Palaeolithic research in Worcestershire: Future Work and Research Priorities

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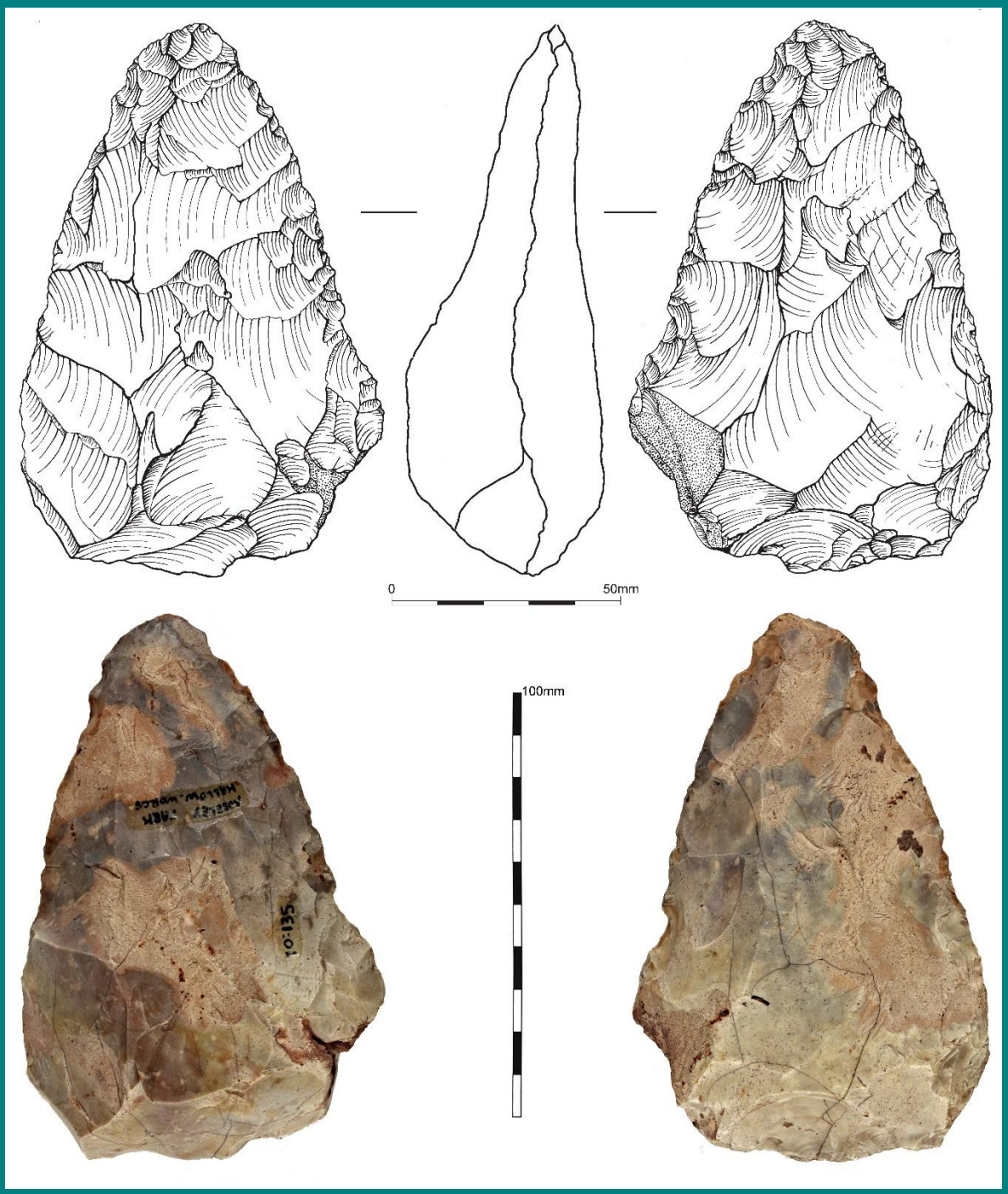

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Explore the Past

Palaeolithic Research in Worcestershire: Future Work and Research Priorities

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Version	Date	Author	Amendment
1.0	November 2019	R Hedge	Original version
2.0	March 2021	R Hedge E Hancox	Additional references, altered the introduction to better reflect the geological approach and renumbered the questions to reflect the numbering system for the wider county research framework
3.0	March 2025	E Hancox	Checked for compliance with the UK's Public Sector Bodies (Websites and Mobile Applications) (No. 2) Accessibility Regulations 2018, which mandate meeting Web Content Accessibility Guidelines (WCAG) 2.1 AA standard

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Palaeolithic Research in Worcestershire: Future Work and Research Priorities

Introduction

The purpose of this document is to summarise the key questions arising from recent work on Worcestershire's Ice Age, explore avenues and priorities for future research, and suggest useful methodologies towards a more connected and collaborative approach to investigating both the Palaeolithic[1] archaeology and the Pleistocene palaeo-environmental sites of Worcestershire.

The Palaeolithic can seem a daunting prospect. It is a period covering more than 500,000 years in the west midlands, characterised by a paradox: the temporal scale is vast, as are the landscapes and geological processes within which the earliest human occupants of this region were living. Yet the human scale and its archaeological footprint are tiny. Small populations ranged across vast distances. Large fluctuations in climate meant that at times Worcestershire was an amenable and resource-rich environment, at others it was at the very edge of the habitable world, and for large parts of the last half a million years, it was too cold, arid, and barren to support human populations at all.

Past human presence in Worcestershire is poorly understood. Traditionally Palaeolithic and Pleistocene research in Britain has focussed in the south and east of England where evidence of our ancestors is far more abundant and apparent. There is, however, plenty of evidence to show that Worcestershire has much to add to our understanding of the human story. The county benefits not only from the existence of two extant river systems, whose terrace sequences are well-preserved and have demonstrated the presence of both artefacts and environmental remains, but also the remnants of pre-Anglian river systems. These deposits have the potential to contain environmental evidence, and possibly artefacts, from key periods in Palaeolithic Britain. Even where they do not contain artefacts, Pleistocene palaeoenvironmental deposits can help to build local and regional deposit models. These can feed into national and even international research agendas.

There are a number of reasons why human occupation in the Ice Age midlands (and the north and west of the country) is less well understood. Firstly, habitation has probably always been less dense and more sporadic than in the south and east. This makes it harder to justify looking for those sites and artefacts that do exist, as a lot of resources would need to go into finding them.

Secondly, the geology of the midlands is less conducive to the survival of evidence. The Anglian glaciation around 480,000 years ago covered Britain in a huge glacier several hundred metres thick. The southern limit of the glacier ran roughly along the current course of the river Thames curving up into East Anglia. North of this the landscape was carved up and altered by the great weight of ice. The glacial outwash at the end of the Anglian must have been immense, cutting new rivers and churning up earlier deposits. Undisturbed evidence from before the Anglian

[1] A glossary of terms is included at the end of this document

glaciation does survive in the midlands however. This has been demonstrated at Waverly Wood in Warwickshire where of a group of handaxes was found alongside animal remains, including straight-tusked elephants, sealed within an ancient river channel.

Thirdly, there are no outcrops containing flint in the west midlands, and stone tools were often made of either poor quality 'drift' flint or local material, generally quartzite. A particular problem with quartzite artefacts is their recognition as stone tools[2]. A very high percentage of the recognised Palaeolithic finds in Worcestershire are handaxes, whereas in the south and east these iconic and easily recognisable tools make up around 10% of the known artefacts. This may partially reflect a true cultural difference, but it is likely that many Palaeolithic tools have gone unrecognised or been misidentified as belonging to later periods.

Finally, for later periods of the Ice Age, research nationally has largely focussed on cave sites and on open-air sites that survive under wind-blown sands (loess). Worcestershire, and the midlands generally, has a limited number of suitable cave systems and few areas of loess likely to hide open air sites. Research funding has naturally gravitated to those areas most likely to produce results, but *in-situ* sites will almost certainly exist in Worcestershire.

Previous research frameworks have tended to emphasis the difficulty of approaching this period of study: *"Few archaeologists working in the region have an in-depth knowledge of Palaeolithic archaeology or the wider research culture in which it is situated"* stressed Buteux and Lang (2002) — quite rightly — at the outset of the West Midlands Regional Research Framework, adding that: *"an understanding of the geological background is a prerequisite for the study of the Palaeolithic"*. However, it is also true that an understanding of the principles and priorities of Palaeolithic archaeology and Pleistocene deposit modelling is within the grasp of anyone with archaeological experience. Framing the period as remote, distant, and tricky to master, has arguably contributed to the difficulties in incorporating deep prehistory into the planning system. We hope that a thematic — rather than chronological — focus will help to make this guidance accessible to a wider audience.

This document also moves away from a lithic focussed approach. Understanding the Pleistocene geology through deposit modelling and more refined dating allows us to create a holistic picture of the landscape through time. This approach should not only contribute to wider research agendas and broader questions, but also help to narrow down where to look for those Palaeolithic sites and artefacts that are elusive in this part of the country.

[2] Quartzite fractures conchoidally,in a similar way to flint, but doesn't produce such distinctive scars. The percussion bulbs and ripples common in flint tend to be absent or more subtle in quartzite, because the grain size is larger. For the same reason, the edges – though durable – are typically duller than flint. Small, precise flake removals are difficult to achieve, so the resulting tools are often less symmetrical. Quartzite tools often don't match people's expectations of a stone tool. Many chance finds of handaxes probably happen because human eyes are so attuned to symmetry – they are spotted in quarry heaps or ploughsoils because they are aesthetically pleasing and balanced. Quartzite tools are less likely to be neat and well-balanced because of the limitations of the material.

Existing Frameworks

A range of relevant research frameworks have sought to establish the extent of our understanding of Palaeolithic archaeology in Britain, and to determine priorities for research and conservation. Historic England's national framework and the West Midlands Regional Research Framework are summarised here. The priorities identified for Worcestershire in this document are linked to the national and regional themes and priorities outlined below.

National

Historic England and the Prehistoric Society, 2008 *Research and conservation framework for the British Palaeolithic.*

This document updated the original 1999 research framework, and highlighted progress. It set out four 'principal themes' to guide research:

1. Hominin environments and climate drivers.
2. Hominin demographies: the palaeoecology of hominin colonisation and settlement processes.
3. How we became human: social, cultural and economic change.
4. Sharing human origins: developing new audiences.

To support these principal themes, the framework identified eight strategic research and conservation themes.

1. 'Areas'
2. Understanding the record
3. Dating frameworks
4. Curation and conservation
5. Dealing with development
6. Professional training
7. Education
8. Collections and records enhancement

Regional

The West Midlands Regional Research Framework (Garwood 2011) takes a chronological approach and lays out the existing knowledge and research priorities.

Lower and Middle Palaeolithic

Period 1

1. Investigating what the pre-Anglian (MIS 18-13; c 800,000-480,000 years ago) material in the West Midlands, particularly the Waverley Wood finds (c. 500,000 years ago), can reveal in respect of the chronology and extent of the earliest human occupation of northern Europe.

2. Identification and investigation of sites in the region contemporary to Waverley Wood.

3. Investigation of the pre-Anglian river terrace and paleochannel deposits for evidence of early human activity including possible use of rivers as migration routes.

4. Investigation of the concentration of pre-Anglian or Anglian material in Warwickshire to establish the date and character of artefacts, their geographical and environmental context and the research potential of the area.

5. Using surface collection programmes to recover Palaeolithic artefacts in areas that are promising in geological terms to provide further information on Lower Palaeolithic material outside the main river systems.

Period 2

1. Investigation of the absence of Hoxnian (MIS 11, 423,000-362,000 years ago) sites in the West Midlands, which contrasts with very rich evidence from deposits of this period elsewhere in southern and eastern England.

2. Further study of the significance and precise dating of the few artefacts dateable to Early Wolstonian occupation (MIS 10-8, 362,000-243,000 years ago), recovered from the river terraces of the Avon and Severn. This combined with studies of the processes of terrace formation and reconstruction of the changing environment would clarify whether the scarcity of these objects reflects small-scale and episodic occupation or limited field investigation.

Period 3

1. Early Middle Palaeolithic handaxes found in Avon terrace 4 and Severn terrace 4 suggest human activity during the early part of MIS 7 (Lang & Keen 2005, 79), but the rarity of artefacts with evidence for Levallois technology raises questions about the chronology, extent and nature of occupation.

2. Utilise geological and bio-stratigraphic evidence from the West Midlands, particularly the river terrace contexts, to shed light on environmental conditions in the period MIS 6 to MIS 4, during which Britain was apparently abandoned by human populations (Lang & Buteux 2007,19).

Period 4

1. The extent to which the West Midlands region was occupied by Neanderthals at the end of the Middle Palaeolithic, after the re-colonisation of Britain at the end of MIS 4 (from c 70,000 years ago at the earliest) and the early part of MIS 3 (c 59,000-40,000 years ago) is unknown.

2. The rich paleo-environment evidence from sites of this period, especially along the Avon valley river terraces, point to the potential for discovering contemporary archaeological sites in similar contexts throughout the West Midlands (Lang and Keen 2005, 79)

Research aims and methods

There is a need for more detailed evaluation of the research potential of the Palaeolithic archaeology and Pleistocene paleo-environments of the region, especially in river gravel contexts (cf English Heritage 1998). This should certainly be undertaken at local and county levels, although larger regional and inter-regional scales of analysis are especially appropriate for investigating major river systems.

Continuing assessment of quarry sites and further evaluation of museum and private collections are also essential for defining in more detail the nature, scale and research potential of the archaeological resource in the region.

It is evident that Palaeolithic archaeology should be brought more effectively into the domain of developer-funded archaeology and the planning process, guided by the National Planning Policy Framework and associated guidance. In particular, finds of non-archaeological fossils and deposits do not fall within the current remit of curatorial archaeology, yet these are central to Quaternary studies and the investigation and interpretation of Palaeolithic remains (Land and Buteux 2007, 19). In this context, perhaps the most important issue for curatorial archaeologists relates to how archaeological and paleo-environmental data of this period can be effectively incorporated into the region's Historic Environment Records (HERs).

An important methodological development that can be facilitated by HER databases is 'predictive modelling' of sites and finds (cf English Heritage 1998; Wymer 1999). This should be combined with systematic and regular monitoring of sand and gravel workings for Palaeolithic finds and Pleistocene deposits, combined with a programme of site prospection. Contacts among fieldworkers, quarry companies and workers, and professional archaeologists, geologists and other specialists should be an essential feature of such work.

Lang and Buteux (2007, 6) observe that most field and curatorial archaeologists in the region, as elsewhere in England, are unfamiliar with Lower and Middle Palaeolithic archaeology and that there is a need to establish protocols for dealing with this evidence and to provide training in appropriate sampling and analytical techniques. Recommended prospection, investigation and evaluation procedures in Palaeolithic archaeology outlined recently by Collcut (in McNabb 2006; app 2) provide some important guidelines in this area.

Period 5 Early Upper Palaeolithic

1. Reinvestigation of King Arthur's Cave, Herefordshire, and a search for Early Upper Palaeolithic sites of similar date in the same area, are clear priorities for investigating the earliest presence of anatomically modern humans in the west midlands and their relationship with late Neanderthal communities.

2. In wider terms, the thin distribution of artefacts currently known in lowland areas need not reflect either the research potential of Early Upper Palaeolithic sites in the region nor the extent and intensity of occupation.

3. The hunting station site recently excavated at Glaston, Rutland (Barton 2005, 116; Myers 2006; 2007, 25), demonstrated the existence of Early Upper Palaeolithic remains in open-air locations, with important implications for the possibility of future discoveries of this kind elsewhere in the English midlands (Myers 2007,27).

Period 6 Late and Final Upper Palaeolithic

1. The presence of Creswellian material at King Arthur's Cave, and the concentrations of sites just outside the west midlands, to the south-west in the Cheddar area and to the north-east in the Creswell area, suggests that work on Late Upper Palaeolithic sites in the region may contribute significantly to studies of the rate and extent of re-colonisation of Britain after the LGM. A clear research priority in regional terms should be to determine the spatial pattern of LUP activity, especially in relation to the interpretative frameworks proposed by Campbell (1977) and Smith (1992).

2. Identification of open-air sites in the west midlands would raise questions about the validity of existing spatial models, besides offering opportunities to explore the social organisation and resource procurement and consumption practices of Late Upper Palaeolithic communities. The important open-air sites investigated recently at Bradgate Park (Creswellian assemblage) and Launde (long-blade assemblage) in Leicestershire, point to the potential presence of Late Upper Palaeolithic material in open-air locations in the west midlands (Myers 2007, 26).

3. The long-blade assemblage at Launde also raises questions about the extent to which central Britain was occupied during the first phase of re-colonisation after the Loch Lomond interstadial (ibid; Cooper 2006, 86-90).

Research aims and methods

Myers (2007) notes that most field and curatorial archaeologists are unfamiliar with Upper Palaeolithic archaeology and Late Glacial environmental studies. Guidance for field and curatorial archaeologists in dealing with Upper Palaeolithic sites is called for (cf Myers 2007, 27), especially in terms of the potential of lithic studies and site recognition/date recovery methods (e.g. Collcut, in McNabb 2006, App.2; English Heritage 2000; Lithic Studies Society 2004; Pollard 1998).

Existing lithic artefact collections in museums should be re-evaluated, as Upper Palaeolithic artefacts may have gone unrecognised (Myers 2007, 26).

As much of what is known about the Upper Palaeolithic in Britain derives from cave deposits, a programme of cave prospection offers considerable potential for the identification of new sites. Discoveries of human remains and/or dating evidence in association with stratified artefact assemblages and palaeo-environmental evidence would be of exceptional importance (ibid). It is also important to note that the recent recognition of late glacial parietal art at Cresswell, Nottinghamshire (Ripoll et al 2004), invites detailed survey of cave interiors in the west midlands.

Recent discoveries in the east midlands have shown the existence of important Upper Palaeolithic open-air sites, with major implications for the Upper Palaeolithic archaeology in the west midlands. Curatorial and field archaeologists should be aware of this potential, and take active measures through appropriate site evaluation strategies to locate Upper Palaeolithic sites (Myers 2007, 27). This should include an awareness of potential deposits in what are now urban areas (ibid). The intensity of surface collection and other sampling strategies is especially significant for effective identification of Upper Palaeolithic sites in open-air settings (cf Hey and Lacey 2001).

Worcestershire: Research Priorities and Questions

The following research priorities were identified during the course of the **Putting the Palaeolithic into Worcestershire's HER** project, completed in 2014. Additional research questions have been identified through the **Lost Landscapes** project (2017-18), which included collaboration with the Herefordshire and Worcestershire Earth Heritage Trust, to whom we are very grateful. A detailed account of the superficial geology of the county can be found in *Lost Landscapes: The story of the Ice Age in Worcestershire* (Fairchild, et al. 2018), and the following should be read in conjunction with that document.

Research Questions

Geoarchaeology/geology:

PAL01 Solifluction deposits on the Malverns start at the top of the Hills and stretch downslope to the east (e.g. Castlemorton Common), appearing to contain faunal remains at unusually high altitudes (130m OD). These deposits must be from several periods (Barclay et al 1990 and Barclay et al 1992). Are they burying former land surfaces? How are faunal remains distributed within them?

PAL02 There are early sand and gravel deposits pre-dating the Teme in the very west of the county, most strikingly in a belt of gravels running along the Kyre Valley between Bromyard and Tenbury Wells. They have been interpreted by Andrew Richards as the outflow of a large lake; occurring both north and south of the Teme Valley and originating from a floodplain some 115m OD, they are evidently very old (Richards 1999). How do these relate to remnants of the Mathon? What can they tell us about pre-Anglian drainage patterns? It would appear that the Teme originally drained to the west: at what point in the Devensian was the flow reversed?

PAL03 There are a number of questions concerning the dating of the glacial tills in the northern part of the county. The presence of pebbles from the Clent breccia in the Stour gravels (Maddy 1995) has been seen as an indicator of the proximity of a Wolstonian Ice sheet in MIS 6. The idea of Wolstonian glaciation has proved extremely controversial, because of a lack of evidence to date the deposits. In north-east Worcestershire, there is extensive till with associated sand and gravel for example along the Ridgeway south of Redditch, but it is not known if this is Wolstonian (MIS 6) or Anglian (MIS 12). Another fascinating feature of this area, as far south as Belbroughton and Bromsgrove in Worcestershire is the presence of large (up to 3 m) glacial erratics within and protruding from the top of till and which have been traced to the Arenig area, near Bala in North Wales. Do these represent a distinctive flowpath of ice during the Wolstonian glaciation? Are there glacial tills from MIS4 near Stourport? If so, how many stadials are represented in the county? Up to now, only MIS 12 and 2 confirmed, but do northern tills hint at MIS 10/6 and MIS 4?

PAL04 Gull remnants on Bredon Hill, including the Banbury stone and the King and Queen stones, demonstrate the presence of limestone caves close to the summit of the hill. It is a

dynamic landscape, defined by landslips, but the presence of substantial depths of flowstone on exposed surfaces suggest that the caves were present for a considerable length of time. Derham's *Physico-Theology* (1713) records a visit to caves on Bredon Hill: the description correlates with the position of Kemerton Camp. Allies (1852, 78-80) references a large landslip at Kemerton Camp in the early 19th century, which may have obscured traces of the caves. Can further research and field prospection help to clarify their position and potential to yield archaeological evidence?

PAL05 To date, we lack *in-situ* archaeological deposits within the county. However, the fresh condition of early Middle Palaeolithic artefacts such as the Hallow handaxe (Shaw 2013), and late Glacial implements such as those from Kemerton (Jackson 2005), imply that at least some of the artefacts from the county are likely to have suffered little post-depositional disturbance. Can we identify *in-situ* deposits in the county?

PAL06 A particular area requiring reassessment is the Holt Heath Member. This member is believed to be composite, representing multiple phases of deposition. Thus the dating of this unit has proven problematic in the past (Dawson and Bryant 1987, Maddy et al 1995) and deposition is currently dated to between 109,000 – 20,000 years ago (MIS 5d – MIS 2/ LGM (Last Glacial Maximum)). The Upton Warren Beds contained within the Holt Heath Member have been dated to between 80,000 – 57,000 years ago by amino acid dating (Bowen et al 1989; 2000) and 42,000 years ago by radiocarbon dating (Coope et al 1961) thus indicating the Member was accumulating prior to and after their formation. Despite this dating, the Member is often characterised as containing a significant proportion of Irish Sea basin erratics derived from the Devensian Stockport Glaciogenic Formation (McMillan et al 2011) thought to have been deposited during the Dimlington Stadial (22,000 – 13,000 years ago). Obviously this is in opposition to the dating from Upton Warren and therefore a clearer understanding of the timing and conditions of the Holt Heath Member's deposition is required. It is suggested that sub-division of the unit occurs eg Holt Heath 1, Holt Heath 2 etc depending on phase of deposition or a new nomenclature is applied. It is preliminarily suggested that there are two or three divisions consisting of the lower/oldest member deposited somewhere between MIS 5d - early 4 overlying the Ipswichian faunal beds at Stourbridge, possibly a middle member deposited during MIS 4 - 3 (although this middle may have to be combined with the lower, it also includes the Upton Warren Beds) and finally an upper, youngest member deposited during the Dimlington Stadial of MIS2 containing the Irish Sea erratics. Selection of suitable material from the Whitehead and Upton Warren archives is likely to produce material suitable for radiometric dating and/or other analytical techniques that were previously unavailable. Can we shed light on the dating of the Holt Heath member, and more specifically the Upton Warren beds?

PAL07 The Arrow Valley. Extensive peat deposits are recorded by the BGS along the River in the Redditch area. Anecdotal evidence (from conversations with the engineers who built Redditch New Town) indicates that the peat deposits stretch further than the BGS records. The extent and date of these deposits are intriguing as there are early Holocene C14 dates (Welin et al 1975, 158 and Shotton 1978). What date did the peat formation start?

PAL08 Feckenham Wylde Moor nature reserve and the surrounding area is a considerable quantity of peat and alluvium which may be late Pleistocene/ early Holocene in date. The BGS used to map a lot of it as 'glaciolacustrine' but this appears to have been remapped in recent times as 'lacustrine alluvium', although that doesn't rule out the possibility of the basal deposits being very early (British Geological Survey, 2013, British Geological Survey 1:50000 Geology map). Late Glacial and Early Mesolithic human occupation sites are often on lake edges. Was there a Palaeo-lake at Feckenham? If there was, can we map the ancient shoreline?

Lithics:

PAL09 Findspots are much more sparsely distributed in the north of the county, yet the presence of artefacts such as the Wolverley handaxe demonstrates that there is significant potential. Does the scarcity reflect hominin preference for the more southerly reaches of the Severn Valley, or does it merely reflect the more southerly focus of extractive industries and active researchers?

PAL10 Are there more Palaeolithic artefacts out there in private and/or antiquarian collections?

PAL11 Key Late Glacial finds have been made in assemblages from later prehistoric sites (e.g. Kemerton - late glacial lithics residual within a Bronze Age settlement). Such material is often difficult to spot, especially if few diagnostic pieces are present. Excavators and specialists should be made aware of the possibility of residual Palaeolithic material in later assemblages. Are there Palaeolithic artefacts within existing later assemblages that have yet to be recognised?

PAL12 Re-use of Palaeolithic material in later prehistory is evident at Clifton Quarry, where two examples of Palaeolithic implements being re-worked in the Neolithic/Bronze Age have been recently noted (Anderson-Whymark 2018, Hedge 2017). These implements have interesting implications for the way in which people in later prehistory viewed their past, and on the visibility of Palaeolithic landscapes in later prehistory. Are there other examples of the re-use of Palaeolithic material in the west midlands?

PAL13 The alleged Aurignacian scraper held at the British Museum was unavailable for high-res photography and/or illustration during the 2014 project. This is something that should be considered for further work as the confirmed identification of a scraper of this date is nationally significant. Due to its significance, the preparation of a short journal article confirming the identification of the Aurignacian should be considered as concerns regarding the provenance and identification of the artefact have rightly been raised (Dinnis 2012). As part of the preparation of this article, the reassessment of Whiteheads notes should be undertaken to try and confirm the exact location and nature of the context from which it was recovered. Can funding be secured to achieve this?

PAL14 What date do we have re-occupation of the area after the Last Glacial Maximum? Where might we expect late glacial lithic scatters? The shouldered points from Kemerton attest to the presence of humans in county at the end of the Upper Palaeolithic, but the finds were redeposited in a much later context. Research should be undertaken to establish when people returned.

Faunal:

PAL15 Key assemblages of faunal remains, especially those excavated in the mid-19th century, are missing. Examples include: deer antlers from Defford, noted by William Symonds as being in the possession of Lady Coventry; woolly rhinoceros remains from the cutting of the Colwall railway tunnel, and elephant remains from beneath what is now Malvern St James' School. At least some is thought to have gone to William Boyd Dawkins during his time as curator at Manchester Museum. Some of these lost specimens have the potential to aid dating of key deposits, such as the solifluction deposits on the east of the Malvern Hills. There may yet be more mentioned within the archives of local history societies or field/naturalists' clubs. Can we locate and assess this material?

PAL16 Human butchery/modification marks have been noted on a number of faunal specimens presumed to be of Pleistocene date, including the antlers from Defford (missing), and specimen 2468 in the Whitehead catalogue. However, as yet none of these have been confirmed. Can we substantiate this evidence - especially from the vicinity of Bredon Hill, as this would help us to correlate the faunal and artefactual evidence?

PAL17 Faunal remains continue to be recovered by quarry operators: productive informal working relationships between local archaeologists and quarry staff have recently led to the recovery and conservation of a number of examples, including the Clifton tusk. Their value is not merely academic: quarry operators have benefitted from positive publicity, and the discoveries have attracted considerable public interest. The value of such discoveries to public understanding of the Pleistocene should be acknowledged, and fruitful dialogues between operators and local specialists encouraged. Can we focus resources on interaction with quarry companies to allow suitably trained and inducted professionals and volunteers access to active extraction sites to scan the reject heaps? This may lead to access for brief recording of faces and collection of material that would previously have been lost.

Strategy

In order to start to answer some of these research questions, we need to:

- Ensure that the framework and research questions are accessible to all and publicised, so that interested researchers, students, contractors can develop projects and tailor methodologies to fit.
- Maintain and develop user-friendly public-facing resources such as the iceageworcestershire.com website.
- Promote and enhance the teaching of the Ice Age through locally-specific resources and education activities for school-age children.
- Encourage closer interdisciplinary connections between geologists, geoarchaeologists, archaeologists, and the museum sector, potentially through a collaborative network or online conference to link researchers in different fields.
- Develop professional expertise by exploring remote options for enhancing subject-specific knowledge, e.g. for contractors through online CPD, or for quarry operatives through 'toolbox talks'.

- Endeavour to secure funding to raise awareness and provide training with metal detectorists and community groups who are undertaking their own projects to metal detect, field walk or otherwise investigate arable fields in the county. This funding should also ensure the resources are available for specialist assessment of any material they uncover.
- Explore the potential for small grant schemes to assist with conservation or curation of specific parts of existing collections, taking an approach to collections management informed by priorities identified in the research framework.
- Foster cross-sector relationship with academic researchers and students, ensuring that researchers such as postgraduate students are able to align their research questions to key local and regional priorities. This will benefit early career researchers by linking their efforts to research needs, tapping into an existing network of expertise across local authorities, museums, contractors and independent specialists.
- Embed the Palaeolithic firmly within the development management process. This can be achieved through refining the areas of Palaeolithic potential included in the Historic Environment Record to include more details about depths and thicknesses of deposits to allow a clear understanding of when deposits with potential will be impacted by development. Also by ensuring that specialist geoarchaeological assessment is included within the archaeological requirements for quarries and large-scale infrastructure.

Number	Research Questions and Priorities	Linked National Priorities	Linked Regional Priorities	Approaches to answering the question
PAL01	Understanding the solifluction deposits on the Malverns	Principal theme 1. Strategic theme 1,2,3.	Period 2 -3	Geophysical surveys of the deposit geometry and particularly its lower surface. Likely to have formed over a protracted period and direct dating is not feasible. There may be some max/min constraints in particular situations, but this would need new exposures (e.g. in foundations) to observe relationships. Historic evidence suggests there may be megafaunal remains. Major building projects on E slope of Malverns may generate exposures.
PAL02	Understanding drainage patterns in the Teme Valley	Principal theme 1. Strategic theme 1,2,3.	Period 1	The Teme Valley Geological Society is interested in developing a project on Teme terraces, and these terraces in the Kyre Valley could provide maximum age constraints. Old workings could be examined for directional structures (cross-bedding, imbrication) and any N-S changes in grain size. Clast composition could be examined to constrain source areas. OSL dating would be valuable. Aberystwyth (Prof. Geoff Dullar) are developing techniques for OSL dating of gravel (forthcoming).
PAL03	Glacial tills in the north of the county. Are there glacial tills from MIS4 near Stourport? If so, how many stadials are represented in the county? Up to now, only MIS 12 and 2 confirmed, but do northern tills hint at MIS 10/6 and MIS 4? Can Worcestershire provide evidence of the Wolstonian Glaciation (MIS 6 – 10)?	Principal theme 1. Strategic theme 1,2,3.	Period 2	In north-east Worcestershire, there is extensive till with associated sand and gravel for example along the Ridgeway south of Redditch, but it is not known if this is Wolstonian (MIS 6) or Anglian (MIS 12). Another fascinating feature of this area, as far south as Belbroughton and Bromsgrove in Worcestershire is the presence of large (up to 3 m) glacial erratics within and protruding from the top of till and which have been traced to the Arenig area, near Bala in North Wales. Do these represent a distinctive flowpath of ice during the Wolstonian glaciation? Need to build on PhD work of Maddy,(Maddy 1989) but limited by available exposures. An attempt at cosmogenic dating of erratic boulders by Seb Gibson (Gibson 2019) supports the idea of reworking of boulders in one of the stadials between 2 and 12.
PAL04	The potential of Bredon Hill	Principal theme 2, 3. Strategic theme 1,2,3,8	Periods 1 - 6	Calcareous crusts (spelethem) on the walls of the gulls would provide age constraints for archaeology. These deposits further S in Cotswolds have been dated in published work led by Andy Farrant (Farrant et al 2015). The Bristol Spaeleological (sic) Society may be able to provide advice. Professor John Gunn (honorary prof at Birmingham) also has good contact with speleological community.
PAL05	Are there Middle Palaeolithic in-situ deposits?	Principal theme 1, 2, 3. Strategic theme 1,2,3,5	Period 3 - 4	Further investigation of the Kidderminster Station Member, and potential associated contemporary finds such as the Wolverley handaxe, would be beneficial
PAL06	Understanding the Holt Heath Member and the Upton Warren beds	Principal theme 1. Strategic theme 1,2,3,8.	Period 4	Looking for artefacts in the base or lower part of the Holt Heath Member (under terrace 3) combined with OSL dating of the Holt Heath member - a composite deposit? Subdivision may be required. Dating of existing material from Upton Warren/Whitehead collections should be a priority, and may help to clarify matters, though further field investigation may also be necessary. Given the importance of the Upton Warren site, a programme of coring in surrounding areas would be justified. This could provide new material for palaeoenvironmental analysis and dating.
PAL07	Understanding the Arrow Valley.	Principal theme 1, 2, 3. Strategic theme 1,2,5.	Period 6	Geophysical surveys of the deposit geometry. Need to core to the base of the peat at several locations following geophysical survey. Shallow coring should be straightforward followed by palaeontological work and possible radiocarbon dating.
PAL08	Is there a Palaeo-lake at Feckenham?	Principal theme 1. Strategic theme 1,2,3.	Periods 5 - 6	Geophysical surveys and coring to determine presence/absence and date of deposits.
PAL09	Is artefact distribution across the county representative of collection bias or is the potential for artefacts largely in the south?	Principal theme 1, 2 3. Strategic theme 1,2,4,5.	Periods 1 - 6	Raising public awareness could lead to more stray finds coming forward. Work to establish areas of potential and check them using appropriate techniques. New quarry workings in the north and north west may allow for this work. Pursue opportunities for walkover surveys in areas where surface finds have been recorded, such as Madresfield and Hallow, but also in the former quarry areas and fossil bed locations i.e. Kemerton Lakes, Eckington to identify if any of the sections of old workings or associated drainage channels are extant or if stray material has been exposed.
PAL10	Establishing whether there are other artefacts or collections in private collections or museums	Principal theme 2, 3, 4. Strategic theme 1,2,4,7,8.	Periods 1 - 6	Raising public awareness, working with communities, PAS and metal detectorists to encourage the recording of new and existing chance finds. Contacting and working with museums to improve on the index compiled in 2014, including specialist assessment of any potential artefacts.
PAL11	Researching possible mis-identifications in existing later prehistoric flint collections	Principal theme 2, 3. Strategic theme 2,3,4,6,7,8	Periods 1 - 6	Work with the museums to identify significant flint collections at sites from other periods and source funding for specialist assessment

Number	Research Questions and Priorities	Linked National Priorities	Linked Regional Priorities	Approaches to answering the question
PAL12	Re-use of Palaeolithic material in later prehistory	Principal theme 2, 3. Strategic theme 1,2,6,7	Periods 1 - 6	Raise awareness to ensure that excavators and specialists are made aware of the possibility of residual Palaeolithic material in later assemblages. Focus on instances (e.g. Clifton) of later prehistoric reworking of Palaeolithic artefacts: this can be difficult to spot, but promotion and publication of examples could raise awareness.
PAL13	The Aurignacian in Worcestershire?	Principal theme 2 3. Strategic theme 1,2,3,5	Period 5	Specialist reassessment of the possible Aurignacian scraper from the Whitehead Collection. A possible further example from Lower Moor found in 2020 raises questions about whether there may be more deposits containing MIS3 material along the Avon Valley, particularly the Wasperton Member
PAL14	What date do we have re-occupation of the area after the Late Glacial Maximum?	Principal theme 1, 2, 3. Strategic theme 1, 2, 3	Periods 5 - 6	Re-evaluation of the Holt Heath member (see 1.6) and refining the late glacial geochronology will be valuable. Reassessing existing later prehistoric collections (as in 2.3 above) is also likely to contribute to this research question. Hand-dug test-pits and sieving of topsoil in areas that have potential for open air sites, e.g. elevated ground at confluences between two watercourses or in areas that have not suffered erosion (or deposition). At Beckford they do occur in low-angle fans (Briggs et al. 1975). Integrating recent work on the sources of raw material for Pleistocene and early Holocene artefacts (e.g. Elliot 2019)
PAL15	Locating and assessing local faunal assemblages	Principal theme 1, 2. Strategic theme 1, 2, 3, 4, 7, 8.	Periods 1 - 6	Working with local and national museums to trace assemblages and identify any previously unknown ones. Check archives of local history societies and field/naturalists' clubs.
PAL16	Can we substantiate the evidence of human butchery/modification of Pleistocene assemblages?	Principal theme 1, 2 3. Strategic theme 1, 2, 3, 8.	Periods 1 - 6	Attempt to locate and reassess the missing material.
PAL17	Can we focus resources on interaction with quarry companies to allow suitably trained and inducted professionals and volunteers access to active extraction sites to scan the reject heaps?	Principal theme 1, 2 3, 4. Strategic theme 2, 4, 5, 6, 7.	Periods 1 - 6	Endeavour to obtain funding to dedicate time to fostering relationships and provide training and support.

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Glossary

Acheulean – Archaeological tool making industry/ style associated with the Lower Palaeolithic. The industry is found across much of Europe, Africa and parts of Asia and dates from around 1.7 million years ago to 100,000 years ago.

Aurignacian - Relating to the early stages of the Upper Palaeolithic culture in Europe and the Near East. It is dated in most places to about 34,000–29,000 years ago.

Breccia - Rock consisting of angular fragments of stones cemented by finer calcareous material.

Creswellian - A British Upper Palaeolithic culture named after the type site of Creswell Crags in Derbyshire by Dorothy Garrod in 1926. It is also known as the British Late Magdalenian.

Devensian - The term used by British geologists and archaeologists to refer to the most recent glaciation, broadly 114,000 - 12,000 years ago.

Dimlington Stadial - A term for the main glacial episode of the Late Devensian in Britain, also referred to as the Late Devensian Glaciation, c.26,000 to 13,000 years ago.

Erratics – A rock or boulder that differs from the surrounding rock and is believed to have been brought from a distance by glacial action.

Flowstone - Rock deposited as a thin sheet by precipitation from flowing water

Handaxe – a tool with two faces usually made out of flint or chert, rounded at one end and pointed at the other. They were first made by our ancestors around 1.6 million years ago in Africa. In Worcestershire the earliest known is the Allesborough handaxe, which was probably made during one of the interstadials, between 300,000 and 424,000 years ago.

Holt Heath Member – The third terrace of the River Severn, also known as the 'Main Terrace'; part of the Severn Valley Formation. Gravel overlain by sand; a high proportion of the gravel includes exotic clasts from Scotland, Lake District and Malvern Hills. Dated to MIS 6 through 10 (352,000 years ago to 130,000 years ago).

Hominin – Modern humans and their closest relatives, e.g. Neanderthals and Homo Erectus

Hoxnian Stage – a geological period in the British Isles. It is equivalent to Marine Isotope Stage 11, which started c.424,000 years ago and ended c.374,000 years ago

Interstadial – Relating to a minor period of less cold climate during a glacial period.

Ipswichian – geological period in the British Isles. The term is used for the second to latest interglacial period, broadly 130,000 to 110,000 years ago

Levallois – Stone knapping technique most commonly associated with Neanderthal industries of the middle Palaeolithic

Loess – A clastic, predominantly silt-sized sediment that is formed by the accumulation of wind-blown dust. Much more common in the south and east of the British Isles, here formed at the end of the Palaeolithic and therefore sometimes seals and protects Late Upper Palaeolithic sites and associated deposits.

Long blade – A lithic tradition in the British Isles that is characterised by long thin blades and appeared right at the end of the Upper Palaeolithic

Lower Palaeolithic – A prehistoric period based on the type of tools used by our human ancestors, c.2.5 million years ago to 300,000 years ago

Marine Isotope Stages (MIS) – Alternating warm and cool periods in the Earth's past climate recorded from oxygen isotope data recovered from deep sea core samples

Middle Palaeolithic – a prehistoric period based on the type of tools used by our human ancestors, c.300,000 years ago to 30,000 years ago

Neanderthal – species of human that lived in the British Isles before modern humans, briefly over-lapping between c.45,000 and 36,000 years ago

Optical stimulated luminescence (A.K.A Optical dating or OSL) –Scientific dating technique determining how long ago minerals were last exposed to daylight. Used to date sediments

Oxygen Isotope – Isotopes are variants of chemical elements (same number of protons, different number of neutrons). Oxygen has three variants 16O, 17O, and 18O. The 18O/16O ratio provides a record of ancient water temperature

Palaeochannel – former silted-up water course

Palaeoecology – The study of interactions between organisms and/or interactions between organisms and their environments across geologic timescales

Palaeolithic – The Old Stone Age. In the British Isles this refers to the period between c. 1 million years ago and the end of the last Ice Age around 11,700 years ago.

Periglacial – An adjective referring to geographical areas close to glaciers where geomorphic processes occur such as freezing cycles and permafrost weathering

Quaternary - The current and most recent of the three periods of the Cenozoic Era and spans from 2.6 million years ago to the present. The Quaternary Period is divided into two epochs: the Pleistocene (2.6 million years ago to 11,700 years ago) and the Holocene (11,700 years ago to the present).

Quartzite – An extremely compact, hard, granular rock consisting essentially of quartz. It often occurs as silicified sandstone.

Shotton – Professor Fred Shotton was a geologist, natural historian and Fellow of the Royal Society. He spent many years researching the geology of the West Midlands, culminating in his Professorship at the University of Birmingham between 1949 and 1974. In 2003 a project was funded by English Heritage through the Aggregates Levy Sustainability Fund to improve understanding of the Palaeolithic across the midlands, this project was named after Prof. Shotton: The Shotton Project: A Midlands Palaeolithic Network

Solifluction – The natural slow downslope movement of water-logged earth.

Upper Palaeolithic – a prehistoric period based on the type of tools used by our human ancestors, c.50,000 years ago to 10,000 years ago

Wolstonian – Geological period in the British Isles equivalent to MIS 6 through 10 (352,000 years ago to 130,000 years ago) it appears to have included three glaciations and is followed by the Ipswichian.

Explore the Past

For at least 500,000 years humans have made a home in the harsh, dynamic and everchanging landscapes that comprised the Ice Age in the west midlands. This document explores avenues to expand our knowledge of early human history of this part of the world, and promote that knowledge to professionals, academics, and the public.

Worcestershire Archive and Archaeology Service cares for Worcestershire's past for the benefit of present and future generations. Dating from the Ice Age to the 21st century, our collections tell the story of the communities, individuals, buildings and landscapes of historic Worcestershire. They include over 12 miles of archives, more than 80,000 records of archaeology, and at least 20,000 local studies and archaeology reference books.

www.iceageworcestershire.com

Cover image: A possible Early Middle Palaeolithic handaxe, ca. 200,000 years old. In 1970, a sharp-eyed observer spotted this handaxe on the surface of a ploughed field at Moseley Farm, Hallow, and took it to Worcester City Museum