rea as nomenclature has altered and some species have been merged or re-classified. Nevertheless, it is hard to imagine that so many key species have been ignored or not seen since 1940. Perhaps the answer lies between the various options and may be resolved by a more intensive search for *Cortinarius* at Shrawley. The author's own observations suggest that *Cortinarius* along with many other uncommon fungi have become scarcer over recent times across a range of woodland habitats. Nitrate deposition, phosphate and acid rain have been suggested as causes for this reduction in fungal fruiting by limiting mycelium growth. The *Cortinarius* records from Shrawley do seem to indicate that this may be true. Saprotrophic

species appear to be less affected by this decline in species over time and many more of those recorded by Rea are still present today. 44 species of *Cortinarius* recorded by Rea have not been recorded post 1940, but on closer examination using the checklist (Legon & Henrici 2005) 14 species are best described as doubtful in Britain or are *nomen dubium* and therefore cannot be accepted as correct records (Table1). This leaves 30 species not recorded post 1940 which are summarised. (Table 2). This may appear to be a considerable number but *Cortinarius* is a difficult genus to identify and classify, so taking into account the nomenclature changes, perhaps it is not unexpected to find so many incorrect or doubtful records. Most other groups such as *Lactarius* and *Russula* are more stable in their classification and less affected, so the number of incorrect or doubtful records should be far lower.

Table 1 Rea's 14 *Cortinarius* species considered doubtful in Britain or *nomen dubium*.

Species	Status	Notes
Cortinarius argentatus = C. diosmus	*nomen dubium*	
Cortinarius castaneus	*nomen dubium*	unknown
Cortinarius dolabratus	*nomen dubium*	
Cortinarius macropus	not authentically UK	
Cortinarius multiformis		Unknown
Cortinarius mussivus		error for *Heboloma* sp.
Cortinarius pluvius		Misidentified
Cortinarius quadricolor	*nomen dubium*	
Cortinarius raphanoides		Unknown
Cortinarius rigidus	*nomen dubium*	
Cortinarius subpurpurascens	*nomen dubium*	
Cortinarius talus		doubtful species
Cortinarius turbinatus	*nomen dubium*	
Cortinarius varius		doubtful species

Table 2 Rea's *Cortinarius* species recorded and their principal host trees

Species	Mixed	Deciduous	Conifer	*Quercus*	*Betula*	*Alnus*	*Fagus*
Cortinarius acutus	X						
Cortinarius alboviolaceus		x					
Cortinarius cagei = Cortinarius bicolor					x		
Cortinarius caninus		x					
Cortinarius cinnabarinus							x
Cortinarius cinnamomeus	X						
Cortinarius claricolor	X						
Cortinarius collinitus			x				
Cortinarius cotoneus		x					
Cortinarius flexipes var. flexipes		x					
Cortinarius germanus = cagei					x		
Cortinarius glaucopus							x
Cortinarius helvelloides						X	
Cortinarius hinnuleus				x			
Cortinarius incisus		x					
Cortinarius infractus							x
Cortinarius largus		x					
Cortinarius leucopus =obtusus		x					
Cortinarius limonius			x				
Cortinarius mucifluus	X						
Cortinarius obtusus		x					
Cortinarius paleaceus =flexipes var. flabellus		x					
Cortinarius pholideus					x		
Cortinarius psammocephalus		x					
Cortinarius saturninus		x					
Cortinarius scaurus var. scaurus			x				
Cortinarius tabularis				x			
Cortinarius torvus		x					
Cortinarius violaceus					x		
Cortinarius xanthocephalus							X
Totals	4	12	3	2	4	1	4



03. *Cortinarius violaceus*

Of the 30 species listed in the table 2, 12 are associated with mixed deciduous woodland, and difficult to assign to any one species of tree or shrub. An additional four species are associated with *Betula* and four associated with *Fagus* with two associated with *Quercus*. In mixed woodland (conifer and broadleaf) there are four more species difficult to assign and finally three species associated only with conifer (*Pinus* and *Picea*). (Legon & Henrici 2005). Whilst it is difficult to assign every species to an ectomycorrhizal host, it is clear that a range of broadleaf trees and shrubs, typical of a varied mixed woodland supported Rea's *Cortinarius* species. How large a role *Quercus* played is difficult to ascertain and is open to debate, but many of the deciduous species of fungi could have been associated with it. In the modern woodland *Quercus* is much reduced and in some areas it is all but absent. *Corylus* is also very limited with *Betula* the only species that has managed to remain within the *Tilia*-dominated woodland. Perhaps this is one important factor when considering why these species of fungi are now absent or not recently recorded. *Fagus* as a planted tree is uncommon and its role is less important. There are seven species indicating the presence of conifers with at least three clearly associated, showing how the woodland mycota has changed and is developing. Perhaps one reason why these have not been recorded more recently is that some were typically early successional species and are no longer common since the conifer is now nearly all mature.
Species recorded post 1940, by Bateman, Fincher, Smith. Total 14 species;
Cortinarius anomalus, Cortinarius anthracinus, Cortinarius armillatus, Cortinarius brunneus, Cortinarius caerulescens, Cortinarius decipiens var. decipiens, Cortinarius elatior, Cortinarius hemitrichus, Cortinarius purpurascens, Cortinarius salor, Cortinarius sanguineus, Cortinarius semisanguineus, Cortinarius triumphans, Cortinarius uliginosus.

***Lactarius* species**

The genus *Lactarius* is another strongly ectomycorrhizal group, many of which are ancient woodland indicators, so it is hardly surprising that 33 species have been recorded. As with the genus *Cortinarius* there are considerable differences between the records made by Rea *et al* and those more recently, post 1945. There are some 13 species listed by Rea which are no longer recorded. No doubt some are merely missing or difficult species to identify, but their absence does suggest a real change in the fungal species composition of the woodland, possibly linked to the ectotrophic woody flora. (Table 3). In contrast only three species were not recorded by Rea; *Lactarius acerrimus* in 2005, *L. fluens* in 1960 and *L. obscuratus* in 1962. *L. chrysorrheus* recorded three times by Rea *et al* is a *Quercus* associate and normally common in *Quercus* woodland locally, so its absence since 1921 at Shrawley Wood may suggest a decline in the abundance of *Quercus* present within the woodland.

There are 17 species noted throughout the recording period by both Rea and by recent recorders. These represent the more common species associated with a range of broadleaf trees particularly *Betula* and *Corylus*.



04. *Cortinarius sanguineus*



05. *Lactarius torminosus*



06. *Amanita crocea*

Table 3 *Lactarius* species recorded in Shrawley

Species	Rea et al.	Not Recorded by Rea	Throughout by all
Lactarius acerrimus		x	
Lactarius aurantiacus			x
Lactarius blennius			x
Lactarius camphoratus			x
Lactarius chrysorrheus	x		
Lactarius circellatus			
Lactarius deliciosus	x		
Lactarius fluens		x	
Lactarius fuliginosus			x
Lactarius glyciosmus			x
Lactarius hepaticus			x
Lactarius insulsus	x		
Lactarius lilacinus	x		
Lactarius minimus	x		
Lactarius obscuratus		x	
Lactarius pallidus			x
Lactarius pergamenus	x		
Lactarius piperatus			x
Lactarius pubescens	x		
Lactarius pyrogalus			x
Lactarius quietus			x
Lactarius rufus			x
Lactarius serifluus	x		
Lactarius spinosulus	x		
Lactarius subdulcis			x
Lactarius tabidus			x
Lactarius torminosus			x
Lactarius trivialis	x		
Lactarius turpis			x
Lactarius uvidus	x		
Lactarius vellereus			x
Lactarius vietus			x
Lactarius volemus	x		
Totals	13	3	17

***Amanita*:15 species recorded.**

The genus *Amanita* includes some of our most poisonous species as well as some of the most well-known attractive species such as *A. muscaria*, the Fly Agaric. Recent work has indicated that a more diverse mycota is now to be found in the UK due in part to climatic changes and new, hitherto unrecorded species could well appear at Shrawley. (Kibby 2012).

Of the species present, *Amanita citrina* var. *citrina* and the var. *alba* are both common in the *Tilia* woodland, but also present with a range of broadleaf tree species. *Amanita excelsa* var. *spissa*, *A. vaginata* and more rarely *A. pantherina* are also found occasionally with *Tilia* but have a wide range of associated species. *Amanita muscaria* var. *muscaria, A. fulva and A. rubescens* var. *rubescens* are more common in *Betula* dominated areas but often appear in *Tilia* woodland, perhaps never far from *Betula*. The Deathcap, *Amanita phalloides* occurs in a wide range of habitats but *Quercus* seems the most common associate.

Rea recorded three species that have not been seen recently (post 1921) *Amanita ceciliae, A. nitida and A. porphyria*, whilst *Amanita verna* was last noted in 1948 by Fincher, but not noted by Rea. Additional species not recorded before are *Amanita crocea* in 1999 abundant in *Betula* areas in 2017 (Bingham *pers. comm*.) and *Amanita submembranacea*, added by 2000 due to recent changes to identification provided in 1988. (Outen 1988).

***Boletus* Species**

There has been considerable revision of this genus in recent years and some species once considered common are now in doubt. (Kibby 2011). Many of the smaller species have been reassigned to *Xerocomellus* and *Xerocomus*. Some species recorded at Shrawley Wood are still common and include *Boletus badius, B. erythropus (Neoboletus luridiformis)*, *B. edulis, B. pulverulentus and B. subtomentosus*. *Boletus chrysenteron,* a once common species, is now renamed as *Xerocomellus chrysenteron* and presents a dilemma as this species has been split. It is possible that many of the former records for *B. chrysenteron* may refer to *Xerocomellus cisalpinus* or even *Boletus truncatus*.



07 *Boletus edulis*

Species not recorded by Rea include the very distinctive *Boletus* (*Caloboletus*) *calopus* in 1995, *Boletus* (*Xerocomellus) pruinatu*s in 1990, *Boletus pulverulentus* in 1995 and *Boletus* (*Xerocomellus*) *porosporus* in 1989. It would appear these may be new species that were either very rare or absent in the past.

Conifer species include *Suillus grevillei*, a common species recorded by Rea in 1909, so clearly *Larix* had been planted at Shrawley by then. Rea also listed *Suillus luteus* in 1909, associated typically with *Pinus,* and *Suillus viscidus* also in 1909 associated with *Larix*. Surprisingly neither have been seen recently. The Plantations on Ancient Woodland Sites policy from Forestry England to revert the woodland back to broadleaf will reduce conifer trees and their associated fungi. It is unlikely that all the coniferous trees will be eradicated, but many of these associated species will be greatly reduced in their abundance.
Several species were only recorded by Rea. *Boletus appendiculatus* recorded in 1921, *B. impolitus* in 1909, *B. reticulatus* 1940 and *B. rubellus* 1921. All are thermophilic species that may have responded in the past to coppicing or a more open, hence warmer woodland, although they appear to be increasing nationally or at least are better recorded. (Ainsworth 2013).
Boletus satanas was recorded in 1909 by Rea and is listed RDL Vulnerable D1. With no other record apart from Rea's it might have been mis-determined for *B. luridiformis*. It is another thermophilous bolete mainly found in central and southern England associated with *Fagus* and *Quercus* on calcareous sites. It was a Priority Biodiversity Action Plan species until 2007.

Strobilomyces strobilaceus is perhaps better known under its former name of *Strobilomyces floccopus*. This is a speciality of Shrawley Wood being recorded regularly from 1872 to 2000 and no doubt into the 21st Century somewhere! It was formerly red-listed as vulnerable but is now listed as Nationally Threatened. A potential ancient woodland indicator species, it is associated with various trees, mainly *Fagus*, also possibly *Tilia* at Shrawley. It tends to favour fruiting in leaf litter in shade. It has a localised distribution in the UK with a particular stronghold in the Welsh Marches/West Midlands area following the Severn Valley corridor into Shropshire. As with most fungi it can become common in good fruiting years and yet go unnoticed for years in poor seasons.
The only *Leccinum* recently recorded is *L. scabrum*, a common species under *Betula*. Rea recorded *Leccinum duriusculum* associated with *Populus,* indicating there may have been more extensive areas of wetter woodland than the present day, and *Leccinum versipelle* in 1909, a *Betula* associated that may be merely overlooked in recent years.

***Inocybe* species.**
The genus *Inocybe* has 18 species noted. They are difficult to identify so recording these fungi is uncertain and they tend to be left to specialist recorders, making any comparison less conclusive. They are strongly mycorrhizal and have generally declined in numbers over recent years. The more distinctive species of *Inocybe geophylla* var. *geophylla* and *I. geophylla* var. *lilacina* are both common in the woodlands often under *Tilia*. *Inocybe asterospora*, *I. napipes* and *I. rimosa* are also generally common. Whilst there appears to be a less diverse mycota today than in the past, identification challenges and nomenclature changes make it hard to derive meaningful data from this genus. Expert knowledge would greatly help in our understanding should anyone wish to take on this task.


08. *Inocybe geophylla*

***Russula* species**.
Russula have 51 species recorded with six species listed as *nomen dubium* or not authentically British which leaves 45 species we can be reasonably confident have been recorded in Shrawley Wood over the years.
Russula species are an important group of ectomycorrhizal fungi and many are restricted to just one species of tree. Several are abundant in broadleaf woodland and typical species found at Shrawley include *Russula aeruginea, R. atropurpurea, R. cyanoxantha, R. densifolia, R. emetica, R. foetens, R. fragilis var. fragilis, R. lutea, R. nigricans, R. ochroleuca, R. rosea and R. vesca*. (See Table 4)
In this genus Rea recorded nine species that do not appear in modern lists: *Russula albonigra* 1909, *R. alutacea* 1909, *R. aurora* 1892, *R. mustelina* 1931 a rare conifer species and of some note. *R. pectinata* in 1931 a species associated often with *Tilia*, but not exclusively. Problems occur as there have been many taxonomic changes since Rea's time. Four species recorded by Rea are now considered *nomen dubium* or not authentically British: *Russula consobrina* 1921, *R. furcata* 1909, *R. galochroa* 1909, and *R. incarnata* 1909. Some species recorded have clearly not been seen since the early part of the 20th century which may represent a real decline, but care is needed in placing too much emphasis on these records. New post 1950 records principally made by Fred Fincher, Diana Bateman and D. Champion have added another 20 species (Table 4). However, *Russula mariae* recorded in 1962 is considered not authentically British, so the figure of 19 new species is correct. Perhaps there is little real change in the species present and differences are more a reflection of recording and identification of the genus. More work is needed to be certain and new field guides are now clarifying identification issues (Kibby 2009), so we should be able to assess the changes more accurately.

Table 4 *Russula* species recorded from Shrawley

Species	Rea *et al* pre 1950 Date last record	New post 1950 Date first record	Throughout	Comments
Russula adusta			*	Uncommon
Russula aeruginea			*	Common
Russula albonigra	* 1909			On Pinus
Russula alutacea	* 1909			
Russula amoenolens		* 1999		
Russula atropurpurea			*	Common
Russula aurora	* 1892			
Russula betularum		* 1993		
Russula chloroides			*	Uncommon
Russula claroflava		* 1996		
Russula consobrina	* 1921			Doubtful, possibly *Russula sororia*
Russula cuprea		* 2000		Rare
Russula cyanoxantha			*	Common
Russula delica			*	Common
Russula densifolia			*	Common
Russula emetica			*	Common
Russula exalbicans		* 2009		Rare
Russula fellea			*	Common
Russula foetens			*	Common
Russula fragilis var. *fragilis*			*	Common
Russula fragilis var. *knauthii*		* 1962		
Russula fragilis var. *nivea*	* 1909			*nomen dubium*
Russula furcata	* 1909			*nomen dubium*
Russula galochroa	* 1909			Doubtful, possibly *R. heterophylla*
Russula gracillima		* 1995		
Russula grata		* 1962		
Russula grisea			*	Rare
Russula heterophylla		*1951		Uncommon
Russula incarnata	* 1909			*nomen dubium, R. aurora*
Russula laeta		* 1999		
Russula lutea			*	Common
Russula mariae		* 1962		Not authentically British
Russula mustelina	*1931	*		Rare conifer species
Russula nigricans			*	Common
Russula nitida			*	Rare
Russula ochroleuca			*	Common
Russula olivacea		* 1962		
Russula parazurea		* 1980		
Russula pectinata	* 1931			Often on *Tilia*
Russula puellaris		*2001		
Russula risigallina			*	Rare
Russula rosea			*	Common
Russula sardonia			*	Rare
Russula silvestris		* 1962		
Russula sororia		* 1962		
Russula velenovskyi		* 1987		
Russula vesca			*	Common
Russula veternosa		* 1962		
Russula violeipes		* 1962		
Russula virescens		* 1962		
Russula xerampelina			*	Uncommon

***Tricholoma* 13 species**.
Ectomycorrhizal with various broadleaf trees *Tricholoma* are robust species often associated with *Quercus* or *Fagus*, whilst *Tricholoma fulvum* is a common associate with *Betula* sp. As with many of the mycorrhizal species there appears to be a decline in species richness in Shrawley Wood with 10 species not recorded since 1910 or earlier. These are; *Tricholoma albobrunneum, T. album, T. atrosquamosum var. atrosquamosum, T. spermaticum, T. sejunctum, T. columbetta, T. inamoenum, T. portentosum, T. robustum* and *T. vaccinum*. This group of fungi are not particularly difficult to identify and large and conspicuous enough not to go unseen. This genus seems to follow the trend in species decline as this is not reflected so much in the decomposing saprotrophic species. Rea has a single record for *Armillaria robusta* var. *minor* made in 1909 that is now *Tricholoma robustum* listed as Critically Endangered / B (Red Data List, Evans et al. 2006) a Biodiversity Action Plan (BAP) species. There appears to be no record outside of Scotland for this species, so perhaps it was recorded in error or is an introduced species that has become extinct in the wood.

***Entoloma*: 19 species recorded.**
Many species of *Entoloma* are associated with unimproved grassland as well as woodland habitats. In woodland these saprobic species typically include *E. rhodopolium* and *E. sinuatum*. Most of the species recorded from Shrawley Wood indicate grassland habitat such as rides or glades or more open unimproved grassland. (see *Hygrocybe*).



09 *Entoloma rhodopolium*

***Hygrocybe:* 15 species recorded**.
These species of fungi are commonly referred to as waxcaps, a colourful group of fairly distinctive fungi typical of grassland habitats. Considerable work has been done in using *Hygrocybe* as indicator species of unimproved grasslands together with the species groups of *Clavariaceae, Hygrocybe, Entoloma* and *Geoglossaceae,* referred to in shorthand as CHEG from the names of each group. (Rauld 1985).
Grassland sites have been assessed on the number of *Hygrocybe* (note some names have altered) species present with 4-8 species of local importance, 6-16 of regional importance and over 17 of national importance, but 19 are needed for a site of SSSI quality. *Hygrocybe* are not typical of woodland habitats and require unimproved grasslands, but also occur on more acid sites, rich in bryophytes rather than vascular plants. Some species may be mycorrhizal on bryophytes and do seem to form close associations. With 15 species recorded this makes Shrawley Wood a site of regional importance although many species have few recent records which may reflect limited access to some parts of the site and could prove to be misleading. Some *Hygrocybe* can occur in woodlands or in grassy glades and rides. Species that are more tolerant of nitrate and phosphate tend to occur in wooded grasslands and of those recorded include*, Cuphophyllus virginea var. virginea, H. chlorophana, H. conica, Gliophorus laeta var. laeta.* The first three have most recent records. They are also more tolerant of ranker swards and more enriched soils and often occur in woodland habitats. (Boertmann 2010). Other species are more typical of unimproved grasslands with a short-grazed sward with associated bryophytes. These include *H. punicea, H. coccinea, H. pratensis var. pratensis, H. obrussea* and *H. calyptriformis* var. *calyptriformis* now named *Porpolomopsis calypriformis*. The last species has long been the flagship waxcap and a former BAP species last recorded in 1950. *Hygrocybe fornicata* var. *fornicata* recorded in 1909 is another typical grassland species. An assemblage of 15 species is exceptional and indicates areas of unimproved grassland within the parkland around Wood House or adjacent fields. One small field near Oliver's Mound is known to have over eight species recorded on a single visit in the recent past (Bingham *pers comm).* As recent fungal recording has concentrated within the woodland it is probable that the grassland, especially the parkland, is under-recorded and may yet prove to be of considerable interest. Shrawley had a diverse *Hygrocybe* mycota in the past so if the list is updated and other indicator species can be identified to locations, we may discover areas of grassland outside the main woodland of national importance for CHEG species. (Ainsworth 2004)



10. *Hygrocybe punicea*

Gasteromycetes
The sandy soils at Shrawley appear to favour many Gasteromycetes especially *Lycoperdon* and *Scleroderma*. The abundance of *Scleroderma citrinum* and to a lesser extent *Scleroderma verrucosum* in the *Tilia*-dominated woodland is quite noticeable in some years. *Phallus impudicus* var. *impudicus* also grows well in such areas. The other phalloid, *Mutinus caninus* is often recorded but not so frequently. The smaller *Scleroderma areolatum*, generally more associated with damp woodland has been seen several times.

Eight species of *Lycoperdon* occur with *Lycoperdon perlatum* on soil and *Lycoperdon pyriforme* on wood being the most abundant species. The species of more base rich soils *Lycoperdon echinatum* is found as well as *Lycoperdon nigrescens* which favours more acid soils. Soil type and soil pH values play a key role in the diversity of these species. The similar *Bovista* species include *Bovista nigrescens* as common but *Bovista aestivalis* noted by Rea is a rare species that has a preference for base-rich sandy soils: more records would be useful to confirm its continued presence at Shrawley, most likely within the more open parkland. The *Geastrums* or earthstars are surprisingly scarce with only *Geastrum fimbriatum* recorded in 1927. Sandy soils tend to favour such species so it is somewhat of a mystery why only one species has ever been recorded, especially as this group of fungi are regarded as 'special' attractive species by many mycologists.



11. *Scleroderma citrinum*

The introduction of conifers especially with the Forestry Commission's tenure of the woodland has added species not previously known to the early recorders. The wholesale planting began in the 1930s when a slow increase of conifer ectomycorrhizal species would be expected, the first early succession species, followed by species more associated with mature trees or deadwood. Species such as *Suillus grevillei*, associated with *Larix*, and *Suillus luteus* with *Pinus* appear as early as 1909 recorded by Rea. The uncommon helotiale *Spathularia flavida* found on *Larix* was first noted in 1889, so conifers were starting to alter the mycota well before the main Forestry planting. Fungi on decaying conifer tend to appear later with *Postia stiptica* not appearing on the list until 1952 and *Postia subcaesia* in 1996. The common yellow *Calocera viscosa*, frequent on cut conifer stumps, did not appear on the lists until 1991. Generally, the influence of conifers on the fungal species at Shrawley has not been very extensive: most ectomycorrhizal species appear to have been noted by 1909 or even earlier and only the deadwood species appear later on the lists as would be expected as the trees matured.

Saprotrophic species

As expected in a woodland, the fungal lists are dominated by saprotrophic species that utilise dead wood, branches, twigs and leaf litter. Some 730 species come under this general heading. *Mycena* are very typical of the smaller decomposer fungi with 35 species noted. The majority recorded in the past are still present with only a couple of small, rather insignificant species absent and no doubt these are still present if looked for carefully. The number of species is relatively high for this family suggesting some diligence by recorders over the years who did not ignore the smaller leaf litter species.



12. *Pluteus cervinus*

Many of the old *Tilia* stumps are infected with *Hypholoma fasciculare* var. *fasciculare* and *Coprinellus micaceus* both appearing in some abundance in most years. The similar looking *Kuehneromyces mutabilis* is also a common fungus on many stumps. The agaric *Gymnopilus penetrans* is commonly found on fallen *Tilia* stems but not confined to this wood. The only *Armillaria* recorded is *A. mellea* which suggests this species has been lumped together by recorders as other *Armillaria* species are likely to occur. The large *Pluteus cervinus* is common on old stumps of both *Quercus* and decaying *Tilia* wood and found throughout the wood. *Xylaria hypoxylon* is one of the most commonly encountered species on all manner of deadwood. In some years *Marasmiellus ramealis* becomes abundant on any of the smaller fallen stems and twigs. Equally at home on *Tilia* wood and abundant on twiggy stems is the ascomycete *Nectria cinnabarina*. With smaller fungi on twigs *Crepidotus variabilis* is the commonest member of this group of small gilled, bracket-like fungi, but many similar species are now found to be quite common. *Hygrophoropsis aurantiaca* is confined to the coniferous plantations where it can be frequent. Both of the parasitic *Asterophora* have been noted with *A. lycoperdoides* not seen since 1962 and *A. parasitica* being more frequent, the last being recorded in 2000. Both are still likely to be present on the decaying fruit bodies of *Russula* species.

The leaf litter provides habitat for a host of very typical species including *Rhodocollybia butyracea, Agaricus silvaticus* and *Ampulloclitocybe clavipes*. The *Clitocybe* group are well represented by common species such as *C. fragrans, C. geotropa, C. gibba, C. nebularis, C. odora, C. phyllophila* and *C. prunulus*. Most of the species noted by Rea are still present at Shrawley in contrast to the ectomycorrhizal fungi that show greater difference with far fewer species still present. The large *Clitocybe nebularis* is of interest as it can form large fairy rings within the woodland that become fragmented over time. As with the grassland species *Marasmius oreades,* it may be possible to date the expansion rates in order to assess the age of undisturbed woodland soils, especially if the woodland is secondary, so providing a date of establishment. Many of these old fungal rings are candidates for the oldest living organisms in the woodland. The large family of *Coprinus* and similar species are represented with *Coprinellus disseminatus, Coprinopsis atramentaria* and the base-rich-loving *Coprinopsis picacea.* As many of the smaller species are ephemeral and short lived, they tend not to be recorded, so many more species are likely to be found. This is an area for more expert and focussed recording. *Coprinus comatus* is unusual as there are no early records for this very common and obvious fungus. This may be an oversight by early recorders or an indication of enrichment or disturbance to the woodland in more recent years.



13. *Coprinus comatus*

Arboreal Species

With a history of coppicing, Shrawley lacks many mature or veteran trees and so the diversity of larger arboreal bracket fungi is limited. The associated parkland is more suitable but because this is an ornamental managed park many trees lack deadwood compared to ancient wood pasture. In the woodland *Tilia* does not support many species and most are likely to be saprotrophic resupinate species. The large persistent *Ganoderma* brackets are rarely seen, perhaps to be found most often on large fallen or felled branches of *Quercus.*

Also, on dry fallen wood or old stumps, *Daedalea quercina* appears. The white rot *Pseudoinonotus dryadeus* occurs on some of the more mature *Quercus* but is uncommon, as does the brown rot species *Fistulina hepatica*. The most frequent larger bracket on *Quercus* is *Laetiporus sulphureus* occurring on both tree boles and fallen branches. It can also appear on *Castanea* or *Taxus*. The familiar birch bracket *Fomitoporus betulinus (*formerly *Piptoporus)* is common but often localised depending on the presence of mature or dying *Betula*. The smaller polypore *Polyporus tuberaster* is often found on *Tilia* amongst fallen branches. The wood-rotting *Kuehneromyces mutabilis* can occasionally form large tufted clusters on dead or dying boles of old *Tilia* coppice stools. The majority of brackets are common species occurring on more minor trees and shrub species and often on fallen branches. These include *Daedaleopsis confragosa* on *Salix* stems, *Daldinia concentrica* on fallen branches of *Fraxinus* and the jelly fungus *Auricularia auricula-judae* on *Sambucus.* On deadwood and often occurring in abundance are *Trametes hirsuta, T. versicolor, Stereum hirsutum, S. rugosum* and *Postia caesia*. The wood- rotting resupinate *Bjerkandera adusta* is common on the underside of many fallen branches. The very distinctive and unusual *Grifola frondosa*, a white rot species, occasionally appears at the base of a mature oak. Mature coppiced stems of *Tilia* that touch can often be 'glued' together by the fungus *Hymenochaete corrugata.*



14. *Laetiporus sulphureus*

The uncommon *Phleogena faginea* is a species found on the dead coppice stems of both *Tilia* and *Betula* with fruit bodies formed in rows running up and down the stem. Each consists of a small rounded head and stem. The underlying wood usually smells of fenugreek (curry powder). This species was not recorded until recently so this may reflect the abandonment of regular coppice management. (Bingham 2015).

Ascomycetes

This second major group of fungi are well represented on the lists but more limited to the larger more obvious species. Many of the smaller ascomycete species are yet to be recorded at Shrawley, a role for the more specialist mycologist to undertake. Many species are microscopic and require different recording methods: only the tip of the iceberg is recorded presently. The Truffles and *Helvella* are mycorrhizal and all other species are considered saprotrophic.

Larger Cup Fungi and Helvella

There are few records of *Helvella* species from Shrawley and no records of the vernal *Morchella* species suggesting a lack of early spring recording although *Disciotis venosa* and *Sarcoscypha austriaca var. austriaca* both vernal species are recorded. *Helvella crispa, H. elastica* and *H. lacunosa* are all equally recorded but uncommon. Of the larger cup fungi only *Aleuria aurantia* is recorded frequently over the years, although for unknown reasons this species has become uncommon in more recent times. A total of 10 *Pezizia* species are noted as occasional with *Peziza succosa* and *P. vesiculosa* being the most frequent, both typical of damp woodland. The attractive *Otidea leporina* and *O. onotica* are possibly associated with the *Tilia* woodland, as the appearance of *O. onotica* often deep within the *Tilia* coppice areas suggests a mycorrhizal association. (*Pers. comm.* Bingham). *Leotia lubrica* was not noted until 1962 despite being very distinctive and not an uncommon species in woodlands.



15. *Aleuria aurantia*



16. *Leotia lubrica*

Smaller Species

Of the small discomycetes there are many species likely to be found but due to their near microscopic size few have been recorded from the woodland. Rea recorded a reasonable number of these smaller species but few have been re-discovered recently, there is no reason to suppose that they are absent from the woodland just merely overlooked awaiting a specialist mycologist to resume Rea's work. A summary of some of the species is given but considerable work is needed before a clear understanding of this group becomes known. The more common and larger species of note include the orange fringed disks of *Scutellinia scutellata*, the white-cupped *Humaria hemisphaerica* and *Tarzetta cupularis* growing on bare wet soil. On fallen dead stems and wood *Bisporella citrina* is frequently noted due to the obvious clustering of bright yellow disks. The pink fruitbodies of *Ascocoryne sarcoides* are readily observed growing on larger deadwood and *Chlorociboria aeruginascens* is equally eyecatching as a turquoise staining in fallen wood or from its blue – green fruit-bodies. Cut logs of *Quercus* are often adorned with *Bulgaria inquinans:* this species was not recorded until 1946 by Fincher but is now quite common.

Small discomycetes often recorded are *Hymenoscyphus fructigenus* and *Mollisia cinerea,* but we are looking at a tiny fraction of these smaller species, much dependent on recording. There are 12 records for *Crocicreas cyathoideum var. cyathoideum,* a common but small and overlooked species: nearly all records are attributed to M.C. Clark made during the 1980's and reflect the activities of an expert,

specialist mycologist, who visited the site over a specific time period. Clark did re-find many of Rea's smaller species, but others were missed. Even Rea did not record that many, his main interest was with the larger basidiomycetes. Other species often recorded include *Calloria neglecta* obvious as orange spots on dead stems of *Urtica dioica* and the similar *Nectria cinnabarina*, a very frequent species on small fallen twigs and herbage. On dung *Cheilymenia granulata* is frequent, but not all species appear to be common. *Spathularia flavida* as noted by Rea has not been recorded since 1909 but has perhaps been overlooked as it is more associated with *Larix,* so may be very localised if still present.



17. *Bisporella citrina.*

Many species of inconspicuous 'black spots' on deadwood and branches are within the pyrenomycetous fungi, often overlooked and difficult to correctly identify so records are dependent on recorders' knowledge or interests. Within this group are the more conspicuous and generally recorded species such as *Xylaria hypoxylon* abundant on stumps. Fallen stems of *Fraxinus* and *Acer* will have *Xylaria polymorpha* and *Xylaria longipes,* whilst on *Betula Annulohypoxylon multiforme* is common. On *Fraxinus* stems the round fruitbodies of *Daldinia concentrica* are more obvious. Other species forming spots on fallen *Fagus* wood include *Diatrype disciformis and Hypoxylon fragiforme. Diatrype stigma* produces a black covering over the trunk. Similar dark spots on *Corylus* stems will be *Hypoxylon fuscum.*

Clavnoid species.
Both *Clavulina cinerea* and *C. coralloides* occur under the closed *Tilia* coppice areas, typically on bare or mossy soils. Other species occasionally occur in woodland, but some recorded are likely to be grassland species, more often found within the open parkland or unimproved grassland. Typically, both *Clavulinopsis corniculata* and *C. helvola* are open grassland species. One new woodland species is *Ramaria stricta* recorded first by Bateman in 2004.

The rarest fungus ever recorded from Shrawley must be the coral fungus *Clavicorona pyxidata*, Candelabra Coral, immortalised by a painting by Rea's daughter Violet Rea of a collection made on 20th October 1896 of the Shrawley Wood specimen. It is listed ERDL as Rare and appears to have two or three other known sites in the UK. There is one vague record from Esher, Surrey in 1900s and it was reported doubtfully from East Gloucestershire in 2008 and recorded with certainty at Holton Hall Park, East Suffolk in 2012: this is regarded as the first record for 110 years (Henrici, A. & Mahler, N., 2013). It grows on dead wood, typically logs of broadleaf trees. It has been placed in the genus of *Artomyces*, but (this is) possibly a synonym.

Other rare species recorded in Shrawley Wood
The clavarioid fungus *Clavariadelphus truncatus* was recorded by Rea on soil in woodland on 14th May 1924 from Shrawley Wood. The specimen was placed in the herbarium at Kew (Herb.: K(M)80252). Since then the specimen has been redetermined *as C. pistillaris* on morphological criteria by Spooner & Ainsworth (2014). This species is occasionally reported from Britain but invariably in error for *C. pistillaris* (Buczacki 2012).

The rosette fungus *Cotylidia pannosa* is listed as RDB Endangered (Evans et al. 2006) and a BAP species. Rea recorded it from Shrawley in 1909, the only record. It appears Rea was familiar with this species as *Thelephora sowerbyi* and recorded it at several other sites nationally. It occurs in broadleaf woodland on soil or with bryophytes. Recent records locally are for 1985 from the Wyre Forest on a mossy wooded slope with *Vaccinium*. There are very few records nationally for this species and it appears to have an association with Ancient Semi-Natural Woodland. Rediscovery at Shrawley would be important but information on the exact location does not appear to exist.

Coprinus sterquilinus RDB Vulnerable (Evans et al. 2006). The only Shrawley record is from Rea on 22 September 1921. This species is typically associated with horse manure and/or straw waste, but possibly other dung. It may therefore be an occasional record made when horses were used in forestry operations etc. and is perhaps not likely to be present in more modern times. However, deer or rabbit dung may offer habitat for this typical and not especially distinctive *Coprinus.*

Cortinarius limonius is listed as RDB Near Threatened (Evans et al. 2006). This is a Scottish pinewood species associated with *Pinus sylvestris* recorded by Rea in 1909 but not seen since. It may have been introduced with pine saplings brought from forestry nurseries in Scotland: the other possibility is that it was recorded in error. Scots Pine is uncommon in Shrawley and localised so this species may be overlooked if the original record was correct.

Hygrophorus arbustivus RDB Vulnerable (Evans et al. 2006). Rea's record is of 20 November 1896 and in 1909. He also recorded it with W. B. Allen at Lutwyche Hall, Shropshire in 1925 (British Mycological Society database). It has associations with broadleaf trees especially *Quercus* and *Fagus*, so *Tilia* may also be a possible associated species. It is not an obvious species but when found the dull brownish slimy cap is distinctive. It could be overlooked by recent recorders and is worth looking for in leaf litter.

The distinctive habitat of *Onygena equina* RDB Near Threatened (Evans et al. 2006) is on sheep horn which makes identification easy. Rea recorded it 1909 (presumably on horn) but there are no records since then. Modern farming now limits the likelihood of finding dead sheep in most woodlands unless commoners' rights still occur. This is a species that has declined but deer antler may sometimes be an alternative suitable host.

Polyporus umbellatus was first recorded in 1998 by Bateman and recorded again in 2009. It is listed as Near Threatened (Red Data List, Evans et al. 2006). A parasitic species causing white rot found on the base of *Quercus* or *Fagus* trees. It is often associated with a large buried *Sclerotium*. The fruit-bodies are similar in appearance to the more common species *Grifola frondosa.* It was reported found on buried wood near the base of a *Tilia* coppice. (BMS Checklist).

Psathyrella maculata listed as Vulnerable / D2 (Red Data List, Evans et al. 2006). The only record is that of Munrow in 1952, and no further details appear to exist. This species is saprobic and known from large dead or decayed broadleaved tree stumps. The fruit-bodies are quite distinctive and grow in clusters.

Table 5. Shrawley Wood, The Commonest Recorded Fungi. Top Thirty Species.

Kuehneromyces mutabilis (Schaeff.) Singer & A.H. Sm. 1946
Hypholoma fasciculare var. *fasciculare* (Huds.) P. Kumm. 1871
Piptoporus betulinus (Bull.) P. Karst. 1881
Russula ochroleuca Pers. 1796
Trametes versicolor (L.) Pilát 1939
Laccaria laccata (Scop.) Cooke 1884
Xylaria hypoxylon (L.) Grev. 1824
Coprinellus micaceus (Bull.) Vilgalys, Hopple & Jacq. Johnson 2001
Pluteus cervinus (Schaeff.) P. Kumm. 1871
Phallus impudicus var. *impudicus* L. 1753
Boletus chrysenteron Bull. 1791 (now split into several species)
Stereum hirsutum (Willd.) Gray 1821
Amanita citrina var. *citrina* (Schaeff.) Pers. 1797
Amanita muscaria var. *muscaria* (L.) Pers. 1783
Laccaria amethystina (Huds.) Cooke 1884
Nectria cinnabarina (Tode) Fr. 1849
Mycena galericulata (Scop.) Gray 1821
Paxillus involutus (Batsch) Pers. 1801
Russula cyanoxantha (Schaeff.) Fr. 1863
Clitocybe nebularis (Batsch) P. Kumm. 1871
Lycoperdon perlatum Pers. 1796
Auricularia auricula-judae (Bull.) Wettst. 1897
Gymnopus fusipes (Bull.) Gray 1821
Lactarius turpis (Weinm.) Fr. 1838
Russula rosea Pers. 1796
Craterellus cornucopioides (L.) Pers. 1825
Mycena pura (Pers.) P. Kumm. 1871
Russula atropurpurea (Krombh.) Britzelm. 1893
Tubaria furfuracea (Pers.) Gillet 1874
Amanita rubescens var. r*ubescens* Pers. 1797



18. *Laccaria amethystina*



19. *Coprinellus micaceus* within Shrawley Wood

Summary

The fungi recorded from Shrawley Wood indicate a mixed broadleaf woodland dominated by *Quercus* with *Betula* and *Corylus* also present. *Tilia* spp. have little, if any influence on the fungal mycota having limited mycorrhizal associations, so although the fungal mycota fail to indicate the presence of *Tilia* spp. within the woodland, it does not mean the trees were in any way absent.

The introduction of non-native conifer has added a few species, but numbers are not significant and may decline with conversion to native broadleaf.

The number of species, particularly in the genus *Cortinarius, Russula* and *Lactarius* are impressive for a relatively small woodland. We have experts like Carleton Rea to thank for many of these records based on a tradition of local recording particularly around the early part of the 20th Century. Latterly records have become sparse and this could suggest a decline in species and their abundance, possibly associated with climate change, increased nitrate deposition or changes in management. This is more notable in the mycorrhizal species and less obvious in the saprotrophic species suggesting a greater susceptibility in the former. It is important to maintain fungal recording at Shrawley to assess the changes observed - are these declines real or do they reflect a lack of recent recording?

The indication of a rich *Hygrocybe* element to the grassland associated with the wood and parkland needs to be investigated to discover if this is still important. There is potential here to provide a picture of a woodland's fungal history over some 100 years and assess how it has altered over time and responded to management and environmental changes. In order to achieve this a concerted effort is needed to record throughout the whole woodland and adjacent parkland with sufficient expertise to find and name as many species as possible. Such a project is very dependent on having good fruiting seasons and is likely to need many years of recording effort by more than one individual. Fungal recording is fraught with problems but for a well-studied woodland like Shrawley it should repay the effort in our understanding of the dynamics of woodland fungi.

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Lichens of Shrawley Wood

Trevor Duke

The casual visitor to Shrawley Wood, entering via the main public access opposite the New Inn public house, is unlikely to notice many lichens. This Forestry Commission part of the woodland is dominated by a patchwork of shady lime coppice and conifer plantation and has been ravished by the air pollution of the 19th and 20th centuries. However a more persistent search gradually reveals a growing list, initially of the more common species but also with the occasional glimpse of species that are not so often seen in the midlands, such as the white crusts of *Graphis scripta* or its rarer sister species *Graphis elegans* and *Graphis inustuloides*. At first the occasional isolated half-inch rounded white patches of *Graphis scripta* may be encountered on the lime coppice. As you sink deeper toward the Dick Brook these white patches with their black fruits that resemble some form of random script get much larger until they can cover stems and are joined by the other *Graphis* species. In his write up of the lichens for the British Mycological Society Worcestershire Fungus Foray in 1921 Mr. Knight stated that the Graphidaceae were scarce in all the woods, *Graphis elegans* was seen on only one tree (in Shrawley Wood). Did they look in the wrong places or has there been something of an explosion in the occurrence of the Graphidaceae. I suspect the truth lies somewhere in between.

Photographs of many of the species mentioned in this chapter are on pages at the end of the chapter. They are arranged alphabetically except for two placed at the end: *Collema flaccidum* and *Ochrolechia androgyna. Alyxoria varia* is with the O's from previous name *Opegrapha varia*.

The nature of lichens

Lichens are a diverse group of fungi, linked only by having evolved a very specialist life strategy, living in close association with photosynthesising algae or cyanobacteria (the latter often also referred to as blue-green algae). Although a symbiotic partnership, the lichen morphology is dominated by the fungus which forms not only the outer protective skin of the lichen but also the soft spongy interior in which the photosynthesising partner is nurtured. It is the fungus that largely determines the shape and form of the lichen and taxonomically lichens are regarded as fungi; lichenised fungi.

From this partnership the fungus receives a steady and reliable supply of carbohydrate, manufactured by the alga from the sun's rays. For its part the alga lives in a protective stable environment with water and mineral nutrients laid on. Blue-green algae have the additional ability to fix atmospheric nitrogen, a further benefit for the partnership, especially where accessible nitrogen is scarce. Typical "blue-green" lichens include the greenish black *Collema flaccidum* which is minutely leafy, and gelatinous when wet; found here at its only Worcestershire site on the damp sandstone close to the River Severn flood plain and from a distance looking like flakey black crud. The only previous Worcestershire record was made before 1960. Also blue-greens are the tough looking leafy growths of dog lichen which include *Peltigera membranacea* and *P. hymenina*, very occasionally seen here on tree stumps and rocks.

Thanks to the life strategy of lichens they are able to seek out the harsh environments where more demanding and faster growing plants would struggle. What can be harsher to higher plant growth than the barren conditions of vertical bare rock and bark surfaces where lichens often flourish. Usually their only competitors for such sites are the bryophytes (mosses and liverworts), and, in constantly damp places, algae.

Unlike many plant groups, lichens are rarely seasonal and the same specimen can usually be observed throughout the year, often with little change provided that it is not damaged by snail grazing or other externally controlled factors. Whilst the lichen provides a protective and stable environment for the alga it is nevertheless frugal and the lichen's growth is much slower than in most other organisms. Even the long-lasting fruiting bodies emerge slowly and spores are produced very much more slowly than in related non-lichenised ascomycetes.

The variety of form

The vast majority of lichenised fungi are ascomycetes, typically producing spores from either the discs of simple cup shaped fruiting bodies or alternatively from flask shaped fruits from which the ascospores are released through a central pore. Only a very few lichenised fungi in Britain are basidiomycetes, bearing small delicate toadstool like fruits which tend to be more ephemeral than the fruits of most lichens. There are only two species of basidio-lichen which are likely to be found in Worcestershire of which *Lichenomphalia umbellifera* is recorded for Shrawley. The small tawny coloured toadstools of *L. umbellifera* emerge from small clumps of mat forming algae that are held together by a barely visible weft of fungal hyphae. For more details see note 4 at the end of the species list.

The growth form of lichens is very diverse. Simple crustose lichens have only an upper cortex or skin, the medulla below becoming closely integrated with the substrate. Sometimes this crust is almost swallowed by the substrate and is evident only from the fruiting bodies or a slightly discoloured patch. Although the fungal hyphae may penetrate into the (non living) bark of a tree their presence is benign; they are not parasitic, nor even saprophytic.

The *Lepraria* species are powdery (leprose) lichens with little apparent structure and typically non-fruiting. The differences in morphology and colour are mainly subtle and difficult to distinguish with certainty. For many *Lepraria* species certainty in species identification requires the use of thin layer chromatography to determine the lichen chemistry and as a result often only the more common species are recorded. Common on the more acid bark, especially of the conifers, is *Lepraria incana*, which has a distinctive bluish grey hue. More often on the bark of deciduous trees are *Lepraria finkii* and *L. vouauxii* which are more of a greenish grey and are distinguished by subtle differences in colour and texture.

The thin leafy lichens such as the various *Parmelia* and allied species, which so often clothe tree branches in their delicate grey frills have both an upper and lower cortex. They are attached to the substrate by root-like rhizines on the underside. These rhizines are merely organs of attachment and have none of the functions attributed to plant roots. This allows the leafy lichens to stand proud and flourish, or when rhizines are scattered across most of the lower cortex they may hold it tightly adpressed to the substrate, almost like a crust but peelable. Other leafy lichens such as *Physcia* and allied species are much smaller and more delicate, with narrow lobes. A community of leafy lichens, grey, green, brown and yellow in colour, often form the most conspicuous cover on the trees here, but are also at home on other substrates such as old or nutrient enriched fence rails and posts. The make-up of this community varies with substrate, acidity, nutrient enrichment, pollution and other ecological factors.

In some lichens the leafy structures may be narrow and strap like, as in the tufts of *Ramalina* species. Here these include the common *Ramalina farinacea* which has discrete powdery abrasions (soralia) along its edges. Also *Ramalina fraxinea* which lacks the soralia, but has concolorous disc like fruits along its edges and over the surface generally.

Another form is the rounded grey-green tufts of beard lichen; typified by *Usnea cornuta*. If the thalli are stretched, the cortex breaks revealing a white elasticated cord in the core, a diagnostic feature of *Usnea* species. *Usnea florida* var *hirta* was recorded for ShrawleyWood in the 1821 Flora appendix, see note attached to the species list below.

A clear favourite of many are the *Cladonia* species, which have two parts to their growth form. The primary or basal thallus is of small leaf like squamules, here typically seen growing on decaying stumps or fallen trees. The secondary thallus or podetium grows up from this, bearing the ascomycete fruits, and takes on a variety of forms, such as the familiar pixie cups or alternatively spike like podetia the latter being simple or variously branched and at one time these were collected by modelers to represent bushes.

The history of lichens at Shrawley and the effects of pollution
The earliest published records we have for lichens in Shrawley Wood are listed by John Amphlett and Carleton Rea in their 1909 *Botany of Worcestershire*. This was compiled mainly from the herbarium specimens of two local nineteenth century lichenologists, the Reverend J. H. Thompson and Dr. Holl. Their herbaria were and are currently held in the Worcester City Art Gallery and Museum and merit a critical examination and cataloging. In 1921 Carleton Rea took advantage of a British Mycological Society (BMS) meeting in Worcestershire to update the original Worcestershire lichen list according to the then latest nomenclature and including some new additions, particularly from the BMS foray, which included a visit to Shrawley Wood. The revised lichen list was published in the *Transactions of the Worcestershire Naturalists Club*, as an Appendix to the Worcestershire Flora. It included a mere 27 species for Shrawley, of which 11 have not been recently recorded from the Wood, although most of these are known in the surrounding area and may still be waiting to be re-found at Shrawley. There were no further lichen records for the Wood until Bob Kemp visited several times in 2015/16 followed by myself in 2020/21, bringing the total list up to 116 species.

The limited amount of recent survey work has mainly been undertaken in the northern half of the Wood and it is on this that the present account is based. The large blocks of conifer plantation are of little lichen interest. Most of the remainder is Small-leaved Lime which has been traditionally coppiced, a form of management which does not encourage lichens. Lichens favour long-lived trees with continuity of habitat and are discouraged by the dark conditions under the coppice. Add to this that most of the old standard trees of various deciduous species have been commercially extracted and not replaced and, as if this were not enough, the woods are recovering from the severe effects of pollution.

The nineteenth and early twentieth century lichenologists would have been familiar with the vast amounts of toxic smog produced by the Black Country iron mills, a few short miles to the north. At its height, the pollution would have 'cleansed' most trees of their lichens; the only refuge being those trees somehow shielded from the worst of the polluting winds and their fall-out. Chief amongst the pollutants was sulphur dioxide, not only toxic to most lichens but when dissolved in rain drops or mist it formed acids which transformed tree bark into a substrate no longer palatable to the lichen communities once found there. One lichen did thrive; *Lecanora conizaeoides*, a thick, grey green, granular sorediate crust otherwise known as pollution lichen. It spread rapidly becoming the most common species in polluted areas. It still occurs in Shrawley Wood but is becoming rarer and diminishing.

Other lichens vary from moderately tolerant of sulphur dioxide to very sensitive. Examples of the latter include the oceanic species such as *Lobaria pulmonaria* (Lungwort). The nineteenth century Worcestershire naturalist, Edwin Lees, described a handful of Worcestershire sites where this and other oceanic species once thrived and had become either relict or gone. One such relict site was on a wooded ridge just a few miles south of Shrawley, where there was a large growth of *L. pulmonaria* on a magnificent veteran lime tree. I mention this only as testimony to what Shrawley might once have been like.

The recovery is still in progress
As sulphur dioxide decreases, for example with distance from the source of pollution or with passage of time after the introduction of the clean air acts, so other species of lichen appeared. Amongst the first leafy lichens to appear and flourish were *Parmelia sulcata, Hypogymnia physodes, H. tubulosa, Platismatia glauca* and *Parmeliopsis ambigua*, and these are still found at Shrawley, particularly on well lit branches, and in the canopies of the few remaining standards. Canopy lichens can often be seen on fallen twigs and branches on the woodland floor, although such windfall is far less abundant here than in most woods. All of the above lichens are of a grey green colour. *Parmelia sulcata* has wide spreading lobes with cracks in the upper cortex that develop powdery soralia. *Hypogymnia physodes* has somewhat inflated looking hollow lobes, often with powdery soralia on the lobe ends. *H. tubulosa* is similar but the lobe ends are more erect and fist like. *Platysmatia glauca* has erect, deeply divided lobes that are crisped up and often have branched isidia along the margins. *Parmeliopsis ambigua* is a small delicate leafy lichen with narrow 1 mm wide lobes, tightly appressed to the surface, pale yellowish green grey in colour and dotted with paler soralia. Also amongst these more tolerant species was *Evernia prunastri*, a much branched, delicate, flattened strap lichen, yellow green to grey green upper surface and whitish underside. It is still common at Shrawley and with now much reduced sulphur dioxide pollution forms large hanging tassels on well lit branches, particularly in the canopy of the scattered standards that still remain. This and associated leafy lichens allow these standards to be clearly photographed by a drone camera from above, picked out by their whitish grey colour once the trees have shed their leaves in autumn.

As pollution has further declined more species have joined this leafy community. These included several 'parmelioid' lichens, such as the apple green coloured *Flavoparmelia caperata*, the large, pearly grey *Parmotrema perlatum*, with delimited soralia and often long black cilia along the margins and otherwise a smooth upper surface. *Punctelia subrudecta* comprises a grey rosette which is closely appressed to the bark, has white dot like soralia scattered across the upper surface and a pale underside, at least toward the margins. *P. jeckeri* has soralia mainly towards the margins of the upper surface. *P. borreri* which is now a mainly southern species, is very similar to *P. subrudecta* but has a black underside. It is said to be spreading and overlooked. In *Hypotrachyna revoluta* the lobes are rolled under at the margins and soredia are somewhat spreading whilst in the similar *H. afrorevoluta* the soralia are more delimited. There are other subtle differences in lobe size and colouration of the underside.

As sulphur dioxide pollution has dwindled away it has been replaced by nitrogen enrichment and nitrophilous lichens have joined the common leafy lichen community. Many of the moderatly sulphur tolerant species continue to thrive under nitrogen enrichment but others have become less abundant. Amongst the most obvious additions are the yellow/orange species, previously seen mainly on farm stock yards and wood pasture, as well as on roofs and other bird perches. The largest and most dominant of these is *Xanthoria parietina*, a bright orange appressed leafy thallus with lobes upturned toward the margin. The orange parietin pigment is the lichen's natural sunscreen and fades away to leave a grey green colour in shaded conditions. It is usually richly fruiting but not as densely as the next species, the small closely related *X. polycarpa* found mainly on small twigs and comprising narrow lobes which may become obscured with the numerous yellow/orange fruits. *Candelariella xanthostigmoides* comprises tiny appressed squamules which are up to 1 mm diameter and obscured by a tight clump of minute bright yellow soredia. *C. vitellina* comprises larger yellow to mustard-yellow, flattened squamules usually on saxicolous substrates but occasionally on nutrient enriched bark. *Caloplaca*

cerinella is a grey crust, usually immersed in the bark and apparent only due to the tiny 0.3 mm wide yellow fruits. These fruits tend to occur singly or as small groups amongst the small leafy lichens on twigs and is easily overlooked. The small leafy lichens here are dominated by *Physcia tenella* and *P. adscendens*. Both are pale grey narrow lobes, up to 1mm wide. In *P. adscendens* the lobe ends are hood shaped whilst in *P. tenella* the lobe ends are lip shaped, that is curled back on themselves revealing the sorediate underside. *P. leptalea* is infrequent, a little larger and with longer marginal cillia than the previous two species, and with no soralia even when mature. It may be increasing in the midlands. One that has definitely increased substantially with nitrogen enrichment is *P. aipolia*, a substantially larger species of closely appressed radiating lobes, the centre densely packed with large pale rimmed jet black fruits, it is a distinctive much photographed lichen. *Physconia distorta* is also large, with large brown to dark brown fruits which are less crowded than those of *Physcia aipolia*. It also differs in general appearance and the thallus colour turns green on wetting (this is the alga showing through the wet cortex). The much smaller *Physconia grisea*, which is rarely fertile, also turns green when wetted, has pruinose lobes (the pruina disappearing when wetted) and the lobes develop coarse soredia. *Phaeophyscia orbicularis* is a very small tightly appressed species with grey to brown lobes turning green when wetted, with black-mottled grey green soralia.

The crustose species associated with these nutrient enriched bark communities, or which have returned following the reduction in sulphur dioxide levels, include *Lecanora chlarotera*, in circular pale grey patches which develop reddish brown fruits with greyish white margins, looking like jam tarts. L. pulicaris is similar and most easily distinguished by a chemical test (dabbed with a drop of paraphenylenediamine solution (pd) the pale margin slowly turns red). *L. carpinea* has a paler disc to its fruits, which are covered with white pruina (like a thin coating of icing sugar) which disappears when wetted. Two other common *Lecanora* species are *L. confusa* and *L. symmicta*. Both are pale yellowish green, *L. confusa* being small (less than 1 mm in size) with persistent pale margins. *L symmicta* is double the size with larger fruits that are often crowded and with the disc swelling to overtop and thus 'exclude' the margin. *Lecania cyrtella* has much smaller (less than 0.5 mm) fruits, which have a pinkish to brown disc with pale margin and tends to be hidden amongst the small species of *Physcia* on small twigs. A very delicate easily overlooked species.

Lecidella eleachroma stands out, often in a mosaic with *Lecanora chlarotera*. Its pale yellowish grey thalli, marked out by a black margin, are dotted with black to reddish black fruits with black margins. The other crust worthy of mention is *Arthonia radiata*, which has small but distinctive black fruits which are sunken with no margin and irregular to stellate in outline. The crowded fruits are picked out against the white to pale greyish thallus.

The species described above are widespread and form predominantly leafy communities wherever there is a suitable bark or wood based substrate. A key factor is adequate illumination and this is at its best in the canopy, albeit limited by the overall sparsity of standard deciduous trees. There are also a few well illuminated standard trees in wide woodland rides, and one of these in particular stood out in my winter visits, with its yellow and grey bejewelled twigs right down to ground level.

The trunks of trees within the main woodland block are poorly colonised, largely due to the historic pollution levels and slow recolonisation under shady conditions. The trunks of the trees here do not appear to be as affected by the recent nutrient enrichment as the crowns which stick up into the polluting winds. A species pair which occasionally pops up on rough acid bark here are the extensive sheets of silver grey *Lecanactis abietina*, often with a subtle mauve hue and intermingled with the rusty yellow streaks of *Chaenotheca ferruginea*. *Lecanactis abietina* is usually sterile, but has numerous white pruinose pycnidia that stain briefly red when dabbed with fresh chlorine bleach, a colour change that quickly fades. *Chaenotheca ferruginea* has very small black 'pinhead' fruits. In his write up on the lichens of the 1921 Worcester Fungus Foray Mr. Knight remarks on the most noticeable feature of Ockeridge and Shrawley Woods being the abundance of *Chaenotheca ferruginea* and *Calcium viride,* both growing on oaks. The latter is a distinctive bright green crust also with black pinhead fruits and for which we have no modern record at Shrawley.

A rather different lichen in this habitat, *Cliostomum griffithii* forms rather indistinct but sometimes extensive grey patches, usually without fruits but recognisable by numerous tiny (0.2 mm) black pycnidia scattered over the bark. *Coenogonium pineti* has a smooth dark olivaceous green thallus that is most often around old scars left by fallen branches or sometimes around tree bases, but is often overlooked, particularly if it lacks both fruits and the white pycnidia. The minute fruits are ivory white, becoming translucent; up to 0.4 mm wide but often young and much smaller. *C. pineti* may also occasionally be found on the conifers. Although it sometimes catches the eye if the fruits are very numerous it often has to be specifically searched for.

Areas of particular interest

The best large deciduous trees examined were in the old parkland and in particular oaks in the old pasture on the south west side of the wood. These have a nutrient enriched bark, probably as much from a long history of grazing as from the influence of wind borne nitrogen compounds. The lichens on the trunks and lower branches would suggest they are not regularly subjected to agricultural chemicals. One of the typical indicators of enrichment from farm livestock are the whitish grey crustose rosettes of *Diploicia canescens*, ornamented with pale yellowish grey soralia. Also here is *Hyperphscia adglutinata*, comprising numerous coalescing tiny greenish thalli with lobes less than 0.5 mm wide, very closely adpressed and merging into the bark so well that even when forming large patches it is easily overlooked. Another lichen of the lower trunks is the wide-spreading greenish to evanescent thalli of *Amandinea punctata* with numerous well spread out black fruits. Higher up the trunks and on the branches the communities dominated by foliose lichens share many of the species already mentioned but are also a stronghold for the brown foliose species of Parmelioid lichens, including *Melanohalea elegantula* and *M. laciniatula. M. elegantula* has branched peg like isidia whilst *M. laciniatula* has crowded flattened lobules over its surface. Also here is *Ochrolechia subviridis*, a grey crust covered in small fine grey isidia which may erode to form soredia.

The best area encountered for lichens in the main woodland block is the lower ground along the Dick Brook. This has high tree covered banks on all sides, before the brook winds its way round and then falls out onto the River Severn flood plain. It has been relatively sheltered and protected from the aerial pollution from sulphur dioxide and nitrogen compounds. It is relatively shady and humid and particularly rich in the Graphidaceae, *Graphis scripta* forms extensive coverage on smooth barked trees, particularly limes, and comprises a whitish thallus with elongated black serpentine fruits (known as lirellae). These fruits look like black 'script' on the white background. In *G. inustuloides* the fruits, which are more sunken, range from serpentine to shorter and stellate, and the slit between the parallel margins is much narrower than in *Graphis scripta. G. elegans* is similar to *G. scripta* but has thicker margins to the fruits, which are furrowed (giving the appearance of a double margin). In *Phaeographis dendritica* the fruits are elongated and often stellate, more sunken than in the other *Graphis* species with a wide open disc between the margins. All these species of the Graphidiacae can be quite variable and are best confirmed by their spores.

Also in this area, generally on rough barked trees, are *Alyxoria varia* (formerly *Opegrapha varia*), *Opegrapha vulgata* and *Arthonia atra* (formerly known as *O. atra*). These three species also have black lirellae but much shorter, up to 2 or 3 mm long. *Alyxoria varia* is

distinguished by wider lirellae with open exposed discs. In *Opegrapha vulgata* the disc is more slit-like and fruits are often interspersed with black pycnidia. *Arthonia atra* has short lirellae which are narrow and often crowded; and lack pycnidia. *Diarthonis spadicea* has flat black fruits with no margins, looking like small tar spots on an immersed or greenish grey thallus. *Phlyctis argena* forms whitish thalli which may spread and become extensive. It is sorediate but with bare patches arranged such that it appears snail grazed. It can be confirmed with a dab of caustic potash which reacts yellow, turning red after a short interval. Two other white crusts here are *Lepra amara* and *L. albescens* var. *albescens*. Both are covered with a thick layer of white soralia and can be easily and conclusively separated from each other on taste. Lifting a few soredia on a dampened finger tip*, L. amara* has a slightly delayed but distinctive bitter taste. *L. albescens* does not. *Pertusaria. pertusa* is a greyish warty thallus, each wart has several minute black pits in its tip, each bearing a sunken fruit and giving each wart the appearance of a pepper pot. *Pertusaria leioplaca* was recorded in 1921, probably from this part of the Wood. A creamy to greenish grey thallus with single fruits in two mm, spreading warts - often referred to as looking like lumpy custard.

An additional habitat within the main block of woodland is that of decaying tree stumps and fallen timber. This habitat appears to be limited due to the tidy management of the Wood but can be found and is locally interesting for two species that are fairly rare (or under recorded) in Worcestershire and are easily overlooked. *Cladonia caespiticia* is unusual amongst *Cladonia* species in having pinkish brown fruits arising directly from the primary squamules. It is often seen without fruits and is then difficult to identify especially if pycnidia are also absent. *C. parasitica* is usually sterile, a mat of very small squamules with finely divided lobe ends tipped with isidia which easily break down into fine soredia and the whole feels soft when brushed lightly with a finger tip. There are 16 *Cladonia* species present, all recorded from this habitat. They include the red fruited yellowish pixie cup, *C. diversa*. The brown fruited *Cladonia fimbriata* has podetia resembling golf tees, a goblet on narrow stem, and is covered in powdery farinose soredia. *C. chlorophaea* has larger cups which expand more evenly from the base and are covered with coarser soredia. *C. pyxidata* differs in being covered with coarse corticate granules (ie granules which have a smooth skin, or cortex.

C. floerkeana has upright simple podetia tipped with large red fruits, leading to its common name of devils matchsticks. The grey green podetia are usually covered in squamules or corticate granules in the upper half. It is never sorediate. *C. macilenta* is similar but is squamulose toward the base, sorediate in the upper part and has bluish grey colour. *C. coniocraea* is distinguished from the latter by its greener grey colour and when fertile bears brown fruit rather than red. *C. ochrochlora* is similar to *C. coniocraea*, but upto 4 cm tall and terminating in a small narrow cup. The red fruited *C. polydactyla* is similar to *C. macilenta* but taller, circa 3 cm. and when well developed it may develop cups with secondary podetia proliferating from the cup margins. The brown fruited *C. squamosa* is up to 5 cm tall, green to grey brown and covered with peeling squamules (formed by peeling back of the cortex rather than as outgrowths of the cortex). The podetia may branch and it may form irregular cups, often with open splits in the branch axils and inside the cups. It has a generally irregular, proliferating and untidy growth. *C. ramulosa* is similar but without open splits in the branch axils or cup bottoms and the brown fruits may be quite prominent. *C. furcata* is straggling, usually brown grey, but green in the shade of Shrawley Woods. It has smooth often reticulated cortex, the stems irregularly branched and terminating in pointed tips. *C. subulata* comprises slender vertical yellow grey to green grey stems simple below but when well developed branching antler-like at the top. Mainly farinose sorediate but may be corticate or squamulose at the base.

Finally there are two species of *Peltigera* that occasionally turn up on mossy decaying stumps or timber and might also be found on damp horizontal sandstone. *P. membranacea* forms tough leathery rosettes, grey brown in colour often with thick grey white pruina. The surface is bullate, reflecting the pattern of very prominent white to pale tan veins on the underside. P. hymenina is a little smaller with a smooth grey to grey brown upper cortex, dark green when wet and the veins on the underside flattened, not prominent.

A small vertical section of exposed sandstone at the southern end of Oliver's Mound was examined for saxicolous species. *Collema flaccidum* has already been mentioned as a good find here on the damp sandstone just above the flood plain. Another nice-to-see here was *Ochrolechia androgyna sensu lat.*, a grey crust with a thick covering of yellowish grey soredia which turn scarlet when dabbed with chlorine bleach and with fleshy-orange coloured fruits with pale sorediate margins. Several species of *Trapelia* were seen and included *T. glebulosa, T. coarctata* and *T placodioides,* all staining red when dabbed with chlorine bleach. The first comprises tiny pinkish grey squamule like islands of thallus which grow flat against the stone and may sometimes coalesce into a continuous crust. *T. coarctata* differs in being a continuous cracked areolate crust with small dark red brown to black fruits bursting from the cortex. *T. placodioides* differs in having sorediate cracks between the areoles and rarely fruiting.

Postscript

As stated above most of the lichen recording was undertaken in the northern half of the Wood, which is owned and managed by the Forestry Commission and for which there is good public access. The private southern half is of a different character and may contain additional lichen species and communities. This part has been managed as part of the grounds attached to Wood House, and any old stone structures merit checking out. The parkland trees and wood pasture forming part of the private estate could also be investigated, and although they will have been substantially affected by sulphur dioxide pollution and nutrient enrichment, the few such trees that have been looked at, for example the large wood pasture oaks towards the village hall, have added a few species more typical of traditional nutrient enrichment.

Only a small area of exposed sandstone was examined, yielding species of interest. There are extensive exposures overlooking the River Severn and where accessible these may yield further interest. There is an old record for *Xanthoparmelia conspersa* which is a species that favours exposed sandstone. It also likes the drier rocks within the splash zone of streams or alternatively nutrient enriched stonework that might occur on the private estate. In Worcestershire this species is most commonly associated with the stonework in churchyards.

The Dick Brook and the associated sheltered valley on the northern edge of Shrawley Wood had only limited time spent on it. It is the most interesting area seen for lichens on trees and may form an important reservoir for relict species from which recolonisation might occur. Further time spent looking around the valley of the Dick Brook should yield additional species.

One odd little puzzle from the past is *Calicium viride* - a bright green crust distinctive with its black pinhead fruits. In 1921 it was one of the most notable features of Ockeridge and Shrawley Woods, growing on oaks. But there is no modern record of it in Shrawley. Is this due to the extensive removal of mature oaks from the commercially managed woodland? Does it still live on in the private woodland or on "parkland" oaks associated with the Wood House? Although not common it is still known in the wider area.

Over the years the lichen communities of Shrawley Wood have undergone substantial changes. What will the future hold?

List of historically recorded and current Lichen species in Shrawley Wood.

Aquacida viridefarinosa (Bacidia viridefarinosa)
Alyxoria varia (Opegrapha varia)
Amandinea punctata (Buellia punctata)
Anisomeridium biforme
Arthonia atra (Opegrapha atra)
Arthonia radiata
Arthopyrenia punctiformis
Baeomyces rufus.
Buelia griseovirens
Calicium viride (C hyperellum)***(1909, 1921)
Caloplaca cerinella
Candelariella vitellina
Candelariella xanthostigmoides (C. reflexa).
Chaenotheca ferruginea
Chrysothrix candelaris
Chrisothrix flavovirens
Cladonia caespiticia.
Cladonia chlorophaea s.str.
Cladonia coniocraea
Cladonia digitata.
Cladonia fimbriata
Cladonia floerkeana
Cladonia furcata subsp furcata
Cladonia humilis.
Cladonia macilenta
Cladonia ochrochlora
Cladonia parasitica
Cladonia polydactyla
Cladonia pyxidata
Cladonia ramulosa
Cladonia squamosa var squamosa
Cladonia subulata.
Cliostomum griffithii
Coenogonium pineti (Dimerella pineti)
Collema flaccidum
Diarthonis spadicea (Arthonia spadicea)
Diploicia canescens
Evernia prunastri
Flavoparmelia caperata (Parmelia caperata)
Fuscidea lightfootii
Graphis elegans
Graphis inustuloides (Graphina anguina)
Graphs scripta
Hyperphyscia adglutinata
Hypogymnia physodes
Hypogymnia tubulosa
Hypotrachyna afrorevoluta (Parmelia revoluta)
Hypotrachyna revoluta s. str.) Parmelia revoluta s. str)
Lecanactis abietina
Lecania cyrtella
Lecanora carpinea.
Lecanora chlarotera
Lecanora compallens
Lecanora confusa
Lecanora conizaeoides f. conizaeoides
Lecanora expallens
Lecanora pulicaris
Lecanora symmicta.
Lecanora varia . ***(1909, 1921)
Lecidella elaeochroma f. elaeochroma
Lepra albescens var albescens (Pertusaria albescens var albescens)
Lepra amara. (Pertusaria amara).
Lepraria finkii (Lepraria lobificans)
Lepraria incana s. lat.
Lepraria vouauxii (Leproloma vouauxii)
Lichenomphalia umbellifera *** (1895) (see note below)
Melanelixia glabratula (Parmelia glabratula)
Melanelixia subaurifera (Parmelia subaurifera)
Melanohalea elegantula (Parmelia elegantula)
Melanohalea laciniatula. (Parmelia laciniatula)
Micarea prasina s. lat.
Naevia punctiformis (Arthonia punctiformis).
Ochrolechia androgyna
Ochrolechia subviridis
Opegrapha vulgata.
Parmelia sulcata
Parmeliopsis ambigua
Parmotrema perlatum (Parmelia perlata)
Peltigera hymenina. (P. lactucifolia). *** (1909, 1921).
Peltigera membranacea.
Pertusaria leioplaca.*** (1921)
Pertusaria pertusa
Phaeographis dendritica
Phaeophyscia orbicularis
Phlyctis argelaea *** (1909, 1921)
Phlyctis argena
Physcia adscendens
Physcia aipolia
Physcia leptalea
Physcia tenella
Physconia distorta (Physconia pulverulacea)
Physconia grisea
Placynthiella icmalea
Platismatia glauca.
Porina aenea
Pseudoschismatomma rufescens (Opegrapha rufescens). *** (1909, 1921)
Psoroglaena stigonemoides
Punctelia borreri. (Parmelia borreri, Parmelia dubia auct. p.p..).*** (1921).
Punctelia jeckeri. (Parmelia ulophylla, Parmelia subrudecta).
Punctelia subrudecta (Parmelia subrudecta)
Pyrenula macrospora ***(1909, 1921)
Ramalina farinacea
Ramalina fraxinea
Scoliciosporum chlorococcum
Scoliciosporum Umbrinum
Trapelia coarctata
Trapelia glebulosa. (Trapelia involuta)
Trapelia placodioides
Trapeliopsis flexuosa (Lecidea flexuosa, L aeruginosa).
Trapeliopsis granulosa (Lecidea granulosa)
Trichonectria hirta (Lichenicolous fungus growing on physcia spp)
Usnea cornuta
Usnea subfloridana?? (U. florida var hirta) ***.(1921)
Xanthoparmelia conspersa (Parmelia conspersa)***(1909, 1921).
Xanthoria parietina
Xanthoria polycarpa

NOTES

Note 1. The names are those currently listed (as of July 2021) on the Taxon Dictionary of the British Lichen Society (BLS) website (www.britishlichensociety.org.uk). An enormous amount of taxonomic work is currently being undertaken and will undoubtedly result in further name changes. The taxon dictionary is regularly updated and includes former names (synonyms). For those who wish to take the subject of lichens a little further the BLS website also includes very good and accessible introductory information as well as useful resources such as distribution maps.

Note 2. The list of species is based on several visits by Trevor Duke in 2020/21 and by Bob Kemp in 2015/16 plus 11 additional species listed in old records but not recently re-found. These old records are marked with an asterisk although the fact that they have not been re-found in the limited recent recording is not necessarily evidence that they are now absent.

Note 3. Recently used names which are no longer considered correct, are given in brackets after the current name.

Note 4. The Worcestershire Biological Records Centre has an old record for *Loreleia postii*, dating back to 1895, and passed on to me as a lichen record. In 1895 it would have been recorded as a non-lichenised fungus, probably under the name of *Omphalina postii*. Many years were to pass before the existence of lichenised bacidiomycetes was recognised and even in the 1980s the controversy lingered between mycologists and lichenologists as to whether some species of *Omphalina* were lichens or not. Modern taxonomy splits the old *Omphalina postii* into two different species, now known as *Loreleia postii* and *Lichenomphalia umbellifera.* The delicate toadstool fruiting bodies are virtually indistinguishable, even by microscopic morphology. The only difference is that in *L. umbellifera* the toadstools arise from clumps or mats of algae and in *L. postii* they arise from the base of bryophytes; but this is made difficult by the fact that algae and bryophytes often grow together in damp places. *L. umbellifera* is widespread in the UK, including on rotting stumps or damp sandstone. *L. postii* is somewhat rarer (52 UK records on the NBN atlas) and is a species of burnt ground and peat. On balance I consider the old record of *Omphalina postii* for Shrawley Wood almost certainly refers to *Lichenomphalia umbellifera.*

Note 5. The remainder of the species for which there are no recent records are marked with a triple asterisk and a date in brackets. There are three sources for these records. 1 - The 1909 Flora of Worcestershire. 2 - Carleton Rea's taxonomic revision with additions and following the British Mycological Society's Worcester Foray in 1921 (published in the *Transactions of the Worcestershire Naturalists Club)*. 3 - Mr H H Knight's lichen list for the 1921 Foray published in *Transactions of the British Mycological Society* 1922. In revue of these historical records I add the following comments:

a. *Phlyctis argelaea* is a rare, possibly declining and probably overlooked species of young smooth barked trees. There are a couple of post 2000 records in Herefordshire and a small scattering of old records across the south Midlands. The more common sister species *Phlyctis argena* currently occurs along the Dick Brook. Provisionally accepted as an historic record.
b. *Parmelia borreri* (*P. dubia* (auct. pp)) was recorded by Mr H.H. Knight from the Worcester foray of the British Mycological Society in 1921 but is not mentioned for Shrawley Wood in Carleton Rea's updated appendix to the 1909 *Flora of Worcestershire*. It is not a common species but may have been more common in the past. Provisionally accepted as an historic record.
c. *Usnea florida* var *hirta* was recorded in Carleton Rea's Appendix to the 1909 *Flora of Worcestershire* and in the BMS foray list. The provenance of this name is uncertain but it is described as common. *Usnea subfloridana* was the most commonly recorded species in the wake of the industrial revolution but the past use of this name in the UK is now under review. It should be regarded as an unconfirmed record, which I have tentatively listed as *U. subfloridana*.
d. *Xanthoparmelia conspersa* is recorded in both the 1909 Flora and in the later appendix thereto. It is a fairly common saxicolous species favouring exposed siliceous rocks or stone or drier nutrient enriched rocks in or beside streams and lakes. No search or examination of herbarium specimens was undertaken for this study. It may be associated with natural sandstone on site or it may be associated with a man made or a carved ornamental structure, perhaps within the private area. Accepted as an historic record.

Note 6. *Ochrolechia androgyna* is now recognised as a morphologically diverse aggregate of species. These new species have only recently been accepted and are still poorly understood, at least in a UK context. Interesting features which suggest this lichen at Shrawley may be a more interesting segregate include the yellowish hue of the soralia (at least in part) and the crowded smallish fruits with thickly sorediate margins. For the purpose of this publication the name *Ochrolechia androgyna sensu lat*. is retained. (For further information see pages 10 to 12 of volume 5 in the series "*Revisions of British and Irish Lichens*" on the British Lichen Society website: (www.britishlichensociety.org.uk/content/lgbi3).

References & further reading

Amphlett, J. & Rea, C. 1909. *The Botany of Worcestershire*.

British Lichen Society (In Ed). *The Lichens of Great Britain and Ireland.* 3rd edition. This is to be published both in paper and electronic forms. At time of writing the first 15 family accounts are available on the BLS website as individual free to download pdfs. www.britishlichensociety.org.uk/content/lgbi3.

British Lichen Society (Edited Smith, C.W. *et al*.). 2009. *The Lichens of Great Britain and Ireland.* 2nd edition. (The definitive guide to the British and Irish lichens and their identification).
British Lichen Society. On line resources. The society website has a wealth of advice for everyone, from those wishing to learn more about lichens through to resources of practical use for those at all levels of involvement and knowledge. Below are a few links which you may find particularly useful or interesting.

https://www.britishlichensociety.org.uk/resources/lichen-taxon-database (You may need to refer to this in order to understand the names used in older literature. Even the names used in modern identification guides change. This database can be accessed by both old names and the currently accepted names.)

https://www.britishlichensociety.org.uk/resources/species-accounts (Distribution maps are provided for all British lichen species. It is hoped to add more information on the species in due course)
Dobson, F.S. 2018. *Lichens An Illustrated Guide to the British and Irish Species.* (An excellent guide for beginners and useful also as a quick reference / aid memoir for the more experienced).

Knight, H. 1922. Lichens found during the Worcester Foray. In *Transactions of the British Mycological Society* Vol VIII, page 10
Rea, C. 1923. Appendix to the Botany of Worcestershire: Lichenes. *Transactions of the Worcestershire Naturalists Club*, Vol 8, pages 93-100.

Appendix: Lichens of Shrawley Wood.

Photographs arranged in alphabetical order apart from two placed at the end *Collema flaccidum and Ochrolechia androgyna. Alyxoria varia* is with the O's from previous name *Opegrapha varia.*

The photographer's name is at the end of each picture caption.



Baeomyces rufus. A lumpy subsquamulose grey crust (green when damp). Brown fruits, sessile or on short stalks upto 6 mm high. Bob Kemp.



Chaenotheca ferruginea. Often most noticeable by the extensive mustard-yellow to ferruginous patches amongst an otherwise grey green crust (as pictured here). Pinhead type fruiting bodies with black stalks and topped with an open cup of brown spores. Bob Kemp.



Chrysothrix candelaris. Thin golden yellow thallus forming vertical streaks in acid bark. Comprising minute (0.1 mm) granules. Bob Kemp.



Cladonia caespiticia. Very small salmon pink fruit on translucent stem arising directly from squamule. Fruits are more common and may be larger in the more oceanic west of Britain. Tiny top shaped blackish pycnidia may develop across the surface of squamules. Bob Kemp.



Cladonia caespiticia. At Shrawley, so far, it has only been recorded growing without fruiting bodies or pycnidia. It is usually seen as compact cushions of incised, ascending squamules. Squamules are very small (less than 2 mm) and easily overlooked. Trevor Duke.



Cladonia subulata. Slender grey green podetia which may branch antler like at the tip. Usually covered in fine farinose soredia, or otherwise corticate. Bob Kemp.



Cladonia polydactyla. Red fruited and up to 3 cm tall. Well developed podetia terminate in a shallow cup which is surrounded by small secondary podetia, of which 1 or 2 may develop further. Podetia squamulosa becoming farinose sorediate at the top. (C. macilenta tends to be shorter, less squamulose and always lacks cups.) Rosemary Winnal.



Cladonia chlorophaea. Brown fruited cup shaped podetia covered with granular soredia. Highly variable. It is an aggregate species for which a number of different chemotypes have been identified and confirmed by molecular (DNA) analysis, and with subtle differences in morphology. Also amongst common sister species, C. fimbriata has golf tee shaped podetia covered in farinose soralia. In *C. pyxidata* the granules are larger and corticate). Trevor Duke.



Cladonia parasitica. Forming a dense mat of minute ascending squamules that are up to 1 mm wide and deeply dissected, becoming coralloid with tips breaking down into coarse corticate soredia. Squamules may be apparent only through a x10 hand lens, otherwise resembling a *Lepraria* species. Trevor Duke.



Coenogonium pineti. Dark olivaceous green crust on acid bark of oak and pine, with often numerous minute translucent white fruits. Bob Kemp.



Diploicia canescens. White to pale bluish grey lobate crust, with yellowish soredia toward the centre. Pruinose lobe margins. Not fertile at Shrawley. Bob Kemp.



Evernia prunastri. Branch showing a typical assemblage of (note the whitish undersides), *Ramalina farinacea* (note the oval farinose soralia along the edges), an *Usnea* species (beard lichen – note the round form the thallus takes. If stretched the cortex, or skin, breaks, revealing an elastic white core). Bob Kemp.



Fuscidea lightfootii. Delimited circular thallus of large bright green to grey green granules/warts. Dark brown/black fruits. Bob Kemp.



Graphis elegans. Smooth whitish grey thallus with prominent black lirellate fruits. In *G. elegans* the black carbonaceous margins are furrowed. Although the furrows may be difficult to see, this results in overall wider margins and fruit. The fertile disc forms a narrow strip between these margins. K+ yellow turning slowly red. Bob Kemp.



Graphis scripta. Showing K- to slight brownish spot test reactio. Bob Kemp.



Graphis scripta. Whitish to greenish grey thallus. Note the raised carbonaceous margins are thin and not furrowed. Also the wide open pruinose disc between the thin black margins. (*G. inustuloides* has more sunken lirellae with flat carbonaceous margins and narrow slit like disc; slightly raised whitish thalline margins. Also muriform spores rather than the septate spores of *G. scripta* and *G. elegans*.) Trevor Duke.



Hyogymnia physodes. A grey leafy lichen, note the inflated hollow lobe ends which may break open in older plants producing soralia. (*H. tubulosa* differs mainly in its rounded fist like lobe ends). Bob Kemp.



Hypotrachyna afrorevoluta showing the crowded darker soralia in the centre of the thallus. Trevor Duke.



Lecanora conizaeioides. (Pollution lichen). A thick dirty grey green granular sorediate crust, cracked into areoles and with grey green lecanorine fruits. Bob Kemp.



Lichenomphalia umbellifera. The lichen fruits here are in fact small toadstools, growing out of small clumps of algae which are loosely wrapped in the lichenised fungal hyphae. Bob Kemp.



Melanohalea lanciniatula. Appressed green brown leafy lichen with small overlapping folioles ornamenting the centre of the thallus. The paler green grey leafy lichen is *Parmelia sulcata*. Note the network of white ridges (stretch marks) which break open to form linear soralia. Bob Kemp.



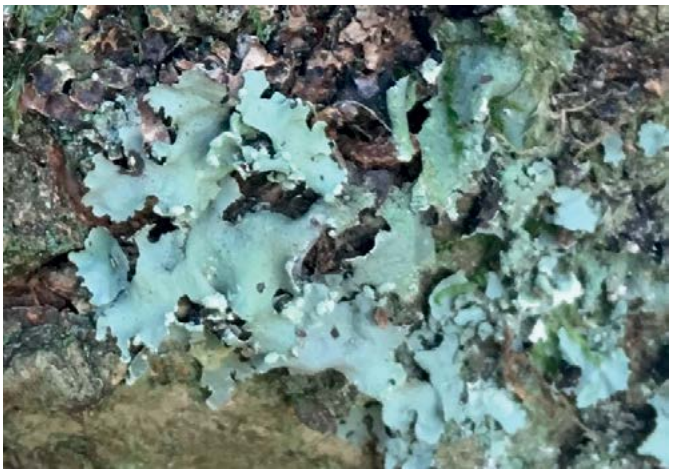
Melanohalia elegantula. Green brown appressed leafy lichen with small overlapping lobes, with coraloid branched isidia. Bob Kemp.



Alyxoria varia. Short lirellae with very wide open white or green pruinose discs, with black carbonaceous margin. Trevor Duke.



Parmelia sulcata clothing the lower branches of a tree. Bob Kemp.



Parmotrema perlatum. Smooth pearly grey leafy lobes with whitish soralia at the lobe margins. Trevor Duke.



Peltigera hymenina. Smooth dark green grey to brown or black upper surface, not pruinose. Wide flattened veins on the underside with simple rhizines, tufted tips. (*Peltigera membranacea* differs in upper surface having a whitish grey tomentum and a bullate pattern following the strongly ridged veins on the underside. Bottlebrush rhizines. Bob Kemp.



Pertusaria pertusa, Thick grey green crust with fruits produced in pits within wart like protuberances, 2-7 per wart. Bob Kemp.



Phaeographis dendritica. Immersed black fruits forming elongated branched to stellate wide grey/brown pruinose discs, the carbonaceous margins barely apparent. The whitish grey thallus may be slightly raised around the margins of the disc, particularly noticeable around young lirellae. K+ yellow turning red. Bob Kemp.



Physcia apoilia. Large thallus upto 8 cm wide with appressed white to blue grey lobes. The centre taken over by a mass of large pale rimmed brown to black fruits. Bob Kemp.



Physcia apoilia, P. adscendens and *Xanthoria parietina*. Bob Kemp.



Physconia grisea. Pale grey lobes up to 2 mm wide and becoming more brown toward the coarsely sorediate centre. Thallus becoming green when wet. Bob Kemp.



Twig nitrophiles, from left to right a small leafy *Physcia* species, black fruited *Lecidella eleachroma*, a rather pallid *Lecanora chlarotera*, bright yellow orange *Xanthoria parietina*. Bob Kemp.



Collema flaccidum. This dark olive green *Collema* is unusual in favouring sheltered damp Siliceous rock. In ideal conditions this will form a large (up to 6 cm) folded and rumpled membrane like thallus with squamule-like isidia. Here it is growing on vertical soft friable sandstone where it is vulnerable to water seepage and inundation from the River Severn, as well as probable snail grazing. It is therefore in a state of perpetual regeneration with spreading colonies comprising small rounded lobes with margin entire and sometimes revolute. Easily overlooked. Trevor Duke.



Ochrolechia androgyna sensu. lat. Thick crust of whitish to yellowish grey soredia. Aggregations of apothecia with concave to flat, orange to buff discs. Pale thalline margin comprised largely of soredia. Growing on vertical soft friable sandstone which is vulnerable to seepage and possible seasonal inundation from the River Severn. Snail grazing could also be an issue. Specimen seen, in January, was somewhat fragmented and as with *Collema fragillescens* it would appear to be undergoing perpetual regeneration.

O. androgyna is now considered a morphologically variable species aggregate which is still poorly understood. Further study of the aggregate in the UK may be needed before this can be revisited and a clear identification made.

Mosses and Liverworts of Shrawley Wood

John Day

Introduction - Worcestershire and Shrawley Wood as bryological habitat

Worcestershire has a relatively restricted bryoflora. It compares poorly with areas of Britain to the north and west. This is due to several factors, which restrict favourable moss and liverwort (collectively known as bryophytes) habitat. It is a lowland county with little ground over 300m. It lacks bogs and extensive wetlands. Rock exposures are uncommon and the soils are generally fertile. Woodland cover is relatively low. Bryophytes grow best in wet and humid locations. Therefore with rainfall moderate or low, relative humidity relatively low and most parts experiencing summer water deficits, bryophyte growth tends to be restricted. The county is, in addition, close to large urban centres and their associated sources of atmospheric pollution.

On the positive side the county has several attributes which contribute to bryological diversity:-

> There is a high proportion of ancient woodland much of which remained interconnected in the early medieval period. Many woodland species are poor colonisers; therefore, a long continuity of cover and habitat integrity is important for many woodland species.
>
> It is endowed with several large river systems.
>
> The geology is varied with most eras represented. Consequently, soils are highly variable often across relatively small areas.

In terms of landscape ecology, land cover units are small and there is a high degree of connectivity.

Although small in scale the topography is highly varied. The county was situated on the southern fringes of the last glaciation. This resulted in a highly rejuvenated landscape as glacial melt-waters and floods reformed the local landscapes. Virtually every small ridge and hillside is now cut through with a gully or ravine, or to apply the local vernacular a dingle or a gutter. Often of little value to agriculture they are frequently wooded. Ravine woodlands are some of the best bryological habitats in Europe. In addition, due to the varied geological character of the county these valleys often cut through different rock formations. The highlight being the calcareous tufa deposits of the western dingles, which at Southstone Rock includes the largest such formation in Britain.

Worcestershire's geographical position is important. It sits astride a biogeographical dividing line between the northwest and southeast. The northern and western fringes of the county align biogeologically with northern and western Britain. This is important for bryophytes as many species reach the limits of their south-easterly ranges in Worcestershire. It lies within the southern zone climatically.

Focusing from the county scale to that of Shrawley Wood, there is a close match with many of the county's attributes. At first sight, this woodland situated on dry sandy soils towards the centre of the county appears unattractive to bryophytes. However, it has many of the positive attributes described above:-

The virtual line marking the biogeographic zones of western and southern Britain more or less passes through the wood. It is situated towards the south-eastern limit of many species common in western Britain and with similarly restricted county distributions.

Shrawley Wood is a large block of ancient woodland with a long continuity of cover and habitat integrity and was still ecologically connected to the extensive Wyre Forest within the early medieval period. It continues to maintain good landscape connectivity today through the linear features radiating from the site.

Shrawley Wood adjoins Britain's longest river, the River Severn and is dissected by two small streams with valley wetlands and adjoins a fast-flowing rivulet, Dick Brook, with rock exposures.

Surfaces, such as rock, hostile to higher plant growth are a preferred habitat for many bryophytes. There is a river scarp with natural rock exposures and the closeness of the sandstones to the surface has made it attractive to both small-scale and larger quarrying operations. Thus rock outcrops are more prevalent than in the majority of Worcestershire woods. Remarkably, for a site on Triassic Sandstone, even tufa mosses occur. Sub-surface drainage through the normally acidic sandstone has, locally, concentrated bases, at springs and seepages.

On a less positive note:-

Intensive twentieth forestry exploitation has almost eliminated the stable bryophyte habitat of aged tree trunks. The traditional coppice cycle with its attendant mix of varied microhabitats was severely disrupted through the course of the twentieth century.

Perhaps more insidious is the close proximity of large centres of population and their associated industries, which has been a major source of atmospheric pollutants. These began very close at hand and as early as the seventeenth century with the smelting associated with Yarranton's furnace. It lies within the zone of high sulphur dioxide levels and for much of the twentieth century was within the fallout shadow of a coal-fired power station at Stourport-on-Severn, which was located alongside the River Severn 4km upriver.

History of Bryological Recording in Shrawley Wood

Four distinct phases can be identified:- 1) an early active phase, which left little trace; 2) a "golden period" with a printed and herbarium legacy; 3) an almost complete cessation and 4) a resurgence in the modern period.

The Early Period 1780-1890

The study of bryophytes, in Worcestershire, has always lagged behind that of flowering plants and ferns. This is mirrored in their study at Shrawley Wood. The first flowering plant record published in the botanical literature was in 1787 (Withering, 1787) but it was 66 years later in 1853 before the first bryophyte record is known (Ricketts and Carrick, 2009).

A great disappointment for modern ecologists and conservationists is that despite a considerable national interest in all aspects of natural history, vast numbers of survey hours spent in the field during the period 1750 – 1950 and with few areas in lowland landscapes left wholly unexplored there is a general paucity of quality, detailed data on individual sites. Despite the footfall, the historical legacy is often meagre and interpreting the past and ecological change is frequently problematic. Previous generations rarely published records of the perceived common-place. The main preoccupation for many naturalists was the acquisition of collections. This resulted in a bias towards the rare and unusual both in collections and publications.

The natural history legacy for Shrawley Wood comes from a variety of publications, collections, occasional note books and drawings, only a little of which relates to the mosses or liverworts.

Within Worcestershire, the bias towards the rare and unusual is especially marked in relation to bryophytes. There was a group of early to mid-nineteenth century botanists who took a keen interest in the group. For instance, Duncan (1911) reporting his examination of the collection in the Hastings Museum, in the first decade of the twentieth century, notes Dr Robert James Nicholls Streeten (d.1849) of Worcester, Rev Richard Hesselgrave Thompson (1811 – 1892) of Cradley, Thomas Westcombe (1811 – 1892) of Worcester, William Mathews (1829 – 1901) of Edgbaston, Dr Griffith Hooper Griffiths (ca.1823 – 1872) of Worcester, as contributors to the collections held at the Worcester Museum (**WOS**).

To these may be added Thomas Bradley Stretch (circa. 1792 – 1826) of Worcester, Dr John Fraser (1820 – 1909) of Wolverhampton, and Edwin Lees (1800 – 1881) of Worcestershire (Bagnall 1903, Carrick 2010).
Combined their published material is very meagre.

The historical and botanical legacy indicates that the following definitely visited Shrawley Wood:-
Edwin Lees at least between 1828 -1874 and on many dates (Florence, 1828; Lees 1834, Lees 1835, Lees 1844, Lees 1848, Lees 1851, Lees 1852, Lees 1856, Lees 1867, Lees1874i, Lees 1874ii, Rea 1897, Rea 1931, Amphlett and Rea (i) 1909, Bagnall 1903, Botanical Society of Britain and Ireland (i) 2018).

Thomas Westcombe at least between 1843 and 1854 (Westcombe, 1844; Newman, 1854, Amphlett and Rea, 1909 (ii)).
Richard Hesselgrave Thompson at least between 1848 and 1870 on 20/06/1848, 21/09/1849, 13/09/1853 and 08/08/1870 (BSBI, 2018, Thompson, 2007, Ricketts, 2009, Amphlett and Rea, 1909 (iii)).

In addition, it is highly probable that the following also did:-
William Mathews provided the rock underpinning much of Worcestershire's nineteenth century botanical study. He was the inaugural secretary for the Worcestershire Naturalists' Club and served for many years in that role, attended many of the Club's field meetings and knew the county very well.

John Fraser is known to have taken field excursions with both Thompson and Mathews (Carrick, 2010).

Worcestershire's senior botanical figure for much of the nineteenth century was Edwin Lees. Although primarily interested in higher plants and ferns with a specialist interest in batology (brambles), he also, particularly, in his earlier years, took notice of and collected bryophytes and included them in his Botany of the Malvern Hills (Lees, 1868). There is an undated record of Overleaf Pellia *Pellia epiphylla* attributed to Lees in Bagnall's account of Worcestershire bryophytes (Bagnall, 1903). This may be the earliest bryophyte record from the wood but Bagnall fails to provide a date or reference. Lees visited Shrawley Wood on many occasions, the earliest and latest dates traced for his visits being 1828 (Florence, 1828) and 1881 (Rea, 1897). However, he is known to have passed close by the wood as early as 25th July 1825, when he noted a butcher bird in a Shrawley hedge (Lees, 1826).

The first written reference to bryophytes in Shrawley Wood is by Lees (1856):-
In one place, where a perennial spring fills a sandstone basin, the elegant three-branched Polypody (P. dryopteris) festoons the rock. Numerous jungermanniae and mosses also occur to charm the exploring cryptogrammic botanist.
Despite giving no species, Lees draws attention to a specific location notable for leafy liverworts and mosses. He clearly knew the wood well and had an eye for bryophytes as the location he refers to remains perhaps the single most important bryological microhabitat in the wood today. This spot supports several, notably lime-loving and tufa-forming species, which occur nowhere else within the wood.
Whilst Lees took an early interest in bryophytes, Thompson was considered by his contemporaries as the county expert on all matters cryptogrammic (bryophytes and lichens). Unfortunately, there is no written record of his Worcestershire discoveries but he did leave his bryophyte and lichen collections to Worcester Museum (WOS), most of which survives, although his volume numbered 5 with mosses I to R is missing, (Carrick T. pers. com., 2018). Collection dates in Worcestershire range from 1844 to 1880 and his favoured collecting sites were the Malvern Hills, Wyre Forest, Hartlebury Common and the Lickey Hills (Carrick, 2010; Ricketts and Carrick, 2009). Thompson came to Worcestershire in 1845 as curate at St Nicholas Worcester (Worcester Journal, 1845). He stayed until 1855 when he transferred to Halesowen as curate (Worcestershire Chronicle, 1855) before transferring in 1856 to Cradley as the vicar (Worcester Journal, 1856), where he remained until his death in 1889. He devoted a considerable amount of his time to botany and Middleton (2017) has produced an extensive biography. He definitely visited Shrawley Wood on at least four occasions:-
from a higher plant specimen in University of Wales, Aberystwyth (ABS) dated 20th June 1848 (Botanical Society of Britain and Ireland, 2018);
from a higher plant specimen in WOS dated 21st September 1849 (*Thompson, 2007; Ricketts and Carrick, 2009; Maskew, 2014; BSBI Database, 2019)*
from a specimen in WOS dated 13th September 1853 (Ricketts and Carrick, 2009);
during a field meeting of the Worcestershire Naturalists' Club on 08th August 1870 (Rea, 1897 pp.152 - 154);
In addition, The Botany of Worcestershire, Amphlett & Rea (iii), (1909) attribute two lichen records from Shrawley Wood to him. The sole bryophyte record which can be attributed to him is the 1853 specimen in WOS which is of Common Cord-moss *Funaria hygrometrica*.

Whether or not Westcombe collected bryophytes on his visit(s) to the wood or if Mathews, Griffiths or Streeten ever did may have been lost with the disappearance of their bryophyte collections from WOS (Carrick, 2010).
It can be inferred that the wood's bryophytes were subjected to several surveys between ca.1800 – 1890 although little trace of these observations either remains or has yet come to light. The total sum of our bryophyte knowledge for the hundred years or so up to 1890 is just three specific records plus reference to a bryophyte rich location. The three species records are:-

Lees' undated record of the common liverwort, Overleaf Pellia *Pellia epiphylla*. It is still noticeable today in wet places and provides little ecological insight.

There is a specimen of Common Cord-moss *Funaria hygrometrica* collected by Rev R.H.Thompson on 13th September 1853 in WOS (Ricketts & Carrick, 2009). Common Cord-moss is a plant of bare ground but is famously a moss of old bonfire sites (Blockeel et al 2014i) so Thompson's collection is suggestive of burnt ground habitat, likely a bonfire site, in 1853.

The third record is nearly twenty years later. Greater Featherwort *Plagiochila asplenioides* was noted *in considerable plenty and great luxuriance* during a field meeting of the Worcestershire Naturalists' Club on 22nd October 1872 (Rea, 1897 p.193. Greater Featherwort is a fairly common liverwort nationally sites (Blockeel et al 2014i) but within Worcestershire it is localised mainly to ancient woodland and wooded stream valleys where it normally occurs on humid banks usually with some water seepage. It still occurs in Shrawley Wood but nowhere does it grow in *great luxuriance*. So, apparently, there has been a loss in a specialist micro-habitat since 1872, this possibly as a result of Victorian landscaping within the stream valleys.

The Golden Period 1890 – 1928
Serendipity frequently plays a significant part in the study of natural history. As the nineteenth century faded, Worcestershire bryology entered its golden period. Lasting from the early 1890s to the late 1920s a cohort of keen and active bryologists, several of national renown resided either in or on the fringes of the county. This was the zenith of bryological recording in Worcestershire. The most notable members of this group were James Eustace Bagnall (1830 - 1918) of Birmingham, John Bishop Duncan (1869 - 1953) of Bewdley, Edward Cleminshaw (1849 – 1922) of Birmingham, Henry Herbert Knight (1862 – 1944) of Cheltenham, Father Philip Mole Grafton Rhodes (1885 – 1934) of Birmingham and Evesham, Augustin Ley (1842 -1911) of Hereford and Thomas Hawkes Russell (1851-1913) of Birmingham. At least four of this group, Bagnall, Duncan, Knight and Rhodes, are known to have visited Shrawley Wood on at least one occasion.

Bagnall came from a modest background and spent most of his working life as a clerk at Hinks and Wells steel pen-nib manufacturers in Birmingham. He was a self-taught botanist

discovering the subject when a friend lent him a microscope in 1864. He would become probably the foremost Midlands' botanist of his period, and spent most of his spare time pursuing botanical interests. His written output was prolific and included a Moss Flora of Warwickshire (Bagnall, 1874), Flora of Sutton Park (Bagnall, 1876), the Flora of Warwickshire, which included bryophytes (Bagnall, 1891) based on papers published between 1881 and 1885 in the Midland Naturalist and a Flora of Staffordshire (Bagnall, 1901b). He wrote a Handbook of Mosses which was published and reprinted in at least six editions between 1886 and 1910 (Bagnall, 1886). He also contributed botanical accounts to the Victoria County Histories of Worcestershire (bryophytes, lichens and alga) (Bagnall 1901), Warwickshire (Bagnall, 1904) and Staffordshire (Bagnall, 1908). In addition, he wrote many notes and papers to botanical journals. He donated his botanical collections to Birmingham Museums (BIRA). On-line catalogues of his collections have been published by Birmingham Museums (Watson, 2013i, ii). Further details on his life and work can be found in Cadbury et al (1971) and Lawley (2021i).

It can be deduced from his collections catalogued in Watson (2013i & ii) that he began a systematic study of Worcestershire bryophytes in or around 1890 and continued to collect from the county until 1903 after which time there is only one further collection, in 1908. His main period of activity was between 1899 and 1903; this reached a peak in 1902. Of his herbarium packets, seven are from Shrawley Wood. These indicate that he made at least five visits, in June 1896, 28th April 1902, 26th September 1902, 28th September 1902, September 1902 and October 1902. The pattern of repeat visits to woodland is typical of his recording activity, often these were within a few days of each other suggesting that he worked a site until he was satisfied he had exhausted its potential. He made, for instance, at least eighteen visits to Seckley Wood (SO77) in Upper Arley parish between December 1890 and April 1899 and thirteen visits to the Worcestershire section of Wyre Forest (SO77) between March 1894 and October 1903. It can be assumed from the number of his visits that he undertook a reasonably thorough survey of Shrawley Wood in 1902.

The first major landmark for Worcestershire bryology was the account of mosses and liverworts written by Bagnall for the Victorian County History (Bagnall**,** 1901). The account is seemingly based on his own observations plus a search of the relatively sparse available literature. In it he notes *in Shrawley Wood the rare Dicranum montanum and Bryum roseum* (Bagnall, 1901)



01 Ant-hill meadow on the southern periphery of the wood, potential habitat for the apparently lost Rose-moss

Mountain Fork-moss, *Dicranum montanum* still occurs in some quantity. It is a woodland plant, which is mainly confined to ancient woodland sites in Worcestershire. It is most frequent on the more acidic tree boles and stumps such as Oak *Quercus*, Sweet Chestnut *Castanea sativa* and Lime *Tilia cordata*. Rare in Bagnall's time it increased its range significantly during the mid-twentieth century, likely due to increased acid deposition (Hill and Preston, 2014). By contrast, the Rose-moss *Rhodobryum roseum* has not been recorded in Shrawley Wood since the first decade of the twentieth century. It is very rare in Worcestershire and favours open woodlands and grasslands on light and/or lime-rich soils. Its apparent loss could be due to the reduction of open habitats within the woodland associated with the loss of coppicing areas and/or increased environmental fertility (eutrophication). It declined considerably in lowland Britain during the course of the twentieth century (Hill and Preston, 2014). It exhibits a high degree of association with nests of the yellow ant *Lasius flavius*, in old grasslands on sandy soils. A fine species-rich example of such a habitat can still be found on the southern border of Shrawley Wood, where it occupies the steep east facing scarp of the outfall valley from New Pool (01). This "ant-hill" meadow has not been subject to recent bryological survey.

Carlton Rea (Rea**,** 1901**;** Carrick**,** 2010) makes criticism of the Victorian County History account in that it failed to take notice of the *valuable herbarium at the Hastings Museum, Victoria Institute* (now Worcester Museum). However, Bagnall's somewhat

preliminary account of 1901 was swiftly followed, in 1903, by a more thorough treatment of the county's bryoflora in a paper in the Journal of Botany entitled *Mosses and Hepatics of Worcestershire* (Bagnall**,** 1903). Bagnall introduces the work:-
The following list of Mosses and Hepatics of Worcestershire is a record of the work of Mr. E. Cleminshaw, M.A., of Birmingham, Mr. J. B. Duncan, of Bewdley, and myself, and gives the result of our work in all portions of the county. The records of the late Edwin Lees, of the Rev. J. H. Thompson, of Cradley, of Dr. G. H. Griffiths, of Worcester, and those of the Rev. A. Ley, M.A., have also been included so far as these were available, and are duly acknowledged (note: the records of early botanists seem to be taken wholly from published sources rather than herbarium material).
My own work in Worcestershire began in 1868 (note: his collections in BIRA indicate active collecting on a small scale between 1866 and 1872)*, but was suspended so that I might give my whole attention to other matters. In 1899, in conjunction with my indefatigable fellow-workers above named, to whom the record owes much of its fullness, this work was again resumed* (note: date is that of the collaboration as his collections show collecting activity in Worcestershire throughout the 1890s)**.**
The 1903 account lists thirty bryophytes: thirteen liverworts and seventeen mosses, for Shrawley Wood and a further five species are noted as Shrawley, so are likely to be local but from beyond the woodland boundary. One record is attributed to Lees, probably from an undiscovered published source. All the rest are likely to be his own from visits in 1896 and 1902. Interestingly, he omits the rare Mountain Fork-moss *Dicranum montanum*, which he noted in his 1901 account. So he may have overlooked his 1896 records in compiling the 1903 list. In addition, his specimens in BIRA include a further three Shrawley Wood species novel to the account. So by 1903 a total of thirty-five species are known from the wood. This list is far from comprehensive, Bagnall was far too competent a bryologist and his work at Shrawley too intensive for the 1903 list to constitute his entire findings for the wood. The 1903 species list can be presumed to be a representative list of the most interesting species at the beginning of the twentieth century. Of the species known to Bagnall two are now considered errors (Duncan, 1911) and sixteen (57%) have not been recorded since 1920, which hints of a decline in bryological diversity through the course of the twentieth century.

Six years later, in 1909, the *Botany of Worcestershire* was published (Amphlett and Rea, 1909). This contains a chapter on bryophytes with all species then known in the county included. On p.xxvii of the introduction reference is made to the bryophyte chapter. This indicates that it is based on a list supplied by Bagnall, which was largely a repeat of the 1903 Journal of Botany account, but that this had been substantially enlarged due to recent work in the county and included many additions of both localities and species. It indicates that J.B. Duncan was responsible for most of the additional information with a significant contribution from H.H. Knight. Although the list overall may be more extensive than the 1903 account, for Shrawley Wood only a single species is added, Flat Neckera *Neckera complanata.* As this species was found by Bagnall on 28th April 1902 (Watson, 2013i) the additional record could either be the correction of an oversight or be indicative of an additional survey, possibly by Duncan sometime between 1903 and 1908.

Although he did not die until 1918, Bagnall's activities in Worcestershire appear to have largely ceased by 1909. It seems that Duncan had taken over the mantle of senior bryologist in the county during the first decade of the twentieth century. He was born in Edinburgh and spent most of his childhood in Moffat. On leaving home he became a bank clerk initially in Scotland before moving to Stratford-upon-Avon, then Birmingham and finally to Bewdley, where he remained until retirement. He seems to have moved to Bewdley sometime in the late-1890s (Lawley 2021ii). The census returns put him in Birmingham in 1891 and in Bewdley in 1901 (Lawley 2021ii) but there are specimens of his in WOS from Worcestershire in 1898 (Carrick, 2010) and in BIRA collected from the Wyre Forest in March 1899 (Watson, 2013i). He moved to Berwick-on-Tweed in 1923 where he remained for the rest of his life. Duncan was a very able bryologist. He joined the Moss Exchange Club (predecessor of the British Bryological Society, BBS) in 1901, was the Treasurer of the BBS from 1925 to 1945 and served as President in 1937-38 (Lawley**,** 2021ii). He acted as BBS's Recorder for mosses for 23 years from 1923 and edited the second edition of the Moss Census Catalogue in 1926 (Lawley**,** 2021ii**;** Carrick**,** 2010). The major part of his bryophyte collection is in Edinburgh (E) but some of his Worcestershire material is in WOS (Lawley 2021ii, Carrick 2010) and there are 105 Worcestershire packets of his dating from 1899 to 1916 in BIRA (Watson, 2014i & ii). His collections in WOS date from 1898 to 1908 (Carrick, 2010), which suggests these were deposited during the period he was working on its bryophyte collection. Most of his later Worcestershire material is likely to be in E.

During his time in Worcestershire, he not only aided Bagnall in his paper in the Journal of Botany of 1903 (Bagnall**,** 1903) and the bryophyte account in Flora of Worcestershire 1909 (Amphlett and Rea iv, 1909) but he undertook a review of the bryological collection at WOS, probably prompted by Carlton Rea. This review is reported by Duncan in the Transactions of the Worcestershire Naturalists' Club for 1911 (Duncan, 1911). His introduction states:-
Excepting Mr. Mathews none of these botanists seem to have collected very much locally.
Carrick reviewed the bryophyte collection in WOS (Carrick**,** 2010). She indicates that the collection now consists mainly of Thompson's and Duncan's packets so it seems that much the Worcestershire material has been lost since his time.
Duncan's principal aim in examining the herbarium was to uncover new species for the county, confirm doubtful records, correct errors and unearth new localities for rare species. There are no records from Shrawley Wood in his 1911 account.

Carlton Rea embarked on an update to the Flora of Worcestershire as early as 1910 (Rea, 1911). This was formalised into an Appendix to the Botany of Worcestershire, which was published in parts commencing in 1921 and distributed with the annual reports of the Transactions of Worcestershire Naturalists' Club, The final report was published with the completion of Volume 8 (1923-1931) published in 1932. The bryophyte account pp. 87 – 93 of the Appendix was distributed with the annual report for 1926 (published 1927). Rea's introduction to the bryophyte account states:-
*I am indebted to my friend Mr.J.B.Duncan, formerly of Bewdley but now at Berwick-on-Tweed, for all the numerous corrections and additions to the list***.**
He goes onto add that H.H. Knight of Cheltenham, Rev. C.H. Binstead, late of Whitbourne Rectory, Rev. Father P.G.M. Rhodes and the late Mr. E. Cleminshaw of Birmingham also made contributions, which are acknowledged with their initials. The Appendix also includes the results of Duncan's examination of WOS herbarium (Duncan, 1911) for which the sources are acknowledged plus novel records of his own. It appears that the later constitute the major part of unattributed records in the Appendix to the Botany of Worcestershire (Rea, 1931)**.**

The Appendix contains six relevant records, three of which are unattributed and can be considered as likely Duncan's. Two are for epiphytes growing on trees adjoining the River Severn by Shrawley Wood. These records first appeared as a short note in Transactions of Worcestershire Naturalists Club Volume 4 1907-1910 but were overlooked for the Botany of Worcestershire account (Rea, 1911). The other record attributable to Duncan is for *Dicranum montanum* and maybe a rediscovery of his own rather than a re-instatement of the 1901 reference. These records place Duncan in close proximity to Shrawley Wood at least in 1906 and possibly post-1909. These are the best indicators that Duncan actually visited Shrawley Wood but as he lived for about a quarter of a century within 10km of a renowned woodland it would seem improbable that he never visited Shrawley Wood other than to walk along the riverbank close-by.

Two undated records are attributed to Henry Herbert Knight. Knight was born in Shropshire where his father was a curate but the family soon moved to Abberton, Worcestershire. He was educated in Lancashire and studied mathematics at Cambridge. He taught at

Llandovery College in Camarthenshire for twenty years before retiring at aged 45 to live at Cheltenham, where he resided until his death in 1944. He was a critical botanist of repute and in addition to bryology his interests extended to vascular plants and lichens. He made major contributions to the botanical knowledge of Camarthenshire and Gloucestershire. His eminence as a bryologist is evidenced by his positions as the British Bryological Society's distributor for mosses 1909-1910 and recorder of liverworts 1911-1933 (Graham & Lawley**,** 2004)**.**
Knight's records likely date from 22nd September 1921 when he attended the British Mycological Society's annual fungus foray held in Shrawley Wood. He provided a list of Lichens found on that occasion (Knight, 1921). No other records of his are known, although his bryophyte collections in NMW, CHM, and WARKS may contain more specimens (Graham & Lawley**,** 2004**;** Riddelsdell et al, 1948).

Of the remaining group of Midland bryologists, from the early twentieth century, no evidence has been located to indicate that Augustus Ley, Edward Cleminshaw or Thomas Russell ever visited Shrawley Wood but we know from two sources that Philip Mole Grafton Rhodes did. Rhodes was born in Birmingham and attended King Edward's School. He became a priest after graduating from Cambridge and Fribourg. He converted to Roman Catholicism whilst serving as curate at Kidderminster and later became a priest at St. Mary's Roman Catholic Church in Evesham. His liverworts and lichens are at Birmingham Museum, which indicate he was collecting in Worcestershire between 1907 and 1928, with his main period of activity between 1909 and 1914 (Watson**,** 2013i & ii). His moss collection is at the Natural History Museum in London, with additional plants at the City Museum and Art Gallery in Bristol (Lawley, 2021 iii). His obituary appeared in *Report of the British Bryological Society* 3 (1934), page 246.

Whilst a curate in nearby Kidderminster, Rhodes attended the annual fungus foray of the Worcestershire Naturalists' Club in Shrawley Wood on Tuesday, 21st October 1913 (Rea, 1913). There are two liverwort packets of his in BIRA collected from Shrawley Wood dated 20th October 1913 and 21st October 1913. So presuming the dates are correctly transcribed then this is suggestive of significant survey effort. His other record appears in Rea's Appendix 1 and is also dated to 1913, when he recorded *Ambelstygia compacta*, which is currently known as Compact Feather-moss, *Conardia compacta*. This is a highly significant record as it is the only national rarity recorded from Shrawley Wood, as it is, currently, known from less than twenty sites in Britain and Ireland (Blockeel et al 2014i).

The publication of Rea's Appendix marks the end of the golden period for bryology in both Worcestershire and Shrawley Wood. The grand total of species recorded by 1928 is just 38 species. However, this represents at least eight surveys by some of the most eminent bryologists of their day. Therefore, it is probable that these are all the scarcer species, which had been located within Shrawley Wood by that date. If more pre-1930 records exist the most likely source is within herbarium collections. Those of potential relevance to Shrawley Wood are listed in Appendix 2.

Decline and Resurgence 1929 - 2018
As the Edwardian cohort passed away or moved on, Shrawley Wood entered a bryological slumber-land, from which it did not emerge for seventy years and after a period of great ecological change. When the record resumes, the wood has emerged as considerably altered by shifts in ownership and forestry management. Although the wood continued to retain its draw to succeeding generations of local naturalists the bryophytes were largely ignored or the records lost to posterity. It wasn't until the 1970s that Shrawley Wood once again attracted the attention of bryologists

Following 1928, there is a period of 40 - 50 years in which, as far as it is known, no bryophyte records were made and no surveys undertaken. Although there was a brief resurgence of interest in Worcestershire bryology in the 1960s based around the extramural department of Birmingham University, that group mainly confined their survey work within the Wyre Forest (Carrick**,** 2010**;** Greene & Clark**,** 1962). Shrawley Wood remained unexplored. The first post-World War II record was noted in the 1960s (Simmons**,** 1970) and is for the liverwort-Glaucous Crystalwort *Riccia glauca*, which is a plant of damp bare ground, noted as occurring in some abundance within a ponded tractor wheel rut. It was in the considerable area of open ground associated with clear-felling and replanting with conifers instigated by the Forestry Commission. This is the sole bryophyte record from the period of the extreme changes wrought by forestry activities.

The last third of the twentieth century witnessed a surge in ecological field work throughout the county with resurgence in the study of natural history and as a response to perceived conservation need. This was undertaken by both professional ecologists and amateur naturalists. But it was not until the twenty first century that Shrawley Wood once again became subject to specific bryological survey, which has resulted in a surge of first records.

Between 1970 and 1982 Richard Fisk was resident in Droitwich. He undertook a considerable amount of survey work throughout the county. On leaving Worcestershire his field records were deposited with the Worcestershire Biological Records Centre. Today, he is one of the senior bryologists within the British Bryological Society. He surveyed the Shrawley Wood reach of Dick Brook on 7th December 1975 during a field meeting of the Worcestershire Naturalists' Club, which added five species. He also made a recording trip to Shrawley Brickpits on the banks of the River Severn on 22nd June 1980, which added nine species. Unfortunately, he never recorded any deeper within the woodland before leaving Worcestershire.

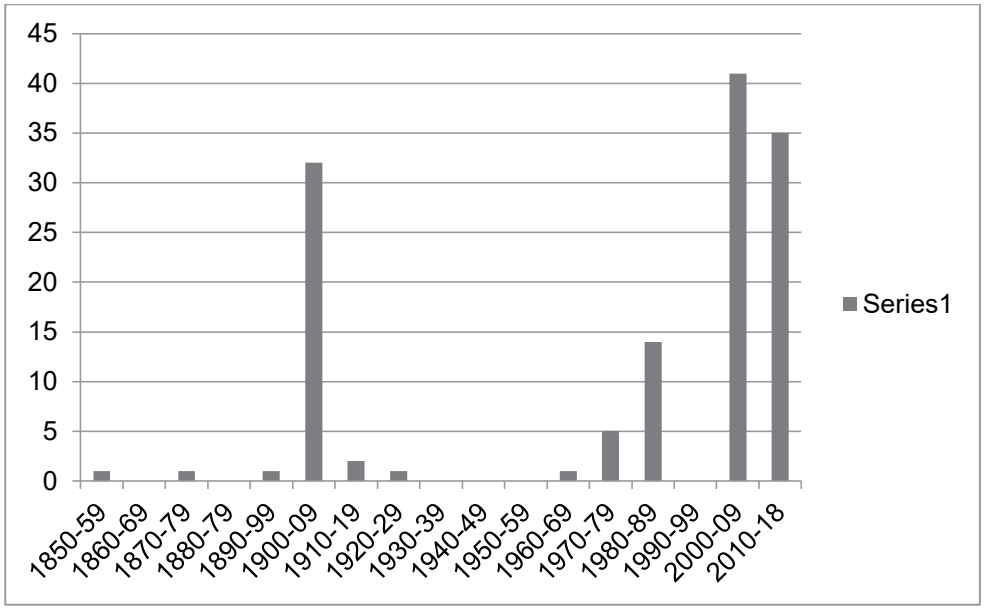
In 1980, Paul Day and Fred Fincher surveyed the wood on behalf of the then Nature Conservancy Council. There has been some confusion concerning their records (WBRC, 2014) as Paul Day compiled a list of bryophytes extracted from Botany of Worcestershire (Amphlett and Rea, 1909 iv)**,** which have subsequently become transposed in some lists as their own (WBRC, 2014). Paul and Fred did note a few bryophytes adding five species to the woodland list and Fred Fincher's wildlife notebook for 1980 (Fincher**,** 1980) confirms that, in addition, they recorded Large White-moss *Leucobryum glaucum*. This is and was a rare species in Worcestershire. Apart from the Wyre Forest and some of its outlying woods where it is moderately frequent it has only been reliably recorded from the Lickey Hills, Hartlebury Common and Shrawley Wood. This along with records of a suite of vascular plants including Lily-of-the-Valley *Convallaria majalis*, Wood Melick *Melica nutans*, Common Wintergreen *Pyrola minor* and Oak Fern *Gymnocarpium dryopteris* establishes a floristic link between Shrawley Wood and Wyre Forest, which is likely indicative of a continuity of woodland in ancient times (personal observation by the author). Of the vascular plants listed above only Lily-of-the-Valley still survives in Shrawley Wood, therefore it is of some concern that Large White-moss has not been recorded in Shrawley Wood since 1980.

When bryological recording resumed, post-2000, it was more systematic, attempts were made to record all species present and not just those deemed of special interest. Carrick (2010) gives an account of the revival of bryological recording in Worcestershire, recording was stimulated by the appointment of Lorna Fraser (LF) as County Bryophyte Recorder for Worcestershire, the formation of the Worcestershire Bryophyte Group (circa. 2002) and the guidance of Mark Lawley (ML) the appointed County Bryophyte Recorder for Shropshire and co-author of the latest field guide on bryophytes (Atherton et al 2010). In the mid-2000s Ann Hill (AH) replaced Lorna Fraser as the appointed VC37 Bryophyte Recorder for Worcestershire and the leader of the Worcestershire Bryophyte Group (WBG).

The following recording visits were made to Shrawley Wood: 2001 October - LF and AH; 2003 June - LF, AH and ML recorded 15 mosses and 6 liverworts; 2006 November - LF, AH and WBG recorded 41 mosses and 12 liverworts; 2009 July - Gillian Davis;

and in 2015 October - AH and WBG recorded 38 mosses and 14 liverworts. All these surveys were confined to the northern part of the wood, the open access areas controlled by the Forestry Commission. In total, they added twenty-nine species to the site list. In 2017, the author of this account, John Day added three mosses. In 2017, November AH and WBG recorded 24 mosses and 9 liverworts in the south east corner of Shrawley Wood. In February 2018 permission for a bryophyte survey of the southern privately owned section of the wood was granted, which made the valleys with their potential bryophyte rich wetland habitats available for the first time to survey. Mark Lawley and Ann Hill recorded 71 mosses and 16 liverworts and twenty-six species were added to the wood's all-time list. With just a single visit over such a large section of the wood it must be assumed that there are still more species to be added or re-finds to be made within the southern half of the wood.

02 shows the acquisition of new records per decade. The rate of acquisition of novel species shows little sign of decline suggesting that they are more species awaiting discovery.



02 Number of novel species added per decade

The Bryoflora - An Ecological Profile
Species Richness
The total of accepted bryophyte species is currently 134. These are listed in Appendix 1 with first and last dates and an indication of county status (personal observation by the author). In addition to the main woodland, it includes species only found along the adjoining reach of Dick Brook, within Shrawley Brick-pits or the Severn banks close to the wood. It does not include those old records recorded only from *Shrawley*. Of the older records two were established by Duncan as errors (Rea, 1931). Since 1970, 118 bryophytes have been recorded in Shrawley Wood.

In terms of bryophyte diversity, Shrawley Wood is currently considered one of the best sites in Worcestershire. The modern total of 118 compares very favourably with the county's other notable woodland sites. The most diverse Worcestershire woods are the ravine woodlands, the dingles, of western Worcestershire with their high humidity and geological variations, which frequently include calcareous tufa deposits, plus the larger ancient woodlands in the north and west of the county. Amongst these, modern totals for the more diverse sites include Wissetts Wood (SO67) 126 species, Deaths Dingle (SO66) 108 species, Hunthouse Wood (SO77) 126 species and the Worcestershire section of the Wyre Forest (SO77) 144 species (Carrick, 2011).
Shrawley Wood's bryophyte total is impressive if the nature of the woodland is taken into account, which is a predominately dry site on freely-draining sandstones. Its relative richness is likely a reflection of a long continuity of woodland cover (ancientness), its large size (in a county context), its geographic location and a high diversity of micro-habitats.

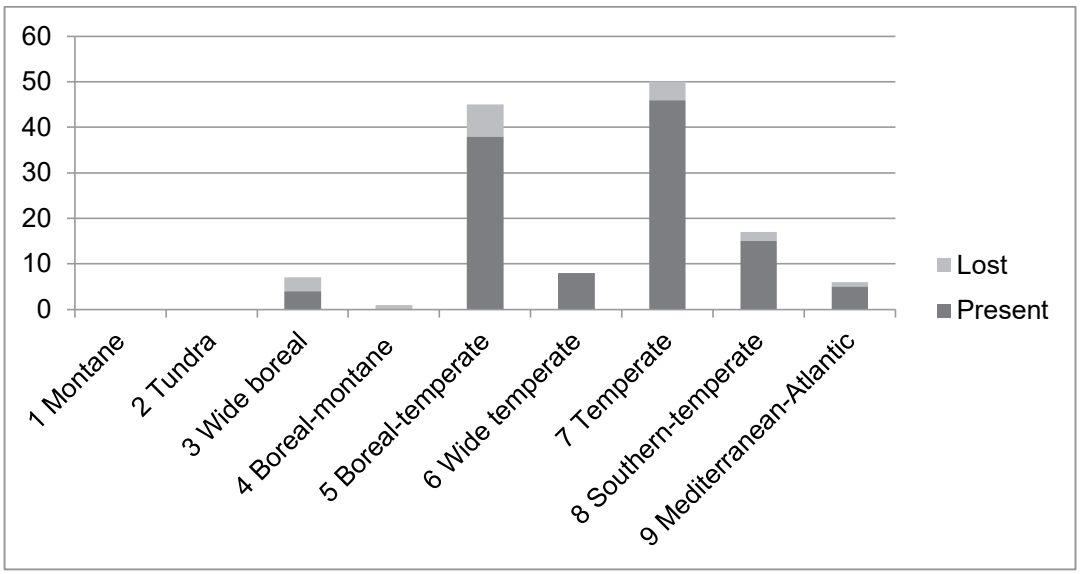
Even allowing for natural species turnover, it is unlikely that in a woodland of this size that a complete bryophyte list could be attained. Some of the species not relocated are likely to still occur. For commoner species the number of species is likely to be approaching a maximum but several specialist habitats have not been subject to modern specialist survey. In particular, the eastern scarp with its rock outcrops and quarry faces and the stream valley habitats including two bridges along the southernmost valley. Peripheral habitats such as Dick Brook, the unimproved grasslands including the ant-hill meadow, the Severn banks and adjoining wetlands including the brick-pits may also harbour more species. Bare ground habitats will be revealed and decline due to forestry management, therefore ephemeral colonists will come and go. These are best surveyed in wet periods between autumn and spring in the first year following clearance. For these species timing of survey is critical so repeat visits may be required to capture this element, which is currently largely unknown but was previously and still has the potential to be of significant interest.

Ecological Profile
Given an all-time species list in excess of 130 Shrawley Wood's bryological profile is unique. The combination of biogeographic elements with environmental parameters provides a distinct ecological fingerprint. There is nowhere else in the world which precisely matches the character and species complement which occurs here. The combination of size, ancientness of woodland cover and geomorphology are the most essential features contributing to this distinctiveness. In examination of the ecological attributes of the individual bryophytes it is possible to capture something of this essence, its unique quality. This section interrogates Shrawley Wood's ecological profile. Firstly, in examination of biogeographic elements, habitat indicator values and rarity then goes on to look at the site's broader habitats before describing specific microhabitats.

Biogeographical Elements
Bryoatt (Hill et al, 2007) defines the world range of each bryophyte using a two number system. In broad terms, these equate to a northerly range and an easterly range, examining these provides a biogeographical profile.

03 shows the north-south element applied to Shrawley Wood. As expected, the principal character of the bryophyte flora is temperate. For a lowland location, the lack of the most northerly (tundra) and

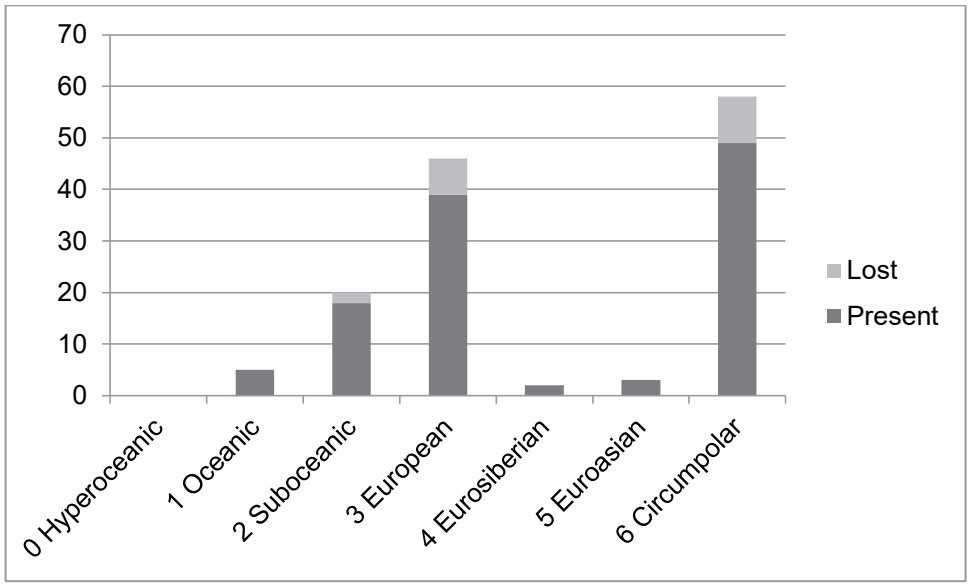
high altitude (montane) elements is typical and expected. Notably, about a sixth of the flora is distinctly southern, which puts the site distinctly within a southern British biogeographical zone. By contrast there is also a very strong presence, 40% of the flora, typical of the more northerly Boreal zone. These are largely the species which are characteristic of the highland zone within Britain. Most of this group approach their lowland limit in Britain, which runs as a virtual line along the Severn at this point. So even with this one parameter Shrawley Wood's biogeographic relationships become fairly well defined.



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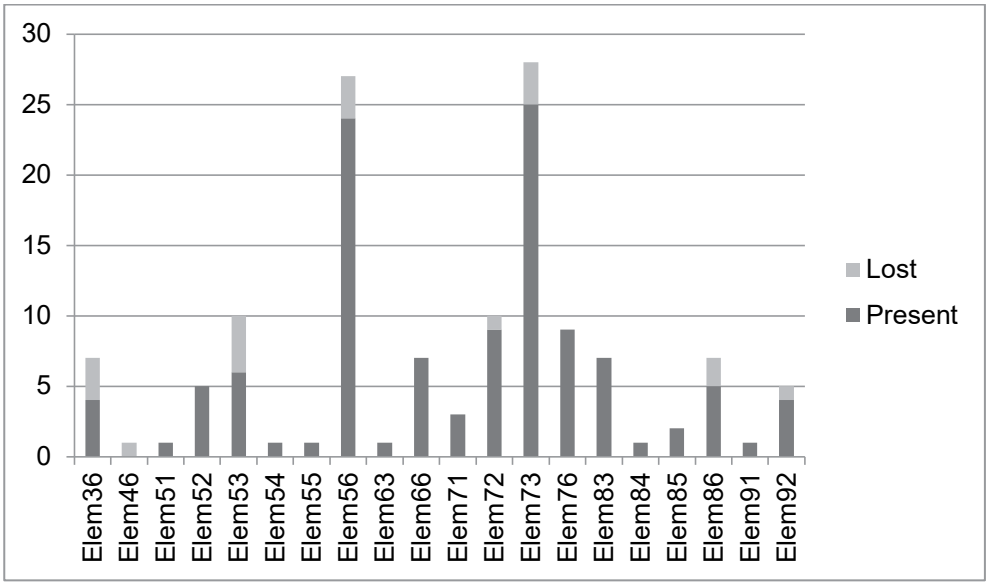
03 North-South element in Shrawley Wood

04 shows the east-west element applied to Shrawley Wood. For this parameter, most of the species have an extensive European or world range. The important component for defining Shrawley Wood is those species demanding of oceanic (western) conditions, the Oceanic and Suboceanic groups. No hyperoceanic species, often termed Atlantic bryophytes, occur. Shrawley Wood is just not wet or humid enough. However, more than a fifth of the species are decidedly western in their distribution. These species are generally moisture demanding and are typical of western Britain. Such a large element in Shrawley Wood is highly significant and on environmental grounds unexpected. The wood lies within the driest zone in Britain based on annual rainfall and number of rainfall days per annum (Pescott & Preston, 2014). Many of these species are towards the extreme easterly edge of their British range.



04 East-West element in Shrawley Wood

Shrawley Wood's uniqueness can be illustrated by combining the two biogeographic elements in a single code, 05. In effect this is a bar code with the amplitudes defining Shrawley Wood as a bryological habitat.



05 Shrawley Wood - Biogeographic elements adapted from Hill et al (2007)
(Note - the numbers follow those in 02 and 03, for instance 36 is Wide-boreal/Circumpolar and 92 is Mediterranean-Atlantic/Suboceanic)

Widespread biogeographic elements, mainly those towards the centre of the table, dominate but the strong representation towards the extremes indicates distinct affinities both with more northerly and southerly groups. There is a distinctive south-western group within the flora (elements >80).

A worrying aspect emerging from the table is the potential loss of the most distinct elements within the flora. This includes a proportionately greater loss amongst northern, southern and oceanic components. The lost species component overall is about 11%, compared to a 21% loss of Boreal (northern) species and a 25% loss in southern species. The subtle and distinct qualities of the bryological assemblage and therefore of the wood as a whole appear to be subject to gradual erosion. The replacement species profile is one of greater uniformity. This insidious effect is a process evident in much of lowland Britain and across many groups of flora and fauna.

Bryophyte Rarity - National context

By far the rarest bryophyte recorded to date within Shrawley Wood is Compact feather-moss *Conardia compactum*, originally noted as *Amblystegium compactum*. It was discovered by Rhodes in 1913 (Rea, 1931) but has not been recorded since. This is a highly significant record being a national rarity and currently known from less than twenty sites in Britain and Ireland (Blockeel et al**,** 2014ii**;** British Bryological Society, 2018). All time, it has only been recorded from about forty sites in the UK. Shrawley Wood is amongst a favoured group of ravine and cliff woodlands in the West Midlands known to have held this species (British Bryological Society, 2018). It occurrence here confirms a biogeographic link between the hard rock ravine woodlands of the lower Severn, Teme and Wye valleys, which is also evident in the vascular plant flora (Botanical Society of Britain and Ireland, 2019). These cliff and ravine sites are all linked geomorphologically by having been shaped in their modern form during the rejuvenation instigated by the glacial melt waters of the last ice-age.

The Severn valley has produced several records of Compact Feather-moss - from about 7km north on another sandstone cliff by the River Severn, Blackstone Rock (SO77), from about 13km northeast at Gloucester Coppice a woodland site on sandstone in the Stour valley at Wolverley (SO87) and from two sites in the valley of the River Worle in Shropshire (SO79), including Badgers Dingle. There are also sites at Downton Gorge on the River Teme in Herefordshire (SO47) and from ravine woodland in the lower Wye Valley (SO51). It still occurs in the last two locations but has not been seen for about 100 years in the Severn valley (British Bryological Society, 2018).

Compact feather-moss is a species, mainly, of rocky woodland, where it often occurs as mats over rocks in deep shade and is intolerant of competition (Blockeel et al**,** 2014ii). Suitable habitat still occurs in Shrawley Wood, most notably on the rock exposures and old quarry faces along the eastern scarp slope above the floodplain. These habitats remain relatively unexplored for bryophytes within the modern period. British conservation agencies define nationally scarce species are those which occur in 16-100hectads (10km x 10km squares) in Britain. Shrawley Wood holds no nationally scarce bryophytes. However, five species are uncommon having been recorded from less than 200 hectads post-1990 (this is the period of the latest Bryophyte Atlas, Blockeel et al, 2014i & ii). Table 01 lists all the Shrawley Wood bryophytes known nationally from less than 500 hectads in Britain since 1990.

Taxon Name	English Name	Last record	GB total hectads post-1950	GB total hectads post-1990
Conardia compacta	Compact Feather-moss	1913	32	16
Platygyrium repens	Flat-brocade Moss	2018	141	119
Rhodobryum roseum	Rose-moss	1909P	298	127
Scleropodium tourettii	Glass-wort Feather-moss	2018	227	129
Reboulia hemisphaerica	Hemisphaeric Liverwort	1909P	345	173
Dicranum montanum	Mountain Fork-moss	2018	288	181
Calliergonella lindbergii	Lindberg's Plait-moss	1909P	534	213
Brachythecium glareosum	Streaky Feather-moss	2018	467	222

Fissidens crassipes	Fatfoot Pocket-moss	2009	527	302
Mnium stellare	Starry Thyme-moss	2018	629	352
Scleropodium cespitans	Tufted Feather-moss	1909P	552	371
Riccia glauca	Glaucous Crystalwort	1968	792	398
Cephalozia lunulifolia	Moon-leaved Pincerwort	2018	718	416
Fissidens pusillus	Petty Pocket-moss	2018	538	441
Eucladium verticillatum	Whorled Tufa-moss	2018	791	492

Table 01 Shrawley Wood Bryophytes with less than 500 hectads nationally (hectad totals adapted from Blockeel et al, 2014; P = date of publication)

Of the fifteen species in Table 01 one has not been recorded for 50 years and four not for over 100 years. By contrast, five were recorded for the first time in 2018.

UK government advice is that by virtue of Site of Special Scientific Interest status such sites are considered of national significance for ecological interests. Shrawley Wood is a Nature Conservation Review site (Ratcliffe, 1977), which places it in higher category in national significance than its SSSI status confers. If bryophytes alone are considered, then on the basis of species rarity, species diversity and biogeography Shrawley Wood can be considered as of West Midlands significance as a bryological habitat.

Species Rarity - Worcestershire Context

The frequency for each species in Worcestershire has been assessed using a combination of Blockeel et al (2014 i & ii), the British Bryological Society's database (accessed 2018 through National Biodiversity Network) and personal observation by the author (Appendix 1).

Shrawley Wood is very important for bryophytes within a county context. Not only does it support high species diversity but a large proportion of its bryophytes, over a third, have a very restricted Worcestershire distribution. Thirty-four species are scarce and sixteen species are rare within the county (Table 02).

	Number of species	Species of north & west	Lost
Frequent / Abundant	55 (41%)	0	0
Widespread / Occasional	29 (22%)	0	2
Scarce	34 (25%)	17	4
Rare	16 (12%)	4	9

Table 02 Bryophytes - Worcestershire Status

Of the fifty species in the scarce or rare categories, twenty-one (42%) are largely confined to northern and western Worcestershire. These are the plants more typical of the higher rainfall areas of northern and western Britain. Shrawley Wood is at or close to the south-eastern limit of most of these within Worcestershire and many are also towards the limit of their range in lowland Britain. This gives the site significance within a West Midlands context.

A worrying trend is the apparently high turnover in the scarce or rare categories over the past 130 years. Losses (26%) in this group have been high. Despite this, new species of uncommon plants are still being discovered. Over half, twenty-six species have been found for the first time since 1980, which indicates the continuing significance of the site within the county. Some of these will be species which have expanded their ranges but the historic record is very incomplete and it cannot be presumed that all were previously absent. Many of the additions are epiphytes, which maybe genuine colonists since air quality started to improve in the 1980s. For many of these, this process represents a re-colonisation of former habitats rather than a genuine range expansion.

Habitat Indicator Values

Ellenberg et al (1991) developed a series of major scales of habitat attributes for plants. These have been applied to the British flora in an adaption by Hill et al (1999) and further modified for all bryophytes by Hill et al (2007). Hill et al (2007) used six scales for bryophytes of which two, salinity and heavy metal tolerance, are not relevant here. The remaining scales are for light, moisture, reaction (ph) and nitrogen (fertility); in higher plants the last three generally reflect the nature of the soil but in bryophytes they define the nature of the substrate.

	Light	Moisture	Reaction (pH)	Nitrogen (fertility)
Present	5.26 Semi-shade	5.41 Moderately moist	5.42 Moderately acid	4.21 Intermediate
Lost	5.6 Semi-shade	5.6 Moderately moist	5.33 Moderately acid	3.4 Moderately infertile

Table 03 Shrawley Wood - Mean Ellenberg Values

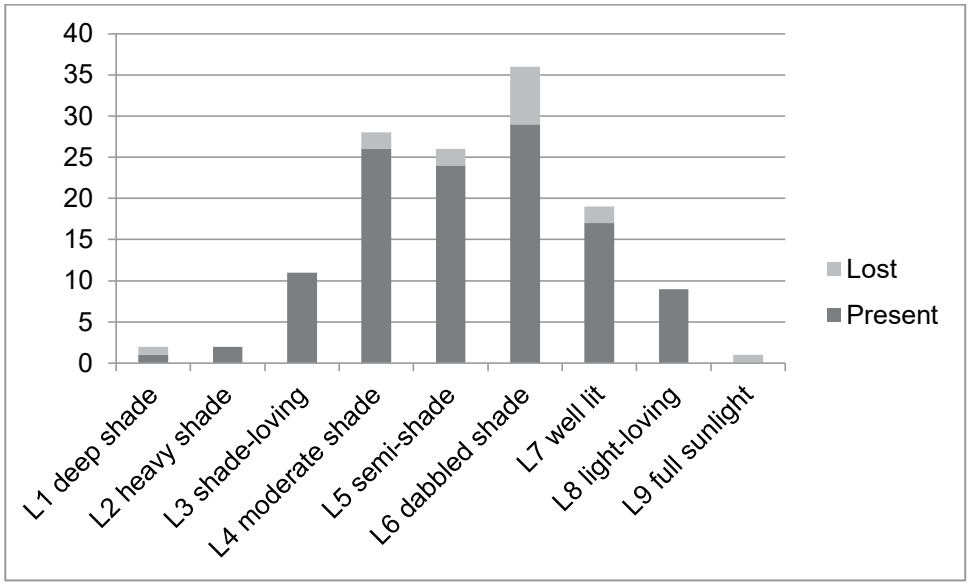
Each species has a fixed scale value for each attribute. By combining the information from all species an ecological profile for the site can be established. These values have been applied to the bryoflora for each of the relevant four attributes and the results are presented as charts which differentiate extant and extinct groups. The average Ellenberg values for the wood are shown in Table 03.

Overall, the current bryoflora can be categorised as one of semi-shade, moderately moist, moderately acid loving and of intermediate fertility. However, averages obscure the actual range and variation. The precise ranges and the amplitude of each attribute will more accurately describe the nature of the complexities at play within large woodlands containing a variety of microhabitats.

Light

Light has a 10 point scale, ranging from L0 *Dark* to L9 *Full sunlight*. The complete range from L1 *Deep shade* to L9 *Full sunlight* is represented (06). As expected for woodland, the proportion of the flora, 78%, requiring some shade is high. However, the significant proportion of more light demanding plants indicates the importance of more open conditions, rides, glades and woodland edges, for

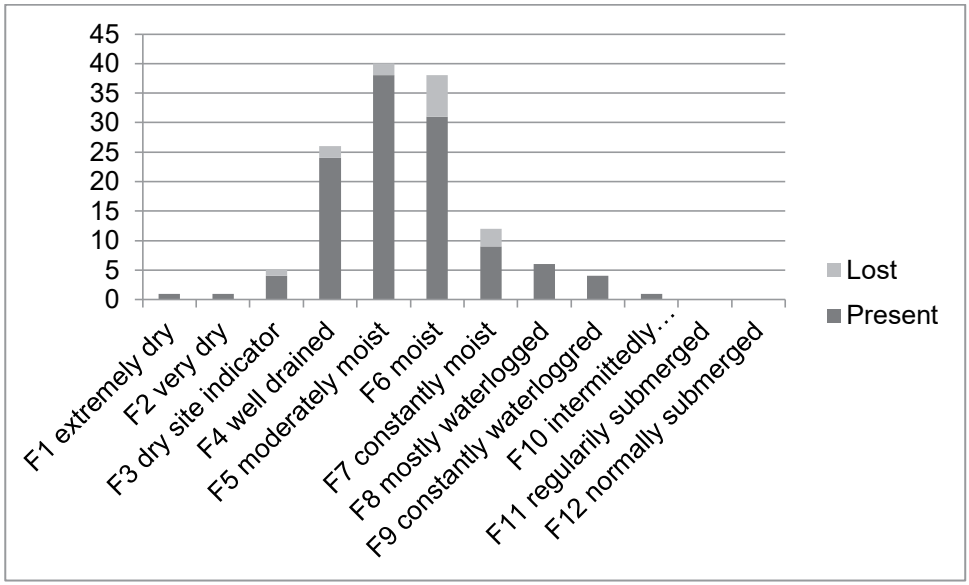
bryophyte diversity. Losses are more prevalent amongst those more light demanding species of the woodland edge (dappled shade) suggesting there is now a greater proportion of the woodland under canopy cover for longer periods than formerly. This is likely a reflection of a reduction in coppicing post mid-twentieth century.



06. Shrawley Wood – Ellenberg light attributes

Moisture Profile

Moisture has a twelve point scale ranging from F1 *Extremely dry* to F12 *Normally submerged*. The range represented here is from F1 *Extremely dry* to F10 *Intermittently submerged* (07).



07. Shrawley Wood – Ellenberg moisture attributes

So despite large pools, a fast flowing stream and small brooks there are no obligate aquatic representatives. These habitats on site are occupied by species able to withstand short periods without water cover, which is more typical in a low rainfall area such as this.

The wide range is a reflection of the diverse suite of wet micro-habitats available. So, for instance, rock habitats range from sandstone faces in full sunlight, bright cliffs, to those dowsed by permanent seepages or water-flows, such as springs and waterfalls.

The vast majority of Shrawley Wood is on well-drained, sandy soils. It is within hectad SO86 of the national grid, estimates for annual rainfall is 500-749 mm per annum and mean number of wet days is less than 120 per annum, which place Shrawley Wood within the driest sub-zones in Britain for bryophytes (Pescott & Preston, 2014). Most of the wood is well drained or dry. Therefore, as expected, there is a significant group, 25%, which require freely drained conditions, including a few plants of exceptionally dry habitats such as the scarce Streaky Feather-moss *Bracythecium glareosum*.

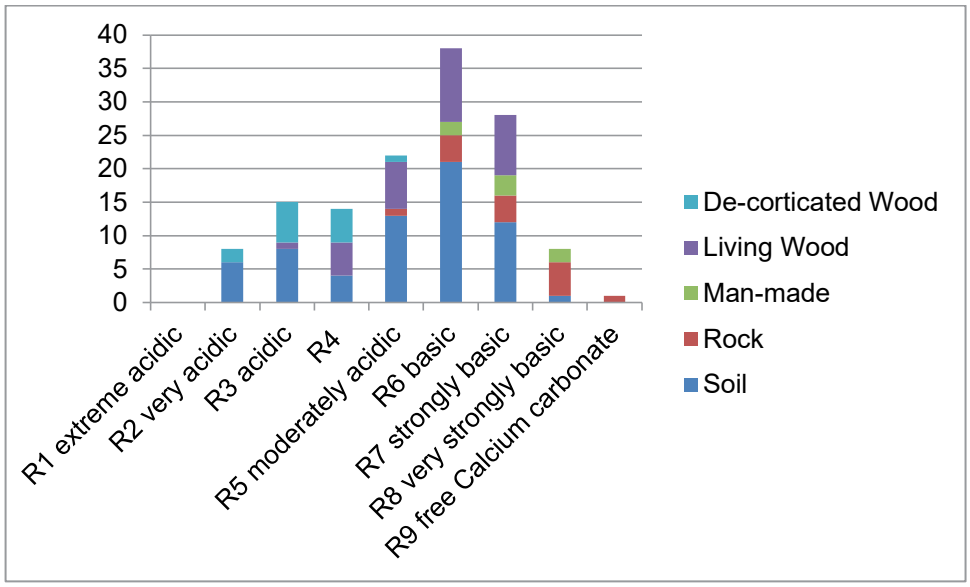
The amount of dry ground available contrasts with the moisture profiles of the bryophytes as 75% are species of moist or wet conditions. The Shrawley Wood study area extends over 201 100m squares of the national grid of which only 25% hold permanent, wet ground. As plants of moderately moist and moist conditions dominate the species diversity, this emphasises the significance of the wetter and more humid areas of the wood as the principal centres of bryophyte biodiversity. The most important are the Dick Brook corridor, the two stream valleys in the southern half of the wood and the riverside habitats, including the brick-pits. These present a varied range of wet and damp microhabitats attractive to mosses and liverworts. In addition, a little less than 20% of the flora requires

very wet conditions such as seepages, waterfalls, pool sides and stream sides. As this group is overrepresented when compared to area of available habitat it identifies these very small habitat components as significant biodiversity hotspots within the wood.

The losses amongst species demanding of dry conditions are, proportionately, around the expected levels. Also there are no known losses amongst those species requiring the wettest conditions. This is suggestive of some stability within these habitats. The largest losses, which are higher than expected, are amongst plants of moist or constantly moist conditions, which is indicative of subtle changes within the woodland environment. Wider environmental variables and climate change relating to rainfall (amount and periodicity) as well as relative humidity may be a factor. However, when considered with other habitat attributes the primary driver of this loss is likely due to changes in forestry practice and management. A shift from regular coppicing utilising horses to less frequent modern interventions using powered machinery has resulted in reduced habitat availability for small scale damp and wet soils within any calendar year. Highly localised ponding opportunities have become much less frequent, few of these microhabitats now occur within the site.

Substrate reaction (pH)

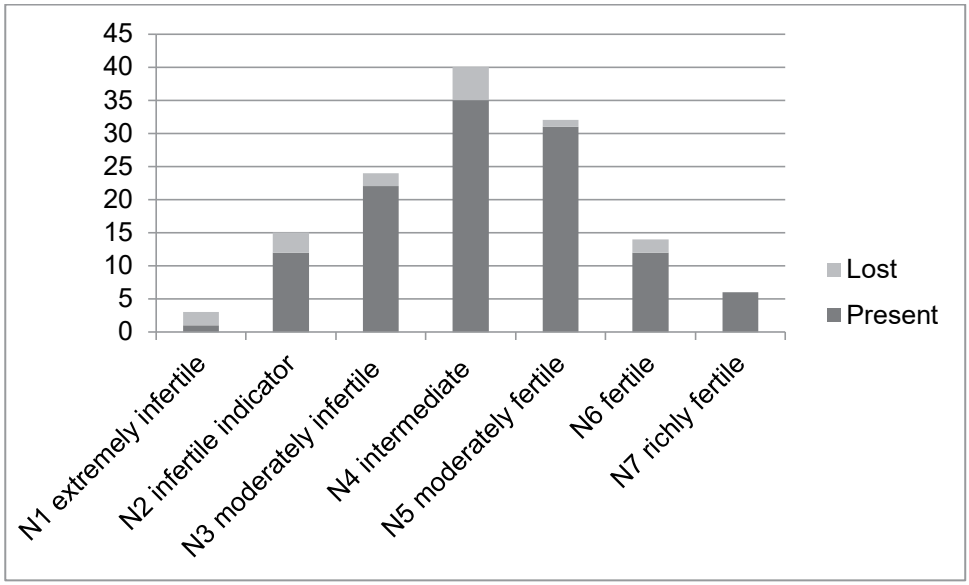
Reaction applies to all substrates, not just soil. Substrate diversity is fairly high (08). The only missing microhabitat is R1 *Extreme acidic* which occurs in conditions such as bog. Notably, the extreme R9 *Free calcium carbonate* is present, although it occurs as only a single, tiny permanently-wet, calcareous seepage. Overall, basic species predominate, 55%, but there is a strong calcifuge element, 45%. Losses amongst species of acid and basic habitats are similar. As a further refinement the data has been further subdivided by habitat. Each species has been assigned to its preferential habitat within Shrawley Wood, which is represented graphically in Figure 12



08. Shrawley Wood – Ellenberg substrate reaction attributes / microhabitat preference

The largest group are those which grow on soil. There is a wide range from R2 highly acidic to R8 very strongly basic. The number of species is fairly even between species of acidic and basic soils. This is good evidence for a high diversity in soil conditions across the site. The vast majority of the soils on site are derived from sandstones, which tend towards acidic in reaction, especially, where the surface layers are freely draining. The more basic soils tend to be down-slope. Valley soils are influenced by inflows and accumulation of enriched silts. There will also be some concentration of bases on sloping ground subject to groundwater flows, as some base-rich lenses occur within the sandstones (Mitchell et al, 1962). These are mobilised and move down-slope with water movements. Consequently, bryophyte biodiversity in the valleys leads to an over-representation of the basic soil element in the bryoflora overall when compared to area of habitat available.

The figures indicate that the species preferring hard substrates, both natural rock and hard man-made surfaces, are almost invariably basic-loving plants and include extreme calcium loving species. However this analysis is picking up only those plants largely confined to rock surfaces within the wood, which skews the results away from acid lovers of widespread occurrence. Those plants confined to basic substrates tend to inhabit surfaces where water in some form, streams or seepages, is able to flood the hard surface with more base rich water. Most have extremely restricted distributions, often to a single very small area on a rock where suitable conditions occur. For instance, there is a very small colony of Rambling Tail-moss *Anomodon viticulosus* on a tiny rock outcrop high above the Dick Brook and the tufa mosses Whorled Tufa-moss *Eucladium verticillatum* and Curled Hook-moss, *Palustriella commutata* are restricted to wet faces associated with the permanent spring above the rock cut basin at approximately SO8051465820.
Species which prefer living wood break down fairly evenly into those preferring acid bark and those preferring basic bark. As the vast majority of available bark in the wood is acidic (oak, lime, chestnut, beech) this illustrates the importance of the less prevalent woody species (willow, alder, sycamore, hazel, elder) as important bryophyte habitats.
Species inhabiting decorticated wood are invariably calcifuges. This mirrors the available habitat as the vast majority of stumps are derived from either small-leaved lime, oak or sweet chestnut.



09. Shrawley Wood – Ellenberg fertility attributes

Change in habitat indicator values
Shifts in Ellenberg scores, Table 04 give some indication of environmental changes for species lost but obscure potential changes and gains, due to data deficiency in earlier records. Comparing the Ellenberg scores for lost species with those of the whole flora provides insights into temporal environmental change.

	Lost taxa	Extant taxa
Light	5.5	5.06
Moisture	5.56	5.46
Reaction	4.94	5.29
Fertility	3	4.36

Table 04 Average value of Ellenberg scores for lost and extant taxa

In terms of average values, there is a tendency towards a loss of species of lighter, damper, more acid conditions with a stronger loss amongst species of infertile soils. So, in broad terms Shrawley Wood has become darker, drier, less acid and more eutrophic over the past 100 years.

The drivers behind these changes are likely to be forestry practice (loss of a regular coppicing, changes in species composition), climatic / atmospheric changes, particularly nitrogen deposition and changes in human activity.
Sulphur dioxide deposition is likely to have had profound impacts but it both rose and fell dramatically during the 100 or so years for which there is bryological data. Unfortunately, the site data is insufficient to assess the impact in detail but national trends indicate dramatic increases in epiphytes of neutral and base-rich substrates (Hill & Preston, 2014).

Bryophyte Habitats - Principal Substrate
Bryoatt (Hill et al 2007) attaches substrate attributes to each species. Species often utilise more than one substrate, but to aid interrogation a simplified version is used here. A single preferred or principal habitat within the wood has been assigned to each species based on personal observations by the author. The results are shown in Table 05.

Rock (R)	15	11.20%	11.20%
Hard man-made surfaces (RM)	7	5.20%	5.20%
Soil (So)	65	48.50%	48.50%
Decorticated wood (ED)	14	10.50%	
Living wood (EL)	33	24.60%	
Combined Wood (E) (ED & EL)	47		35.10%

Table 05 Principal habitat in Shrawley Wood based on Bryoatt (Hill et al**,** 2007)

Ground or soil dwelling species predominate. The diversity is a reflection of the varied nature of the soil conditions across the site, which range from waterlogged, valley, fertile soils to dry, heavily leached, infertile ones plus much of the range of variation between.

As befitting woodland, a third of the flora is epiphytic in some form. Most are epiphytic on bark whilst a significant proportion, 10%, are preferential for rotting stumps and decorticated wood.
The range of rock outcrops present provides a specialised habitat which supports a ninth of the flora. Man-made surfaces are of very restricted distribution, being largely confined to the valleys associated with New Pool but they increase bryophyte diversity by about 5% overall.

Bryophyte Habitats - Ground flora - soil
Most species grow preferentially on soil but species composition and abundance are variable through the wood. The majority of the wood is under canopy cover but the abundance of bryophytes within the ground flora is highly variable. In part, it relates to woodland structure and therefore will vary over time and change with management.
Another major and linked predictor for bryophyte abundance is vascular plant cover. Wherever there is a high cover of vascular plants bryophyte cover is low. Three ground flora communities dominate most of the ground layer within the wood. Great swathes of the woodland under small-leaved lime canopies have a dense cover of Bluebell *Hyacinthoides non-scripta*, more localised are receiving slopes dominated by Ramsons *Allium ursinum* and thirdly, areas under conifer canopies and some stored small-leaved lime coppice are dominated by brambles *Rubus*.
Where shade is dense as under recent coppice (up to 40 years) and higher plant growth and particularly bramble growth is suppressed, bryophytes are frequently a significant component of the ground flora. In such situations, cover tends to be very variable but can be high (well over 50%). However, the range of species tends to be limited to a small cohort of fairly common, shade tolerant, woodland species. The principle component species are Common Smoothcap *Atrichum undulatum*, Rough-stalked Feather-moss *Brachythecium rutabulum*, Common Striated Feather-moss *Eurhynchium striatum,* Common Feather-moss *Kindbergia praelonga,* Swan's-neck Thyme-moss, *Mnium hornum*, Fox-tail Feather-moss *Thamnobryum alopecurum*, Common Tamarisk-moss *Thuidium tamariscinum* and the Pocket-mosses *Fissidens.* Large White-moss *Leucobryum glaucum*, which is a good ancient woodland indicator in Worcestershire is a component of this community but it has not been seen since 1980.

The most diverse soil communities are associated with steep banks which generally have thinner, less fertile soils. They are far from common in the wood. Most banks are very small scale and highly localised. There are two zones within the wood which hold a greater concentration, along Dick Brook and in the southern valleys.
A range of banks are associated with Dick Brook, here humidity and shade tend to be high and plants such as Pocket-mosses *Fissidens* and thallose liverworts are frequent.

Victorian landscaping within the southern valleys created pools and an associated ride network, which extends in excess of 2.5km. The banks of the ride system are highly variable but in part support some of the most diverse bryophyte and higher plant communities within the woodland. They are at their best where shade is partial and soils very thin. The Hair-cap mosses *Polytrichum* and *Pogonatum* and Fork-mosses *Dicranum* are the defining mosses of this habitat and they reach their greatest frequency within the wood here, see (10).



10. In valley by Middle Pool, ground cover under beech dominated by mosses, *Polytrichum* and *Dicranum*

Bryophyte Habitats - Arboreal flora
In Shrawley Wood, tree trunks and branches above 1m in height tend to be poor in both abundance and species composition over the majority of the site. This is due to a variety of parameters. These include climatic factors, low rainfall and relative humidity. Higher parts of trees are too dry and bryophyte growth is restricted to the lowest parts of the trunks where water flow accumulates and relative humidity is higher. Another significant factor is tree species composition. Small-leaved lime, conifers, oak, sweet chestnut and beech form the majority of standing trunks. All of these species have

relatively acidic bark, which is unattractive to the majority of epiphytes. Also, age and structural diversity of trunk and branch growth is rather uniform and therefore micro-niche availability for bryophytes is low. There is little in the way of veteran trunk and branch growth throughout the wood with very few trunks older than eighty years. Additionally, light levels further restrict niche availability being very low within the stands dominated by small-leaved lime or conifers, which dominate the majority of the wood.

The better areas for arboreal species are along the Dick Brook corridor and in the stream valleys in the southern half of the wood. These areas are damper with higher relative humidity and tend to have more light penetrating the canopy. Tree and shrub species composition is generally more diverse and stand structure more variable. Ash, hazel, elder, willow and alder are present and these tend to support more diverse floras. Occasional bushes on ride-sides or woodland edges also support a more diverse bryoflora. The typical range of arboreal species includes several species of Bristle Mosses *Orthotrichum*, Pincushions *Ulota*, Veilworts *Metzgeria* and Scaleworts *Frullania.* The current arboreal flora is both much more extensive and diverse than in the 1970s and early 1980s (personal observation by the author).

Although tree trunk and branch bryofloras are restricted over much of the wood, the lowest woody parts, such as stools, mostly derived from coppicing, and tree bases present a structurally diverse and abundant habitat throughout the non-conifer sections of the wood. These are one of the wood's more important bryophyte microhabitats. Small-leaved lime stools dominate but locally sweet chestnut and oak are frequent. Bryophyte cover is generally high with pleurocarpous (creeping) species dominant. Most bryophytes of the shaded floor community also occur in this habitat but with many additions commonest amongst which are Mammillate Plait-moss *Hypnum andoi,* Cypress-leaved Plait-moss *Hypnum cupressiforme* and Slender Mouse-tail Moss *Isothecium myosuroides*.



11. A super-stool of Small-leaved Lime, Tilia cordata - stored coppice, with a wealth of micro-niches at low elevations available for bryophyte colonisation but note few epiphytes other than green algae on trunks

Rotting stumps are fairly frequent in the wood. Old and rotting stumps tend to have more diverse bryophyte communities than boles and trunks. Most individual stumps are of oak from felling in the mid twentieth century but there are also many derived from coppiced stools of small-leaved lime and some sweet chestnut. They support a much greater component of acrocarps (upright species) such as Common Pincushion *Dicranoweisia cirrata* and Forklet-mosses *Dicranella* together with leafy liverworts such as Crestworts *Lophocolea* and Pouchworts *Calypogeia*.
These decorticated stumps are a fine bryophyte resource and are an important microhabitat for several species which are scarce or rare in the county (12). The scarce Mountain Fork-moss *Dicranum montanum,* which is generally confined to ancient woodland in Worcestershire, has been found on a range stools and stumps at many locations throughout the wood. Stumps in the southern valleys where light levels and relative humidity are fairly high appear to have the richest stump bryofloras. Some species uncommon in Worcestershire such as Flat-brocade Moss *Platygyrium repens* and Moon-leaved Pincerwort *Cephalozia lunulifolia* have not been located elsewhere in the wood.

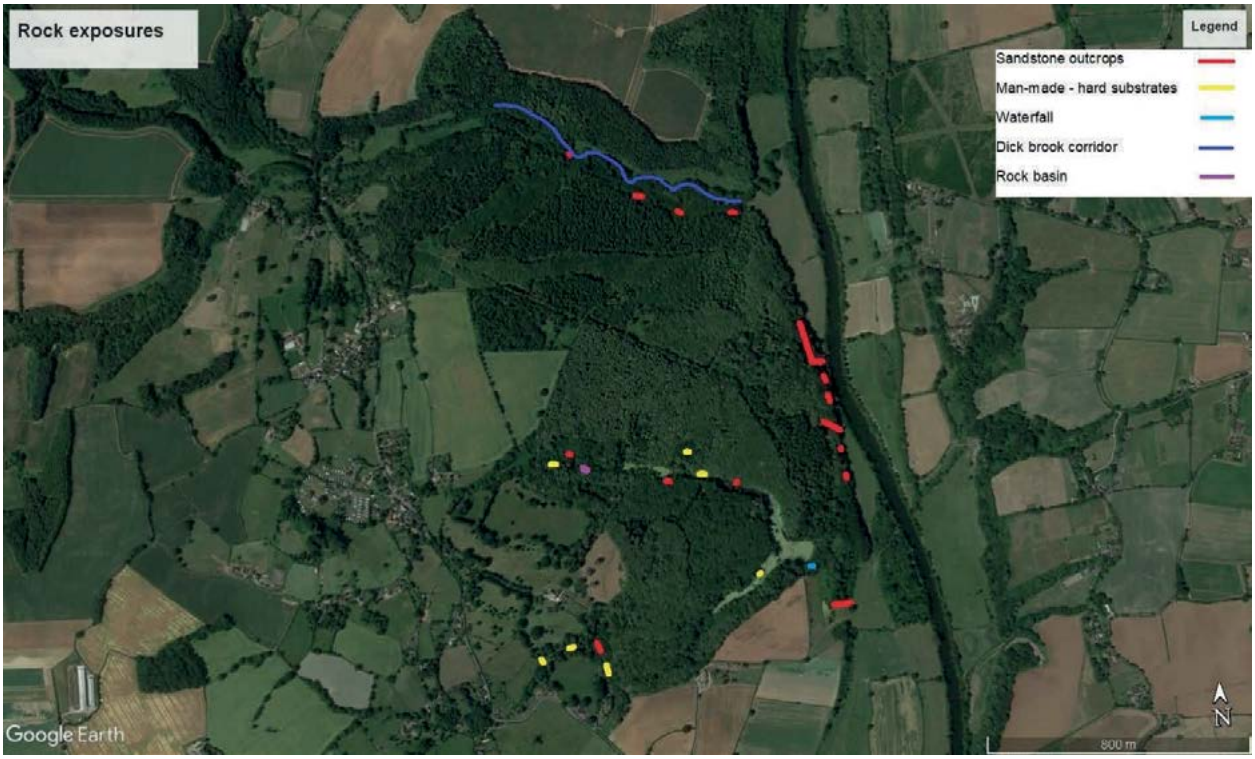


12. Stored coppice of Sweet Chestnut, *Castanea sativa* with large coppiced stool and rotting stumps presenting many opportunities for bryophyte colonisation

Bryophyte Habitats - Hard substrates and rock exposures

Rock exposures provide a niche for many bryophytes. Habitats hostile to higher plant growth are frequently of high importance for bryophytes. Hard rock surfaces whether man-made or natural present such an opportunity. About 10% of the species are confined to these substrates although many species more typical of the woodland floor and tree boles can also be found on this habitat.

Shrawley Wood has a range of rock faces (13.). The underlying rock here is the Triassic, Bromsgrove Sandstone (British Geological Survey, 2021). This rock generally produces an acidic reaction but it is not entirely uniform, holding occasional more calcareous nodes (Mitchell et al, 1962). It is porous and water travelling through it can mobilise bases so that calcareous (base-rich) seepages may develop.



13. Shrawley Wood – distribution of hard substrates

The largest rock exposures occur as outcrops on the eastern river scarp and north of the main west-east public footpath and at the southern point of Oliver's Mound, with smaller exposures on the banks of Dick Brook, and on the scarp above it. Most rock outcrops appear to have been derived from quarrying, which has created a series of microhabitats important for bryophytes. Quarrying appears to have been through several phases, which have so far eluded attempts to date them accurately. For the larger quarries the Heritage Environmental Record (HER: Shrawley High Quarry, SO812660, WSM41349) states: *Shrawley High quarry consists of two small red sandstone quarries lying at the western edge of Shrawley Wood just east of the River Severn, in the parish of Shrawley. It is not clear when sandstone was first quarried from the site, but it may have been the source of building stone for Oliver's Mount Castle, which lies just to the south. The castle was built around the year 1100.* (Note the HER's cardinal points are erroneous, the quarry is on the eastern edge of the wood and is situated west of the River Severn).



14. Shrawley High Quarry looking towards its south-western corner

From personal observations, it appears that at least six, possibly unrelated, phases of quarrying in the wood can be identified. The largest rock exposures are the quarry faces in the scarp above the Severn floodplain. The largest of these with mainly vertical rock faces extends for about 80m north –south and 20m east-west and is up to 8m high. The majority of the surfaces are bare but there are occasional crevices and small ledges. Much is inaccessible and it remains to be surveyed in detail. Also just to the south of the main quarry is a small cave cut into the rock face which has been described as a hermitage, *Mr. Rea has kindly pointed out that there was a hermitage in Shrawley Wood*, Beeston (1906). This feature is unrecorded in Worcestershire's HER. A series of outcroppings occur south from here and some appear natural exposures.



15. The "Hermitage", cave on cliffs above the Severn floodplain

There is a significant area of exposed rock along the line of the old trackway near the point where the main west-east public footpath disgorges from the wood onto the floodplain (Figure 22). This appears as a rock cut holloway along the line of a small natural valley. It was probably the main route linking the ford to the village of Shrawley and no doubt served the nineteenth century public house near this spot as well as being the easiest timber haul to the River Severn. It is very shaded and humid and is the haunt of Yews. Bryophyte cover is high on damp ledges but only common species have been located here to date.



16. Rock exposures along holloway leading to River Severn

There is a series of small scale quarries along the valley of the Dick Brook; at least three of the rock outcroppings here appear to be the result of quarrying. It seems plausible that at least some would have been associated with the lock construction along this reach of the Dick Brook (see pp. . All are in shade and although vertical faces are small, less than 2m, there are a range of small crevices which support good growths of bryophytes. Diversity is fairly good but to date only a range of relatively common species have been recorded.



17 Worked sandstone outcrop above Dick Brook, ancient coppice provides an indication of age

In addition, the Dick Brook itself holds a range of stones and boulders and there are sections supporting dressed stone banks, which are considered to be remnant locks (associated with Yarranton's seventeenth century waterway in HER**,** 2021i, but see pp. 82-95 and 96-102). The Dick Brook and its banks support high cover of bryophytes in places. Thallose liverworts dominate dressed stonework but the brook's habitats have been largely unexplored bryologically since the 1980s.

There are at least 3 small scale quarries associated with the New and Middle Pools valley. They are most likely borrow pits associated with the landscaping of the valley in the nineteenth century. Bryophyte cover is relatively high.

The southernmost tip of Oliver's Mound is marked by a vertical face of sandstone. It is not natural in origin and the ground at its foot is a rock based cut platform, which was occupied by a homestead in the first half of the nineteenth century (Shrawley tithe plan, 1839) but had been lost by the time of the Ordnance Survey 1:2500 plan of 1886. This exposure is about 50m long by up to 7m high. It has an open aspect and is south facing. It presents a highly hostile environment for plant growth. Bryophyte growth is restricted to low cover and a few common light demanding species.



18. Oliver's Mound, excavated sandstone face at southern extremity of wood

There are a couple of small exposures on the eastern edge of the wood south from the holloway which maybe old worked faces. They are shaded and support bryophytes but remain to be surveyed in detail.

Two rock faces which support bryophytes of calcareous conditions have been located. There is a tiny apparent natural rock outcrop high above Dick Brook which has a small colony of the Rambling tail-moss *Anomodon viticulosus*. A larger man-made face occurs towards the western end of the valley containing Middle Pool where a natural spring emerges from the sandstone. Tradition claims that it never dries. It flows into a rock cut basin (19). This habitat holds significant bryological interest. It supports Whorled Tufa-moss *Eucladium verticillatum* and Curled Hook-moss *Palustriella commutata var. falcata*, species which require free calcium carbonate in the water to thrive. These are tufa forming species. This is an important microhabitat for bryophytes both within Shrawley Wood and in a Worcestershire context. Calcareous cements known locally as *catbrain* are a feature within, particularly, the basal beds of the Bromsgrove Sandstone formation (Mitchell et al, 1962) but their surface expressions in the form of calcareous springs and seepages occur very rarely in the county (personal observation of the author), with probably the best example at the former SSSI at Stanklyn Pool 10km northeast.



19 Excavated rock basin and base-rich spring, habitat of Whorled Tufa-moss and Curled Hook-moss

Waterfalls are a specialist habitat often important for bryophytes. New Pool was landscaped in the nineteenth century to outfall via a waterfall over the natural sandstone rock (20). This waterfall is carpeted in the moss, Long-beaked Water Feather-moss

Platyhypnidium riparioides, with the basal stones and rocks supporting an abundant growth of thallose liverworts. Further survey may reveal a more diverse bryoflora.



20. Waterfall – outfall from New Pool, abundant Long-beaked Water Feather-moss on rock surface

Man-made hard surface habitats provide a range of microhabitats for bryophytes. These are generally basic, small scale and mainly associated with the water features in the southern valleys. They include a brick and concrete boathouse (21.), two stone bridges, an iron bridge, at least four pool spillways (stone, concrete, brick), a stone grave, some brickwork associated with a former summerhouse and occasional rock debris in streams. Most support bryophyte growth and add to the overall diversity of microhabitats and bryoflora within the wood, with seven species confined to these substrates.



21. Brick built boathouse with concrete cap, habitat for lime loving bryophytes

Bryophyte Habitats - Aquatic habitats
There are no obligate aquatic bryophytes recorded from either the streams or pools. However, streams and stream sides support some bryophyte communities on rocks and stonework. All species recorded from these habitats have some ability to survive in semi-submerged conditions. The best example of such a community occurs around the waterfall outfall from New Pool.

Change
Locally, forestry practice, extractive industries, landscaping, construction and waterway management have all affected the bryoflora. At a more distant scale, atmospheric quality, climate change and individual species fortunes affect change.

The Lost Flora
Of the 37 species recorded from the wood before 1925 a total of 16 (43%) have not been recorded since then, see **Table 05**. A few may survive but the loss rate is high. Over half the losses mirror trends recognised on a national scale (Hill and Preston, 2014).

Taxon	Last date	Habitat	National trends
Calliergonella lindbergii	1909	open, moist, mildly acid habitats	national decrease
Cirriphyllum crassinervium	1909	woodland floor & tree bases, calcicole	no change
Conardia compacta	1913	open & shaded sandstone rock	loss in Severn valley
Dicranum majus	1909	woodland floor on acidic soils	decline in southern England
Fossombronia pusilla	1909	pioneer - damp acid soils	national decrease
Nardia scalaris	1921	pioneer - damp base-poor & sandy soils	national decrease, lowlands
Neckera complanata	1909	tree trunks, bases and stools	no change
Orthotrichum sprucei	1907	riparian roots & trunks liable to inundation	no change
Plagiomnium affine	1909	soil lightly shaded woodland & rides	no change
Polytrichum piliferum	1909	pioneer - well-drained acid soils	national decrease, lowlands
Reboulia hemisphaerica	1909	open, sandy winter-wet soils	no change
Rhodobryum roseum	1909	dry sandy soil, open wood & ant-hills	national decrease
Riccia glauca	1968	pioneer - bare acid soil	national moderate decline
Scapania nemorea	1909	humid banks in woodland	national decrease, lowlands
Scleropodium cespitans	1909	riparian tree bases	no change
Solenostoma gracillimum	1913	pioneer - damp base-poor & sandy soils	decline in central England

Table 05 Lost Species, national trends (adapted from Hill & Preston, 2014) and Shrawley Wood habitat

Two species, Tufted Feather-moss *Scleropodium cespitans* and Spruce's Bristle-moss *Orthotrichum sprucei* are riparian epiphytes, for which suitable habitat still exists on the banks of the River Severn and in the brick pits and possibly along the Dick Brook. These locations have not been subject to recent intensive survey.

Compact Feather-moss *Conardia compacta* is a specialist of bare, shaded rock outcrops. This species has not been recorded for over 100 years within the Severn (British Bryological Survey, 2018)
Two are epiphytes. There seems no apparent reason why Flat Neckera, *Neckera complanata* should not still occur. The other Beech Feather-moss *Cirriphyllum crassinervium* is normally associated with calcareous substrates, so if the old record was correctly determined then it likely had a restricted and / or specialist habitat and may be a genuine loss.
Two species of acid woodland floors, Greater Fork-moss, *Dicranum majus* and Grove Earwort *Scapania nemorea* have also not been re-found. Both have declined nationally. Most suitable remaining habitat in the wood has been surveyed. There are small pockets of potential habitat on the rocky scarp slopes above the flood plain, which have not been examined in detail.

The remaining and largest group of nine species form a distinct ecological group. They are open ground specialists, pioneer plants of infertile conditions on sandy, acid and mainly damp soils. They are characteristic of open woodlands and woodland rides. Most also exhibit declines more widely, in lowland Britain as a whole or within England. The reasons for their declines nationally and specifically here are likely similar. There is a general ecological trend nationally but most marked in lowland Britain to a loss of species associated with the least fertile and acid soils. This seems to be due in large part to eutrophication from atmospheric fallout (Pescott & Preston, 2014). Locally, eutrophication and habitat degradation may also result from regular human activity and dog-walking. Habitat availability is also an issue. Within woodland, changes in management practices such as a cessation in regular coppice rotation has led to less open areas less often. Habitat availability per annum is much reduced. To compound these problems ride quality also seems to have declined both for higher plants and bryophytes. Rides now tend to support less diverse floras dominated by grasses. Eutrophication seems to be a factor but the nature of disturbance has altered with a more continuously uniform compaction from vehicles, which creates a habitat favouring fewer species. This compares to the more diverse disturbance impact from horses and horse-drawn transport.

Principle changes affecting bryophytes

Rides and Glades
A major loss within Shrawley Wood is a much reduced habitat diversity within its largest area of glade woodland. This is associated with the more acidic soils derived from the river terrace deposits at the highest point of the woodland towards the east of the site. Even in the mid-1980s this zone had a grass-heath character and supported heath woodland specialists such as the higher plant, Heath Cudweed *Gnaphalium sylvaticum* but since that time it has largely become overgrown by bracken and is no longer suitable for low-growing bryophytes and heathland specialists associated with open sandy soils. The spread of bracken may be associated with climate change.

All of the principal rides and paths in the wood were surveyed during the course of 2017 and 2018 by the author. Throughout the wood the ride sides tend to be grassy on relatively compacted soils and support very little other than eutrophic species more widespread in the woodland as a whole. The major exception is wherever there are exposed banks. These occur occasionally throughout the wood but reach their most diverse for both bryophytes and higher plants in those bordering the southern valleys and especially the ones associated with the margins of New and Middle Pool; here the vegetation is regularly cut to maintain access. The lakeside rides are flanked by steep cut banks which still support diverse, mainly calcifuge, bryophyte communities.
Potential habitat for open ground and pioneer bryophytes is still created by felling and coppicing operations. These are best examined

in wet autumn and winter periods ideally in the first season after clearance. Specific attention was paid to such areas in 2017 but surveys were not ideal being undertaken in May and June. Those examined held only bryophytes more typical of the woodland floor generally and no evidence of pioneer species of open ground was found.

Quarrying

Quarrying from medieval times to the nineteenth century has left a legacy of habitats important for bryophytes. Most are hard rock exposures. These and their origins have been dealt with in detail in the habitat section.

On the floodplain on the banks of the River Severn and close to the wood is the remains of a pit excavated in the nineteenth century for clay for brick working. The provision of a reliable transport corridor no doubt played an important role in the development of brick industry on the banks of the Severn at Shrawley in the nineteenth century. The pit adjoined the river on the north side on the confluence of the river and the stream outfall from New Pool and Shrawley Wood. Ecologically, its importance lies in its abandonment with the cessation of brick-making. The wet pits became vegetated and are now wooded. For the most part the pits support wet alder and willow woods, parts of which are swamp woodland. The brick pit woodlands of the lower Severn valley are by and large the only remaining examples of wet floodplain woodlands south of the Ironbridge gorge. This is a threatened habitat throughout Europe. They are of high ecological value and very important examples of a habitat largely lost from the British landscape. The swamp woodland and riverbank of the brick pits have been subject to ecological survey several times since 1978 notably on behalf of the Worcestershire Wildlife Trust e.g. Day, J.J. Worcestershire Wetland Survey 1978 and Liley, M.J.S. Worcestershire Wetland Survey 1998. However, there has been only a single bryophyte survey, by Richard Fisk in 1980. His survey found nine species new to "Shrawley Wood" of which five are not currently known from elsewhere on the site. A modern survey of the wet woodland and riverbank is overdue but the swamp woodland here is treacherous and potentially deadly, it may prove impossible to complete a full bryophyte survey here.

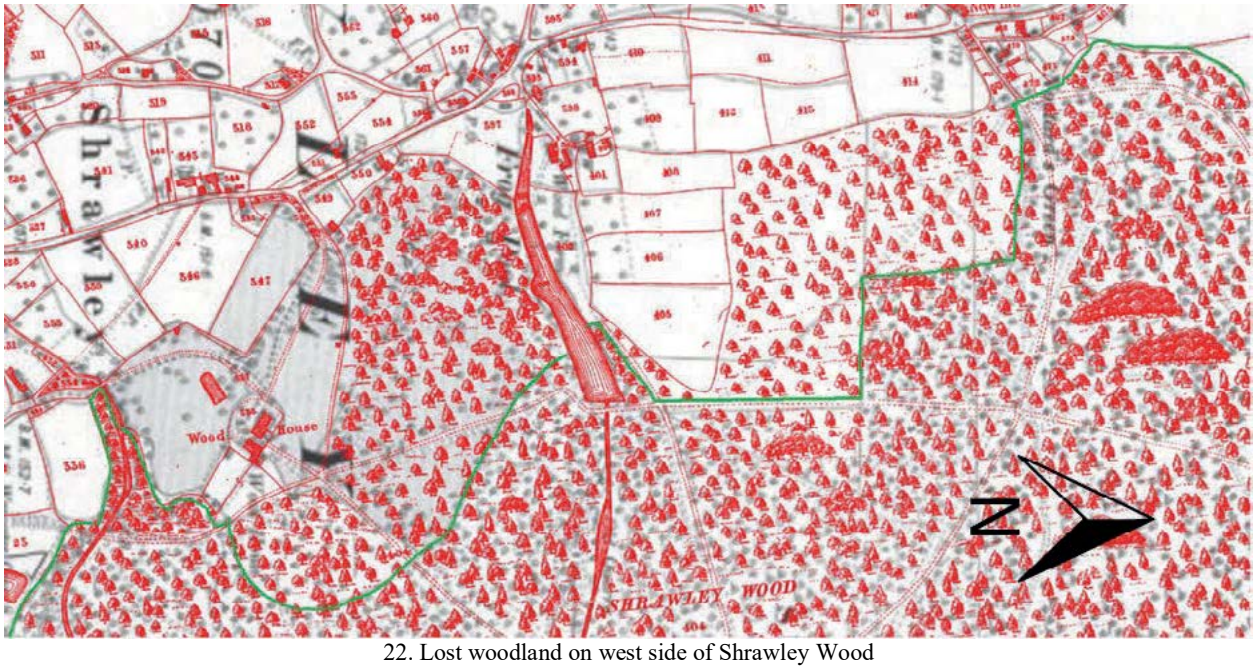
Changes in the Victorian period

Substantial structural changes were wrought on the wood in the second half of the nineteenth century. These began sometime after 1839 (Shrawley tithe plan) and were completed prior to 1884 (Ordnance Survey first edition 1:2500 plan). These had profound impacts on the ecology of the wood and consequently on its bryophyte communities.

Two large blocks of woodland, in total over 20ha, shown on the Shrawley tithe plan of 1839 on the western side of the wood were lost during this period (22). From surviving fragments such as the western boundary hedge, south from Noutard's Green and contemporary accounts, it appears they held a similar woodland type, dominated by small-leaved lime, as today. So there was a substantial loss of woodland bryophyte habitat and communities.

An area of about 10ha was lost between Noutard's Green and Frog Pool. This was converted to arable. About 40% of this was allotment gardens in the Edwardian period (Ordnance Survey 1:2500, 1903 edition p.213 (09a)) but these had gone by 1927 (Ordnance Survey 1:2500, 1927 edition). This area today is substantially without bryophytes.

A second block of woodland of about 12ha between Shrawley Wood House and Frog Pool was cleared to make way for parkland type grassland. Most of this area is still retained as wood pasture / parkland associated with Shrawley Wood House. Most of the trees here are lime standards, which support relatively few epiphytes and the majority grassland habitat holds only a few common grassland bryophytes. 22 illustrates the situation before and after clearance - the tithe plan of 1839 is in red, this overlies the Ordnance Survey 1883 1:2500 plan, the green line is the current woodland boundary, so all red woodland above this line was lost.

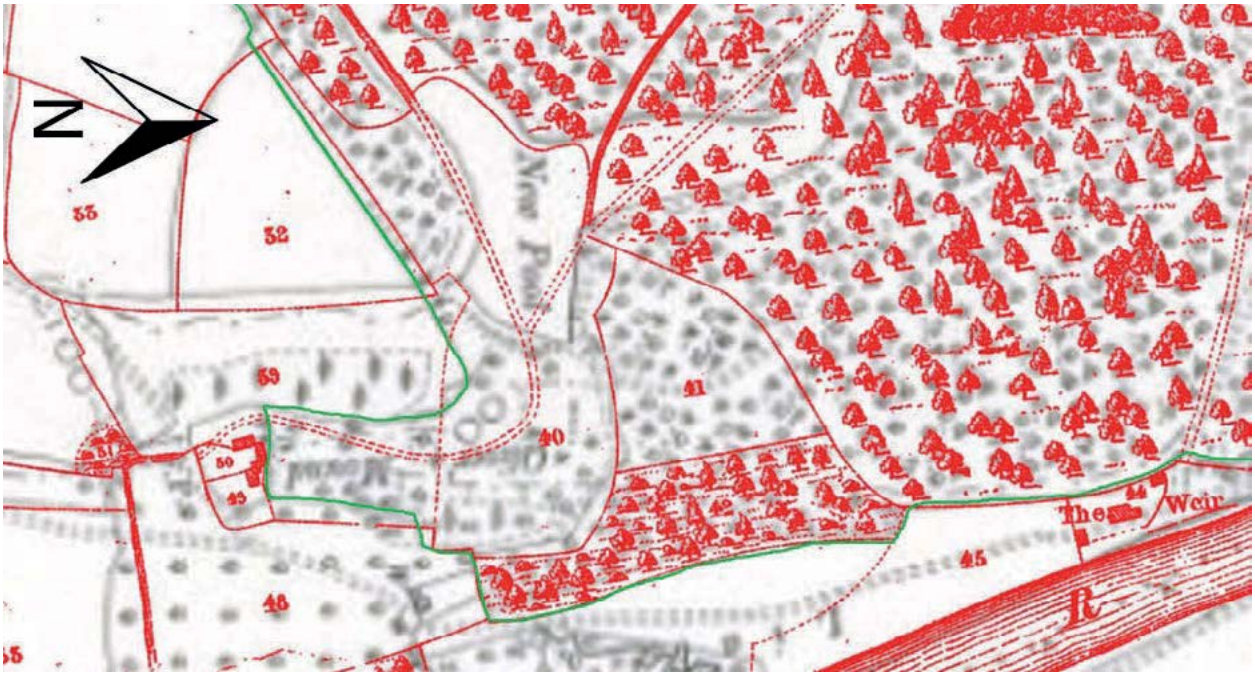


22. Lost woodland on west side of Shrawley Wood

In addition to conversion to parkland there were a number of other Victorian works within the woodland which can be broadly defined as landscaping activity.

In contrast to the woodland loss, approximately 5.5ha of land was incorporated into the woodland at its south-eastern corner in order to accommodate the construction of a dam and the creation of New Pool. Two fields were entirely brought within the boundary of the wood, 41 *Wood Close* which was arable in 1839 and 40 *Barley Green Orchard*, managed for pasture in 1839, a third 39 *Curriers Orchard* lost that part covering Oliver's Mound to the wood (Shrawley tithe apportionment 1839). So Oliver's Mound became incorporated within the woodland boundary probably for the first time in 800 years.

Figure 30 illustrates the situation before and after dam construction - the tithe plan of 1839 is in red, this overlies the Ordnance Survey 1883 1:2500 plan, showing New Pool and dam, Oliver's Mound is wooded. The green line is the current woodland boundary.



23 Woodland gain in south-east corner of Shrawley Wood

Currently, Shrawley Wood holds two large pools New Pool and Middle Pool wholly within its confines, both are impoundments on the small brook which traverses the wood. In their current form they date from Victorian landscaping (pp. 104-8). This was a substantial engineering project which completely altered the character of the wood's internal stream valleys.

The principle engineering work was the 1850 construction of dam of about 80m across the southern outfall valley. This resulted in an impoundment which flooded the two small stream valley floors for approximately 750m.

Prior to that time, southern valleys held small streams (but see p. 28, Court Pool and p. 202 (04)). No descriptions of the stream valleys and their habitats exist prior to the changes. So these have to be inferred, from remaining habitats, profiles of the valleys, cartographic evidence and the historic record. The streams are confined within small valleys with narrow floodplains. It is probable that the valley floors supported wetland vegetation including eutrophic marsh. The extent of woodland cover is unknown but was probably high as this was working woodland with all products exploited. The woodland undoubtedly consisted of alders and willows to varying degrees. All these wetland habitats have high bryological potential, so flooding with standing water with no bryophytes represents a significant habitat loss.

Cartographic evidence concerning Middle Pool is inconsistent. A pool of approximately the right dimensions is shown on the first edition Ordnance Survey 1:63360 plan surveyed, 1828-1830, published 1832 (p. 269 (06)). The Shrawley tithe plan of 1839 is unhelpful as the internal details of tithes were not mapped accurately (see p. 270). It seems likely that Middle Pool already existed by the Victorian period but that it became fixed by a more substantial dam during the landscaping work.

Associated works include a wide ride network traversing both sides of the stream valleys, which extends in excess of 2.1km, linking in to this are a further 1600m of rides through the woodland proper. This ride network especially in the valleys has had a profound impact on woodland flora both for higher plants and bryophytes. They support the richest woodland edge communities in the whole wood. Bryophytes have benefitted in the creation of many microhabitats, especially banks and slopes with exposed soils of low fertility. Streaky Feather-moss *Brachythecium glareosum*, a rare plant in Worcestershire (British Bryological Society, 2018 and Blockeel et al, 2014ii) is a good example of a species which has benefitted.

There are also at least three small quarries which appear to be borrow pits associated with this period of ride construction. These all have well-developed bryophyte communities.

Amenity planting at this time includes beech and a range of conifers planted as specimen trees rather than plantations, which has created small patches of bryophyte rich habitat of types rarely encountered elsewhere in the wood.
A range of new hard substrates associated with the construction project were also introduced into the wood at this time or subsequently. Structures include stone spillways and dams, bridges, a brick boathouse later capped with concrete, natural rock waterfall. These diversified microhabitat availability for bryophytes.
Although the Victorian landscaping certainly destroyed a significant area of semi-natural woodland of high bryophyte potential, it also provided novel woodland habitats and other microhabitats. In terms of species diversity it has almost certainly increased as a result of Victorian engineering.

Forestry
The conversion of large areas to conifers in the second half of the twentieth century resulted in a considerable reduction of ancient coppice woodland habitat. There are no known species gains associated with this change. The closed canopy areas under conifers have a much restricted bryoflora compared to areas under broad-leaved woodland.
From at least the nineteenth century forestry has promoted a more varied broad-leaved tree species composition. The most significant for bryophytes has been that associated with the valleys and the wetland areas, where ash, poplar and willows have been planted or promoted. These species hold a richer epiphytic flora than small-leaved lime, oak, sweet chestnut or beech and so increase microhabitat diversity for bryophytes colonisation.

Planting for purely amenity purposes seems have started in the nineteenth century, with the introduction of amongst others beech (1801, p. 210) and Wellingtonia. It was an on-going feature of the twentieth century. False acacia was planted in 1889 (p. 211). The last quarter of the century saw the introduction of many alien species into the southern half of the woodland, mostly as small groups or individuals particularly in the wetter valleys, including species such as Swamp Cypress. The most frequently planted species though was

Copper Beech. Whilst unadvisable on ecological grounds all novel surfaces have the potential to increase micro-niche availability for bryophytes. However it should be noted that there are no known species gains associated with these changes.
The severe reduction of coppicing both temporally and spatially has significantly impacted on those more light demanding species. Less activity in winter months has reduced areas of temporary puddling events. The use of machinery in modern forestry has reduced the value of rides and other open areas as bryophyte habitats. They are more uniform with greater compaction. Overall there is less open ground in any year.
Traditionally, much of the small-leaved lime was managed as coppice but interspersed with this particularly in the northern part of the wood were oak standards. Few if any oak standards remain in the wood, many were felled in the 1940s and 1950s with the final clearance undertaken by the forestry commission in the 1960s. This virtually extinguished older trunks from the wood. Currently, the only older tree trunks in the wood are a few standard scattered beech and yew trees plus a light scatter of small-leaved lime pollards and a few amenity species such as Wellingtonia.

Transport
The canalization of Dick Brook would have had a profound but localised impact on the bryophyte communities along the Dick Brook with the drowning of habitats and the clearing of bankside cover. Ecologically, the waterway did not last and the watercourse has returned to its natural condition. It has however left a legacy for bryophyte communities, along parts of the reach adjoining the wood, in the form of permanent stone revetments. These are largely dominated by bryophytes, particularly thallose liverworts.

As there is physical continuity of canopy cover between Shrawley Wood, the Severn's banks and Shrawley Brickpit they can be considered as an ecological unit. The development of woodland here represents a positive ecological gain over the past century. Canopy cover now extends from the wood along the Severn banks as far as the confluences of the Dick Brook and the brook draining from New Pool. Towards the latter it broadens out around the site of the former brick pits.

This has not always been the case. This ecological continuity has evolved since the mid-nineteenth century. The river was an important transport route from at least the medieval period. Up-river traffic was largely man-hauled or horse-drawn and bankside tree growth discouraged. In order to provide a more reliable transport corridor the Severn upstream as far as Stourport was made into a permanent navigation in the second quarter of the nineteenth century. As part of this process locks were constructed at Holt, 2.5km downstream and at Lincombe, 3.5km upstream between 1843 and 1846. This coupled with a cessation of bank-hauled transport as it became replaced by steam power allowed the colonisation of the riverbank by broad-leaved trees, especially willows but also occasional alder, oak, ash and sycamore.

Riparian tree trunks and boles especially where they are subject to periodic flooding and deposition of eutrophic silts are a very distinct microhabitat with a specialised bryoflora. This is therefore a relatively new habitat associated with Shrawley Wood. To judge from his records, Duncan took an interest in the bryoflora of the riparian habitats associated with the River Severn. He did for instance find Fountain Pocket-moss *Fissidens fontanum* new to the British flora from the River Severn at Bewdley in 1901 (Lawley, 2021ii and Carrick, 2010). He also explored the riverbank alongside Shrawley Wood in or around 1906 (Rea, 1911), when he recorded Spruce's Bristle-moss *Orthotrichum sprucei* and Wood Bristle-moss *Lewinskya affinis*, so tree cover was established by that time. Spruce's Bristle-moss is largely confined to the lower branches of riparian trees. It has a scattered British distribution although the Severn corridor is one the more reliable habitats. It has not been recorded here since Duncan's time there does not appear to have been any bryophyte survey of the river banks here since Duncan's time.

Atmospheric change loss and gain
Atmospheric pollution has played a significant role affecting bryophyte distribution since the start of the industrial revolution. Effects and relationships are far from simple. Whilst in the main atmospheric pollutants have restricted the distribution of many, mainly, arboreal species other species were favoured by acid deposition. Shrawley Wood is within the high sulphur dioxide zone (Pescott & Preston, 2014) which affects much of lowland Britain and the industrial zones of the West Midlands are relatively close. Atmospheric pollution sufficient to affect bryophyte populations likely began in the seventeenth century with forges within the Dick Brook valley. They are likely to have had a very profound if localised and relatively short-term impact on bryophyte communities. A later major source of atmospheric pollution local to Shrawley was Stourport power station. This was coal-fired and was opened in 1928 by the Prime Minister and local MP Stanley Baldwin, it remained in operation until 1984. It was situated on the banks of the Severn almost due north of and within 4km of Shrawley Wood. Although prevailing winds are mainly south-westerly, exhaust plumes would have frequently affected the wood.

Beginning in the 1980s there has been a significant improvement in air pollution derived from sulphur dioxide. This has allowed many species of arboreal bryophytes to colonise large swathes of lowland Britain mainly from refugia in the west. Changes in distribution and abundance 1960-2013 of British and Irish bryophytes have been published (Pescott & Preston, 2014). So although site specific data is sparse for Shrawley Wood it is likely subject to national trends. It is apparent from my own surveys of woodland throughout Worcestershire in the 1970s and 1980s that epiphytes were previously extremely scarce and a significant difference in abundance was not noticeable until the 1990s. **Table 06** is a list of epiphytes, largely based on the national trends (Pescott & Preston, 2014), which have or may have colonised Shrawley Wood in the past 30 years after a long period of absence, only one of these, Wood Bristle-moss, *Orthotrichum affine* having been recorded pre-2000 (in 1907).

Frullania dilatata	Dilated Scalewort
Frullania tamarisci	Tamarisk Scalewort
Metzgeria fruticulosa	Bluish Veilwort
Metzgeria furcate	Forked Veilwort
Metzgeria temperata	Whiskered Veilwort
Microlejeunea ulicina	Fairy Beads
Radula complanata	Even Scalewort
Cryphaea heteromalla	Lateral Cryphaea
Orthotrichum affine	Wood Bristle-moss
Orthotrichum diaphanum	White-tipped Bristle-moss

Orthotrichum lyellii	Lyell's Bristle-moss
Orthotrichum pulchellum	Elegant Bristle-moss
Orthotrichum stramineum	Straw Bristle-moss
Syntrichia latifolia	Water Screw-moss
Ulota bruchii	Bruch's Pincushion
Ulota crispa	Crisped Pincushion
Ulota phyllantha	Frizzled Pincushion
Zygodon conoideus	Lesser Yoke-moss
Zygodon viridissimus	Green Yoke-moss

Table 06 Shrawley Wood Epiphytes

Other Gains

Gains since the first quarter of the twentieth century include those species which colonised Britain for the first time (Hill & Preston, 2014); Heath Star-moss *Campylopus introflexus* (first UK record 1941), Cape Thread-moss *Orthodontium lineare* (first UK record 1910) and Flat-brocade Moss *Platygyrium repens* (first UK record 1945). The latter is considered a natural colonist from Europe whilst the other two are introductions to Britain.

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Appendix 1
Shrawley Wood Bryoflora
Taxonomy follows Blockeel et al 2021

Abbreviations:	**County Status**	**Note**
Year	F/A Frequent / Abundant	L Considered lost/extinct
P Publication date	W/O Widespread / Occasional	R River Severn only
	S Scarce	B Brickpit only
	R Rare	Sh Shrawley only
		Er Error (Duncan in Rea, 1931)

		First	Last	County Status	Note
Liverworts					
Calypogeia arguta	Notched Pouchwort	2015	2018	S	
Calypogeia fissa	Common Pouchwort	2018	2018	S	
Cephalozia lunulifolia	Moon-leaved Pincerwort	2018	2018	R	
Chiloscyphus polyanthos	St Winifred's Moss	1980	1980	S	B
Conocephalum conicum	Great-scented Liverwort	1975	2018	F/A	
Diplophyllum albicans	White Earwort	1903P	2015	S	
Fossombronia pusilla	Common Frillwort	1903P	1909P	R	E
Frullania dilatata	Dilated Scalewort	2003	2018	F/A	
Frullania tamarisci	Tamarisk Scalewort	2003	2003	S	
Lepidozia reptans	Creeping Fingerwort	1903P	2015	S	
Lophocolea bidentata	Bifid Crestwort	1902	2018	F/A	
Lophocolea heterophylla	Variable-leaved Crestwort	1913	2018	F/A	
Lunularia cruciata	Crescent-cup Liverwort	1975	2018	F/A	
Metzgeria consanguinea	Whiskered Veilwort	2018	2018	F/A	
Metzgeria furcata	Forked Veilwort	2001	2018	W/O	
Metzgeria violacea	Bluish Veilwort	2006	2018	S	
Microlejeunea ulicina	Fairy Beads	2015	2015	S	
Nardia scalaris	Ladder Flapwort	1921	1931P	R	E
Pellia endiviifolia	Endive Pellia	1903P	2018	W/O	
Pellia epiphylla	Overleaf Pellia	1903P	2018	S	
Plagiochila asplenioides	Greater Featherwort	1872	2018	S	
Plagiochila porelloides	Lesser Featherwort	2006	2018	S	
Porella platyphylla	Wall Scalewort	2006	2006	S	
Radula complanata	Even Scalewort	1903P	2018	W/O	
Reboulia hemisphaerica	Hemisphaeric Liverwort	1903P	1909P	R	E
Riccia glauca	Glaucous Crystalwort	1968	1968	S	E
Scapania nemorea	Grove Earwort	1903P	1909P	R	E
Solenostoma gracillimum	Crenulated Flapwort	1903P	1913	R	E
Mosses					
Amblystegium serpens var. serpens	Creeping Feather-moss	2001	2018	F/A	
Anomodon viticulosus	Rambling Tail-moss	2017	2017	S	
Atrichum undulatum var. undulatum	Common Smoothcap	1980	2018	F/A	
Aulacomnium androgynum	Bud-headed Groove-moss	1980	2018	W/O	
Barbula unguiculata	Bird's-claw Beard-moss	1903P	2018	F/A	
Brachytheciastrum velutinum	Velvet Feather-moss	2006	2018	W/O	
Brachythecium albicans	Whitish Feather-moss	2018	2018	W/O	
Brachythecium glareosum	Streaky Feather-moss	2018	2018	R	
Brachythecium rivulare	River Feather-moss	2003	2018	W/O	
Brachythecium rutabulum	Rough-stalked Feather-moss	1902	2018	F/A	
Bryum argenteum	Silver-moss	2015	2018	F/A	
Bryum capillare	Capillary Thread-moss	1975	2018	F/A	
Bryum dichotomum	Bicoloured Bryum	2018	2018	F/A	
Bryum rubens	Crimson-tuber Thread-moss	2006	2006	F/A	
Bryum subapiculatum	Lesser Potato Bryum	2018	2018	S	
Calliergonella cuspidata	Pointed Spear-moss	2006	2018	F/A	
Calliergonella lindbergii	Lindberg's Plait-moss	1902	1909P	R	L
Campylopus introflexus	Heath Star-moss	1980	2018	F/A	
Ceratodon purpureus	Redshank	2001	2018	F/A	
Cirriphyllum crassinervium	Beech Feather-moss	1903P	1909P	S	L
Cirriphyllum piliferum	Hair-pointed Feather-moss	2001	2018	F/A	
Conardia compacta	Compact Feather-moss	1913	1913	R	L
Cratoneuron filicinum	Fern-leaved Hook-moss	2018	2018	F/A	
Cryphaea heteromalla	Lateral Cryphaea	2009	2018	W/O	
Dicranella heteromalla	Silky Forklet-moss	2001	2018	F/A	
Dicranella varia	Variable Forklet-moss	1980	1980	F/A	B
Dicranoweisia cirrata	Common Pincushion	1975	2018	F/A	
Dicranum majus	Greater Fork-moss	1903P	1909P	R	L
Dicranum montanum	Mountain Fork-moss	1901P	2018	S	
Dicranum scoparium	Broom Fork-moss	2003	2018	F/A	
Didymodon fallax	Fallacious Beard-moss	1975	2018	F/A	
Didymodon insulanus	Cylindric Beard-moss	2001	2018	F/A	
Didymodon rigidulus	Rigid Beard-moss	2018	2018	F/A	
Didymodon sinuosus	Wavy Beard-moss	2018	2018	F/A	
Eucladium verticillatum	Whorled Tufa-moss	2018	2018	S	
Eurhynchium striatum	Common Striated Feather-moss	2001	2018	F/A	
Fissidens bryoides var. bryoides	Lesser Pocket-moss	2001	2018	F/A	
Fissidens crassipes	Fatfoot Pocket-moss	2009	2009	R	

Fissidens pusillus	Petty Pocket-moss	2018	2018	R	
Fissidens taxifolius var. taxifolius	Common Pocket-moss	1980	2018	F/A	
Funaria hygrometrica	Common Cord-moss	1853	2018	F/A	
Homalia trichomanoides	Blunt Feather-moss	1980	2018	S	
Homalothecium sericeum	Silky Wall Feather-moss	2015	2018	F/A	
Hookeria lucens	Shining Hookeria	1903P	2009	S	
Hypnum andoi	Mammillate Plait-moss	2006	2017	W/O	
Hypnum cupressiforme var. cupressiforme	Cypress-leaved Plait-moss	1903P	2018	F/A	
Hypnum cupressiforme var. resupinatum	Supine Plait-moss	2006	2015	F/A	
Hypnum jutlandicum	Heath Plait-moss	2018	2018	S	
Isothecium alopecuroides	Larger Mouse-tail Moss	2018	2018	S	
Isothecium myosuroides var. myosuroides	Slender Mouse-tail Moss	2001	2018	F/A	
Kindbergia praelonga	Common Feather-moss	1980	2018	F/A	
Leptodictyum riparium	Kneiff's Feather-moss	1980	2018	F/A	
Leskea polycarpa	Many-fruited Leskea	1980	2006	W/O	
Leucobryum glaucum	Large White-moss	1902	1980	R	
Lewinskya affinis	Wood Bristle-moss	1906	2018	F/A	
Mnium hornum	Swan's-neck Thyme-moss	1980	2018	F/A	
Mnium stellare	Starry Thyme-moss	1903P	2018	S	
Neckera complanata	Flat Neckera	1902	1909P	S	L
Orthodontium lineare	Cape Thread-moss	2006	2018	W/O	
Orthotrichum diaphanum	White-tipped Bristle-moss	2001	2018	F/A	
Orthotrichum pulchellum	Elegant Bristle-moss	2006	2018	W/O	
Orthotrichum sprucei	Spruce's Bristle-moss	1906	1907	S	L, R
Orthotrichum stramineum	Straw Bristle-moss	2003	2018	S	
Oxyrrhynchium hians	Swartz's Feather-moss	2001	2018	F/A	
Palustriella commutata var. falcata	Curled Hook-moss	2018	2018	S	
Plagiomnium affine	Many-fruited Thyme-moss	1896	1909P	W/O	L
Plagiomnium rostratum	Long-beaked Thyme-moss	1903P	2018	W/O	
Plagiomnium undulatum	Hart's-tongue Thyme-moss	1980	2018	F/A	
Plagiothecium curvifolium	Round Silk-moss	2001	2001	S	
Plagiothecium denticulatum var. denticulatum	Dented Silk-moss	2006	2015	W/O	
Plagiothecium nemorale	Woodsy Silk-moss	2001	2018	W/O	
Plagiothecium succulentum	Juicy Silk-moss	2001	2018	S	
Plagiothecium undulatum	Waved Silk-moss	1980	2018	S	
Platygyrium repens	Flat-brocade Moss	2018	2018	R	
Plenogemma phyllantha	Frizzled Pincushion	2018	2018	W/O	
Pleuridium acuminatum	Taper-leaved Earth-moss	2018	2018	W/O	
Pogonatum aloides	Aloe Haircap	2018	2018	S	
Polytrichum commune var. commune	Common Haircap	1903P	2015	S	
Polytrichum formosum	Bank Hairhap	1903P	2018	W/O	
Polytrichum juniperinum	Juniper Haircap	1903P	2018	W/O	
Polytrichum piliferum	Bristly Haircap	1903P	1909P	S	L
Pseudoscleropodium purum	Neat Feather-moss	2017	2018	F/A	
Pseudotaxiphyllum elegans	Elegant Silk-moss	1903P	2018	W/O	
Pulvigera lyellii	Lyell's Bristle-moss	2018	2018	W/O	
Rhizomnium punctatum	Dotted Thyme-moss	1903P	2018	F/A	
Rhodobryum roseum	Rose-moss	1901P	1909P	R	L
Rhynchostegium confertum	Clustered Feather-moss	2006	2018	F/A	
Rhynchostegium riparioides	Long-beaked Water Feather-moss	2006	2018	F/A	
Rhytidiadelphus squarrosus	Springy Turf-moss	2015	2018	F/A	
Schistidium crassipilum	Thickpoint Grimmia	2018	2018	W/O	
Scleropodium cespitans	Tufted Feather-moss	1902	1909P	S	L
Scleropodium tourettii	Glass-wort Feather-moss	2018	2018	R	
Streblotrichum convolutum var. commutatum	Lesser Bird's-claw Beard-moss	2018	2018	W/O	
Streblotrichum convolutum var. convolutum	Lesser Bird's-claw Beard-moss	2018	2018	F/A	
Syntrichia latifolia	Water Screw-moss	2006	2006	W/O	
Tetraphis pellucida	Pellucid Four-tooth Moss	2018	2018	W/O	
Thamnobryum alopecurum	Fox-tail Feather-moss	2006	2018	F/A	
Thuidium tamariscinum	Common Tamarisk-moss	2001	2018	F/A	
Tortula acaulon	Cuspidate Earth-moss	1980	1980	F/A	
Tortula muralis	Wall Screw-moss	2017	2018	F/A	
Tortula truncata	Common Pottia	2006	2015	F/A	
Ulota bruchii	Bruch's Pincushion	2006	2018	F/A	
Ulota crispa	Crisped Pincushion	2003	2003	W/O	
Weissia controversa var. controversa	Green-tufted Stubble-moss	2018	2018	W/O	
Zygodon conoideus	Lesser Yoke-moss	2015	2018	W/O	
Zygodon viridissimus	Green Yoke-moss	2003	2003	F/A	
Dubious Records					
Liverwort					
Solenostoma sphaerocarpum	Round-fruited Flapwort	1903	1903		Er
Scapania aspera	Rough Earwort	1903	1903		Er
Mosses					
Leptobryum pyriforme	Golden Thread-moss	1903	1909		Sh
Tortula marginata	Bordered Screw-moss	1903	1909		Sh

Some Mosses and Liverworts.



The mounds along the bank are covered with *Polytrichastrum formosum.* Bank Haircap. In between the first two mounds are the upright shoots of *Mnium hornum* Swan's-neck Thyme-moss with capsules. Growing beneath the *Mnium* are a few pleurocarpous mosses. John Bingham



Cryphaea heteromalla Lateral Cryphaea-1 Ann Hill showing secondary stems of the plant projecting stiffly away from the substrate Mossy bark of trees and shrubs in woods and elsewhere away from the substrate Mossy bark of trees and shrubs in woods and elswhere



Kindbergia praelonga Common Feather-moss. Common in woodland on banks, logs, trunks, and ground. Ann Hill



*Plagiothecium undulatum.*Waved Silk-moss with a few a few shoots of a *Polytrichum* sp. Haircap species. Common in woodland on wood rocks and in turf. Mike Averill.



Polytrichum piliferum Bristly Haircap male plant. Pioneer on dry acid substrates and tracks. Ann Hill.



Metzgeria furcata-Forked Veilwort. Common liverwort on bark of a wide range trees and shrubs. Mike Averill



Mnium hornum Swan's-neck Thyme-moss. On soil, logs, rocks, tree bases, often abundant in woodland. Ann Hill.



Conocephalum conicum. Greats Scented Liverwort. Commonly found on shady rocks by rivers, streams and waterfalls. John Taylor

Appendix 2
Herbarium Collections

The most likely source for additional old records is from within herbarium collections. The following lists, based on collectors, are the most likely herbaria to hold material from Shrawley Wood, (Lawley i, ii & iii, Graham 2004, Carrick 2010, Ricketts & Carrick 2009, Duncan 1911, Kent et al 1957, Desmond 1977, Watson 2011 i & ii, Middleton 2017).

Herbaria holding Shrawley Wood material:-

Birmingham City Museum and Art Gallery (BIRA): collections: James Eustace Bagnall; Philip Grafton Mole Rhodes (mainly liverworts); Thomas Hawkes Russell

The collection in Birmingham Museum has been catalogued and is available online; records from this are included in this account:

Worcester Museum (WOS): collections - Joseph Hesselgrave Thompson and John Bishop Duncan; [apparently lost William Mathews, Thomas Westcombe, Griffith Hooper Griffiths, John

Fraser, Richard James Nicol Streeten, Edwin Lees and Thomas Bradley Stretch]
The collection in Worcester Museum was catalogued by Tessa Carrick and Joy Ricketts circa. 2009, records from this are included in this account

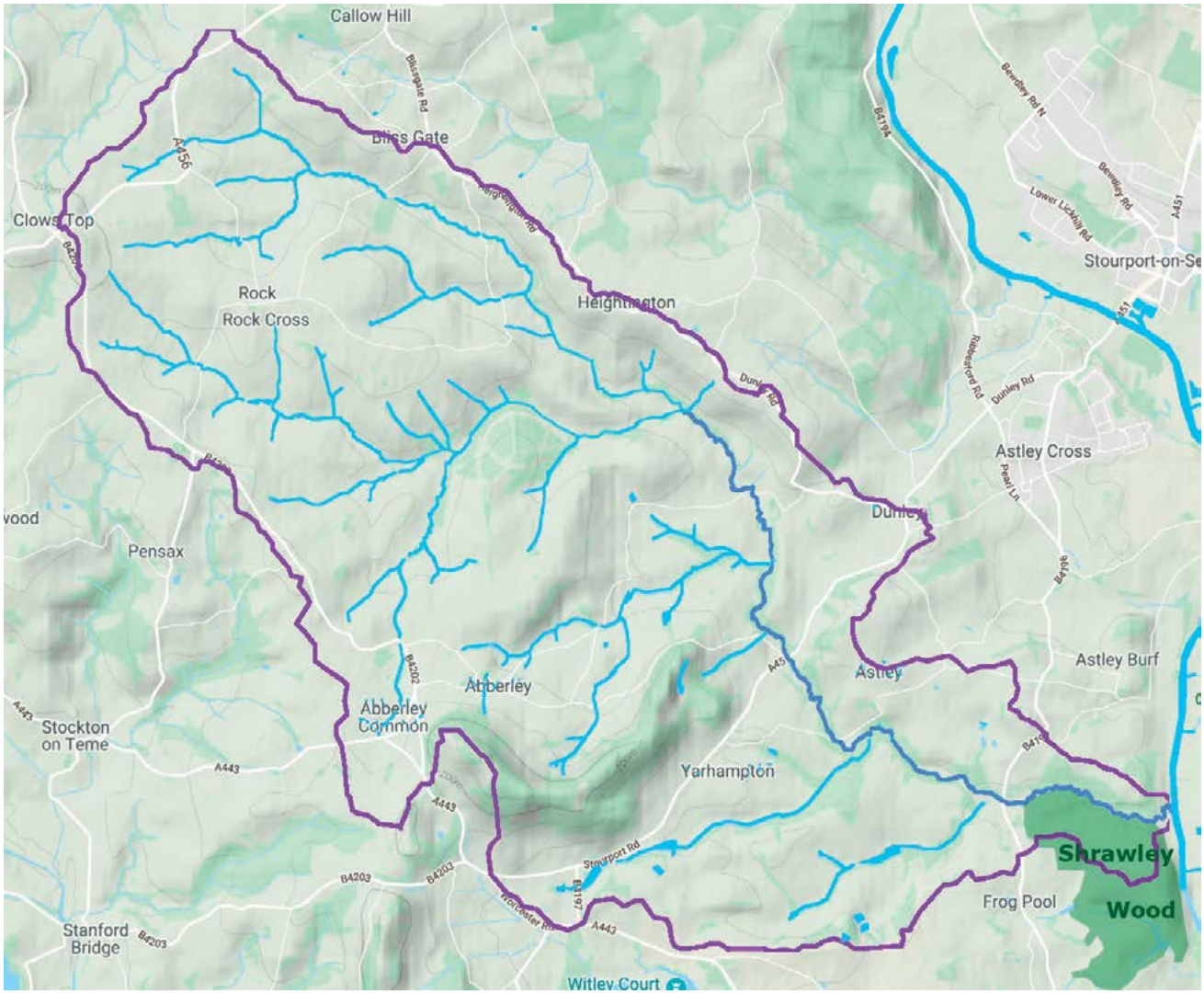
Herbaria which may hold Worcestershire bryophytes:-
Birmingham University (BIRM): collections - Edward Cleminshaw; Augustin Ley
Edinburgh Royal Botanic Gardens (E): collection - John Bishop Duncan
Hull University (HLU): collection - John Fraser
National Museum Wales Cardiff (NMW): collections - John Bishop Duncan; Edward Cleminshaw
Warwick Museum (WAR): collections - Henry Herbert Knight; Edward Cleminshaw
Cheltenham Art Gallery and Museum (CHM): collection - Henry Herbert Knight
Bristol City Museum and Art Gallery (BRISTM): collection - Philip Grafton Mole Rhodes
Natural History Museum London (BM): collections - Philip Grafton Mole Rhodes (mosses).

Dick Brook: History and Ecology

Mike Averill and Francesca Llewellyn

This small stream, just over 8 kilometres (5 miles) in length, forms, in its lowest section, the boundary between Shrawley and Astley Parishes. As it meanders towards the River Severn it brushes the northern edge of the modern Shrawley Wood; on the other side in Astley Parish are Upper and Lower Astley Woods. In the spring there is no finer time to walk the brook when the wild garlic forms a snowy edge to the bluebells within the wood (02).

Dick Brook is one of the many smaller watercourses that drain the west of the Severn from Bridgnorth to Worcester. The catchment is characterised by hilly ground that drains sandstones from both the Devonian and Triassic periods still known to many as the Old & New Red Sandstones and it also picks up water draining the Silurian Limestone ridge in the Abberley Hills. The soil is predominantly deep loam and the land cover in the catchment consists primarily of arable agricultural land and improved grassland, with areas of broad-leaved and coniferous woodland. The brook itself has many characters from raging red torrent to clear mayfly-abundant summer stream and it has a history intertwined with man's management of agricultural land and his use of water.



01. Catchment area of Dick Brook.

The brook rises mainly in Rock Parish, several very small streams joining at Joan's Hole to form the Dick Brook proper. It passes under the road from Dunley to Abberley through Wordley Dingle where it formed the original boundary between Astley and Areley Kings, then flows under the road to Great Witley (A451), past Astley Church, under New Bridge and then to Glazenbridge (Glasshampton Bridge) on the Stourport to Worcester road (B4196). It is in the Glasshampton Bridge area that it forms the Parish boundary between Shrawley and Astley. It then winds for about two miles with bends and meander loops past open meadows and Shrawley Wood to join the River Severn.

The brook flows through steep banks, cutting deeply into the local rocks of marlstone and sandstone and has a catchment area of about 36.6 square kilometres (14 sq miles) (01). Despite the smallish area, the gradient is steep particularly between the Worrall's House and Woodend Farm and the Bridge Farm area and this can lead to severe flooding after heavy rainfall, such as in 2007.

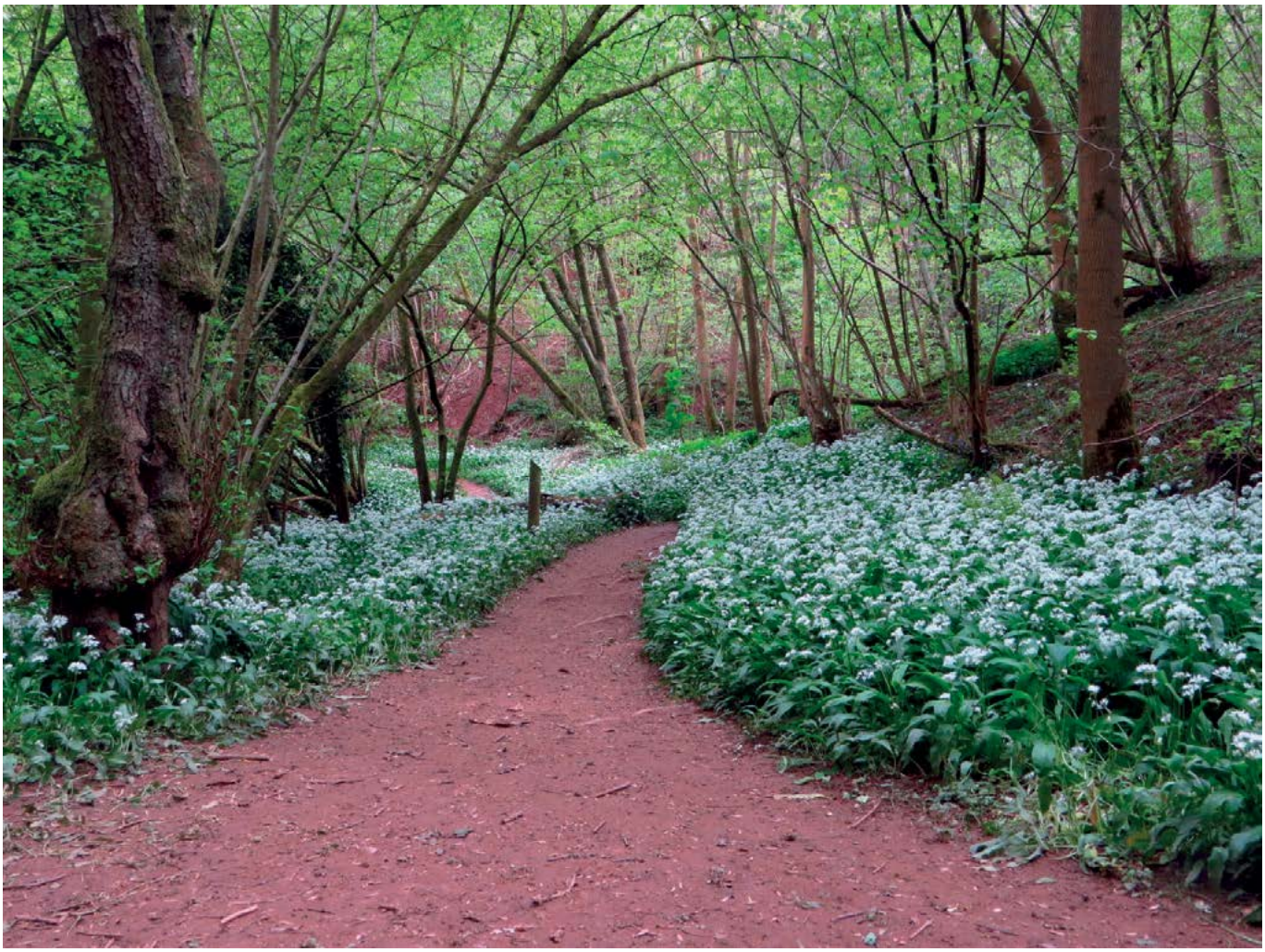
Other significant floods occurred in 1728, 1852 and 1924. In the 1852 flood both bridges over the Dick Brook on the Stourport to Great Witley Road and the Stourport to Shrawley Road were badly damaged.[1] The water had risen to a height of 20 feet and had carried away the parapets. Glazenbridge was swept away again in 1924. The bridge has plaques marking these floods.

Most streams in past centuries supported a number of mills, and the Dick Brook is no exception. The known mills on the brook are Worrall's Mill near Joan's Hole, then Prior's Mill near Astley Church and what is now called Astley Forge Mill below Glasshampton Bridge. There is another mill in Astley Parish located on the brook called Old Mill. No trace is left of it now.

Below Glasshampton Bridge, the Dick Brook valley opens up into meadows bounded by the two woods - Shrawley Wood on the south and Astley Wood on the north. Immediately below the bridge is evidence of the leat to Astley Forge Mill as well as stonework in the bank of the stream. Further down the valley is the Forge Mill. The first reference to this is in an indenture of 1665 which refers to "*those Three Water Corn Mills to ye sd messuage called ye Woodend*."[2] Later the buildings were used as a fulling mill, a paper mill, a scythe mill, a grinding mill and a forge. It went out of use in the early part of the nineteenth century after a disastrous flood ruined the forge. Below the forge is the first of two locks. Nothing certain is known about the locks; the first one has a date stone in it of 1715. There is a reference to the Upper Lock in the Shrawley Wood Book for 1799[3] when the wood in that area was cut. The other lock is by the River Severn.

Just below the upper lock is a bend in the stream and an area of flat ground on the Shrawley side of the brook, which in the terrier to the Dougharty map of the Vernon estates of 1733 is called Mill Meadow. Was this the site of one of the mills referred to in *The Daily Post* of Tuesday July 16 1728? The newspaper reports that *"On Saturday Night last two Corn-Mills, a Paper-Mill and a House were swept down Astley-Brook into the River*" This was caused *"by means of a sudden Inundation, occasion'd by a most violent Thunder-storm, and Bursting of the Clouds, from which the Water descended as if it had been poured out of Hogsheads, about Astley*."[4] Further downstream, there is a footbridge crossing over the Brook from Astley to Shrawley Parish. This is Riddings Bridge, also shown on the Dougharty Map and later referred to in the Shrawley Wood Books "*1800 Rec.d of Meſsers Flight & Barr for 15 foot of Timber for the Repaires of ye Riddin Bridge 1..2..6..*"[5] Messrs Flight and Barr were the proprietors of the Worcester Porcelain Company at the time, who used Astley Forge Mill to grind soaprock from Cornwall, which was a key ingredient of Worcester Porcelain. In March 1940, it was reported in the Shrawley Parish Council Minutes that Riddings Bridge needed repair. Astley Parish Council was asked to pay half the cost. Shrawley's half amounted to £2-5s-1d.[6] After Riddings Bridge, the last part of the brook flows between open meadows before entering the River Severn. The lower lock is located in the section which runs parallel to the Severn, away from the wooded area adjacent to Riddings Meadow in Shrawley.

The Shrawley side of the brook, the northern boundary of Shrawley Wood, between Riddings Bridge and the stepping stones (which are near the Astley Forge Mill) has a steep escarpment parallel to the stream. There are several small valleys cut through the rock by water which are at right angles to the brook. Between these valleys there is evidence of a number of small quarries.



02. The path alongside the south side of Dick Brook with abundant Ramsons. Shrawley Wood is to the right. Mike Averill



03. A more open stretch of the Dick Brook 3rd May 2018. Shrawley Wood is to the right. Note the silt-rich water. G. H. Green.



04. The Dick Brook 3rd May 2018 adjacent to Shrawley Wood. Searching for aquatic animals. Ammocoete lampreys were found in this area. G. H. Green



05. A general view of the Dick Brook adjacent to Shrawley Wood. The water is running at a moderately high level and some woody debris is present providing a good habitat for invertebrates. Mike Averill

In order to manage the water resources of river basins, rivers and streams have their flow measured to help understand the amount of water available at low and high flows. Many rivers and large streams have flow measuring stations, although one is not present on Dick Brook. This stream can, however, be compared with Dowles Brook in Wyre Forest which (with 46 square kilometres) has only 10 square kilometres more catchment, and it also drains into the west bank of the River Severn. Dowles is used by the Environment Agency (EA) as a surrogate for estimating low and peak flows in the Dick Brook.

Dick Brook can be expected to have peak flood conditions of a little less in magnitude than estimated for Dowles Brook where a flow of 74 m^3/second was recorded in June 2007, the highest flow recorded since 1971. Normal river flows range from 0.03 to 5.0 m^3/second summer to winter[7] but it is the flashy nature of the Dick Brook which leads to problems.

Recent years have produced a run of peak flows, with four of the highest having occurred in 2007 and 2012, emphasising the ability of changing weather to produce extreme rainfall events. These have occurred in the summer as well as the winter putting pressure on land that may not be in the best condition to receive high rainfall. Land that has been cultivated and left bare is likely to become severely eroded with soil, together with leached agricultural chemicals, washing downhill into the brook.

In order to promote sound land management, the EA can arrange a programme of visits to farms in rural catchments to advise on good practice near watercourses. Nowadays the preferred techniques are to hold back water by unimproved drainage and the use of interception devices to prevent flood water reaching pinch points too quickly. The use of winter storage reservoirs for summer irrigation

is another way to collect water in times of plenty which then becomes available in drier times. The usage of agricultural chemicals in terms of timing, quantities and storage is also part of the advice given on the EA visits.

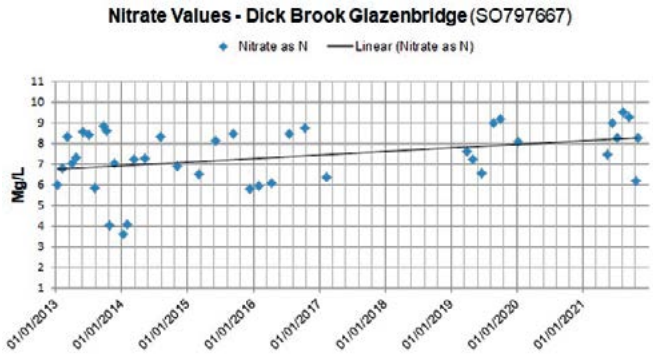
Regarding water quality, the EA has confirmed that Dick Brook failed to meet an overall Water Framework Directive (WFD) status of Good in 2016, due to the 'poor' macrophyte and 'moderate' fish survey results[8.] The reason for this is not clear but low counts of plant species suggest poor habitat quality. The low count for fish could be due to a lack of suitable habitat or siltation or invasive species affecting the biological community.

Further investigation of pressures affecting the watercourse is required, say the EA, and a more recent analysis of the situation in 2019 shows that the status of the Dick Brook remains as 'Poor'. This is despite the fact that there was a slight improvement in the biological element so that fish has changed from Moderate to Good, but the chemical status has changed from Good to Fail, mainly due to the failure of two priority hazardous substances Mercury and Polybrominated diphenyl ethers (PBDE). These are a group of manmade organobromine compounds used in homes and businesses as flame retardants and are found in a wide range of products including electrical and electronic equipment, textiles and foams. Releases occur during use and disposal of these products and they continue to enter waste water treatment works (WwTWs).

Although there are failings in the ecological and chemical measuring parameters, it does not in fact mean that every aspect of the rivers

condition is poor and most other parameters are good. There is no concern for the invertebrates at the bottom of the food chain and sampling during the preparation for this publication by the authors produced some interesting results.

There are concerns however about levels of nitrates and siltation in the watercourse. The brook lies within a Nitrate Vulnerable Zone (NVZ), a significant issue as locally groundwater supplies have to be mixed with water from other sources to lower the nitrate levels for public consumption. Nitrate washing out of fields during wet periods encourages plant growth in valleys which can swamp normal vegetation. It can also deter growth of mosses and lichens. Himalayan Balsam is an invasive plant that particularly thrives if nitrogen is abundant and this plant is found in patches along the Brook. According to the 2016 EA assessment, although the nitrate levels in Dick Brook were high, they did not represent severe eutrophication. That was the case up to the early part of 2015 but the EA's more recent sample runs show a continued rise in the trendline (06) with recent peaks in excess of 9.0 mg/L. This is worrying and is not the general trend in nitrate levels quoted for many other catchments.



06. Nitrate levels in the Dick Brook at Glazenbridge 2013-2021 Data from the EA water quality archive datasets at : https://environment.data.gov.uk/water-quality/view/landing



07. Bullhead found in the Dick Brook. Mike Averill

Siltation is an obvious feature along the Dick Brook and, in combination with invisible agricultural chemical pollution from high nitrates, poses problems to the overall water quality in the brook and its dependant wildlife. The movement of silt in a stream is entirely natural and even in stormy weather is acceptable when the ground cover is maintained. However, in arable areas where the soil is exposed for many months large quantities of silt and sands are being washed out of the soil. Who hasn't noticed the angry blood red colour of water when streams flood in lowland arable areas? Yet in stable catchments in moorland the flood water carries little sediment and doesn't have the red colouration. Siltation causes a number of problems. It blocks and fills small spaces so that aquatic creatures that filter water with gills or sieve water for food particles can find their systems clogged. Mosses and lichens can become covered in fine silt particles resulting in a reduction of light needed for photosynthesis, and clogged pores necessary for the exchange of gases.

Recent surveys found minnows and bullheads (07) but overall fish counts were low in the Dick Brook according to the EA and that could be due to siltation of the brook gravels used by Salmonid species like trout.

There is one group of animals that may not mind some siltation as they live mainly in silt banks in rivers and streams. These are the larval (ammocoete) stage of both the River and the Brook Lamprey *Lampetra* spp. Several were found during surveys of the lower Dick Brook in 2018 and 2019 (04), (08). Lampreys are primitive, jawless fish resembling eels. They are blind filter feeders and live amongst the silt, sand and debris in brooks feeling their way around as their eyes do not form until they are five years old. At the ammocoete point of development it is not possible to tell the two species, Brook and River Lamprey apart. The Brook Lamprey *Lampetra planeri* is the smallest of the lampreys found in the UK. It is a non-migratory freshwater species, occurring in streams and occasionally in lakes. Their larvae are active filter feeders, feeding on detritus. When they become adult they do not feed unlike the River Lamprey *Lampetra fluviatilis* that feed by attaching the jawless sucker-like mouth to a fish. Brook Lamprey move upstream to spawn, while River Lamprey go further down the rivers to the estuary as they approach adulthood.



08. Sightless at this stage, Lamprey ammocoete like this are found in the silty shoals of the Dick Brook. Mike Averill

Siltation can pose a significant problem to filter feeders like caddis fly larvae. *Hydropsyche pellucidula* larvae (09) do not construct cases typical of many caddis but live in colonies where they all weave a silk net to catch detritus. The net mesh size is approximately 0.05mm to 0.40 mm and so silt and sand deposits of similar size block the mesh and prevent filter feeding by the caddis colony. Fortunately they do not feed much in the winter but growth is rapid in the summer so a summer flood can be problematic at peak growth time. Even cased caddis can have issues with too much silt. The species known as the Welshman's Button *Sericostoma personatum* found in the brook relies on water passing over its gills inside a tightly fitting case made of sand grains glued together. The rear of the slightly curved case has a tiny round hole to allow the filtered water to pass through.



09. *Hydropsyche pellucidula* larva. A caseless net-making caddis. Mike Averill.



10. Dick Brook 3rd May 2018. Mike Averill searching for aquatic animals. G. H. Green.

Mayflies, the other key indicator of good water quality, also struggle with high silt levels. One type of mayfly that is reasonably common in the Brook and has a flattened body capable of coping with strong currents, *Ecdyonurus* sp., has a lifestyle of clinging to rocks and stones whilst grazing algae. A recent sample from October 2019 shows how embedded with silt the gills can become (11 and 12).



11. Mayfly, *Ecdyonurus* sp. with trapped silt, Dick Brook. Mike Averill



12.. Mayfly, *Ecdyonurus* sp. without trapped silt, Dick Brook. Mike Averill

Another Mayfly larva, the Green Drake *Ephemera danica,* may be more tolerant as it lives in sand and silt banks and seems able to cope with a lifestyle as a burrowing detritus feeder where fine particles surround it (13).



13. Mayfly larva, the Green Drake *Ephemera danica.* Mike Averill.

One animal that has returned to the Brook is the Otter *Lutra lutra.* Once a common sight it vanished from the Midlands following the widespread use of organochlorine pesticides that contaminated their food sources in the 1940's and 1950's. Following the ban on its use and also the disbandment of otter hunts, otters started to make a comeback in the late 1980's. The presence of this top predator indicates there are enough fish for its survival. Otters may even be helping to control the invasive Signal Crayfish *Pacifastacus leniusculus*. This species originally escaped from crayfish farms but unfortunately has succeeded in making a place for itself in many rivers and streams. It is a threat to our native Crayfish *Austropotamobius pallipes*, which until recently had been recorded in the Dick Brook. Interestingly large physical barriers on a watercourse can prevent the spread of the Signal Crayfish upstream but a barrier may also prevent the passage of fish, eels and lampreys as well. There is such a barrier at Priors Mill on the Dick Brook 4kms upstream from the confluence with the River Severn. Here a 4 metre high dam prevents any natural upstream movement of aquatic creatures and so isolates much of the upper catchment.

The Dick Brook, as it passes alongside Shrawley Wood, might be thought to be untidy with its random piles of fallen trees and branches (05), and this certainly wouldn't have been tolerated by anyone wanting to ply boats through its lower locks in earlier times. Nowadays we recognise the value of these piles of woody debris both in and out of water as habitat for many kinds of invertebrates. One hoverfly seen along the brook is the bee mimic *Chalcosyrphus eunotus*, an enigmatic species whose larvae are believed to develop

in partially submerged timber. It has been found elsewhere in dingles with streams in the West Midlands but is nationally scarce (Ball & Morris 2014) so it is very good to see them sunning themselves along the Brook. Males of this species seek out sunlit logs lying in water in dappled sunshine, and defend them from other males (14).



14. Hoverfly *Chalcosyrphus eunotus*. Mark Peacock

In their report on scarce and threatened flies Ball & Morris (2014) write that this is a flagship species for log-jams in streams, a habitat that is very vulnerable to removal from a flood management perspective although nowadays partial barriers are used to slow flow and reduce the risk of flooding. Interestingly in Poland there is a theory that the increase in beavers and their activities has led to an increase in *Chalcosyrphus eunotus*.

When fine silt remains in suspension, the water in the Brook can look very turbid but fortunately it is not always like that and in most normal summers it has clear water and kingfishers can see their prey. Here grey wagtails wait for those mass emergences of mayflies that epitomise a summer's day, and flitting along the brook are Beautiful Demoiselles *Calopteryx virgo* males dashing out from sunlit trees to exert their territorial rights.



15. A mature male Beautiful Demoiselle *Calopteryx virgo*. Mike Averill

Acknowledgements
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Nitrate levels in the Dick Brook at Glazenbridge 2013-21
Data from the water quality archive datasets at Environment Agency
Water quality data archive: used in diagram 06.

Aquatic fauna and flora of the New Pool in Shrawley Wood

Will Watson



01. The lower pool (New Pool) in May 2018 with Small-leaved Limes reflected in the water. Will Watson.

New Pool (01) is an idyllic privately-owned lake and as a consequence it is a tranquil and undisturbed site which abounds in aquatic wildlife. The pool is divided in two; the upper pool (named Middle Pool) is 180 metres long and lower pool with its broad side arm to the east is over 700 metres in length making it one of the largest water bodies in the county. (see chapter on Pools pp. 104-8).

There is no finer place in the wood to show off the majesty of the Small-leaved Lime trees than New Pool. Here you can see the verdant green canopy reaching up to 30 metres in height and if you are luckier still you can see it reflected across the water (01). Both the upper and lower pools were de-silted around 2000. The regularly mown higher bank slopes gently to the pool's margin. The lower bank is near vertical dropping steeply into the water. Clinging to the edge are a range of typical native emergent species of macrophytes including Yellow Iris *Iris pseudacorus*, Branched Bur-reed *Sparganium erectum* and Soft-rush *Carex effusus*. Beneath the water there is a narrow ledge around the margin at a depth of 1-1.3 metres. This ledge drops away steeply demarcating the side cut of the excavator's bucket. If you look from the grass track or view the surface of the pool from the arched footbridge the water is clear affording views to the relatively shallow base at a depth of over a metre. But looks can be deceptive as beneath the base is another metre or two of soft sediment much of which has been transported from the stream above.

A large section of the pool's base is covered by a deep green tangle of Hornwort *Ceratophyllum demersum,* a native submerged aquatic plant. The upper lake surface is carpeted in duckweeds (02), with four species present, Greater Duckweed *Spirodela polyrhiza*, Fatty Duckweed *Lemna gibba*, Common Duckweed *Lemna minor* and Least Duckweed *Lemna minuta*. Occurrence of all four duckweeds together is unusual and may be unique within the county. The lower pool is more open. A dam with path on top divides the lakes and a sluice gate controls the flow of water between the two lakes. Silt has built up at both ends of the lakes forming a back marsh of reeds and rushes, and here Wood Club-rush *Scirpus sylvaticus*, and Large Bittercress *Cardamine amara* are locally frequent; both these plants are uncommon in Worcestershire. Grass tracks follow the entire margin of the New Pool offering fine views from all angles (02). The path may have originally been laid out to take privileged guests around the estate.



02. Shrawley Wood New Pool 31st May 2018 showing the bordering path, adjacent Small-leaved Lime trees and the water covered by duckweeds. G. H. Green.

A survey of the New Pool lower lake in late May 2018 recorded tens of thousands of tadpoles of the Common Toad *Bufo bufo,* a declining species nationally due to habitat loss, road deaths and disease. Woodlands, however, are favoured habitats for toad hibernation. In the Shrawley Wood pools the population can grow and develop in relatively little disturbance. In both lakes it was a surprise and pleasure to encounter Palmate Newts (03) *Lissotriton helveticus*, Worcestershire's rarest newt, typically associated with ponds on acid soils to the north of county and the Malvern Hills. The Helsby Sandstone (Keuper Lower Sandstone) (see chapter on geology pp. 252-7) must provide the right water chemistry for this species to thrive. The newts are present because the fish population is low or absent although it is difficult to confirm which. Clear water indicates that bottom dwelling Common Carp, frequently introduced into such lakes, are absent. However aerial images (Google Earth) from 1999 shows the pools muddy brown in colour, a sure sign that carp were present.

A small population of Smooth Newt *Lissotriton vulgaris* was also present in the lower lake and Common Frog *Rana temporaria* tadpoles were present in both lakes. The pools are a good locality for amphibians.



02. Female Palmate Newt *Lissotriton helveticus* on Hornwort (photograph of a captive specimen). Will Watson

Dip netting of both pools in 2018 and 2019 revealed the presence of over 50 aquatic invertebrate species. This places it within the Freshwater Habitats Trust's 'very high' category, based upon the total number of species present (Biggs 1997). The high total is indicative of good water quality and included 22 species of water beetles, many sheltering under the overhanging aquatic vegetation around the edge of the pool. Amongst them were the handsome, locally occurring beetle *Rhantus exsoletus* (04) and the Cherrystone Beetle *Hyphydrus ovatus* (05) so called because they are round and globular: both species favour weedy ponds. The latter species was abundant among the dense stands of Hornwort *Ceratophyllum* spp. which provided good cover for a wide range of aquatic invertebrates. On the swamp vegetation between the two lakes large numbers of metallic-coloured Reed Beetles *Plateumaris sericea* and *Donacia simplex* (06) were recorded. The latter is a common species which feeds exclusively on Bur-reeds *Sparganium* spp.



04. The water beetle *Rhantus exsoletus*. Will Watson



05. The Cherrystone Beetle *Hyphydrus ovatus*. Will Watson



06. The Reed Beetle *Donacia simplex* on Branched Bur-reed. Will Watson.

A Giant Lacewing *Osmylus fulvicephalus* (07) was found between the two pools in May 2018. The species is uncommon along brooks and streams in Worcestershire and this is the first and to date the only record from Shrawley Wood. The larvae are semi aquatic living in the mosses at the water's edge.



07. Giant Lacewing *Osmylus fulvicephalus*. Mike Averill

Nine species of freshwater molluscs have been found in the pools: Wandering Snail *Radix balthica*, Margined Ram's-horn *Planorbis carinatus*, Giant Ram's-horn *Planorbarius corneus*, Common Bladder Snail *Physa fontalis*, Common Bithynia *Bithynia tentaculata,* Lake Limpet *Acroloxus lacustris*, Pea Mussel *Pisidium* sp. Swan Mussel *Anodonta cygnea* and Duck Mussel *Anodonta anatina*. We noted a large population of Swan Mussels in the lower pool in 2018. Swan Mussels thrive in lowland lakes in muddy substrates but do best in good water quality. In 2019 there were many abandoned Swan Mussel shells strewn around the margin; an indication of a large die-off, possibly due to silt build up and the lake's substrate becoming too anaerobic for many of the bivalves. Small numbers of Duck Mussel *Anodonta anatina* were also present (09). The latter species along with the Common Bithynia are not often found in lakes and pools. It could be that these two species have in the past been introduced from the River Severn where they are locally abundant.

Nine species of aquatic bugs have been recorded from the Pools: Common Backswimmer *Notonecta glauca;* Lesser Backswimmer *Plea minutissima;* Common Pond Skater *Gerris lacustris,* Yellow Pond Skater *Gerris thoracicus,* Saucer Bug *Ilyocoris cimicoides,* Water Measurer *Hydrometra stagnorum,* Water Cricket *Velia capra,;* Water Scorpion *Nepa cinerea* and the Minute Water Cricket *Microvelia reticulata.* Three leeches, *Erpobdella octoculata, Glossiphonia complanata* and the Duck Leech *Theromyzon tessulatum* one flatworm *Girardia tigrine* (a species introduced from North America), two species of freshwater shrimp, our native Freshwater Shrimp *Gammarus pulex* and another species introduced from North America *Crangonyx pseudogracilis.* Also present were the Common Water Hoglouse *Asellus aquaticus*, an Alderfly *Sialis* sp. and three species of caddisfly: *Cyrnus trimaculatus; Holocentropus picicornis* (08) and *Limnephilus flavicornis*; the latter two species were collected by Mike Averill and confirmed by caddis referee Ian Wallace. In addition Mike collected the case of the 'cased' larva *Limnephilus rhombicus* from the stream upstream of Holders Pool and caddis species *Agapetus fuscipes* and *Sericostoma personatum* from the side stream downstream of Holders Pool.



08. *Holocentropus picicornis.* A caseless snare-making Caddis- found in Shrawley Middle Pool. Mike Averill.

The muddy rides contain several temporary ponds caused by wheel ruts which form in spring and then dry out in the summer. To be classed as a pond, according to the Freshwater Habitats Trust, the water body must be at least 1 metre square and hold water for four months or more during the year. The largest of the ponds measured 4x1.5 metres. These ride ponds are no more than large puddles but they are capable of attracting breeding frogs. In March 2019 eight and 12 clumps of frogspawn respectively were recorded in two ride ponds 300 metres apart. Under the definition they are certainly borderline cases. It just so happens that the frogspawn takes four months to develop from egg to metamorph (an emerging froglet); therefore if it is an established frog breeding site it is reasonable to conclude they are ponds.

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09. Two Swan Mussels *Anodonta cygnea* a live and an empty shell and a live Duck Mussel *Anodonta anatina* from New Pool. Roger Plant.

Just above New Pool there is small rock pond named Parson's Pool or more romantically, *The well of Venus* by Wedley in his book *Twixt Severn and Teme* (Wedley 1928). It is rectangular in shape, about 5 metres long and 2 metres wide and over 1.5 metres deep as my chest waders testified. The base is currently filled with soft silt. Water percolating into the pool from the steep hillside is lime-rich and as it flows over mosses, roots and sticks they become encrusted with calcium salts, the beginning of tufa formation. In Parson's Pool crusts have formed mainly around the uncommon moss *Palustriella commutata* var. *falcata* (now *P. falcata)* which is typically found in and around tufa (10, 11, 12).



10. Parson's Pool in winter, February 2018, with bryologists. G.H.Green.



11. Parson's Pool in Spring, April 2019. Will Watson sampling the fauna near the water inflow. G.H. Green.



12. Parson's Pool. Moss with limy encrustation. G.H. Green

Net-dipping of the pond revealed Water Cricket *Velia caprai,* large numbers of Freshwater Shrimps *Gammarus pulex* and the less common One-spotted Water Hoglouse *Proasellus meridianus* (11) which is on average smaller than the Common Water Hoglouse *Asellus aquaticus* and also has a continuous band just behind the head as opposed to two spots in *A. aquaticus*.



11. The One-spotted Water Hoglouse *Proasellus meridianus* from the Rock Pond above New Pool. Will Watson.

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We are very grateful to Mrs J. Jeavons-Fellows for allowing us to undertake natural history studies at her beautiful lakes and in the adjacent woodland.

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Dragonflies in Shrawley Wood

Mike Averill

The first record of a named dragonfly in Shrawley wood is in the Victoria County History (1901) where J. E. Fletcher mentions the Brown Hawker *Aeshna grandis*. Since then, over 290 records have been collected, most of them since 1977 when the publication of a field guide by C. O. Hammond made it possible to identify British Dragonflies with more certainty. Since that first publication many more field guides have become available aiding the identification of all 20 Dragonflies and Damselflies species seen in or near Shrawley Wood usually without the need of examination in the hand.

Dragonflies are aquatic insects which need permanent water as up to 95% of their life cycle, and hence the majority of their lives, is spent as larvae (nymphs) in flowing and still waters. Fortunately there is no shortage of permanent water features in and around Shrawley Wood as the area is bounded by the River Severn to the east and the Dick Brook to the north, and there are a number of large pools in the wood.

The River Severn is a passing visitor having completed two thirds of its 220mile journey to the sea. As it flows past Shrawley it receives water from the Dick Brook, one of its many tributaries. Within and close to the Wood, there are four sizeable pools: the older Holders pool built in the early 18th century, the Middle and New Pools completed by the mid19th century and the newest pool near Oliver's Mound built in 2000.

Water quality is all important to dragonflies and their presence and abundance indicates that the water in and around Shrawley Wood is good. Water in the Severn, being a major drinking water supply for the Midlands, is well monitored and its quality maintained. The Dick Brook drains 36.6 square kilometres (14 square miles) of Triassic and Devonian Sandstone and also Silurian limestone all giving the water a slightly alkaline tendency. Generally, the water quality is good but there are silt issues (see Dick Brook Chapter pp. 554-560). Looking at the large privately owned Middle and New Pools which are also slightly alkaline, there is little likelihood of pollution entering from external sources, thus ensuring good water quality.

A large river like the Severn has had a huge impact on the local history and wildlife of Shrawley Wood and it has been the source of fish and the many other creatures living in the woodland pools. Around 10 species of dragonfly live in the river during their aquatic nymphal stage, and one of these is the nationally scarce Club-tailed Dragonfly *Gomphus vulgatissimus*. Only found on the wing in June, this secretive species is sometimes encountered hunting other insects and feeding in the woodland glades, an important habitat for this dragonfly.

A slightly less scarce species, the White-legged Damselfly *Platycnemis pennipes* is most likely to be seen when large numbers of the freshly emerged adults fly to the Wood to mature, also during June.

In the Dick Brook the nymphs of the Banded Demoiselle *Calopteryx splendens* and the Beautiful Demoiselle *Calopteryx virgo* live amongst the pools, riffles and woody debris, the latter preferring the more gravelly substrate of the faster sections. The adults of the two demoiselles are to be seen along the brook sitting in sunlit glades amongst the trees, the males guarding prominent leaves, fending off any other competitors and chasing females as they fly a slalom course from one bend to another.

Within the Wood, there are plenty of water bodies to attract dragonflies, including the large, impounded pools in the private section and two smaller pools on the southern edge of the wood, Holders pool and the pool next to Olivers Mound. The large pools in the private area, the Middle Pool and the New Pool, have ten of the most common dragonfly and damselfly species and with a great variety of bankside vegetation, damselflies emerge there and lay their eggs into the many plants. One species, the Red-eyed Damselfly *Erythromma najas* has made these pools its home since the mid 1980's, where they seek out the lily pads growing there. The males are quite conspicuous as they commandeer lily pads to advertise their presence, enticing the females to lay eggs into the plants (01. 02).



01. Red-eyed Damselfly *Erythromma najas* in tandem with the ovipositing female. Mike Averill



02. Red-eyed Damselfly *Erythromma najas* larva Shrawley Wood pools. Mike Averill

The Hawkers such as the Brown Hawker and Migrant Hawker *Aeshna mixta* are particularly noticeable patrolling the edges of these big pools clashing with the Emperor Dragonflies *Anax imperator* as they pass each other like motorists who don't know which way to go around a roundabout. The other two pools on the southern edge of the wood are smaller and less deep and these attract dragonflies like the Black-tailed Skimmer *Orthetrum cancellatum*, Broad-bodied Chaser *Libellula depressa* and Ruddy Darter *Sympetrum sanguineum* which are not seen at the larger deeper pools.

A more recent arrival, the Small Red-eyed Damselfly *Erythromma viridulum,* new to the county in 2006, has made its way to Shrawley seeking out the water plants Hornwort *Ceratophyllum* sp. and Milfoil, *Myriophyllum* sp. which are found in the pool at Olivers Mound.

All these species have their own season and that starts with the Large Red Damselfly *Pyrrhosoma nymphula* in late April and usually ends in November with Common Darters *Sympetrum*

striolatum which sit on posts and trees catching the last of the low sun in the shortened days.

A species often encountered in the wood hawking along paths is the Southern Hawker *Aeshna cyanea* which will not readily give way but will investigate the intruder until it is satisfied that there is no competing male or prospective mate present, before it continues its searches.

Sheltered from winds by the surrounding woodland, dragonflies and damselflies can thrive in the undisturbed waters of Shrawley Wood, while the river species can also seek sanctuary in the Wood as they mature. Damselflies can live in quiet communities while the more conspicuous hawkers patrol the lake margins, jousting briefly as they pass each other on their border patrols.



03. Southern Hawker *Aeshna cyanea* flying. Mike Averill

Table. Dragonflies recorded at or in the waters in and around Shrawley Wood

	Dragonflies	Odonata	First Record	Last Record	No of records
1	Azure Damselfly	*Coenagrion puella*	1982	2020	30
2	Banded Demoiselle	*Calopteryx splendens*	1979	2020	32
3	Beautiful Demoiselle	*Calopteryx virgo*	1997	2018	14
4	Black-tailed Skimmer	*Orthetrum cancellatum*	2002	2002	1
5	Blue-tailed Damselfly	*Ischnura elegans*	1979	2020	43
6	Broad-bodied Chaser	*Libellula depressa*	2002	2002	1
7	Brown Hawker	*Aeshna grandis*	1901	2020	14
8	Common Blue Damselfly	*Enallagma cyathigerum*	1981	2018	24
9	Common Club-tail	*Gomphus vulgatissimus*	2013	2019	5
10	Common Darter	*Sympetrum striolatum*	1979	2017	19
11	Common Hawker	*Aeshna juncea*	1997	1997	1
12	Emerald Damselfly	*Lestes sponsa*	1982	1983	2
13	Emperor Dragonfly	*Anax imperator*	1997	2020	8
14	Large Red Damselfly	*Pyrrhosoma nymphula*	1981	2018	11
15	Migrant Hawker	*Aeshna mixta*	2007	2020	10
16	Red-eyed Damselfly	*Erythromma najas*	1986	2020	31
17	Ruddy Darter	*Sympetrum sanguineum*	2010	2019	2
18	Small Red-eyed Damselfly	*Erythromma viridulum*	2018	2019	2
19	Southern Hawker	*Aeshna cyanea*	1979	2020	20
20	White-legged Damselfly	*Platycnemis pennipes*	1979	2020	26
	Total records to 2020				296

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Lepidoptera of Shrawley Wood

Tony Simpson

This unique Small-leaved Lime wood has a number of rare and local Lepidoptera species associated with it.

A total of 20 species of butterfly have been recorded in recent years. All the usual widespread woodland species occur plentifully, such as Orange-tip *Anthocharis cardamines*, Green-veined White Pieris napi, Speckled Wood *Pararge aegeria*, Holly Blue *Celastrina argiolus*, Comma *Polygonia c-album*, Peacock *Aglais io* and Brimstone *Gonepteryx rhamni*. The most interesting are records for White Admiral *Limenitis camilla* and Silver-washed Fritillary *Argynnis paphia* and although High Brown Fritillary *Argynnis adippe* was recorded in the 19th Century, with unconfirmed records up to the early 1980s, it has now become extinct throughout Worcestershire. A single record of Wood White *Leptidea sinapis* has not been confirmed or repeated.

In total 439 species of moths have been recorded in the past 20 years, including good numbers of local ancient semi-natural woodland macromoths, for example; Gold Swift *Phymatopus hecta* , Poplar Lutestring *Tethea or*, Alder Kitten *Furcula bicuspis*, Lobster Moth *Stauropus fagi*, Great Prominent *Peridea anceps*, Alder Moth *Acronicta alni* , Angle-striped Sallow *Enargia paleacea*, Bird's Wing *Dypterygia scabriuscula* , Beautiful Carpet *Mesoleuca albicillata*, Blomer's Rivulet *Venusia blomeri*, Brindled White-spot *Parectropis similaria*, and Scallop Shell *Hydria undulata*.

Pale Oak Beauty *Hypomecis punctinalis* a very uncommon species in the county has occurred at Shrawley Wood, its only site away from the Wyre Forest.

Among the micromoths the larval cases of the Pyschid *Taleporia tubulosa* are commonly found pupating on lime trunks and cases of another, *Diplodoma laichartingella*, have been found on old lime coppice stools. Lichen covered silken tubes of the pretty little black and white *Infurcitinea argentimaculella* can be found feeding on *Lepraria* lichens in deep shade. Other typical local woodland micromoths include *Agnoea subochreella*, *Olindia schumacherana*, *Ancylis laetana, Lobesia reliquana*, *Pammene obscurana* and *Pammene albuginana*.

There are 19th century records of two species since unrecorded in the wood; *Crassa tinctella* and *Phyllonorycter kuhlweiniella*. The former may well be still be present but the latter has now become very local and rare in the UK and is unlikely to still occur.

The planted conifer blocks do add diversity and contain many of the usual associated species such as Dwarf Pug *Eupithecia tantillaria* , Ochreous Pug *Eupithecia indigata*, Pine Carpet *Pennithera firmata*, Grey Pine Carpet *Thera obeliscata,* Spruce Carpet *Thera Britannica*, Satin Beauty *Deileptenia ribeata* and the micros *Rhyacionia pinivorana* and *Dioryctria abietella*, as well as good populations of Red-necked Footman *Atolmis rubricollis* (Linn.) and Buff Footman *Eilema depressa* (Esp.) feeding on algae and lichens thereon. Other footman moths such as Rosy *Miltochrista miniata*, Common *Eilema lurideola*, Scarce *E. complana* and Dingy Footman *E. griseola* are commonly found in the wood and Four-dotted Footman *Cybosia mesomella*, usually found around heather, also occurs.

There are lush moist areas of herbaceous vegetation along the rides and in clearings and coppice plots leading to a good variety of associated species for example *Calybites phasianipennella* (Hb.) feeding on various *Polygonaceae* and *Mompha langiella* (Hb.) on Willowherb *Epilobium* spp. and Enchanter's Nightshade *Circaea lutetiana*. In places Great Wood-rush *Luzula sylvatica* is mined by larvae of the local *Elachista regificella* Sirc.

The rare and beautiful Oecophorid, *Schiffermuelleria grandis* (Desv.) (01) has been found in the wood since 2015 and is elsewhere known mainly from Ribbesford Wood and Wyre Forest in Worcestershire. Its larva feeds under the bark of dead wood of various tree species.



01. *Schiffermuelleria grandis.* Oliver Wadsworth.

Because of the unusual preponderance of lime species that feed on many other tree species elsewhere have adapted to feed mainly on this tree in this site. For example Square Spot *Paradarisa consonaria* (Hb.), Nut-tree Tussock *Colocasia coryli* (Linn.), and Pale Tussock *Calliteara pudibunda* (Linn.).

However the most interesting and important species are those on the lime trees:
The beautiful Gelechiid moth*, Dichomeris ustalella* (D. & S.), (02. 03, 04) was first found in the U.K. in 1861 by the Rev. Horton, but apart from saying that he found it "resting" on a lime leaf, he did not disclose the identity of the site. In 1987 a moth was swept from under a lime in Shrawley Wood and searches for the larvae that September showed that they fed between spun lime leaves and were widespread in the wood, and the moth has been seen frequently at light since. This was then the only site in Britain but in 1999 it was found in lime Woods near Tintern in the Wye Valley.



02. *Dichomeris ustalella.* Oliver Wadsworth.



03. *Dichomeris ustalella* Shrawley Wood. Oliver Wadsworth.



04. *Dichomeris ustalella* Shrawley Wood. Oliver Wadsworth.

The Pyralid moth, *Salebriopsis albicilla* (H-S), (05) was first found in Wye Valley lime woods and larvae and moths were found to be present in Shrawley Wood in 1999, and have often been recorded there since.



05. Salebriopsis albicilla Shrawley Wood. Oliver Wadsworth.

Another rare moth of ancient lime woods, the Scarce Hook-tip *Sabra harpagula* (Esp.), has been searched for at Shrawley Wood but seems to be absent. It remains confined in the U.K. to lime woods on limestone in the Wye Valley and nearby areas.

Another very local lime feeding moth is Fletcher's or Pauper Pug *Eupithecia egenaria* H-S (06) whose larvae eat the lime flowers. Like the former species it seemed to be confined in the U.K. to the southern Wye Valley, but then was found in woodland in Norfolk and Lincolnshire. It was recorded commonly from Shrawley Wood for the first time in 2000. Since then it has been recorded in a number of sites across Worcestershire and elsewhere in England, so it is not known if like the first two species it was an original inhabitant in the wood, or a more recent arrival.



06. Pauper Pug *Eupithecia egenaria.* Oliver Wadsworth.

Many more widespread lime feeding species occur in very high numbers; such as the leaf mining *Stigmella tiliae* (Frey) (07), *Bucculatrix thoracella* (Thunb.), and *Roeslerstammia erxlebella* (Fabr.). *Semioscopis avellanella* (Hubn.) is very common in early spring and the pretty little Tortrix, *Hedya atropunctana* (Zett.) (08) feeds in a leaf spun into a pod. This species is usually found commonly in northern Britain feeding on bog myrtle *Myrica gale* but here exists in an entirely different habitat. Lime Hawk Moth *Mimas tiliae* (Linn.) is common. Orange Sallow *Xanthia citrago* (D.& S.) is very common with huge numbers of larvae climbing up the lime trunks at dusk in May, from their daytime retreats at the base of the trees.



07. *Stigmella tiliae* Lime Pigmy, mine in Small-leaved Lime leaf. Shrawley Wood. Mike Averill.



08. Hedya atropunctana. Oliver Wadsworth.

The Incurvariid, *Lampronia oehlmanniella* (Hb.) normally occurs on moorland and in heathy woodland associated with bilberry *Vaccinium myrtillus*, but it is very common in Shrawley and here is mining initially in lime leaves before feeding on the ground in a portable case. Similarly *Coleophora annatipennella* (Hb.) normally found on Blackthorn and Hawthorn, *Incurvaria pectinea* (Zinck.) most often on birch and hazel, and *Adela croesella* (Scop.) often in larval cases under privet, are here feeding on or associated with lime.

Because large parts of the wood are a lime monoculture quite a large number of mixed deciduous woodland micro-moth species which one would expect to find in ancient semi-natural woodland are uncommon or absent, but in contrast there are nationally rare species and big populations of lime feeders and others that seem to have adapted to this unusual situation.

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The Hymenoptera of Shrawley Wood

Geoff Trevis

Generally the hymenoptera will reach maximum species diversity and population densities on dry, warm sites, particularly heaths. In Worcestershire this means places such as Devil's Spittleful and Rifle Range or Hartlebury Common all part of the sandlands near Kidderminster. However, woodland rides and clearings will hold interesting populations of bees, wasps, ants, sawflies and their associated parasites. Additionally, a range of gall causing wasps will be found, identified mainly from the galls rather than the insects themselves. About 66 hymenoptera species have been recorded in Shrawley Wood, the list being dominated by three genera, the bumblebees *Bombus, Andrena* mining bees and Nomad bees *Nomada.* Some difficult to identify species have been recorded only to genus level.

Ten species of bumblebees have been recorded: The Garden Bumblebee *Bombus hortorum*, The Tree Bumblebee *B. hypnorum* (02), The Red-tailed Bumblebee *B. lapidarius*, The White-tailed Bumblebee *B. lucorum*, The Common Carder Bee *B. pascuorum* (01), The Early Bumblebee *B. pratorum*, The Buff-tailed Bumblebee *B. terrestris* and three cuckoo bees, The Red-tailed Cucnkoo Bee *B. rupestris*, The Forest Cuckoo Bee *B. sylvestris* and The Vestal Cuckoo Bee *B. vestalis* (03).



01.The Common Carder Bee *Bombus pascuorum.* Kevin McGee

The number of bumblebees for each species recorded does not reflect the national populations. By far the most frequently recorded species is the Common Carder bee, followed by the Tree bumblebee whilst other species have only been recorded in single figures. This disparity probably reflects the fact that Common Carder bee and the Tree bumblebee are the most easily recognised whilst other species can present identification difficulties. Also, recent taxonomic changes in relation to the White-tailed bumblebee and recognition that workers of the White-tailed and Buff-tailed bumblebee cannot always be reliably separated may occasionally have contributed to a reluctance to submit records. The dominance of the Common Carder bee may also be due to its nesting above ground in tussocks of grasses and other vegetation which will be common along rides and in clearings. All this means that there is plenty more work to be done in Shrawley Wood on this popular group.



02. The Tree Bumblebee *Bombus hypnorum.* Kevin McGee.

The cuckoo bees also present some unexpected results. The Red-tailed cuckoo bee is a parasite on the nests of the Red-tailed bumblebee, the Forest cuckoo bee on the Early bumblebee and the Vestal cuckoo bee on the Buff-tailed bumblebee. In all cases the cuckoo bee appears to be present in numbers not far short of the host, which seems unlikely as generally a parasite population is significantly lower than that of the host. Conversely, the Field cuckoo bee *B campestris* has not been recorded at Shrawley Wood though it is the nest parasite of the Common Carder bee which is the most frequently recorded species.



03. The Vestal Cuckoo Bee *B. vestalis*.

Mining bees of the genus *Andrena* are represented by six species, the Yellow-legged mining bee *Andrena flavipes*, the Ashy mining bee *A. cineraria,* the Impunctate Mini-miner *A. subopaca* (04), the Chocolate mining bee *A. scotica,* the Green-patched mining bee *A. nitida* (05) and the Short-fringed mining bee *Andrena dorsata.* All these are common though two, the Yellow- legged and Short-fringed mining bees, are restricted mainly to southern England. Generally, species of *Andrena* nest in dry places and sunny banks and are unlikely to be numerous in woodland except where such conditions occur in glades and along wide rides. They are subject to cleptoparasitism from Nomad bees *Nomada*.



04. Impunctate Mini-miner *Andrena subopaca*. Kevin McGee



05. Green-patched mining bee *Andrena nitida.* Kevin McGee

Seven species of Nomad bees have been recorded in Shrawley Wood, these being the Flavous nomad bee *Nomada flava*, Gooden's nomad bee *N. goodeniana*, Panzer's nomad bee *N. panzeri*, the Early nomad bee *N leucophthalma*, the Long-horned nomad bee *N. hirtipes* (06), Lathybury's nomad bee *N. lathburiana* (07) and the Little nomad bee *N. flavoguttata*. They are generally yellow and black striped sometimes with orange/ brown bands as well and are frequently thought to be small wasps. The species found in the wood are fairly common over southern England except for the Long-horned nomad bee which is very scarce and is the cleptoparasite of the Big-headed mining bee *Andrena bucephala* which itself is widespread but scarce across southern Britain

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06. the Long-horned nomad bee *Nomada hirtipes.*

Of local interest is the comment by Steven Falk that Lathbuy's nomad is particularly linked to the Cotswolds and West Midlands.



07. Lathybury's nomad bee *Nomada lathburiana.* Kevin McGee.

The associations between nomad bees and *Andrena* species are as follows, the *Andrenas* mentioned being restricted to those so far found in Shrawley Wood: the Flavous nomad with the Chocolate mining bee, Gooden's nomad with the Green-patched mining bee and possibly the Chocolate mining bee, Panzer's nomad with spring flying *Andrena* species none of which have been recorded from Shrawley, the Early nomad with *A. apicata* and *A. clarkella*, the Long-horned nomad with the Big-headed mining bee, Lathbury's nomad with the Ashy mining bee and the Little nomad bee with the Impunctate Mini-miner and other small *Andrena* species. These associations indicate the need for further survey as both Panzer's nomad bee and Early nomad are both cleptoparasites of species not yet recorded from Shrawley Wood. The hosts of Panzer's nomad are spring flying hence the failure to find them may be due to surveys taking place too late in the year whilst the host of the Long-horned nomad bee, the Big-headed mining bee, is scarce and may turn up as further surveys are undertaken.

Apart from the above, solitary bees appear poorly represented at Shrawley Wood, only four species having been recorded. These are the Short-horned yellow faced bee *Hylaeus brevicornis,* the Bloomed Furrow bee *Lasioglossum albipes,* and Wood-carving Leaf Cutter bee *Megachile ligniseca.* The fourth species is the cleptoparasite Geoffroy's Blood bee *Sphecodes geoffrellus* (08) which parasitises the nests of smaller solitary bees such as *Lasioglossum*. Although bees generally prefer warm, sunny places it is likely that these records are not representative of the bee population at Shrawley Wood and that more species would be found if further survey were to be undertaken.



08. Geoffroy's Blood bee *Sphecodes geoffrellus.* Kevin McGee.

Woodland sites provide excellent opportunities for wasps, particularly the solitary ones, provided open areas have warm light soils for nesting and a variety of trees, shrubs and plants to support the insect prey with which the wasps provision their nests. These conditions are met at Shrawley Wood. So far, nine species have been recorded but, as with the solitary bees, many more wait to be found through further survey work.

Surprisingly, only two species of social wasps have been seen and recorded, these being the Tree Wasp *Dolichovespula sylvestris* and the Hornet *Vespa crabro*. The Hornet far outweighs Tree Wasp in terms of the number of records.. There was only one record of the Tree Wasp but twelve for the Hornet. It is probable that the Hornet, being easily recognised, can be confidently identified without capture but the other social wasps generally require closer study and many people wisely avoid catching then for the purposes of identification. The Tree wasp belies its name to some extent as it often does not nest in trees but may selects sites at ground level, in hollows in the ground, in the eves of houses etc. It is not rare. The Hornet, which has been expanding its range in recent years, nests in hollows in trees and has a liking for nest boxes from which the nest may expand beyond the confines of the box.

The solitary wasps have a life cycle in many ways similar to that of the solitary bees except that they provision their nests with insects. The current list contains seven species which includes two cleptoparasites. These are the Field Digger Wasp *Mellinus arvensis*, a sand wasp *Argogorytes mystaceus* (09), the Sand Tailed Digger Wasp *Cerceris arenaria*, the Ornate Tailed Digger Wasp *Cerceris rybyensis, Rhopalum coarctatum* and the two cleptoparasitic species, a ruby tailed wasp *Chrysis ignita* and the Large Spurred Digger Wasp *Nysson spinulosus* (10). None of these is considered rare or threatened though the number of records for any one species is in single figures.



09. A sand wasp *Argogorytes mystaceus*, Kevin McGee.



10. Large Spurred Digger Wasp *Nysson spinulosus*. Kevin McGee

These wasps exploit a wide range of insect prey or species to act as hosts for their larvae and are generally found in mid to late summer when the insect abundance is high. The Field Digger Wasp takes small flies, the sand wasp larvae of small leaf hoppers and spittle bugs, the Sand Tailed Digger Wasp small adult weevils, the Ornate Tailed Digger Wasp small to medium bees and *Rhopalum coarctatum* small flies. Of the cleptoparasitic wasps the ruby tailed *Chrysis ignita* parasitises eumeninine wasps such as *Ancistrocerus parietum* and *Nysson spinulosus* utilises nests of *Argogorytes* species.

The bee and wasp species form two of the aculeate hymenoptera, the third being the ants. Again, a wood such as Shrawley should be able to support several ant species but, in fact, only five have been recorded. These are the Negro Ant *Formica fusca*, the Small Black Ant *Lasius niger*, the Red Ant *Myrmica rubra*, *Myrmica ruginodis* and *Lasius brunneus*. (11). These are all relatively commom and widely distributed around Britain except for the last. *Lasius brunneus* has been found fairly commonly in Worcestershire but nationally it has a most unusual distribution being found in the south-east in the Thames catchment and in the west in the Severn catchment and virtually nowhere else.



11. *Lasius brunneus*. John Bingham

Sawflies too are hymenoptera though often are not recognised as such. Many have large larvae which look superficially like larvae of butterflies or moths. Woods such as Shrawley have a wide range of plants, shrubs and trees which offer ample opportunity for an equally divers range of plant eating sawfly larvae. Adult sawflies can be difficult to identify and there are few modern keys to help. However, 10 were identified to species level, one to genus.

The larvae of some species are fairly specific about the plants on which they can be found. Thus, we have *Biophorus pallipes* on rosaceae and betula; *Tenthredo scrophulareae* (11) on figworts; *Pontania bridgmanii* forming galls on salix spp; *Fenusa ulmi* on elms; *Parna apicalis* and *P.tenella* leaf miners on lime leaves: and *Dolerus sanguinicollis* on grasses whilst two species, *Tenthredo mesomelas* (12) and *T. temula* are more polyphagous. There was also a record of a species in the genus *Pyllocopa* most of which are leaf rollers on salix.



11. Sawfly *Tenthredo scrophulareae*. Kevin McGee



12. A sawfly *Tenthredo mesomelas*. Kevin McGee.

Two other groups of hymenoptera remain, the gall wasps and the parasites or parasitica. Eight species of gall formers on oak have been recorded from the galls, these being the Oak Apple *Biorhiza pallid* (13); the Common Spangle Gall *Neuroterus quercusbaccarum*; the Ram's Horn Gall *Andricus aries*; the Oyster Gall *A. anthracina* ; the Artichoke Gall *A. Andricus foecundatrix* (15); the Marble Gall *A. kollari* (14); Cola-nut former *A. lignicola* and the Knopper Gall *A. quercuscalicis* (16). Apart from the galls caused by sawflies the only other gall noted was the Robin's Pincushion Gall *Diplolepis rosae* on roses.



13. Oak apple gall *Briohiza pallid*. John & Carol Taylor.



14. Oak Marble Gall *Andricus kollari*. John Bingham.



15. Oak artichoke gall *Andricus foecundatrix.* John Bingham.



16. Knopper gall *Andricus quercuscalicis* John Bingham

The final group, the parasitica, is generally very poorly recorded due mainly to problems of identification. However, several species of ichneumon are attracted to light and are frequently recovered from light traps. Six such species were recorded at Shrawley Wood and, as a key is available for them, identification to species level proved possible. The Shrawley Wood species were *Ophion minutus, O. mocsari, O. obscuratus agg., O. ocellaris, O. ventricosus* and *Netelia latungula*. Ichneumons lay their eggs in the immature stages of various insects and spiders and their attentions result in the death of the host. The only other parasitic species identified to species level was *Gasteruption jaculator* whose eggs are laid on larvae of solitary bees and wasps.



17. *Ophion obscuratus* agg. John Bingham



18. *Gasteruption jaculator.* Brett Westwood

In summary, Shrawley Wood supports a wide range of hymenoptera but is still very much under recorded. Further work would undoubtedly considerably extend the list. If some way could be found to carry it out safely, a very interesting project would be to survey the lime canopy at flowering time. When conditions are right at this rime of year the hum of insects from the tops of the trees can be remarkably loud!

Acknowledgement

I would like to thanks all those who have submitted the records which form the basis of this report.

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Woodlice, millipedes and centipedes
(Isopoda, Diplopoda and Chilopoda) of Shrawley Wood

Gary Farmer

Woodlice have many local names including wood-pigs and coffin-cutters which reflect their favoured damp-wood habitat to chucky-pigs and granny-sows referring to the fact that different sized woodlice gather tightly together resembling miniature feeding piglets (Marren & Mabey 2010). They can also resemble ground beetles, especially the faster moving species but woodlice are actually terrestrial crustaceans and so are more closely related to crabs and crayfish. These Armadillos of the invertebrate world are an important part of the woodland ecosystem because they are detritivores recycling nutrients as they feed on rotting vegetation, fallen leaves, decaying wood and even animal corpses.

There are 40 or so species of woodlice found outdoors in Britain (Gregory 2009) but only the five very common species (Farmer 2019) have been recorded in Shrawley Wood. Turn over almost any log on the woodland floor and the Rough Woodlouse *Porcellio scaber* will be there and will amble away, heading back to the dark, shunning sunlight. The Shiny Woodlouse *Oniscus asellus* has a smooth, flanged body and will clamp down limpet-like in an attempt to foil predators while the Striped Woodlouse *Philoscia muscorum* (01) with its polished grey bodywork, black shiny head and go-faster stripe will race off at speed. The Pill Woodlouse *Armadillidium vulgare* will roll into a tight shiny ball making it very difficult to pick up. But this habit and the fact that their bodies contain calcium carbonate encouraged our ancestors to collect and swallow Pill Woodlice in the mistaken belief that that they could cure indigestion. (Marren & Mabey 2010). The final species is small and reddish coloured living in leaflitter or under stones and wet timber. Known as the Pygmy Woodlouse *Trichoniscus pusillus* this species can be incredibly numerous and is capable of reproducing by parthenogenesis (without the need of a male).



01. Striped Woodlouse *Philoscia muscorum*.

The woodlice share their habitat with millipedes which are also detritivores. There are around 60 species in the UK (Lee 2006) but the number is constantly changing as new species are discovered. They can be very difficult to identify so there are only five species presently known from Shrawley Wood. The one most often found is the Black Snake Millipede *Tachypodoiulus niger* which has a very dark body and contrasting white legs. The Blunt-tailed Snake Millipede *Cylindroiulus punctatus* (02) is also very common but will hide away beneath bark on dead trees or deep in soft rotting logs.



02. The Blunt-tailed Snake Millipede *Cylindroiulus punctatus*

The Striped Millipede *Ommatoiulus sabulosus* is one of the larger millipedes in Britain and is easily identified by the pair of ginger stripes along its back. This is a widespread species especially around the coast and is associated with heathland and sand dunes so the sandstone soil at Shrawley Wood probably suits it well. The Pill Millipede *Glomeris marginata* is very similar to the Pill Woodlouse but as with all millipedes it has two pairs of legs per body segment (one pair per segment in woodlice) and is usually shiny black when mature. The flat-backed millipedes have no ocelli (eyes) and sculptured, flattened backs. There are several very similar species in Britain and *Polydesmus angustus* is the only one recorded to date in Shrawley Wood.

Centipedes are top predators on the woodland floor, fast moving and armed with venom, they feed on any small invertebrates that they find. They are so specialised that they belong to a Class of their own, the Chilopoda which refers to the fact that their front pair of legs are modified to form venomous jaws (Barber 2009). The most commonly recorded species in Shrawley Wood is the large Banded or Variegated Centipede *Lithobius variegatus* (03). This species is often found beneath fallen branches and in decomposing vegetation and is identifiable by the bands on its legs. The only other centipede to have been recorded in Shrawley Wood is one of the subterranean earth centipedes *Stigmatogaster subterranea* which can measure up to 70mm in length. The earth centipedes are found in deep leaf litter or just below the soil surface especially around plant roots where they hunt for small arthropods, snails and earthworms.



03. Banded or Variegated Centipede *Lithobius variegatus*

Shrawley offers ideal habitat for woodlice, millipedes and centipedes and the small number of species recorded has undoubtedly more to do with the difficulty in identification than in the actual species present. Searching under fallen branches and in leaf litter at different times of year will surely reveal more species.

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The True Bugs – Hemiptera – of Shrawley Wood

Gary Farmer



01. The Linden Aphid *Eucallipterus tiliae* photographed in Shrawley Wood. John Bingham'

The Hemiptera are the true bugs, and all have characteristic needle-like mouthparts, designed for piercing and sucking and, depending on species, they feed on juices from plants or body fluids from animals (usually other invertebrates). Over 1,830 species of Hemiptera have been recorded in Britain (Brock 2019) and this diverse group includes aphids, froghoppers, plant bugs, damselbugs and shieldbugs which are all represented in Shrawley Wood.

With so many small-leaved lime trees *Tilia cordata* in Shrawley Wood it is not surprising that the Linden Aphid *Eucallipterus tiliae* has been found here (01). This species is restricted to lime trees where it feeds on the underside of the leaves producing sticky honeydew. This drips from the trees and will be familiar to anyone who parks their car under limes planted as street trees! (Also, see Whitehead The invertebrates of Shrawley Wood – this volume).

Another Hemipteran found only on lime trees and present in Shrawley Wood is the nationally scarce Lime Leafhopper *Pediopsis tiliae* (Bingham & Bingham 2013) which is a distinctive species having brown wings and a plain yellow face (02).



02. *Pediopsis tiliae* Shrawley Wood. John Bingham

A similar but more patterned species found in Shrawley Wood is the Poplar Leafhopper *Populicerus populi*. This species feeds on poplars and willows (also, see Whitehead The invertebrates of Shrawley Wood – this volume) and shares its habitat with the large froghopper *Aphrophora alni*, a species well camouflaged on low branches of willow and other deciduous trees. The nymphs of this species, as with other 'spittle bugs' produce a mass of small bubbles known as cuckoo-spit which hang from the twigs of the host tree. This is plant sap that has passed through the bug and is expelled from the anus (Stewart & Harkin 2020). This frothy flatulence provides the vulnerable nymphs with protection from predators and reduces the risk of dehydration.

Lower down in the shrub and herb layers lives another froghopper, the striking red and black *Cercopis vulnerata* that survives the winter as a nymph feeding on roots of various plants. The adults emerge in summer along the warm woodland rides and in young shrubby regrowth following tree felling operations.

Shieldbugs are amongst the largest of the true bugs and some species such as the Green Shieldbug *Palomena prasina* and Hairy Shieldbug *Dolycoris baccarum* are very common. Other species are rare and some are expanding their range nationally, colonising Worcestershire quite recently (Partridge 2004). Shieldbugs either get their name from the shield-shape of the adult body or from the fact that they have a large triangular plate pointing back from the thorax called a scutellum from the Latin for "small shield" (Hawkins 2003). In some other countries, particularly the USA they are known as 'stink bugs' because many species give off a lingering, pungent odour if threatened by predators.

As with all of the true bugs, shieldbugs undergo an incomplete metamorphosis, starting as an egg but lacking a pupal stage, passing instead through several instars with their final moult resulting in the adult stage (Boardman 2014). Many true bugs overwinter as adults and then reproduce in spring. Overwintering bugs tend to become

less brightly coloured, losing green coloration and changing to more subdued browns to reduce the risk of predation. This is particularly noticeable in the Green Shieldbug which loses its bright green colour, becoming brown in time with the autumn leaves (03, 04).



03. Green Shieldbug *Palomena prasina in spring.* Gary Farmer



04. Green Shieldbug *Palomena prasina* in winter. Gary Farmer

A common shieldbug in Shrawley Wood, the Forest Bug or Red-legged Shieldbug *Pentatoma rufipes* is unusual in that it is mature from July to November, only occasionally overwintering as an adult (Evans & Edmondson 2005). They are polished brown with broad 'shoulders' and have a yellow/orange spot in the centre of their back. As one of their common names suggests, their legs are bright red/orange in colour. Their nymphs are encountered through the year on trees where they are wonderfully camouflaged against the bark, their sculptured, dull mottled bodies resembling the knobbly twigs on which they often rest (05, 06). Also, see Whitehead The invertebrates of Shrawley Wood – this volume pp. 431-449.



05. Forest Bug or Red-legged Shieldbug *Pentatoma rufipes* nymph camouflaged on tree bark. John Bingham



06. Forest Bug or Red-legged Shieldbug *Pentatoma rufipes* Nymph and eggs. John Bingham.

A similar species is the Bronze Shieldbug *Troilus luridus* but this large brown bug is a predator of moth and beetle larvae which it hunts amongst tree and shrub foliage. Adults are mottled brown and lack the orange/yellow spot of the Red-legged Shieldbug while their nymphs are garishly coloured red and metallic bronze. The Blue Shieldbug *Zicrona caerulea* is another predatory shieldbug found in Shrawley Wood. It is a small metallic blue species and is occasionally found around willowherbs where it hunts for the similarly coloured *Altica* flea beetles and their larvae which feed on the leaves of willowherbs.

There are other shieldbugs to be found amongst the wildflowers and grasses within Shrawley Wood. The Small Grass Shieldbug *Neottiglossa pusilla* is an uncommon insect found at only a few sites in Worcestershire including Shrawley Wood (Bingham 2012). Bishops Mitre Shieldbug *Aelia acuminata* is a relative newcomer to the county but has spread quickly to most areas. This straw-brown bug is said to resemble the ceremonial headwear worn by bishops giving the insect its common name. It feeds on grasses and can be found quite easily in summer by sweeping with an entomologist's net. The Pied Shieldbug *Tritomegas bicolor* has been found here feeding on White Dead-nettle *Lamium album* but despite this being a common plant in the county, the bug is not found very often. Soil type is almost certainly a factor as the bug over-winters in the ground beneath the host plant and so probably requires free-draining, friable soils (Partridge 2007). The Dockbug *Coreus marginatus* is a close relative of the shieldbugs and belongs to a group called the squash bugs. This is a relatively large species and often sits quite openly on the leaves of docks *Rumex sp* and other plants where adults and different aged nymphs can be found together.

Where birch trees *Betula sp.* grow in Shrawley Wood two more shieldbugs have been found. Parent Bug *Elasmucha grisea* and Birch Shieldbug *Elasmostethus interstinctus* lay their eggs on the leaves of deciduous trees, most often birch and also alders. But while the Birch Shieldbug abandons its eggs after laying them, the female Parent Bug looks after her eggs, guarding them until they hatch and she continues to tend her young, keeping them together until they are adults. These two species feed on birch catkins and where these are present Birch Catkin Bugs *Kleidocerys resedae* are often found. This small tree-dwelling ground bug is neatly camouflaged against the brown catkins. Another tree-dwelling ground bug, the Pine-cone Bug *Gastrodes grossipes* was discovered living in pine trees on the edge of Shrawley Wood in 2020: this rather broad, flattened bug favours Scots Pine *Pinus sylvestris* where it feeds on the cones.

Another ground bug found here is *Trapezonotus desertus* a ground-living species associated with heathland which shares areas of sandy ground in Shrawley Wood with a shore bug *Saldula orthochila*. Shore bugs are dark oval-bodied bugs that are difficult to identify to individual species. *S. orthochila* is the only one found in dry habitats.

The heathland bug *Alydus calcaratus* has also been found here and this large elongate bug is almost black in colour until it flies (which it does frequently) when it exposes a bright orange abdomen. It is an unusual insect, being the only member of the broad-headed Alydidae bugs found in Britain. It has nymphs that look just like ants and live within their colonies, being so similar that they have even been known to fool entomologists searching for ants (Hawkins 2003).

There are wetter grassland areas within the woodland and in these areas two very small, odd-looking plant hoppers can be found. Both species have thick antennae which project out from the sides of their head looking like clubbed-ears. Their wings are short and contrast against the insect's body giving the impression that they are wearing waistcoats. One of these species *Javesella discolor* feeds on grasses while the other *Conomelus anceps* feeds on rushes *Juncus sp*. (07)



07. *Conomelus anceps*. Gary Farmer

Rushes are also the home of a very common green leafhopper *Cicadella viridis*. The females are mostly green with yellow eyes and the males have blue-tinged wings. On a sunny day patches of rushes can appear to explode when approached as many little green hoppers take to the air.

In some of these damper areas the plant Enchanter's Nightshade *Circaea lutetiana* can be found and careful searching might be rewarded with the sight of an Enchanter's Nightshade Bug *Metatropis rufescens* that feeds on the leaves of the host plant. This slender, orange-brown stilt-bug with long thin legs can be easily mistaken for a cranefly (08).



08. Enchanter's Nightshade Bug *Metatropis rufescens*. Gary Farmer.

A very similar bug rarely found in Shrawley Wood is the slender assassin bug *Empicoris vagabundus*. Despite belonging to the menacingly named assassin bugs *E. vagabundus* is a delicate little bug known as a thread-legged bug. In close up, it resembles a very slim mantis with front legs designed for gripping prey, but whereas the mantids have mouth-parts for biting and chewing, the assassin bugs have needle-like mouthparts typical of the true bugs. These mini predators feed on small flies, aphids and other insects (09).



09. Slender assassin bug *Empicoris vagabundus*. Gary Farmer.

Damselbugs are also slender predatory bugs that feed on small insects and mites. Only two species have been recorded in Shrawley Wood so far. The Tree Damsel Bug *Himacerus apterus* is the only tree-dwelling damselbug in the UK, females have a relatively broad abdomen and both sexes have short wings. The Common Damselbug *Nabis rugosus* is fully winged and can be found in most grassland types.

Plant bugs or Capsid bugs-belong to a large family comprising 229 species (Brock 2019) and members of the family can be found in a variety of habitats where most feed on selected plants but others are predatory and others are omnivores. *Miris striatus* is a large dark species with distinctive bright yellow streaks found on deciduous trees and shrubs where it is predatory, feeding on small insects. Its nymphs are quite different from the adults, looking more like ants, similar to the adults of another predatory species *Pithanus maerkelii* which inhabits areas of damp grassland in the woodland. Other grassland plant bugs found in Shrawley Wood include *Phytocoris varipes*, a mottled brown species with long back legs. One of several very similar *Phytocoris* bugs this species feeds on the flowers and seeds of various plants. *Stenodema laevigata* feeds on unripe grass seeds and this slender grass bug is pale brown when it matures in late summer, turning green in spring before mating. Another grass bug, the Meadow Plant Bug *Leptopterna dolabrata* feeds on a variety of grasses and is found most often in damper grasslands. It is sexually dimorphic; the males are black and orange when mature and have long wings while the females are paler in colour and have short wings (10).



10. Meadow Plant Bug *Leptopterna dolabrata* male left, female right. John Bingham.

Stinging Nettles *Urtica dioica* are common in parts of Shrawley Wood especially near Dick Brook and they host a large number of plant bugs. *Calocoris alpestris* (11) and *Liocoris tripustulatus* are two common species that feed on the nettles along with the brightly chequered *Grypocoris stysi* a flower-feeding species that will also feed on small invertebrates. *Deraeocoris ruber* is a predatory plant bug feeding on small insects. This shiny bug is quite unusual amongst the plant bugs as it is very variable in colour, ranging from bright orange to almost completely black but always with an orange spot on the tip of each wing.



11. Plant bug *Calocoris alpestris.* Gary Farmer.

Flat bugs are another small group of true bugs but are strange little things looking like they have spent too much time in a flower press: they are completely flattened dorsally. There are two species present in Shrawley Wood, *Aneurus laevis* and *Aneurus avenius* but neither are seen very often as their flattened bodies allow them to spend their lives beneath the bark of dead deciduous trees where they feed on fungi. Flat bugs lay eggs several times throughout the year resulting in all of their life-stages co-existing.

There can be little doubt that many more bugs await discovery in Shrawley Wood. The areas of high canopy, open-rides, young shrub and tree growth alongside dry and sunny, damp and shaded conditions create a wide range of habitat ideal for Hemipterans.

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The grasshoppers, crickets and earwigs (Orthoptera) of Shrawley Wood

Gary Farmer

Grasshoppers generally prefer sheltered, sunny areas with a range of vegetation types, where they can bask in the sun but retreat to longer vegetation if disturbed. This means that in woodlands these sun-loving insects are restricted to open areas, glades and wide rides.

Only two species of grasshopper are seen regularly in Shrawley. The very common Meadow Grasshopper *Chorthippus parallelus* occurs along the edges of stands of bracken and in the wider rides. This is a widespread species in Worcestershire and can survive in most unsprayed grasslands which aren't regularly mown. The Field Grasshopper *Chorthippus brunneus* is more likely to be encountered in the open areas where the dry sandy soils hold the sun's heat providing ideal conditions for this species to breed.



01. The Field Grasshopper *Chorthippus brunneus*

There are single records of two other species of grasshopper in Shrawley Wood. The Lesser Marsh Grasshopper *Chorthippus albomarginatus* is a relative newcomer to the area and closely resembles the Meadow Grasshopper. Unlike the Meadow Grasshopper which is flightless, the Lesser Marsh flies well and since its arrival in Worcestershire in 1993 it has spread across much of the county (Farmer 2018) and may well be seen more often in Shrawley in the future. The Common Green Grasshopper *Omocestus viridulus* is to be found in open flower-rich damp grassland or humid heathland and so is unlikely to be encountered very often within the woodland but it is worth searching for as this species appears to be declining nationally (Evans & Edmondson 2007).

Groundhoppers are small relatives of the grasshoppers and can be found in damp places where mosses are abundant. Slender Groundhopper *Tetrix subulata* (02) is the only species to have been found in Shrawley Wood so far, but groundhoppers are secretive little Orthopterans and on further searching the Common Groundhopper *Tetrix undulata* may also be found to be present. Both are found throughout Worcestershire.



02. Slender Groundhopper *Tetrix subulata.*

Bush-crickets are a little more tolerant of shading but still need to bask in sunshine so are mostly restricted to areas of nettles and brambles in the open areas of the woodland and in young regrowth following tree-felling operations. The relatively large, grey or brown Dark Bush-cricket *Pholidoptera griseoaptera* is the most regularly encountered species. In May the young nymphs resemble wolf spiders and are easily spotted as they sit openly in the sunshine on bramble and bracken leaves. Speckled Bush-cricket *Leptophyes punctatissima* is also common here but is well camouflaged being dark green in colour and hiding amongst thistle and nettle stems. Equally common is the Oak Bush-cricket *Meconema thalassinum* (03), a pale green fully-winged species which spends most of its life in woodland canopy or hidden in shrubs along wide woodland rides.



03. Oak Bush-cricket *Meconema thalassinum*

Two other bush-crickets, have been found in Shrawley in recent years. Roesel's Bush-cricket *Metrioptera roselii* and Long-winged Conehead *Conocephalus discolor* (*C. fuscus*) are both going through a huge range expansion, spreading from the south and east of England and are now common through most of Worcestershire (Green 2007). Both of these bush-crickets are likely to be seen more often in Shrawley Wood in the future.

One species which would seem unlikely to occur here is the nationally rare Wood Cricket *Nemobius sylvestris* yet in April 1948 Fred Fincher found what he suspected to be a nymph of this species (Fincher 1953). He sent the specimen via the British Museum to other experts who were unable to confirm the identification due to its immaturity but all agreed it was likely to be a Wood Cricket. This is a rare species in Britain being confined to southern England with the main populations located on the Isle of Wight and in the New Forest where it lives in leaf litter in sunny woodland clearings or patches of

scrub. This raises the intriguing question of whether the Wood Cricket was once present in Shrawley Wood and if so, could it still be here?

Earwigs are relatives of the Orthopterans and three species are found in Worcestershire (Farmer 2001) but only one, the ubiquitous Common Earwig *Forficula auricularia* (04) has been found in Shrawley Wood to date.

The Lesser Earwig *Labia minor* is tiny and resembles a small Staphylinid rove beetle. It is associated with rotting vegetation especially muck heaps and is easily overlooked. Lesne's Earwig *Forficula lesnei* is nationally scarce but is spreading along river systems (Farmer 2018) and is worth searching for in hedges and scrub. In recent years it has been recorded both north and south of Shrawley Wood in Worcestershire (Westwood 2015 and Farmer 2012).



04. Common Earwig *Forficula auricularia*. Male above & female below

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Molluscs in Shrawley Wood

Rosemary Hill

Fifty-one species of mollusc, both land and freshwater, have been recorded in Shrawley Wood and its pools and lakes. This is a good number for a woodland situated largely on somewhat acid soils, but the natural soil variation across the wood provides a good range of habitats, even if the number of individual molluscs is often generally low.

There is an increasing concentration of land molluscs leading down to the valley of the Dick Brook, excluding the zone where it spates and the valley sides are scoured. The land slopes down to the brook from 60m to 20m above Ordinance Datum and the resulting erosion and runoff increases the dampness and nutrients available to the molluscs so the acidity decreases as the species count increases. Snails in particular need calcium to manufacture their shells, so fewer are found in areas where this element is scarce. Slugs are less constrained by the availability of calcium but are often more abundant in areas where calcium is present.

The gradient of calcium abundance explains some of the variation in species richness and distribution. For example, of the Toothless Chrysalis Snails *Columella aspera* is the species found on the higher sandier part of the bank but *Columella edentula* is found slightly further down the valley. The Two-toothed Door Snail *Clausilia bidentata* is found in drier areas but is joined by the Plaited Door Snail *Cochlodina laminata* in areas with moister soils. The Slippery Moss Snail *Cochlicopa cf. lubrica* is found in damp areas usually with some ground vegetation. Likewise the Tawny Glass Snails: *Euconulus fulvus* is found in damp leaf litter or sheltering under dead wood whereas *Euconulus alderi* requires persistently wet woodland or marshy ground. Adults of the Pellucid Glass Snail *Vitrina pellucida* (01) which is tolerant of acid substrates may be found in autumn and winter.



01. Pellucid Glass Snail *Vitrina pellucida*, Shrawley Wood 18.11.19. Rosemary Winnall

The drier top sections of the wood are more acidic and the acid-woodland indicator, the Hollowed Glass Snail *Zonitoides excavatus*, has been found there. The Rounded Snail *Discus rotundatus* is found across the drier areas but not where the soil remains damp where the Waxy Glass Snail *Aegopinella nitidula* is more likely to be found and occasionally the Clear Glass Snail *Aegopinella pura*.

The Garlic Snail *Oxychilus alliarius* is found across a wider range of conditions but only where there are other molluscs it can feed on. The Cellar Glass Snail *Oxychilus cellarius* which does not favour acid sites and Draparnaud's Glass Snail *Oxychilus draparnaudi*, an introduced species have also been found, the latter on one occasion near a path.

The Strawberry Snail *Trochulus striolatus* is found in drier places but only where there is sufficient lime necessary for the construction of its relatively substantial shells whereas the Hairy Snail *Trochulus hispidus* is usually found in damper spots.

The Hedgehog Slug *Arion intermedius* is found sporadically in acid woods but along with Large Black Slug *Arion ater,* the Brown Soil Slug *Arion (Kobeltia) distinctus,* the Blue-black Soil Slug *Arion (Kobeltia) hortensis* and the Netted Field Slug *Deroceras reticulatum*, it is under-recorded in Shrawley Wood. The Tree Slug *Lehmannia marginata* has only been recorded once but is likely to be more widespread. It climbs trees in wet weather to consume algae growing on tree trunks but hides itself at the base of the trunk and under fallen timber under dry conditions. Visits in wet weather are useful to find this species and other climbers such as the Door snails (Clausiliidae).

The Dusky Slug *Arion subfuscus,* the Brown-Lipped Snail *Cepaea nemoralis* and the White-Lipped Snail *Cepaea hortensis* are likely to be found throughout, but the *Cepaea* species prefer hedgerows and woodland edge situations. Sporadic finds of the Copse Snail *Arianta arbustorum* (02) throughout the wood relate to patches of leaf litter where run-off collects or where drainage is impeded.



02. Copse snail *Arianta arbustorum*, Shrawley Wood. Rosemary Winnall.

With regard to vegetation types, patches of Great Wood-Rush *Luzula sylvatica* may shelter the smaller molluscs such as the Prickly Snail *Acanthinula aculeata*, *Columella aspera*, and one of the Crystal Snails *Vitrea crystallina* which can be harder to find.



03. Lemon Slug *Malacolimax tenellus* on *Clitocybe geotropa*. Rosemary Winnall.

Some of the mollusc specialities of Shrawley Wood are most likely to be found in the historically least disturbed areas of the wood such as the old Small-Leaved Lime *Tilia cordata* coppice stools. These include the Slender or Lemon Slug *Malacolimax tenellus* (03)

(called Limax tenellus in the SSSI declaration) which is usually only found in the autumn when this subterranean slug comes above ground to feed on fruiting bodies of fungi and to mate.

The Ash-Black Slug *Limax cinereoniger* (04) is also found in these locations and prefers larger logs and rotting tree stumps. Both these species and the Dusky Snail *Zenobiellina subrufescens* are indicators of ancient semi-natural woodland.



04. Ash-Black Slug *Limax cinereoniger* under log, Shrawley Wood. Rosemary Winnall.

Recent finds of scarcer species include Rolph's Door Snail *Macrogastra rolphii* (05) found in the vicinity of rotten wood; the Three-toothed Moss Snail *Azeca goodalli* and the Point Snail *Acicula fusca* found in damp semi-shaded hollows at the base of slopes where runoff would collect after rain showers. All these species are typical of undisturbed old woodland.



05. *Macrogastra rolphii*. Brett Westwood

Freshwater molluscs are concentrated in the more suitable habitats in the southern section of the wood. There are no records for the fast-flowing Dick Brook which has high levels of silt when in spate. The Red-Crusted Pea Mussel *Euglesa* (formerly *Pisidium*) *personata*, a species of poor habitats, has been recorded from a rut and is often found in leaf litter from wet woods and marshes.

A small pool not marked on the Ordnance Survey map contains Common Bithynia *Bithynia tentaculata*, Wandering Snail *Ampullaceana* (formerly *Radix*) *balthica* and Dwarf Pond Snail *Galba truncatula*, which are typical inhabitants of muddy substrates in woods. The lower end of the brook leading into the larger pools has Short-Ended Pea Mussel *Euglesa subtruncatum* and Shining Pea Mussel *Euglesa nitida*, indicating improving water quality.

A wider range of species is found in the dammed-up pools, notably in the lowest pool, New Pool. These include the Freshwater Nerite *Theodoxus fluviatilis* which prefers a stony substrate to crawl on; the Lake Limpet *Acroloxus lacustris* (06) which is less fussy about substrates; the White Ramshorn *Gyraulus albus* with its fine spiral striations; the New Zealand Mud Snail *Potamopyrgus antipodarum* which is now widespread in all types of water bodies in the UK and tolerates nitrate pollution; the Horny Orb Mussel *Sphaerium corneum* (a common species); Henslow's Pea Mussel *Euglesa henslowana*; the Flat Ramshorn *Hippeutis complanatus* which is found at the margins of pools, and the Keeled Ramshorn Snail *Planorbis carinatus* (07). All these species require some water flow. The presence of marginal and aquatic vegetation is also a factor in increasing the number of species found.

The Swan Mussel *Anodonta cygnaea* is found in the pools where it may have been introduced to filter the water. The Duck Mussel *Anodonta anatina* is also present. Both of these species are found in muddy substrates. They are illustrated in the chapter on the aquatic fauna and flora of the pools (pp. 561-4).



06. Lake Limpet *Acroloxus lacustris.* Rosemary Winnall



07. Keeled Ramshorn Snail *Planorbis carinatus.* Rosemary Winnall

Acknowledgements.
Most images have been kindly provided by Rosemary Winnall.

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Mammals of Shrawley Wood

Harry Green



Badger. John Robinson

There are surprisingly few records of mammals from Shrawley Wood. The Worcestershire Biological Records Centre (WBRC) database held only 150 for 23 species by February 2020 (table 01). There are a few trail camera records for Shotgrove, a separate coppice managed in the past as part of Shrawley Wood (See Chapter Shotgrove p. 311 fig (12)).

	Scientific name	**English name**	**Number of records**
1	*Erinaceus europaeus*	Hedgehog	7 records.
2	*Talpa europaea*	Mole	30 records.
3	*Sorex araneus*	Common Shrew	5 records.
4	*Oryctolagus cuniculus*	Rabbit	4 records.
5	*Lepus europaeus*	Brown Hare	2 records.
7	*Sciurus carolinensis*	Grey Squirrel	11 records.
8	*Microtus agrestis*	Field Vole	1 record.
9	*Apodemus sylvaticus*	Wood Mouse	1 record. Large numbers. Simmons 1960s
10	*Apodemus flavicollis*	Yellow-necked Mouse	1 record Large colony. Simmons 1960s
11	*Rattus norvegicus*	Brown Rat	1 record.
12	*Vulpes vulpes*	Fox	10 records.
13	*Meles meles*	Badger	28 records. Usually of setts.
14	*Lutra lutra*	Otter	11 records.
15	*Mustela erminea*	Stoat	2 records.
16	*Mustela nivalis*	Weasel	1 record.
17	*Mustela putorius*	Polecat	2 records.
18	*Mustela vison*	Mink	4 records.
19	*Dama dama*	Fallow Deer	1 record.
20	*Muntiacus reevesi*	Muntjac	22 records.
21	*Pipistrellus pipistrellus*	Common Pipistrelle	3 records.
22	*Pipistrellus pygmaeus*	Soprano Pipistrelle	2 records.
23	*Plecotus auritus*	Brown Long-eared Bat	1 record.

Table 01. A summary of the records of mammals held by Worcestershire Biological Records Centre at February 2020.

24	*Myodes glareolus*	Bank Vole	Simmons. Originally named Long-tailed Field Vole. See text
25	*Sorex minutus*	Pygmy Shrew	Simmons see text
26	*Capreolus capreolus*	Roe Deer	Buck seen in August 2021 by Mike Averill
27	*Sciurus vulgaris*	Red Squirrel	Hodgkinson; Lees. See text
28	*Micromys minutus*	Harvest Mouse	Hodgkinson. See text
29	*Neomys fodiens*	Water Shrew	One in the Wood September 2017

Table 02. Additional records both ancient and modern for Shrawley Wood which are not in the Worcestershire Biological Records Centre data base at February 2020.

Most of the records in table 01 are from casual visits by naturalists together with a few others extracted from older literature. There appear to have been no special surveys before or since Simmons' work with students on a one acre plot on the Forestry Commission land in the 1960s-1970s (Simmons 1968, 1970, 1976). These are summarised in this book at the end of the chapter *'Measuring and mapping trees'*. Simmons' studies used Longworth traps designed to live-catch small mammals (shrews, mice, voles) for examination and release. The data collected has vanished. Simmons worked at Worcester College which specialised in Rural Studies at that time.

That college has grown to become the University of Worcester. Simmons data may be hidden somewhere there but has not been located to date. Simmons died in 1974 aged 54. It is interesting to read the following, edited from his paper *The Changing Face of Shrawley Wood* (1970).

It is difficult to assess the effect of management upon the fauna of this woodland, since there are few previous records available. ..... There were three large badger setts, now all deserted, but a new one has been excavated near the privately owned area. Foxes still abound as do weasels, but stoats are very seldom seen. Rabbit populations tend to fluctuate yearly (I saw a case of myxomatosis in October, 1968) but hares are plentiful. Moles recolonise the cleared areas as do the Long-tailed Field Vole [now known as Bank Vole Myodes glareolus]. In part of the wood is a large colony of the Yellow-necked Mouse and there are large numbers of the common Long-tailed Wood Mouse [now called Wood Mouse Apodemus sylvaticus]. Many Grey Squirrels have moved elsewhere [away from the study acre] in the wood. These animals are very partial to young limes; I have watched them stripping off the bark to get to the sap and the bast, which they use to line their winter dreys. ..... Mink have been seen several times, gambolling at the pool just outside the wood. Alas the Otter seen on Laze Pool in June 1963, which had a holt amidst the roots of a tree in Dick Brook, has not been seen since the area was disturbed.

All the mammals referred to above are also listed in a document probably written by Simmons in the 1960s as an introduction to the Wood for students, with the addition of Pygmy Shrew *Sorex minutus* and Fallow Deer *Dama dama* (droppings).

Fred Fincher's hand-written Journals (see chapter Acknowledgements) contain only three mammal records for Shrawley Wood; surprisingly few for such a prolific recorder, although he was mainly looking for fungi on his many visits to the Wood. His records are Otter on 03.10.1950, Badger on 05.10.1948 and Rabbit on 13.04.1948.

44 species of mammal were recorded by the Worcestershire 1995-2007 survey (Green *et al* 2012) and most of them are likely to be found in Shrawley Wood although only 29 have been recorded to date. The reason for this difference is mainly due to the lack of specialist surveys. Bats are very under-recorded and it is highly probable that many bat species are present either breeding in the wood or occurring on feeding visits. The habitat is very suitable: woodland with a scattering of old trees; lakes and pools and the nearby river Severn, Dick Brook and another stream. There are also holes suitable for roosting or breeding in the east-side cliffs and in old buildings as well as in trees.

The historical documents in the Vernon archive contain many references to 'game' and some analyses of these records are in the chapters *Shrawley Wood 1700-1763* (especially in its Appendix) and *Shrawley Wood 1875-1897*. These game-keeping records often provide the first County and first Shrawley Wood record dates for some species of mammals and birds. For instance hares are listed in 1750 together with Partridge, Woodcock, and Land Rails (Corncrake). Table 02 shows the species and numbers recorded over the years (see chapter *Shrawley Wood 1700-1763*).

	Woodcock	Snipe	Land Rail (Corncrake)	Water Rail	Quail	Teal	Mallard	Duck	Moorhen	Hare	Rabbit
1750-51	43		2							7	
1752-53	80	2			1	1				20	
1756-57	93	2								18	
1757-58	33				4		1			15	
1760-61	72				3					15	
1762-63	54	7			1					15	
!764-65	28					2				11	
1765-66	40	6				4	2			11	
1772-73	30			1					2		
1779-80	12	1								16	14
1810	14									9	
1811	26									10	
Totals	526	18	2	1	9	7	3		2	122	14

Table 03. Archive records 1750-1811. See appendix to chapter *Shrawley Wood 1700-1763*. Partridges were both reared and shot in the wild and are omitted from this table.

Notes on some species

Where mentioned 'archival records' refer to information summarised in chapter *Shrawley Wood 1700-1763.*

Accounts of all the mammal species recorded are in *Worcestershire's Mammals* (Green *et al* 2012).

The number of records for each species recorded for Shrawley Wood in the WBRC database is placed after the species names in the following accounts. The systematic order used follows Crawley *et al* 2020.

Hedgehog, seven WBRC records.

Hedgehogs were once a very common animal in the Worcestershire countryside. Large numbers were killed as they were thought to suck milk from cows' udders at night. A bounty was paid for each dead animal and there are records in Church Warden accounts for many villages. For example in South Littleton in 1685 and in Beckford in 1695 and other years (see references in Green *et al* 2012). In more modern times hedgehogs have declined in numbers due to a combination of road traffic deaths, intensive agriculture and a more hostile environment in built-up areas. Several of the records for Shrawley are road traffic kills and not of animals in the Wood.

Mole, 30 WBRC records.



Mole. John Robinson.

Moles are common in deciduous woodland and in many grassland sites. They are mostly recorded by the presence of new mole-hills and are common throughout Worcestershire (Green *et al* 2012). In the past Shrawley moles were troublesome in some years and in 1893 the men spent days *"spreading mole heaps in the park"*, and in

1894 James Clarke caught 102 moles and was paid two old pence for each.

Common Shrew, five WBRC records; **Pygmy Shrew,** no WBRC records**; Bank Vole,** no WBRC records**; Field Vole,** one WBRC record**; Wood Mouse,** one WBRC record**.**

Although there are very few records from Shrawley Wood for these five species they are all common in woodland and elsewhere throughout Worcestershire (Green *et al* 2012). Wood Mice were repeatedly captured by trail camera in Shotgrove in April 2020.



Bank vole (L) and Field Vole. John Robinson.



Wood Mouse. John Robinson.

Water Shrew, no WBRC Records
Usually an animal of unpolluted streams, rivers, canals, pools and marshy areas of which there are several in and around Shrawley Wood. There is one record from September 2017 in the Wood. The1995-2007 survey produced 61 records scattered throughout the County (Green *et al* 2012).

Water Shrews are usually solitary and rarely seen. They and other shrews have high-pitched voices that can be detected by people with good hearing even if they are not seen and identified.

Rabbit, four WBRC records.
Rabbits were numerous throughout Worcestershire before myxomatosis struck in the 1950s and 1960s. Numbers now fluctuate in line with the prevalence of the disease in the rabbit population Rabbits require fairly sandy soils in which to burrow so Shrawley Wood soils may not be ideal. In the past rabbits usually lived in warrens of many burrows but in recent times tend to be more solitary or live in small colonies. Archive records mention ferrets and ferreting, a very common rural activity pre WW2 and rabbits were probably eaten by local Shrawley people. There was a small warren in Shotgrove in April 2020.

Brown Hare, four WBRC records.



Brown Hares. John Robinson.

Small numbers of hares are regularly seen in the Wood and they were captured repeatedly on trail camera in Shotgrove in April 2020.

Archival records, summarised in Table 03, show they were regularly shot. The detailed records show the shooting season ran from October through to February.

Red Squirrel, No WBRC records.
Red Squirrels occurred widely in Worcestershire in the early 1800s but were probably not numerous according to Hastings (1834) who also, like Hodgkinson, noted their passion for sweet chestnuts. Edwin Lees (1851) wrote in the *Botanical Looker-Out* of a visit to Shrawley Wood *"the rustle of the squirrel, high in over-hanging forest trees, alone met my ears"*. He surely refers to Red Squirrels at that date.

An extensive survey throughout England and Wales carried out between August 1944 and December 1945 reported Red Squirrels from 65 Worcestershire parishes but it is not possible to confirm their status in Shrawley from the published paper (Shorten 1946) so Hodgkinson (see Grey Squirrel) could have been reporting Red Squirrels in Shrawley Wood in the 1920s-1930s rather than Grey but we don't know.

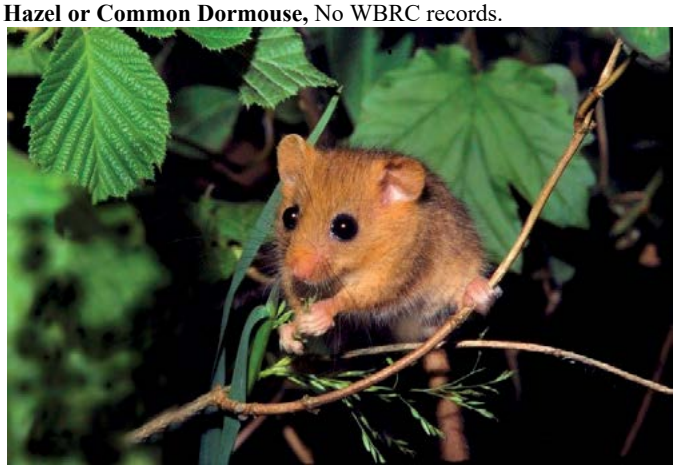
Pickvance & Fincher (1962) mention four records of Red Squirrels in the county in the 1950s with possibly a small colony surviving in Cofton Wood. There are no modern records from Shrawley Wood or Worcestershire.

Grey Squirrel, 11 WBRC records.
Nowadays Grey Squirrels are usually seen on any visit to the Wood despite the lack of records in WBRC. They were captured repeatedly on trail camera in Shotgrove in April 2020.

Originally introduced into England in Victorian times from north-east America the first Worcestershire releases are thought to have been near Birmingham in 1912. They had become widespread in the county by the 1930s. Hodgkinson wrote two books about Shrawley describing it and the surrounding countryside and its people as it was in 1920s and 1930s. In *The Kingdom is a Garden* he mentions squirrels being in the Wood but not always obvious. In *The Eloquent Silence* he writes an account of them collecting sweet chestnuts along with mice and nuthatches. Unfortunately he does not state whether they were Grey or Red Squirrels.

Simmons (1970) writes of Grey Squirrels "*These animals are very partial to young limes; I have watched them stripping off the bark to get to the sap and the bast, which they use to line their winter dreys".*

Hazel or Common Dormouse, No WBRC records.



Dormouse. John Robinson.

There are no modern records of Dormice in Shrawley Wood. The only reference to date of Dormice seen in the Wood is in Hodgkinson's (1948) book *The Kingdom is a Garden* as follows

"Other "rustlers" whose presence is not always obvious are the harvest-mouse, the common shrew and the grey squirrel. And then there are the dormice who keep to the depths of hollow trees or hide in old stumps; in my experience, it is always their beady eyes twinkling in the darkness that gives them away".

Nationally Dormice are restricted to southern England and east Wales. (Crawley *et al* 2020). In Worcestershire they occur in woodlands along the western fringe and in Wyre Forest and they breed in both Monkwood and Ockeridge Wood to the south of Shrawley. Dormice make nests near the ground, often in low bramble tangles, both for breeding and over-wintering hibernation. Stripped honeysuckle bark is often included in the nest wall. On waking in spring they need a good food supply of flowers and early fruit from shrubs. They favour mixed coppice woodland, shrubby woodland edges, and overgrown hedges and are primarily animals of scrub although they do live in conifer plantations in Ribbesford Wood (Rudlin in Green *et al* 2012). Special nestboxes similar to those erected for tits but fixed about 1.5 metres above ground with the access hole facing the tree or shrub trunk are used as breeding sites while horizontal tubes attached to small branches are used as daytime resting sites and sometimes for nesting and have proved useful for detecting dormice at a site. This has yet to be done in Shrawley Wood.

Water Vole, no WBRC records.
Water Voles were once common throughout Worcestershire living along the banks of slow-moving watercourses clothed with an abundance of tall grasses. They are expert swimmers and divers and live in burrows in the watercourse bank often in small colonies. They were often noticed from the plop sound they made as they dive into water to avoid intruders. They are primarily vegetarian and the luxuriant bankside grasses are the main food resource. They were probably common in the River Severn adjacent to Shrawley Wood and in its pools and streams.

Pickvance & Fincher (1962) commented they were generally distributed in rivers, streams and canals. Starting in the 1960s there was a catastrophic decline brought about first by vigorous watercourse engineering followed by predation by Mink which had escaped or had been released from fur farms.

Harvest Mouse No WBRC records.



Harvest Mouse at nest. John Robinson.

The only mention we have seen of Harvest Mice in Shrawley Wood is in Hodgkinson's (1948) book *The Kingdom is a garden* under 'other rustlers 'as quoted in this chapter under Grey Squirrel. It is highly likely they once occurred in the Wood or nearby countryside when they were commoner before the era of intensive farming.
It is highly likely they occurred in the Wood or nearby in the past when they were commoner in the countryside before the era of intensive farming

Nationally Harvest Mice are mainly found in south-east England. East Wales and Worcestershire are on the edge of its range and they may never have been abundant. The1995-2007 survey only produced 26 records (Green *et al* 2012). However, informed searches in the countryside in recent times have revealed nests in tall vegetation alongside hedges and it seems likely they are commoner than expected. Despite the many beautiful pictures published of harvest mice clinging to ripe corn stalks with their long tail coiled round stems Harvest Mice are inconspicuous animals and most records are from accidental discoveries of their nests which are about the size of a tennis ball and made of woven grasses.

Yellow-necked Mouse, one WBRC record of large colony.



Yellow-necked mice. John Robinson.



Yellow-necked Mouse. John Robinson.

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The only record was made by Simmons (1970) "*In part of the wood is a large colony of the Yellow-necked Mouse",* and they are probably still there, but nobody has looked for them. These mice are restricted to south-east England and the English Midlands including the central Welsh borderland (Crawley *et al* 2020). They occur throughout Worcestershire in small numbers but are recorded less often that the similar Wood Mouse. Both are certainly under-recorded and there are probably errors of identification. The1995-2007 (Green *et al* 2012) survey contains 301 records for Wood Mice and 60 for Yellow-necked. Like Wood Mice Yellow-necks often enter houses in winter where they are more obvious being bigger and noisier. Both species use nest boxes erected for Dormice.

The species was not recognised in Britain until 1894. It does not appear in county lists made in 1885 and 1913 (Green *et al* 2012) or in the *Victoria County History* (Tomes 1902). The first Worcestershire record is probably a specimen in the British Museum collected by J. Steele-Elliott who lived at Dowles Manor in Wyre Forest but it is undated (Pickvance & Fincher 1962). Yellow-necked Mice were one of Fred Fincher's favourite animals and there may be early County records in his Journals (see chapter Acknowledgements). In the context of County records to date the Shrawley Wood colony was and maybe still is an important site.

House Mouse no WBRC records
There are no records of House Mouse from Shrawley Wood. In the past they were always pests alongside rats of houses, barns and farm buildings. Nowadays houses are much more mouse-proof and numbers are kept down by domestic cats.

Brown Rat, one WBRC record**.**
It is said one is never more than 10 metres from a rat. Whether that is true for Shrawley Wood is unknown but Brown Rats are widespread throughout the county although only 261 records have reached the WBRC. Historical accounts state they are 'numerous. (Green *et al* 2012).

Fox, ten WBRC records
Foxes are common throughout Worcestershire, town and countryside, and have been for centuries. There were 794 records countywide in the 1995-2007 survey. (Green *et al* 2012). Simmons (1970) wrote they were commonly seen in Shrawley Wood 1963-1969 and especially in areas cleared for forestry. Fred Fincher noted one in his Journal in April 1963. Since then they have been recorded in1979, 1999, 2001, 2003, 2005, 2015, and 2017 (active earth), and in Shotgrove by trail camera.



Fox. John Robinson.

Badger, 28 WBRC records often of setts.
Badgers are widespread and currently common throughout Worcestershire. The1995-2007 survey produced 1538 records (Green *et al* 2012). Of the 28 Shrawley Wood records in the WBRC active setts were recorded in 1999 (four setts), 2003 (four setts). 2017 (three setts) and one record in 2001 simply as a sett. There was a large sett in Shotgrove and trails amongst the bluebells in April 2020.

The only record in Fed Fincher's journals was on 05.10.1948. Simmons (1970) writing of the 1960s states *there were three large badger setts, now all deserted, but a new one has been excavated near the privately owned area*. He also notes there was great disturbance in the Wood at that time due to forestry activities.

Otter, 11 WBRC records
Otters were once commonly seen along rivers and watercourses throughout the British Isles and Ireland including Worcestershire but suffered a serious decline in the1950s and 1960s due to pesticide poisoning. They probably became extinct in Worcestershire, but after the relevant pesticides were banned have recolonised the county and numbers have been slowly increasing in recent years. . There are now more frequent sightings throughout the County although many records relate to discovery of footprints in mud or sweet-smelling spraints (droppings) full of fish remains rather than seeing the animal.

The WBRC records include one from 1892 mentioned in the *Transactions of the Worcestershire Naturalists Club*.
Despite the decline Simmons (1970) recorded them in Shrawley Wood. In 1963 there was a holt at Laze Pool but they were not seen there again in subsequent years, and another holt amidst tree roots by the Dick Brook.

More recent records for Shrawley Woods include in 2018 tracks seen along the Dick Brook and spraints by the old boathouse by the main pools.

Great efforts were made to make the Worcestershire countryside more otter-friendly between 1995 and 2010 recounted by Andy Graham in Green *et al* 2012.

Stoat, two WBRC records
The Stoat has long been a common animal throughout Worcestershire and is a voracious predator of small mammals and especially of Rabbits. The appearance of myxomatosis in rabbits in the 1950s and 1960s reduced the stoat population somewhat as the rabbit population crashed and has remained atet al low levels ever since. There were 116 records countywide in the 1995-2007 survey.

Stoats were regarded as vermin and huge number were killed and displayed on gamekeepers gibbets until recently. In the 17-1900s a parish bounty was paid for dead vermin (Green *et al* 2012). The lack of modern records for Shrawley Wood probably reflects under-recording rather than low numbers

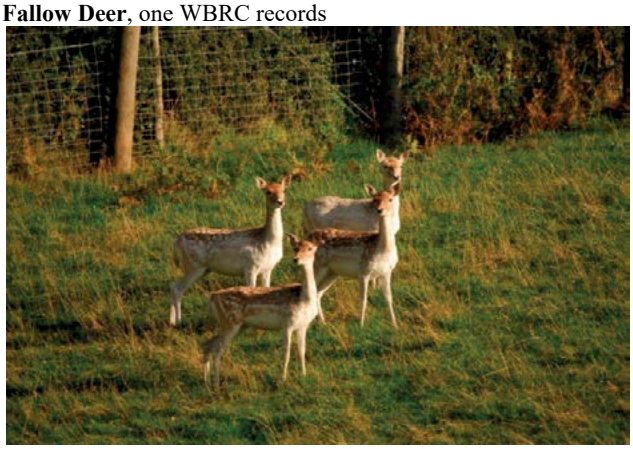
Weasel, one WBRC record.
Weasels have long been common throughout Worcestershire taking smaller prey than stoats. They are slim sinuous animals able to hunt in rodent holes and tunnels and their diet is mainly of small mammals (mice and voles), young rabbits and birds' eggs and nestlings. There were 105 records countywide in the 1995-2007 survey (Green *et al* 2012). The lack of records for Shrawley Wood probably reflects under-recording rather than low numbers

Polecat, two WBRC records.
Polecats were vigorously persecuted for hundreds of year and were near extinction in Worcestershire by the late 1900s. Changes in attitude allowed them to creep back into the county from Welsh strongholds and detailed studies in Worcestershire by Johnny Birks led to a better understanding of the species. They are now commoner in the County than for a very long time although some are killed by road traffic or by secondary poisoning by rodenticides. (see review by Johnny Birks in Green *et al* 2012).
Hastings (1834) states *the fitchet or foumart continues a precarious existence though destroyed by gamekeepers without mercy*; Tomes (1901) notes it is nearly if not quite extinct in the county.

The two WBRC records at Shrawley in 1996 and 2003 appear to have been road casualties on the road through the village.

Mink. Four WBRC records.
American Mink farmed for their fur were deliberately released or escaped into the countryside in the 1960s. The first Worcestershire record was thought to have been in 1969 near Droitwich (Green *et al* 2012). However, Simmons (1970) observed one in June 1963 in Shrawley Wood and they must have been present elsewhere in the county but escaped the biological recording system. Otherwise numbers rose rapidly in Worcestershire with MAFF trappers killing 37 between 1968 and 1969. In 1984 they were widely distributed with most records in the western half of the county. The 1995-2007 survey contains 71 records scattered throughout the county. More recent records for Shrawley Wood are August 1982 and March 2004.

Fallow Deer, one WBRC records



Fallow Deer. John Robinson.
Fallow Deer were probably introduced into Britain by the Normans and are usually associated with parks and forests. In Worcestershire the main populations are in the Wyre Forest area, on and around Bredon Hill and on the eastern border near Ragley Hall. There were 230 records countywide in the 1995-2007 survey. (Green *et al* 2012). There is only one record for Shrawley Wood, in 2015.

Roe Deer, no WBRC records



Roe Deer buck in Shrawley Wood April 2021. Mike Averill

Roe Deer were exterminated from Britain in the 17th century and reintroduced in the 19th. They probably arrived in Worcestershire in the 1970s and since then have spread causing considerable damage to forestry, agriculture and horticulture. There were 140 records for the county in the 1995-2007 survey, mainly in the eastern half of the county. (Green *et al* 2012). However they continue to spread and are slowly invading woodland to the west of the River Severn. The first and only record for Shrawley Wood is of a buck seen in August 2021 by Mike Averill. They were captured repeatedly on trail camera in Shotgrove in April 2020 which suggests there are more in the district than so far recorded.

Muntjac, 22 WBRC records.



Muntjac. John Robinson.

This small deer (also called Reeves' Muntjac Deer or Chinese Muntjac is not native a of Britain, originating from southern China and Taiwan. Some escaped from a captive collection in the grounds of Woburn Abbey around 1900 and there were several later deliberate releases in the Midlands. From these beginnings it has spread rapidly and now occurs in much of southern and midland England. (Crawley *et al*).

The invasion of Worcestershire is poorly recorded but they probably arrived in the east of the county in the 1960s and have gradually spread westwards. There were 278 records in the 1995-2007 survey. (Green *et al* 2012) scattered throughout the county.

One was seen in Shrawley Wood in 1965 by 'anonymous', published in the *Transactions of the Worcestershire Naturalists Club*. Next are records for 1982 by, simply, "Powick" with no further information although it probably refers to observations by Cyril Powick who was a woodman there at that time. The next record is in 2004. Since then there are records for most years and numbers in the Wood appear to be slowly increasing in keeping with the general trend of

population consolidation in woods throughout the county. They were repeatedly captured on trail camera in Shotgrove in April 2020.

Bats, Chiroptera
14 species of bats have been recorded in Worcestershire. Identifying and recording bats is a considerable challenge usually requiring special equipment to identify their calls. To capture them when they fly at night and to visit roosts and breeding sites requires special licences.

To date there are very few records for Shrawley Wood

21	*Pipistrellus pipistrellus*	Common Pipistrelle	3 records.
22	*Pipistrellus pygmaeus*	Soprano Pipistrelle	2 records.
23	*Plecotus auritus*	Brown Long-eared Bat	1 record.

Table 04. The only records of bats in Shrawley Wood held in the WBRC database



Common Pipistrelle. Drawing by Valerie Briggs.



Brown Long-eared Bat. Drawing by Valerie Briggs.

Conclusions
Although records are few for Shrawley Wood they provide a list of mammal species that is probably typical of most Worcestershire woods. Because of the lakes, pools, streams and the nearby river aquatic species like otters also occur. There is no information on numbers or distribution of mammals within the Wood. The use of a trail camera for a short time in Shotgrove revealed mammal activities so often unseen by people.

For the future, regular assessment of deer numbers is highly desirable so that population levels can be controlled before there is significant damage to flora and tree and coppice regeneration is prevented by over-grazing.

Bat surveys may well reveal that Shrawley Wood has an important suite of species due to the location and structure of the Wood.

Acknowledgements
I am very grateful to John Robinson for providing a wide choice of excellent photographs of mammals. Valerie Briggs illustrated every Worcestershire mammal in *Worcestershire's Mammals* (Green *et al* 2012) and it is a pleasure to include two of her drawings of bats in this chapter. Many thanks to everyone who provided records and to Richard Pumphrey for his trail camera records from Shotgrove and to Brett Westwood for proof reading.

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Tailpiece

Harry Green

After thirteen years *Shrawley Wood - A History and Natural History* is at last a real book in the hand. The first ever tentative attempt to document this remarkable place is complete. For me one of the most enjoyable and remarkable aspects of this journey has been the people I have met along the way, both ghosts from the past and all those in the present who have helped build the book. I have made new friends, reinforced long-standing friendshipsand have tapped into an amazing resource of skills learned in many walks of life which have transferred to researching and writing chapters for this book. They and others freely gave time and support.Between them they have searched old documents in dusty archives, read Medieval Latin, identified both obscure and common wildlife and have explored the complex inter-relationships between woodland management past and present, local people, and wildlife. Woodsmen, gamekeepers, craftsmen of many skills, the aristocracy, men and women from many backgrounds, have all played a part in creating the Wood we see today.

Despite filling a great many pages with informative text, diagrams and pictures, we know the task of fully understanding Shrawley Wood is not complete. There will still be fascinating information in unexplored archives. Future studies of buried pollen will reveal the detailed history of the vegetation since the close of the last Ice Age around 10,000 years ago. We are only at the beginning of understanding the invertebrates associated with the Wood and especially with Small-leaved Lime.

George Peterken writes in his Foreword *"Detailed, single-wood studies not only set standards but also enrich the participants. While they study one wood in depth they will have come to understand all woods. The studied wood forms a reference point against which other woods are compared and this monograph giftsthis reference point to others".* For me that statement alone from awoodland authority of national standing who knows another lime wood in detail makes the effort of producing this book worthwhile.

The papers and books of two remarkable people have been of great value and stimulus in writing about this ancient Small-leaved Lime wood : Oliver Rackham, who changed understanding of ancient woods, and Donald Pigott whose studies of lime trees worldwide are an invaluable source of information. Oliver visited Shrawley Wood on 16th May 1985 as part of a tour of Worcestershire's woods. Unfortunately there are no photographs of him in the Wood. I have in my own collection three pictures nearly identical to ones he took of old lime coppice and exceptionally tall limes he noticed by the lakes. Copies of his pictures are in the Cambridge collection. These pictures include John Day who is author of two chapters in this book. Donald Pigott visited the Wood before our study started and he appears in many reference lists. He has answered several of our queries in courteous letters and emails and his monograph, *Lime-trees and Basswoods*, is in constant use.



This picture is nearly identical to one taken at the same time by Oliver Rackham on 16th May1985 showing John Day in a coppice ring in Plot 1 in the chapter on *Birds and Coppice*. Harry Green.



This picture is nearly identical to one taken at the same time by Oliver Rackham on 16th May 1985 showing John Day beside an exceptionally tall Small-leaved Lime beside the lake. Harry Green.

There is also another side to the science and history of the Wood and its people. It is a beautiful place and the Small-leaved Lime is a beautiful and fascinating tree; a tree apart from most other common native species. Its attractively shaped leaves cast a dappled shade and its small flowers growing out of a tongue-shaped bract are amazing producers of pollen and nectar that makes fragrant honey. The flowering trees buzz with insects. Honey bees, bumble bees, solitary bees, hoverflies and many smaller insects; nobody knows how many or the number of species.

The Woodland itself is beautiful. In spring many parts are carpeted with bluebells dappled with sunlight and shade cast by the opening lime leaves. Standing within a towering coppice plot over 20 years old brings Durham Cathedral to mind, spring summer or winter, tall and inspiring. The overhead pictures of the canopy revealed on the cover and elsewhere in this book open up another unexpectedly beautiful treescape.

Free-growing in the open the Small-leaved Lime tree has a wonderful elegance even as a regenerated old pollard in winter.



An ancient flood-plain pollarded Small-leaved Lime near Shrawley Wood 31st January 2003. Harry Green. See this tree in full-flower in Chapter *Gallery.*

Lime timber is smooth and easy to cut with sharp tools. It has inspired remarkable carvings; especially by Grinling Gibbons (1648-1721) who, in Britain, is the most famous Master woodcarver and sculptor of all time. 2021 marked the tercentenary of his death. Which species of lime he used is not clear as *Tilia cordata*, *T. platyphyllos* and clones of their hybrid *T. x. europaea* were all available (see Pigott 2012). In WW2 limewood was used to construct the frames of Mosquito aircraft. Perhaps some was from Shrawley Wood?



An example of a Grinling Gibbons wood carving in lime

Small-leaved Lime has fibres (bast) under its bark used in past ages by people to make rope, string, and fine fibres that were woven into cloth to make clothes. The clothing and accoutrements of Ötzi, the Ice Man whose mummified remains emerged from a melting glacier of the Italian-Austrian border in 1991 contained bast fibres used in several forms. His cape consisted of bundles of *Brachypodium pinnatum* (a moss) tied with *Tilia* bast fibres. His corpse has a Radiocarbon date 3370–3100 cal B.C – the late Neolithic period about 5000 years ago.

If a Small-leaved Lime tree falls over and people leave it alone it simply regenerates and multiplies by growing again from the bits – a phoenix tree.

A chattering crow lives out nine generations of aged men,but a stag's life is four time a crow's,
and a raven's life makes three stags old,while the phoenix outlives nine ravens, but we, the rich-haired Nymphs daughters of Zeus the aegis-holder, outlive ten phoenixes.

This, from Greek mythology, is thought to describe the Phoenix's lifetime as 972 times the length of a long-lived human's: Taking my present age that suggests a Phoenix lives for over 85,000 years. A Phoenix is often coloured gold in pictures, almost the colour of a lime tree in flower and its leaves in autumn.

Given freedom from human activity and the correct environmental conditions perhaps phoenix tree Small-leaved Lime could match the age of a mythological phoenix. More realistically the origins of Shrawley Wood Small-leaved Limes were probably between 8000 and 5000 years ago. Only a future study of pollen deposits will tell.

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End of story



Harvest Mouse tailpiece. John Robinson.

Index

Richard Pumphrey

Spelling in historical records varies greatly and could be a problem for an index. We have therefore compiled a **glossary** pp. 153-166.

The index has been split into categories of search because there are many lists within chapters that are specific to that chapter and further indexing would take a great deal of space for little return. Thus pages with information about particular **animals** or **plants** may be found by reference to the chapter list on pp. iii-iv.

Produce from the Wood is catalogued pp. 249-51. **Historical dates** are indexed in timelines pp. 40-1 (owners of the Wood), pp. 109-117 (general history of the Wood), pp. 246-8 (oak loss and replanting).

The indexes below (**historical people** and **locations)** were generated using TExtract (www.TExtract.com).

Index to historical people associated with Shrawley Wood. NB spelling of names was highly variable before 1800; search on anything that sounds close to what you are looking for.

.

A

Acherley, Roger, 144
Aleyn, John, 35
Allan, Doris, 80
Allan, James, 32, 146
Allen, George, 183–84
Andley, John, 159
Anthonies, John, 111, 152, 154, 157–60, 166, 169–70, 172–73, 190–91, 193
Anthonies, Richard, 174
Antonis, John, 111
Ashmore, Thomas, 209, 216
Atherage, John, 64, 167–68
Atheridge, Edward, 163, 169, 173
Atheridge, Edward Junior, 186
Atheridge, James, 247
Atheridge William, 157, 174
Atkins, Edward, 24
Atkinson, Jeremy, 194, 199
Aurelius, Marcus, 114
Avenant, Richard, 92, 139

B

Baker, Nicholas, 62
Baker, Thomas, 160, 178, 189
Baldwin, Samuel, 140
Barker, James, 106
Barker, Thomas, 214
Barnett, Samuel, 151, 241
Bartlett, Richard, 62
Barton, Albert, 217
Bateman, 177, 502, 509
Bateman, John, 188
Bayliss, Robert, 169, 174
Beach, John, 78, 158, 184, 250
Beauchamp, Elizabeth, 34
Beauchamp, John, 28
Beauchamp, Richard, 29, 40
Beauchamp, Thomas, 29
Beauchamp, William, 37
Beauchamp Earl, 40
Bellamy, 217, 417
Bellamy, Susannah, 217, 237
Belson, Edward, 139
Best, Thomas, 184
Bird, Charles, 151
Bird, Thomas, 151
Blount, Robert, 35, 61, 137, 140
Blount, Thomas, 61, 137
Blount, Walter, 61
Blunt, George, 213
Bond, John, 215
Bourne, Mary, 104
Bourne, Robert, 173, 203
Bradley, Edward, 83
Brasier, 174, 217
Brasier, James, 111
Brasier, Robert, 104, 182, 184
Brazener, John (carpenter), 209, 213, 217–18
Brazener, Mary, 217
Brazier, 251
Brazier, George, 185
Brazier, James, 169
Brewer, John, 57, 109, 134
Brewer, Robert, 110, 137
Brewer, Thomas, 57, 60–61, 109, 134
Bridges, John, 105
Bromley, Henry, 78
Brooke, John, 64
Brooke, William, 137
Brooks, Susan, 182
Brown, John, 154
Brown, Thomas, 209, 215–16, 218
Bruar, Robert, 110, 137
Bruar, Thomas, 109, 134
Bucknall, John, 112
Bunce, Isiah, 216
Bunce, John, 193
Bunce, Thomas (sawyer), 105, 154, 157, 159–60, 174, 193, 212–13, 216–18, 237
Bunce Jr, Thomas, 217
Burgess, William, 218
Burlton, Rector Edward, 152
Burton, Revd Henry, 84

C

Catherine, Queen, 40
Cecil, Brownlow, 144
Cecil, Henry, 31–32, 40–41, 112, 145, 150–51, 174
Cecil, Henry Vernon, 174
Chellingworth, Henry, 64
Child, Margaret, 40
Childe, 30, 58, 89, 117, 206, 309
Childe, Catherine, 138
Childe, Thomas, 31, 40, 58, 89, 111, 117, 138–41, 311
Childe, William, 30–31, 39–40, 58, 110–11, 117, 138–39, 142, 432
Churchyard, George, 171
Clarence, George Earl of, 134
Clarke, James, 209, 217, 587
Clarke, Samuel, 217
Clerke, John, 241
Cliffe, 40, 65–66, 68, 111, 141, 152
Cliffe, Allan, 31, 40, 62, 111, 141, 144, 146, 149
Clutton, Henry; Vernon Land Agent, 41, 113
Coccum, John, 217
Collins, Abigail, 111
Colwall, Thomas, 58, 139
Cook, 170, 195
Cook, George, 195
Cook, John, 71
Cook, Thomas, 170, 173, 177, 185, 190–91
Cook, Thomas Steward, 77
Cook, William, 174
Cooke,Thomas Junior, 190
Cooke, John (carpenter), 105, 156, 162, 182, 193
Cooke, Richard, 64, 87, 168
Cooke, Thomas Gamekeeper, 61, 77, 110, 135, 138, 170, 190
Cookes, Reverend Denham James Joseph, 87
Cook Jr, John, 182
Cornewall, Emma, 144
Cound, Charlie, 106, 182, 186, 218
Cound, Elizabeth, 218
Cound, Jeremiah, 213, 218
Cound, William (sawyer), 156, 182
Crane, John, 162
Crane, Thomas, 63
Cromwell, Lord Thomas, 137
Crowley, Ambrose, 140
Croyden, Joseph, 182
Croyden, Josiah, 182

D

Davies, 174
Davis, William, 103
Dawson, Captain Robert Kearsley, 268
Dawson, Richard, 269
Dawson, Robert, 268
de Toeni, Ralph, 133
de Toeni, Robert, 133
de Toeni's sister Alice, 133
Dougharty, John, 74, 116, 149, 241, 271, 282, 311
Dougharty, Joseph, 179, 201–2, 235, 238, 264, 266–67, 307
Dougharty Jnr, John, 74, 241, 271, 282, 311

E

Eaton, John, 158
Ellis, Captain Godfrey, 139
Elwes, Henry John, 32, 47, 114

F

Foley, Philip, 91, 139–41
Foley, Thomas, 90–91, 139–41, 143
Footeman, John, 251

G

Gegg, William, 217
Greaves, Thomas, 159, 162, 183
Greenwood, John, 268

H

Hadfield, Miles, 47, 114, 236
Harris, Sam, 105
Higgins, Joseph, 216
Holdship, Richard, 103
Horton, Ruth Annie, 33, 114–15
Horton, Ruth Annie Vernon, 36, 41, 222
Houseman, John, 251
Hughes, John, 95, 112, 183–84, 212

J

Jenkinson, Dame Anna Maria, 139, 141
Johnes, John, 110, 135
Johnson, Francis, 141
Johnson, James, 218
Jones, Philip, 73, 155, 173–74, 177, 186, 203–4, 247
Jones, Richard, 251
Jones, Thomas, 161
Jones, Thomas Sr, 173
Jones, William, 64, 73, 167–68, 173, 181, 204, 247
Jones Jr, Philip, 173
Jones Jr, Thomas, 158, 173, 181–82
Jones Senior, Thomas, 181
Jukes, Richard, 38

K
Knight, John, 195
Knowles, David; wheelwright , 182, 213

L
Lygon, Richard, 109
Lygon, Thomas, 109

M
Marks, John, 209, 212–14, 216, 218, 248
Marks, Thomas (cooper), 182
Martyn, Robert, 110
Massey, George, 113
Medlecote, James, 217
Medlicott, Alan, 159, 161, 210–14, 217, 237, 308
Medlicott, James, 217
Medlicott, Mary Ann, 217
Meredith, James, 239
Mynne, George, 139

N
Nelson, Admiral Lord, 247
Newborough, Joshua, 140
Norrise, Richard, 161, 250

O
Oakey, Samuel (carpenter), 213–14, 217, 309
Oakley, Albert, 217
Ocea, Dane, 26, 128
Okey, John, 105

P
Parker, John, 83
Parr, Queen Consort Catherine, 30, 40, 68
Paytwen, William, 110, 137, 159
Perry, Cad, 251
Peterken, George, 50
Phillips, John, 32, 41, 71, 73–74, 77, 142, 145, 151, 196
Phipson, William, 195
Pickernell, Thomas, 184
Piercy, George Henry, 175
Piercy, Rev. Daniel, 112, 116–17, 152, 154, 167, 171–74, 176–77, 190, 264
Pigott, Donald, v, 115, 120, 226, 302–3
Pitt, Thomas John, 217
Poer, 30, 37, 40, 109, 134
Poer, Aline, 29, 40, 57, 134
Poer, Roger, 27, 37
Poer, William, 37, 57
Pooler, William, 137
Pountney, John, 113
Powick, 105, 115, 160, 164–65, 173, 181, 187, 214, 216, 218, 222
Powick, Cyril, v, 33, 47, 52, 114, 227, 236–37, 589
Powick, Denis, 212, 214
Powick, Edward, 73, 173, 184, 186, 210–11, 214, 216, 228
Powick, Harry, 209, 211, 216
Powick, James, 106, 181, 183, 218, 238
Powick, John, 204, 218
Powick, Ruth, 32, 146
Powick, Ruth Annie, 41, 114
Powick, Samuel, 181, 279
Powick, Samuel Gamekeeper, 182, 198
Powick, Samuel; Woodman, 184
Powick, Sarah, 161, 173, 182, 184, 187, 237, 251
Powick, Thomas, 211
Powick Edward Jr., 173
Preece, John, 73, 105, 150, 156, 181, 247
Price, Richard, 169
Price, Sam, 164
Priece, John, 247

R
Rackham, Oliver, v, 33, 48, 50, 57, 60, 72, 115, 204, 223–24, 260
Randle, William, 110, 137
Rea, James, 164
Rea, Thos, 158
Rebols, Owner John, 187
Rice, John, 112, 188
Rodgers, Ann, 150
Rodgers, Joseph (Stourport), 156
Rogers, John, 189
Rudhall, Abraham I, 167

S
Salkfield, William, 87
Salway, Hugh, 61, 87, 110, 138
Sandys, William, 62, 140
Severne, Thomas, 60
Sheldon, William, 30
Smith, James, 215
Smith, Jno, 177
Smith, John, 157–59, 173
Smith, Joseph, 159
Smith, Richard, 218
Smith, Richard (nurseryman), 218
Smith, Thomas, 67
Smith, Thomas (mason), 264
Smith, Thomas (Mason), 174
Smith, William, 173
Sneyd, William, 31, 40, 112, 145
Sprad, Josiah, 106
Spragg, 177, 217, 246
Spragg,Thomas (cooper), 198
Spragg, Arthur, 92
Spragg, Charles, 214, 217
Spragg, James, 92
Spragg, John, 64, 111, 167–68
Spragg, Thomas, 112, 187, 193, 214, 217
Spragg, William, 210–11, 216–17
Spraggs, James, 157
Stone, Richard, 110
Stone, William, 110
Symonds, Alexander, 217

T
Taylor, Job, 210, 212–13, 215–16, 218
Taylor, John, 183
Taylor, Thomas, 218
Thomas, James, 105–6, 160
Thomas, John, 161
Thomas, Joseph, 217
Thomas, Roger, 186
Thomas Henry Cooke, 69
Thomkins, Arthur & Co., 218
Thrupp, 106, 218
Thrupp, Henry, 209, 212, 214, 217, 237, 240, 309
Thrupp, James, 182–83, 186, 213, 217
Thrupp, Joseph, 182, 186, 213, 217, 267
Tilt, John, 58
Tinton, Richard, 62
Tolley, George, 173
Trewell, John, 60
Turner, Francis, 110, 137
Turner, John, 64
Turton, Richard, 140

U
Underwood, Alfred, 218
Urse, 23, 25–28, 30, 128

V
Vernon, Bowater, 40, 74, 105, 107, 111, 116, 144, 146, 149, 169, 241
Vernon, Bowater George, 146
Vernon, Doris, 32
Vernon, Edward, 307
Vernon, Elizabeth, 78, 106
Vernon, Emma, 31, 40, 73, 112, 144, 151, 174
Vernon, George, 47, 78, 213
Vernon, George Croft, 146, 184
Vernon, Harry, 152
Vernon, Harry Foley, 41, 112, 146
Vernon, John, 144, 217
Vernon, Mary, 106
Vernon, Revd Richard, 149
Vernon, Richard, 40, 61–66, 68–69, 73, 111, 141, 144, 167–70, 185, 191, 201–2, 204–6
Vernon, Ruth, 24, 33, 92
Vernon, Ruth Annie, 41, 114, 225
Vernon, Sir Henry Foley, 209
Vernon, Thomas, 31–32, 40, 61–62, 64, 68, 70, 141, 144–45, 168–69, 171, 173, 201–2, 204
Vernon, Thomas Bowater, 31, 41, 104, 112, 144, 146, 151, 184, 307
Vernon, Thomas Shrawley, 41, 106, 112, 142, 151, 166
Vernon, Thomas Tayler, 41, 78, 104, 112, 146, 151
Vernon, William, 111, 141, 173
Vernon-Harris, Ruth, 33
Vernon-Horton, Ruth, 147
Vicaris, Mary, 62, 140

W
Wall, John, 103
Wall, John Jr, 87
Walsh, Joseph, 140
Wanklin, John, 217
Warner, John, 218
Wasband, Thomas, 183
Watmore, Joseph, 171
Watson, 38, 227, 526–27, 550
Watson, Kendrick, 155, 181, 184, 196, 375, 402, 411
Webb, Alderman Edward, 113
Wedley, Isaac, 91, 188
Werdman, Walter, 83
Whattlin, Walter, 153
Wheeler, John, 139
Wildsmith, John, 180
Wilkins, William, 171
Williams, Edward, 216
Wilson, John, 64
Winford, 177
Winnall, William, 110
Winsley, Joseph, 106
with, 110
Wormington, 163, 173, 198, 215, 218, 279, 332
Wormington, John, 185, 198, 209, 212, 215, 251
Wormington, Robert, 78, 190
Worth, Sandra, 29
Wright, 99, 102, 153, 162, 251, 253, 574
Wright, John, 210
Wright, John (Stourport), 165, 251
Wright, Paul, 348–49

Y
Yarnold, Andrew, 115, 281
Yarnold, Bill, 214
Yarranton, Andrew, 58, 62, 67–68, 85–86, 88–90, 94, 96–98, 134, 137, 139–43, 204
Yarranton, Andrew Jr, 62, 64, 68
Yarranton, Robert, 62, 140
Yarranton, Thomas, 111, 138
Yarranton, Walter, 63, 143
Yarranton, William, 63
Yarrington, William, 134, 137, 139, 206
Yates, William, 169, 237
York, James Duke of, 140

Location index

A
Abberley, 85, 89, 102, 107, 119, 123, 126–27, 133–34, 268, 272, 550, 554
Abberley Hills, 78, 125, 127, 554
Aley, 57, 60, 110, 200–201, 207
Aley Coppice, 109
Aleye, 57, 60–61, 109, 134–35
Alley Bind, 109, 207
Ambreslege, 124
Ambre's Wood, 124
ash bed by the forge, 195, 201
ash beds, 59, 73–74, 180, 195, 232, 247, 277, 308, 311
Astley, 103, 123
  Allotments, 213
  Aqueduct, 126, 129
  Burf, 35, 84, 95, 127, 134, 137
  Church, 35, 554
  Common, 137
  Cross, 127
  Forge/Mill, 92–94, 97, 99, 101, 103, 139, 164, 188, 195, 495, 554–55
  Furnace, 86, 88, 90–94, 96, 98, 139–40
  Hall, 25–26, 29, 35, 53, 82, 137
  Hampstall Brickworks, 95
  Osier Bed, 78
  Wood, 5–6, 25, 34–36, 59, 62–64, 69–70, 82, 84, 86, 89, 91, 137, 139, 141
    extensive, 225, 358
    old, 59
    and Penney Park, 35, 63
    remnants, 69, 82
Astley to Worcester aqueduct, 125, 128

B
Bewdley, 64, 67, 69–70, 82–83, 85–86, 140, 172, 174, 187–89, 192, 195, 199, 526–27
binds of Shrawley Wood, 77, 404
Blackstone, 125–26, 129
Blackwych Coppice, 28, 57, 60, 109–10, 134, 155, 201–3, 207
boathouse, 106, 544, 547, 589
Bonefields Farm, 160, 173, 181–82, 187, 237–38
Brampton Wood, 119
Brechyng Coppice, 109–10, 202
brick pits, 116, 212, 273, 278–79, 337–39, 359–61, 530, 534, 545, 547, 551
brickworks, 89, 95, 114, 156, 544–45
Brickworks, Severnside, 184
bridge, 60, 79–80, 82–83, 93, 99, 117, 162, 202, 240–41, 547, 554–55
C
castle, 27–29, 37–39, 53, 69, 76, 133–34, 136, 201–2, 259, 261, 264
Chaddesley Woods, 493–94
Chalkney Wood, 43, 54, 75
chapters Shrawley Pools, 258
Charnwood Forest, 253
church, 25–27, 29–30, 33, 39, 128, 133, 138–39, 152–53, 167, 171–72, 176, 182, 222
Church Cottages, 153, 182–83, 217
College Plot, 281–84, 337–38, 340
compartments, 114, 221, 273–74, 284, 294, 305, 353
Coppices and Binds of Shrawley Wood, 200
Cottage, Summer, 115–16, 222
Curriers Estate, 28, 107, 112, 173, 184, 259, 262, 265, 268, 272

D
Dick Brook, 82, 86–88, 90–95, 99–103, 139, 258–59, 358, 360, 416, 421–22, 481–85, 487, 514–15, 528–30, 534–35, 537–38, 542–43, 547–49, 554–60, 565
dingles, 45, 77, 118–21, 124, 203, 239, 524, 529, 560
Dowles Brook, 90, 100, 102, 127, 492, 557
Droitwich, 25, 37, 52–53, 59, 85, 89, 128, 134, 210–11, 214, 255

E
Eaves Wood, 441, 447
Elmley Castle, 27–28, 133
Estate, Vernon, 71, 74, 95, 145–46, 149–51, 166–67, 171, 173–74, 182, 209, 211–15, 217, 248, 279, 281–82
estates, private, 515
Evesham, 26–27, 51–52, 56–57, 62, 140–41, 194, 199, 470, 473, 475, 526, 528

F
FC land in Shrawley Wood, 411
FC plot, 425
fishery, 82–83, 109, 244
Fish Pools, 104, 106
flash locks, 93, 100–102
footpaths, 78, 97, 105, 271
Frog Pool, 78, 105, 268–69
Fryth, 60, 109–10, 134–35, 202, 207
Fryth Coppice, 109–10

G
gates, 65, 73, 153–54, 158, 196–97, 213–16, 235–36, 240
Glasshampton Bridge, 82, 93–94, 554–55
Glasshampton Brook, 87
Glasshampton Estate, 104
Glazenbridge, 81, 101, 103, 554, 558, 560
Goat Wood, 123
Goblin Wood, 123–24
Greater Redmarley, 125–28
Great Grove Coppice, 180, 200–201, 203, 206, 208, 276
grove, 50, 105–6, 110, 121, 128, 137–38, 162, 304, 307–9, 312, 314
the Grove by Wood House, 203
Grove Pool, 105–6, 161
  Mudding, 105
Grove Pool Head, 105, 160, 203
Grove Pool in Shrawley Wood, 106

H
hamptons, 26, 127
Hanbury, 31–33, 40–41, 64, 107, 111–12, 115–16, 143–47, 151–52, 154, 169–70, 190–91, 198–99, 209, 213–14, 240, 375
Hanbury Estate, 32, 210, 239
Hanbury Hall, 32–33, 71–73, 79, 107, 114, 142, 144–47, 149–51, 164, 170, 205, 210–11
Hartlebury Common and Shrawley Wood, 529
hermitage in Shrawley Wood, 541
high quarry, 264, 279
Horse Leasow, 201, 210, 260, 276
House of Commons, 74, 114, 143, 223, 230–31, 432

J
Jonson's Grove, 190, 203, 208, 211, 246
Jonsons Grove, 177–79, 204, 250
  Measure of ye Timber in, 178
Jonsons Grove to Severn for Halling, 177

K
Kings Binde, former, 24
Kingseel Bind, 204, 207
Kingshill, 40–41, 66, 113, 142, 167, 180, 182, 201–2, 207, 216, 240
  renamed, 202
Kingshill Bind, 111–12, 159, 167, 170, 191, 202, 207
Kingshill house, 202
Knight Iron Works, 178

L
Lady Wall, 202, 208
Ladywell, 180, 201–2, 208, 278
Ladywell Bind, 202–3, 208
Ladywell Bridge, 202–3, 260
Ladywell Brook, 105, 180, 203, 269–70
lakes, v, 1, 79–80, 406, 408, 480, 482–87, 558, 561–63, 583, 587, 590
Layes Brook, 203
Layes Pool, 105, 180, 203, 210, 235, 240, 267, 269, 360
Lench Brook, 308–11
Lenchford, 125–28, 184, 212, 214, 217–18, 235, 237, 307, 309
lock, upper, 93–94, 101–2, 150, 555
locks, 62, 82, 91–94, 100–102, 140–41, 187, 228, 240, 243, 245, 555
  lower, 93–94, 100, 102, 555, 559
Lower Astley Woods, 554
lower Dick Brook, 82, 92–94, 103, 558
lower pool, 105–6, 180, 200, 561, 563

M
Malvern, 39, 46, 76, 84, 108, 116, 121, 133, 550, 582, 590
Martley, 102, 107, 119, 123–25, 127, 133, 213, 268, 272
Middle and New Pools, 565
Middle Pool, 105–6, 203, 260, 264, 308–10, 337, 339, 542–43, 545, 547, 561, 563, 565
Midland Woods, 69, 116, 248
mills, 25, 86–87, 92–94, 99–103, 118, 121, 123–24, 165–66, 195, 310–11, 314, 336, 554–55
Minting Wood, 28, 55–56
Monks Wood, 69, 77
Monkwood, 409, 494, 588

N
Names of Coppice, 117, 120, 201, 206, 221
New Pool, 104–7, 150, 202–4, 236, 262–64, 275–76, 278, 281, 317, 337–39, 421, 543–44, 546–47, 561–62, 564–65
Newport, 74, 255–57
Noutard('s) Green, 168, 173, 180–81, 201, 204, 206, 211, 235–37, 240, 268–69, **271**, 279–80, 545
Nutnell Brook, 88, 90–91, 93, 97, 101
Nutnell Pools, 104

O
Ockeridge and Shrawley Woods, 514–15
Ockeridge Wood, 77, 588
Oldepark, 109, 155, 163
Oliver's Mound, 27, 29, 37–39, 53, 107, 134, 136, 258–59, 270, 279, 337–38, 359–60, 542, 546, 565
Ombersley, 26–27, 38, 44, 51, 56, 76, 83–84, 107, 110, 131, 137, 139, 173
Ombersley limewood, 28
Outward Green, 201, 206, 240
Outwards, Little, 206
Outwood, 60, 109–10, 201, 206
Outwood Coppice, 109

P
Park
  the, 120
  Penney, 35, 137, 139
Plan of Shrawley Court and Curriers Estate, 28, 107, 262, 265, 268, 272

pollard row, 46, 56, 260–61, 275–76, 284
pollards, low, 276, 295
pools, 97, 104–6, 154–55, 159–60, 203, 252, 268–69, 305, 307, 309–11, 359, 361–62, 421, 544–45, 561–65, 583–84, 587–88
  main, 9, 416, 589
  mill, 97
  north, 308–10
pools in Shrawley Wood, 105–6
pound locks, 93–94, 100–101
private compartment, 235, 273, 276, 279–81, 339
private section of Shrawley Wood, 226
private zone, 115, 480–88
property in Astley, 103, 199
Public Footway, 78

Q
quarry, 13–14, 98, 102, 174, 184, 202–3, 208, 221, 258–60, 264, 267–68

R
Ragepoles, Little, 207
Ragnell, 201, 207
Ravenshill Wood, 67, 69
Redmarley, 30, 67, 110, 116, 124, 127–28, 137
retting ponds in Shrawley Wood, 63
  hunt for, 63
Ribbesford Wood, 67, 69, 77, 567
Ridding, Upper, 180, 240
Ridding Woods, 80, 416
rides, 105, 182, 215–16, 221, 231, 236, 355, 358, 506, 544–45, 547, 567, 570
River Severn, 4–6, 21–23, 26–28, 37–38, 54–57, 59–60, 80, 82–86, 88–95, 99–101, 103, 125, 127–28, 133, 187, 245–46, 255, 523–24, 540–41, 554–55
  Upper, 187, 245
River Teme, 91–92, 127, 133, 532
Roche, 60, 110, 201, 207, 259
Roche Coppice, 109
Rough Land, 202, 208
Rough land and Shortegreve, 61
Rough Land Coppice, 202
Roughscentz, 110, 202, 206, 208, 307
Roughscentz and Shotgrove, 202
Rowlane, 66, 142, 202, 208
Row Lane Bind, 208
Rowlene Bind, 208
Rowl Meadow, 112, 183–84
royal forests, 26, 31, 34, 57–58, 72, 119
Rye Wood, 124

S
Sankyns Green, 182, 216–17, 240
sawpits, 70, 151, 157, 161, 213, 236–38, 262
school house, 152, 182
Scyth Mill, 87, 316
Seckley Wood, 49, 526
Second Border, 66, 142, 204, 208
Second Elbow, 58, 66, 142, 201
Second Kings Hill, 66, 142
Severn Bank House, 104, 212, 307
Severn Estuary, 82, 85, 89, 409
Severn river crossings, 27
Severn shallows, 76, 152
Severn Weir, 173
Shap, 314
Shapgrove, cutting, 196
Sharpley Pool, 88, 90, 97–98, 101–2, 139, 143
Sharpley Pool Furnace, 88
Sheba's Coppiced Wood, 208
Shelsley Forge, 91, 93, 139–40
Shopgrove, 28, 31, 35, 57, 60–61, 110–11, 138, 141, 200–202, 208, 307, 314
Shotgrove, 3–4, 40–41, 104, 116, 200, 202, 206, 208–9, 211–13, 262, 264, 273, 277, 307–11, 314
  nearby, 404
Shotgrove area, 309–10
Shotgrove mapped, 305
Shotgrove pools, 308–9
Shotgrove produce, 191
Shotgrove springs, 311
Shotgrove subcompartments, 305
Shotgrove trees, 307, 312
Shotgrove Wood, 71
Shraley Wood, 74, 77, 107, 111, 116, 241, 271, 282, 311
Shrawley & District Historical Society, 37
Shrawley Brickpit, 362, 528–29, 547
Shrawley Brickworks, 95
Shrawley Brook, 12, 104, 118, 124, 133, 252, 258
Shrawley Castle, 27–28, 37–39, 134, 136, 236, 259, 261
Shrawley Church, 29, 31, 36, 126–27, 129, 314
Shrawley Court and Curriers Estate, 28, 38, 41, 106–7, 113, 173, 203, 262, 265, 268, 272
Shrawley Court Farm, 78
Shrawley High Quarry, 264, 540, 549
Shrawley Manor, 27, 30–31, 57, 61, 107, 110–11, 134, 137–38, 141–42, 149, 176
Shrawley Parish, 139, 151, 171–72, 181, 215, 241, 555
Shrawley Parish Church, 246
Shrawley Park, 28, 57–58, 60
Shrawley Park Formerly, 247
Shrawley Pools, 104, 134
Shrawley village, 76, 82, 118–19, 181, 209, 221, 275, 421
Shrawley Weir, 76, 84
Shrawley Wood House, 32–33, 41, 92, 114–16, 147, 151, 227, 362, 376, 433, 545–46
  original, 138
spring (water source), 252, 258, 263–64, 308, 310–11, 355, 524, 534
Spring Hill, 252, 255
springs in Shotgrove, 311
Springway, 263
squirrels, 588
Staffordshire & Worcestershire Canal, 188, 240
Staverton's Land, 150
St Clement's Church, 79, 113
St John, 113, 491
Stourport Station, 211, 213
summer house, 32–33, 80, 106, 222, 228–29, 264

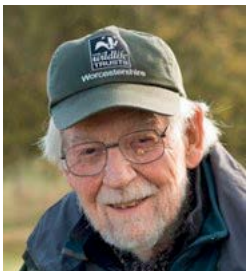
T
thrifes, 159, 207
thrift, 163, 201–2, 204, 207
Tiddesley Wood, 67, 69, 165, 459
turnpikes, 151, 158, 237, 240

U
Upper Severn Lock System, 152, 243–44

W
watercourses, 82, 547, 554, 557–59, 589
waterfalls, 534, 543
waterways, 55, 85, 269–70, 341, 547
  underground, 270
weir house, 83, 173, 184
Weir Inn, 76, 82–84, 152, 158, 160, 173–74, 184, 202–3, 236, 240, 243–44, 261, 263
weirs, 27, 76, 82–84, 99–100, 102, 109, 173, 184, 240, 244–45, 261
  leat-head, 99–102
Wem-Brockhouse, 90, 140
Wend Lēah, 202
Wendleys, 58, 60, 200, 202, 208
Wendleys Coppice, 202
Weogoran, 119, 314
Weogorena leage, 26–27, 72, 119
Whitehouse, 182, 212
White House, 188, 216
Winlesses, Little, 58, 66, 142, 202, 208
withy beds, 212, 307–8, 311, 351
Witley estate, 217
Witley Park, 78
wood banks
  external, 262
  medieval, 196, 261
Woodbury, 127
Wood Close, 180, 204, 546
Woodend, 87, 103
Wood Farm, 106, 128, 158, 162, 173, 179, 203, 213, 216, 236, 238
Wood Farm in Shrawley, 213
Wood Gates, 173, 180, 197, 240
Woodhampton, 26, 137
Woodhouse, 180, 200, 337–38
Wood House, v, 1, 41, 78, 105–6, 138, 160–62, 166–67, 170, 174–75, 202–3, 230–31, 278–79, 281, 515
Woodhouse in Shrawley Wood, 33
Wood House Park, 202, 236, 281
Woodhouse Parkland, 339
Worcester, 24–28, 38–39, 61–65, 68–72, 77–79, 82–95, 101–3, 111–13, 116–19, 125–28, 138–40, 174–76, 191–94, 211–15, 244, 246–49, 491, 495–97, 525, 549–50
Worcester aqueduct, 125, 128
Wychwood, 24
Wyre, 26, 37, 55, 67–68, 76, 82–85, 126, 173, 244, 494, 497
Wyre Forest, 26, 45–46, 48, 67, 72, 90, 140, 375–76, 409, 446–47, 492–97, 499–500, 525–29, 567, 588
Wyre Forest area, 33, 49, 589
Wyre Forest National Nature Reserve, 68
Wyre woodland, 127

Y
Yarranton's Astley Furnace, 90

The Authors



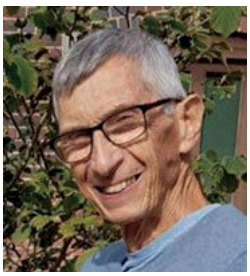
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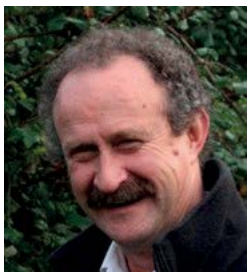
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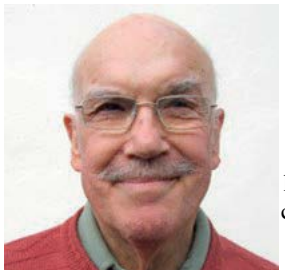
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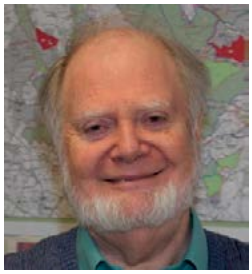
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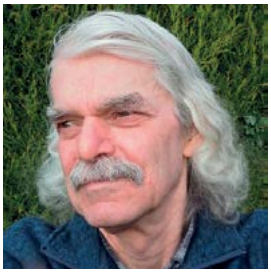
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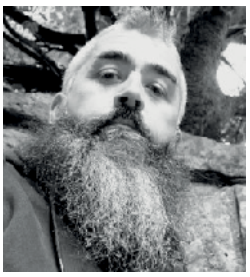
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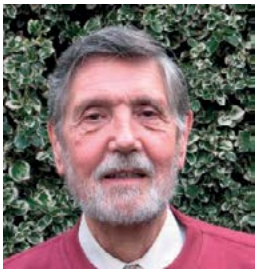
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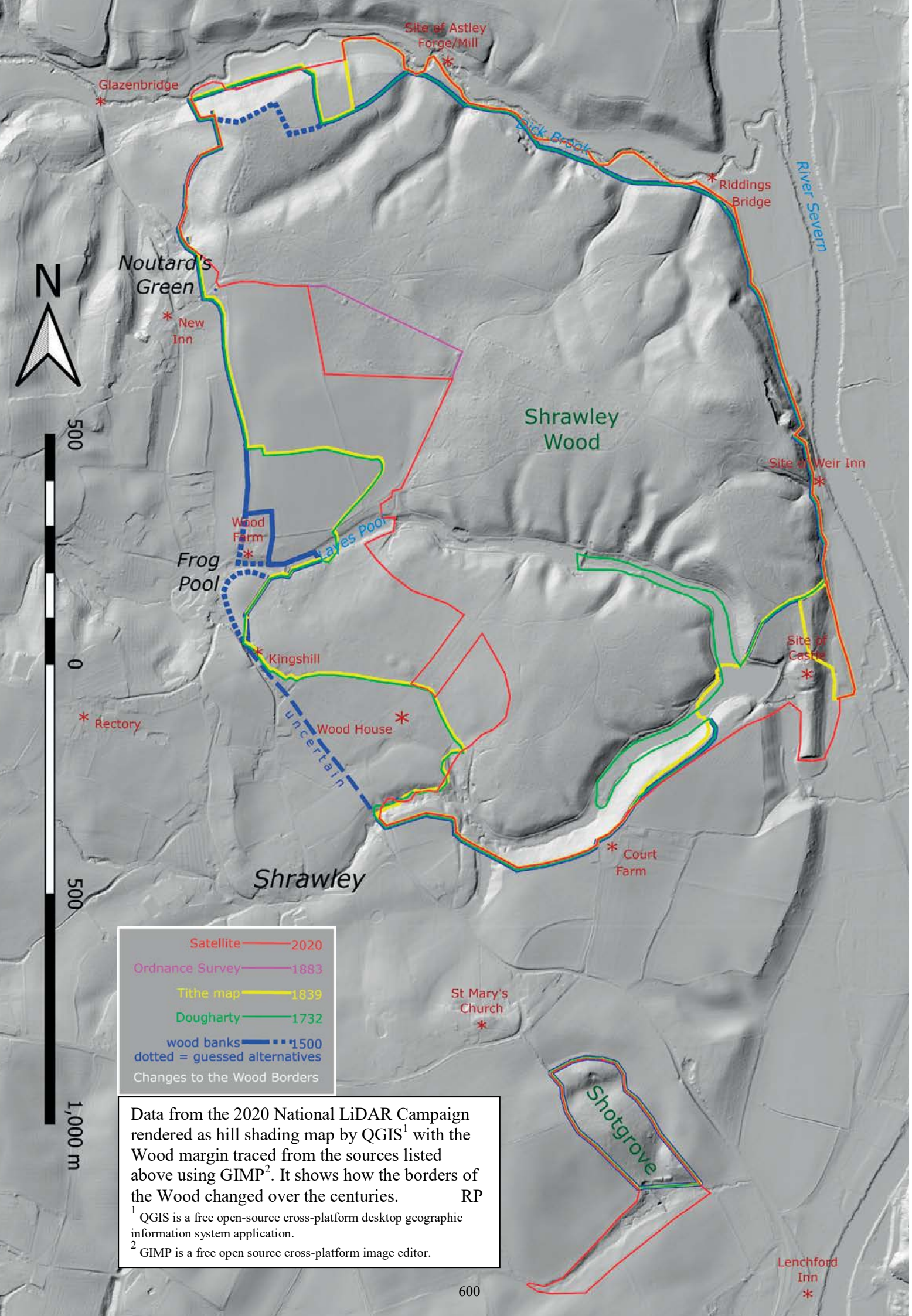
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Data from the 2020 National LiDAR Campaign rendered as hill shading map by QGIS[1] with the Wood margin traced from the sources listed above using GIMP[2]. It shows how the borders of the Wood changed over the centuries. RP

[1] QGIS is a free open-source cross-platform desktop geographic information system application.

[2] GIMP is a free open source cross-platform image editor.