Discovery, Innovation and Science in the Historic Environment

RESEARCH

Historic England

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AT LANDSCAPE LEVEL SPECIAL 2023

Welcome...

...to this managing change at landscape scale special issue of Research.

In this issue the following articles look at ways of managing change to our heritage and the broad landscape level. The starting point for this exploration is that what we may think of as 'natural' landscapes have in fact been shaped by thousands of years of human activity.

Change can come for example through development or planned climate change responses such as tree planting or rewilding. Many of the methods of managing change that we feature here tap into technologies such as GIS and predictive modelling.

In this issue:

- 'Mapping and Modelling the Historic Landscape'. Historic England Landscape Strategy Advisor Jonathan Last gives an overview of the theme of this issue: managing change at landscape level.
- 'Measuring Impact and Managing Change in the Oxford to Cambridge Arc'. Developing the methodology for assessing sensitivity of the historic environment at the earliest stages of major landscape change.
- 'London Archaeology and Characterisation'. The context and challenges of managing change in complex townscapes and time-depth.
- 'Archaeological Sensitivity Mapping'. Developing a methodology for understanding where future significant archaeological discoveries may be made.
- 'The Roman Landscape Characterisation and Prediction Project'. Harnessing the potential of existing knowledge to develop predictive models of Roman settlement.
- 'Beach Replenishments as Windows into Submerged Pleistocene Landscapes'. Evidence of landscapes and lifeways from the distant past brought to light during replenishment of Essex beaches.
- 'Assessing Sensitivity Capacity and Opportunity in the Wider Historic Environment'. Discussion of how historic landscape be more fully involved at the earliest stages of planning for large-scale landscape change.
- 'Planting Trees for the Future Whilst Protecting the Past'. Developing new datasets to ensure that the right tree is planted in the right place.
- 'Landscape Histories for Landscape Futures'. Exploring the evolving role of archaeology in large-scale nature recovery projects.
- Research Reports Roundup August 2023. A roundup of recent research reports added to our database in June 2023 to August 2023, displayed by heritage themes.

John Cattell
National Head of Research
with Historic England.

Front cover image: Seathwaite Graphite Mine, Seathwaite, Borrowdale.

We are the **public body** that **helps people care for, enjoy** and **celebrate** England's **spectacular historic environment**

Contents ..... Managing change

Mapping and modelling the historic landscape

An introductory overview to the theme of this issue: managing change at landscape level.

When you think of the English landscape, what comes to mind? Rolling hills, perhaps, mature woodland, or a vista of hedges and fields – in any case, something to do with nature? Landscapes are the context in which we perceive the natural environment: habitats, wildlife and vegetation. But what can be less obvious is that they are always also historical and archaeological. All our landscapes – upland and lowland, woodland and grassland, moor and heath – owe their character, and the 'nature' they contain, to millennia of human activity. One of the key policy documents for landscape, the European Landscape Convention, recognises this entanglement of the cultural and natural in its basic definition: 'landscape' means an area, as perceived by people, whose character is the result of the action and interaction of natural and/or human factors'. >>

The typical English countryside might look timeless but field patterns are evidence of how the landscape has developed since the Bronze Age. Source Historic England Archive, US_7PH_GP_LOC166_V_5016

Why does it matter that we should work on a landscape level? A key aspect of landscape in this regard, including its historical and archaeological components, is that it is always changing.

The heritage sector usually has good processes and protocols for managing individual 'assets' – buildings, sites and monuments. But what about the wider landscape – rural, urban or industrial – with this complex historic character and often unknown, yet to some extent predictable, archaeological potential? A key archaeological response to the related European Landscape Convention idea that 'all landscapes matter' was the concept of characterisation: a seamless mapping of the continuous historic character of the landscape (or seascape) designed to emphasise that the historic environment is everywhere. However, its main product, Historic Landscape Characterisation (HLC) is generally confined to the visible landscape and does not include buried archaeology.

But why does it matter that we should work on a landscape level? A key aspect of landscape in this regard, including its historical and archaeological components, is that it is always changing. Indeed, the pace of change in England's landscapes in the decades ahead is only likely to increase, in relation to a variety of drivers including climate change impacts, requirements for new housing and infrastructure, and targets for forestry and nature recovery.

While we may seek to preserve individual sites and buildings, when it comes to the landscape the emphasis is on informed decision-making in response to inevitable change. That difference in approach requires us to understand at a broad scale, as far as possible, the sensitivity of the historic landscape (and seascape) to planned or unplanned change, and its capacity to accommodate such change. >>

Top: Infrastructure and industry are also key parts of the historic landscape, whether or not they are considered to 'blend in'.

Bottom: Upland landscapes often contain visible archaeological remains that still serve as boundaries or landmarks.

Above left: An aerial view of Gainsthorpe Deserted Medieval Village, Lincolnshire. © Historic England Archive, PLB_N070099

Above right: : A reconstruction by Judith Dobie of the landscape around a Mesolithic camp. The area would later be occupied by Grimes Graves flint mines in Norfolk. © Historic England Archive, IC046_018

This issue of Historic England Research rounds up a variety of current approaches to improving strategic decision-making in the face of future landscape change through the development of methods, tools and resources for better understanding of archaeological and historical sensitivity, capacity and potential at a landscape level. Characterisation in some form is often the starting point but the contributions take the idea in a variety of directions.

A particular focus of the issue is on archaeological remains of different kinds, including both visible features that still serve a purpose in the landscape and those that are buried and hidden. In either case archaeology both informs our collective understanding of the places where we live today and helps us understand trajectories of past changes in environment, climate and society. In contributing to narratives that promote resilience archaeology can therefore help us imagine and plan sustainable future landscapes.

The scale, ubiquity and significance of the archaeological resource in England may not be fully appreciated, but it stretches back almost one million years, with the last 11,000 years since the end of the Ice Age seeing continuous human inhabitation. For example, the British Museum alone holds more than 80,000 artefacts from the earliest periods of human occupation, the Lower and Middle Palaeolithic; the English Landscapes and Identity (EngLaID) project amassed over 800,000 digital records of sites and finds from the period 1500 BC-AD 1086; and the Roman Rural Settlement Project5 (RRSP) looked in detail at records of about 2500 rural settlements of that period, some 10% of the known number.

Despite this huge resource, much of it coming from archaeological evaluations and excavations that have covered at least 1% of England's land area since 1990, the vast majority of sites we know about from remote sensing and ground-based survey have never been investigated in detail, and for each of those known sites there are many others awaiting discovery.

Moreover, even where we have no remains of permanent settlement, over millennia the paths of hunter-gatherers, droves of pastoralists and fields of arable farmers have spread across virtually the entire surface of Britain, leaving artefacts in the soil and shaping the character of the landscape. Our archaeological heritage is therefore almost literally everywhere (including offshore areas), though the significance of those remains, a matter of both expert judgement and public value, varies considerably. >>

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The projects collected in this issue of Historic England Research emphasise this ubiquity and variability.

Different approaches to area-based characterisation of the known archaeological resource are provided by Melissa Conway ('Measuring impact: managing change' – a landscape-scale approach to the historic environment), and Sandy Kidd (London archaeology and characterisation).

This kind of mapping is extended with a predictive element in the contributions by Jonathan Last & Sandy Kidd (Archaeological sensitivity mapping) and Paul Chadwick, (The Roman Landscape Characterisation and Prediction Project and via a geomorphological focus to deeply buried deposits, in Rachel Bynoe's article 'Beach Replenishments as Windows into Submerged Pleistocene Landscapes).

How we use our understanding of the historic landscape in the practical management of different forms of change is then considered by Pete Herring (Assessing sensitivity, capacity and opportunity in the wider historic environment), David Robertson & Tom Sunley (Planting trees for the future whilst protecting the past), and Rose Ferraby, Caitlin DeSilvey, Hannah Fluck & Ingrid Samuel (Landscape histories for landscape futures).

Most of the approaches rely on the use of Geographical Information Systems (GIS) software to create maps for archaeological purposes. The outputs are colourful but can be hard for the uninitiated to make sense of. We have attempted to leaven the diet of GIS maps with photos and other diagrams but one key aim for the future should be to make characterisation and similar map-based outputs more accessible and useful for communities and non-specialists. The climate and nature emergencies are of critical importance for society, but the environment or landscape is not reducible to nature; we cannot really plan a better future without understanding its deep history. That is why these maps matter ■

The climate and nature emergencies are of critical importance for society, but the environment or landscape is not reducible to nature; we cannot really plan a better future without understanding its deep history. That is why these maps matter.

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Below left: A coastal and farming landscape that includes remains of the tin mining industry, Geevor, Cornwall.

Below right: An aerial view of Tower Bridge, the River Thames, Tower of London and the City from the south east, taken in 2006.

Above left: Shows the centre of Heydon's historic core with historic buildings and plots along the street frontage, minor country houses and associated parkland at Heydon House and Heydon Place, and cropmark remains of a moated complex west of Heydon Place. © Historic England Archive, 27459_013

Above right: Shows Heydon Grange Country Club, an outwardly modern landscape preserving traces of the past. Its clubhouse is a converted 17th century barn, whilst the boundary running on a north-west to south-east alignment immediately to the right of the barn, bisecting the image, is the Heydon Ditch, an early medieval land division. © Historic England Archive, HEA_S3314_V_0122

Measuring impact and managing change in the Oxford to Cambridge Arc

Developing the methodology for assessing sensitivity at the earliest stages of major landscape change.

In the Government's spring budget of 2016, the National Infrastructure Commission was tasked with investigating potential infrastructure needs and the economic case for maximising the benefits of the Oxford – Milton Keynes – Cambridge 'knowledge-based cluster', referred to as the Oxford to Cambridge Arc (hereafter 'the Arc'), and providing recommendations on growth to Government. The kinds of change envisaged include new and upgraded rail links (East-West Rail), strategic road network upgrades, new or expanded towns and villages and industrial/commercial hubs. Options for such development began to emerge in 2018 and many are still being refined.

However, these early options lacked meaningful consideration of the historic environment. In response, in 2020 Historic England commissioned LUC to develop a methodology for measuring the impact of the potentially transformative change on the corridor's historic character and assets. The resulting project, Measuring Impact: Managing Change (hereafter 'the Project'), seeks to embed consideration of the historic environment in the early stages of the planning of change within the Arc so that extensive harm to significant heritage assets is avoided and, where possible, opportunities to enhance them are identified. >>

In 2020 Historic England commissioned LUC to develop a methodology for measuring the impact of the potentially transformative change on the corridor's historic character and assets.

How is this being done?

The Project aims to establish a strategic-level baseline understanding of the sensitivity of the historic environment in different parts of the Arc to large-scale development in order to ensure that decisions on growth are well informed about the potential impact of proposed change. It does this by undertaking a rapid, but comprehensive, review of existing historic environment data and other relevant evidence to map the sensitivity of the historic environment throughout the Arc.

Areas with coherent historic environment characteristics are defined as Historic Environment Character Areas (HECAs). The size of these can vary considerably depending upon the nature of the landscape and the historic environment resource, with rural Historic Environment Character Areas s tending to be larger than those in urban areas.

A Historic Environment Character Area's 's sensitivity is considered against four aspects: above- and below-ground heritage assets, historic landscape and setting. Each Historic Environment Character Area is assigned sensitivity levels for each aspect, supported by a short narrative explaining the qualities which underpin the level ascribed. An 'overall' sensitivity level is also ascribed to each Historic Environment Character Area to indicate its key aspects. Each sensitivity level is assigned a level of certainty so that users can understand where knowledge of a Historic Environment Character Area is relatively secure and where it is not. The sensitivity values include the option to record that there is no data for an aspect. This helps flag areas of greatest uncertainty which, potentially, present significant risks in planning land-use change because they are 'unknown unknowns' and are obvious targets for further research.

In developing the methodology, rather than reinventing the wheel, the Project team has been keen to stand on the shoulders of previous attempts to consider sensitivity at a large scale. The last wave of such studies involved the growth areas of the early 2000s, including the Thames Gateway and the London-Stansted-Cambridge Corridor. These studies predate the more holistic approach to the historic environment brought in by Planning Policy Statement 5 in 2010 and preserved in the current National Planning Policy Framework, which removed the distinction in planning policy between whether a heritage asset is an archaeological site/feature or a standing building/structure. The earlier studies also lacked the more consistent approach to setting enshrined in Historic England guidance from 2011 onwards.

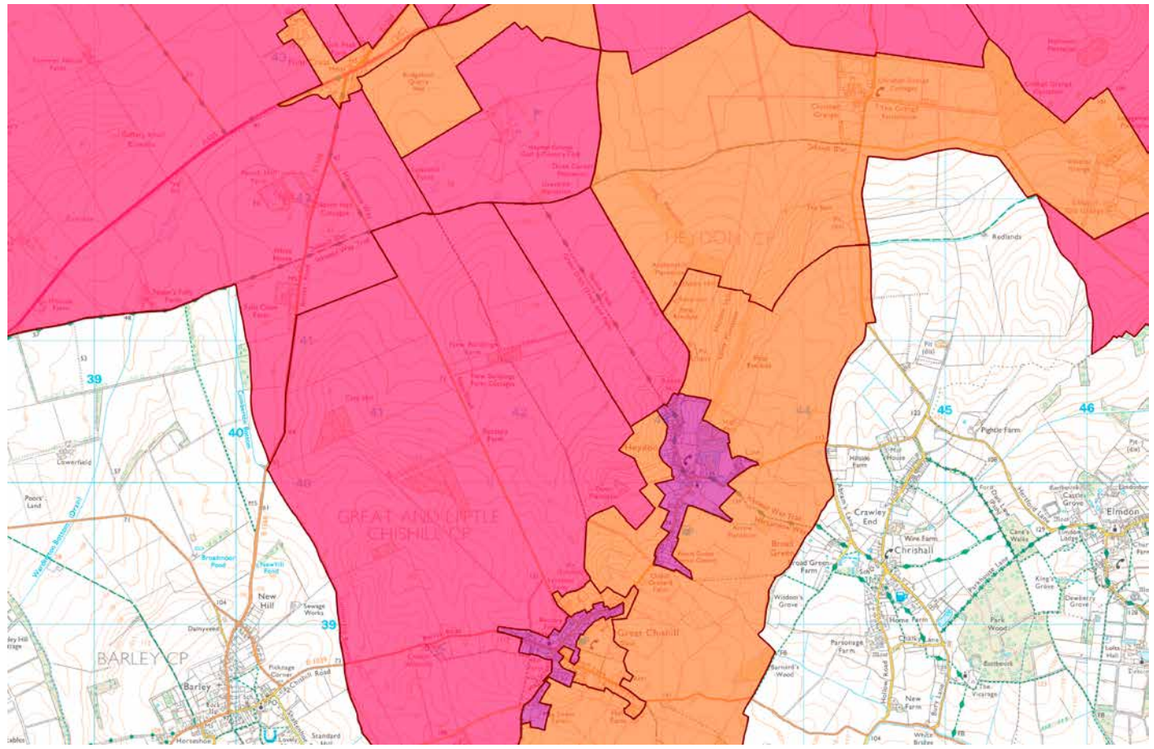
Despite this, there was much to draw on from earlier work. The Project's sensitivity levels are based upon those used by the Thames Gateway studies (2005). These required only limited adaptation to reflect the changed language around assets, impacts and setting used today, and were considered robust since they had already been through significant stakeholder consultation in their development and detailed public scrutiny in planning examinations. The Project employs the definition of sensitivity adopted in the Thames Gateway work, which related it to major physical change with the potential to significantly alter a defining aspect of a Historic Environment Character Area. In a rural area this might be developing fields into a housing estate or solar farm. In urban areas this might be something which changes building stock and land use (i.e. residential to commercial), such as redevelopment of a market area to a residentially-driven mixed-use development.

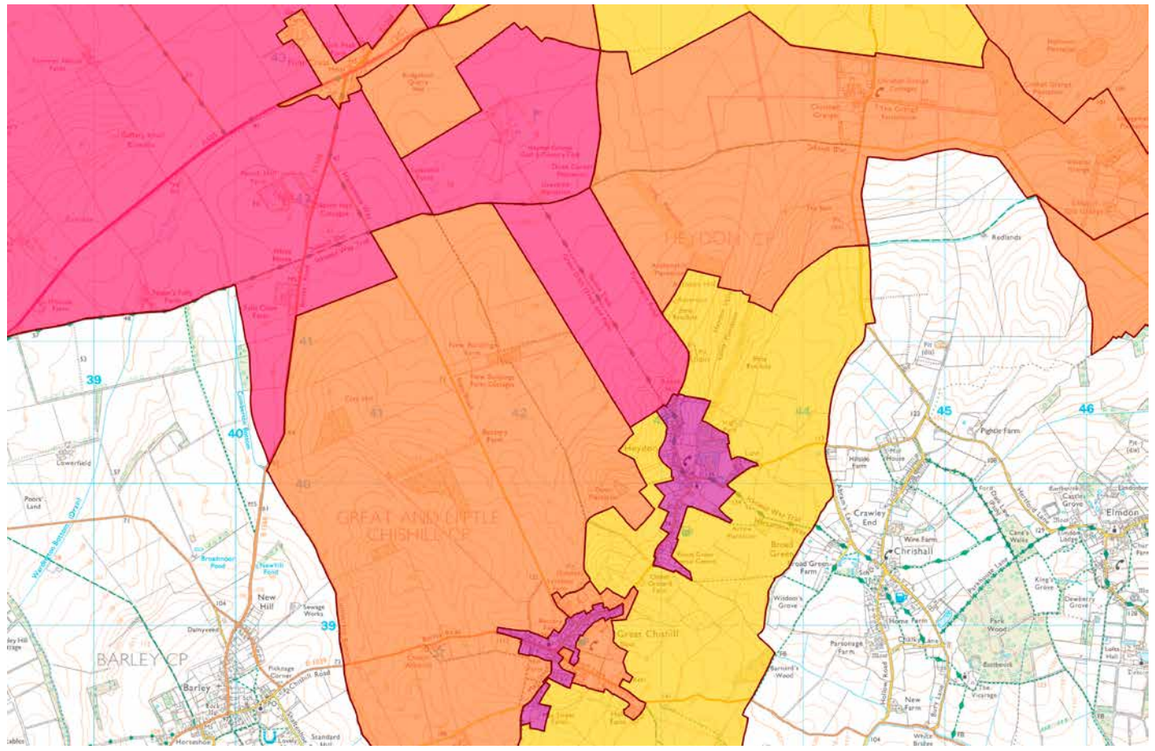
In developing the methodology, rather than reinventing the wheel, the Project team has been keen to stand on the shoulders of previous attempts to consider sensitivity at a large scale.

The images cover land around Great Chishill and Heydon in South Cambridgeshire, and reflect how differing concerns, such as protection of historic settlement cores, standing earthworks, sub-surface archaeological remains and the modernising effect of recent land use, need to be balanced. The maps show this area divided into Historic Environment Character Areas and illustrate how differing levels of sensitivity can be measured against the four different aspects (in all cases, the darker the colour, the greater the level of sensitivity). Sometimes sensitivity can be similar across all four aspects because proposed change would threaten each equally. An example would be a historic settlement core with well-preserved historic building stock and plot patterns (forming one Historic Environment Character Area) adjacent to a historic park (another Historic Environment Character Area): historic buildings, buried archaeology, landscape and setting would all be equally sensitive to a proposed change such as the development of a new town.

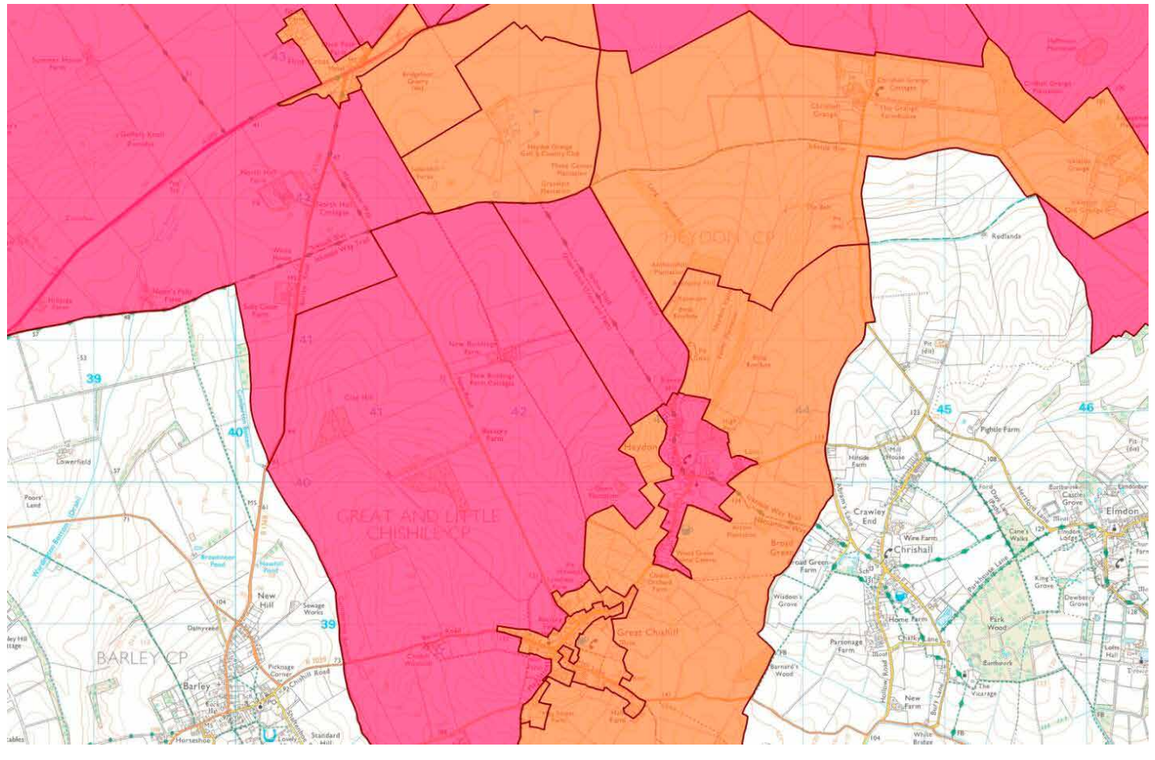
At first glance the areas shown in the figures look fairly coherent, with each village surrounded by fields, but closer examination indicates significant variation in both above-ground heritage assets and the historic landscape. For example, Great Chishill has a greater level of fringe expansion so is split into two Historic Environment Character Areas. That covering the historic core – a conservation area containing numerous listed buildings – has higher sensitivity (purple) and the other, the more modern outer fringe, is assessed as less sensitive (orange). >>

Below right: Shows overall sensitivity for the Great Chishill and Heydon area. Contains Ordnance Survey Data © Crown Copyright and Database Right 2023

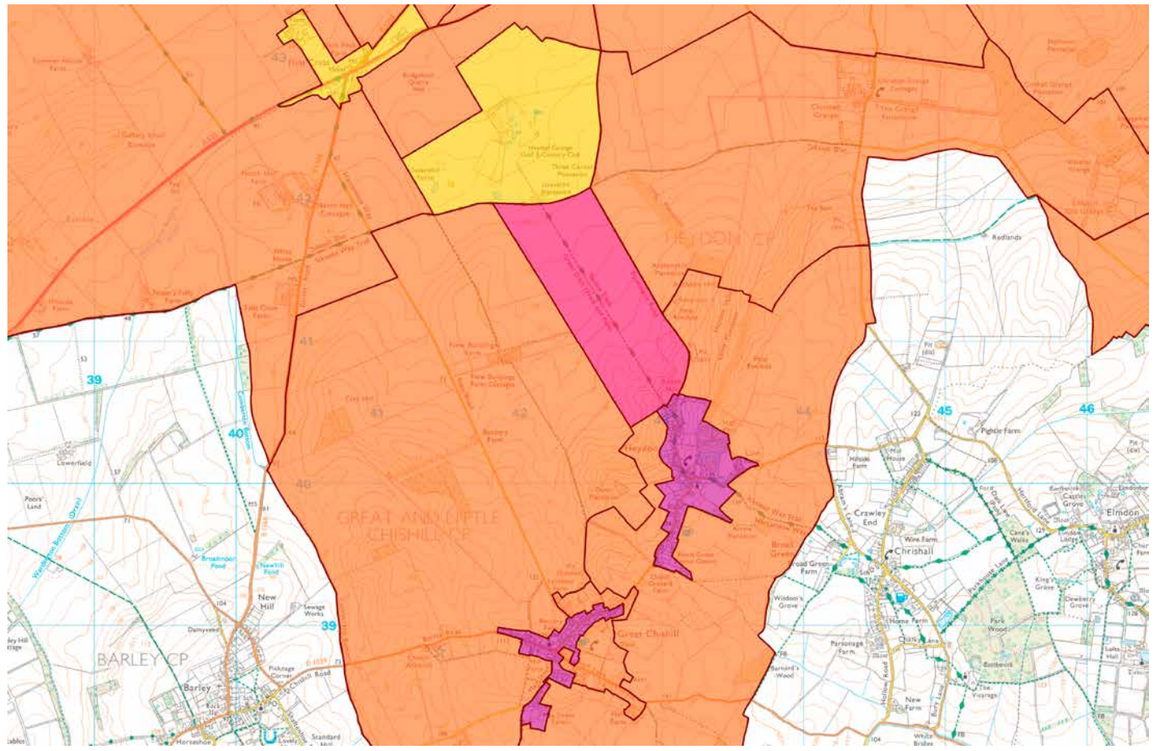




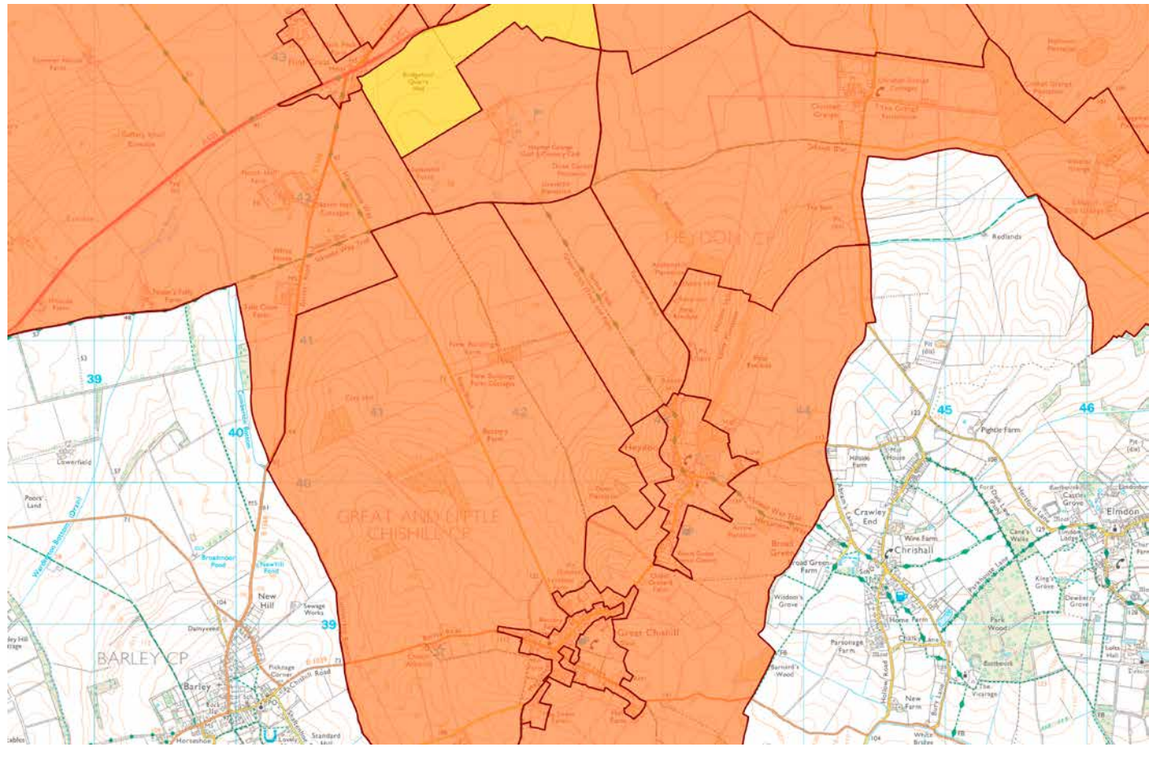
Top left: Above-ground' sensitivity for the Great Chishill and Heydon area. © Crown Copyright and Database Right 2023



Bottom left: Below ground sensitivity for the Great Chishill and Heydon area. © Crown Copyright and Database Right 2023



Above right: Historic landscape sensitivity for the Great Chishill and Heydon area. © Crown Copyright and Database Right 2023



Bottom right: Sensitivity of settings in the Great Chishill and Heydon area. © Crown Copyright and Database Right 2023

Above-ground assets in the surrounding landscape are limited to the Heydon Ditch, an early medieval land division and scheduled monument which runs northwest from Heydon, and listed buildings at current and former farms to the northwest of the villages. The Historic Environment Character Areas are assessed to reflect the potential impact of change. Those around the Heydon Ditch have a greater level of sensitivity (pink), while the adjacent fieldscapes generally have a similar and lower level of sensitivity as they are 20th century and later modifications to 19th century planned and post-medieval piecemeal enclosures (orange).

There is also significant variation in terms of known or potential buried heritage assets. Most of the land west of Heydon, including the village and Heydon Ditch, has a greater density of known assets, many identified though cropmark transcription or considered to have heightened potential by virtue of documented settlement since the early medieval period. These have a greater level of sensitivity (pink) than other Historic Environment Character Areas in the area (orange).

In setting terms, much of the area is relatively sensitive (orange) as most Historic Environment Character Areas border ones which contain designated heritage assets with sensitive settings. Overall sensitivity is assigned on the basis of which aspects of the Historic Environment Character Areaare most sensitive and is intended as a flag to highlight what is most crucial to understand about the Historic Environment Character Area as part of a consideration of large-scale change.

What are the project outputs?

The Project is nearing completion and its key end products will be:

- Sensitivity mapping and supporting texts for the Project area, for use by Historic England and local authority planners;
- Historic England Research Report explaining the Project methodology and results.

The report and mapping will include clear definitions of sensitivity levels and usage guidelines so that the outputs are used appropriately, that is as a preliminary assessment rather than a definitive statement of the significance of the historic environment across the Arc.

What other benefits will the Project have?

Technology, especially in GIS, has advanced since the early 2000s growth area studies, but nevertheless the Project has encountered significant methodological and data-use challenges. A key element of this has been resolving interoperability of data across the 11 Historic Environment Records in the project area.

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The challenges have been resolved by the Project team working in close consultation with Historic England and other stakeholders to agree changes to methods and reporting. As such, there is a rich range of lessons which can be applied in future strategic work, and the detailed methodology can be adopted and perhaps developed further by the historic environment sector.

One of the key methodological challenges for the project has been the usability and currency of data on the historic environment, whether designations data maintained by Historic England or local datasets, such as Historic Environment Records and local lists. Issues with these included differences in how the Historic Environment Records recorded similar aspects of the historic environment and inconsistency in applying monument thesauri. These made it hard to develop rule-based approaches to understanding sensitivity and meant that a lot more individual interpretation by project team members was required. Lessons learned from this process will also be valuable to those considering the development of a more automated and/or artificial intelligence-based spatial planning system.

Crucially, however, the Project demonstrates that it is possible to combine diverse datasets and specialist interpretation to create a strategic understanding of the sensitivity of all facets of the historic environment and support regional-level land-use planning. The rapid, high-level assessment of sensitivity permits issues affecting the historic environment to be considered at the earliest stages of planning major landscape change ■

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Melissa is an experienced historic environment consultant at LUC, a multi-disciplinary planning and design consultancy. Originally from an archaeological background, she has a strong track record in development assessments, setting, historic characterisation, strategic planning, landscape survey and heritage asset management. Her experience spans the UK and she has particular knowledge of the various approaches to characterisation, particularly in England, having been both a creator and user of characterisation datasets over the last 20 years.

Further information

https://historicengland.org.uk/images-books/publications/thames-gateway-historic-environment-characterisation-project-final-report

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London archaeology and characterisation

Challenges of complex townscapes and time-depth.

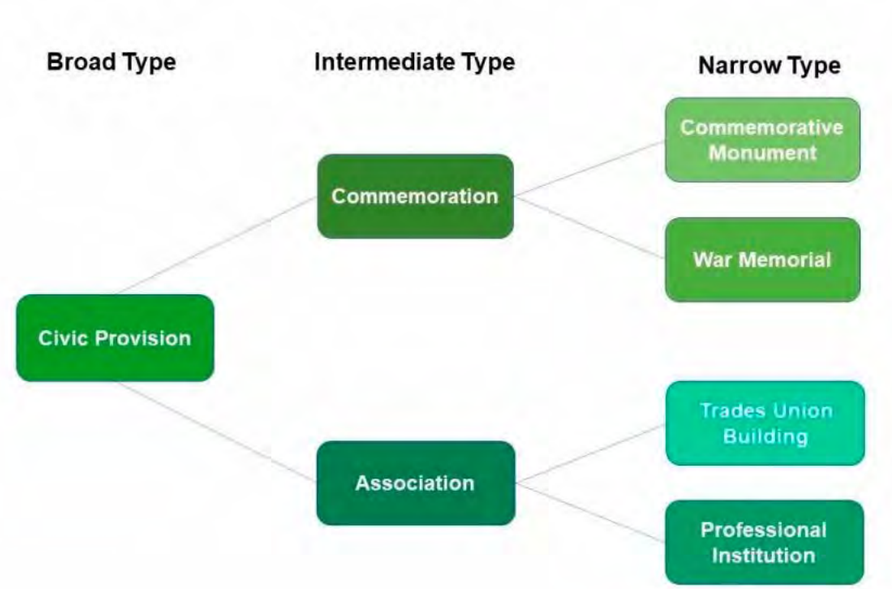
The City of London with Westminster and Southwark have been at the centre of English population, government and commerce for almost 2,000 years. Occupying a gateway into the British Isles, what is now inner London has successively been the capital of Roman Britannia, an Anglo-Saxon trading emporium, the principal town of the Kingdom of England, an imperial capital and a world city.

The Great Fire of 1666 kicked off expansion into the open countryside which has carried on for over 300 years only partially constrained by modern green belt policy. London's influence on land use has always extended well beyond its built-up area encompassing such things as transport links, mineral extraction, power and water infrastructure and places of recreation and burial.

Despite notable episodes of destruction, many historic buildings and places survive above ground, and below them the intensive occupation of inner London has created a great build-up of urban archaeological deposits of international significance.

London is an 'Alpha World City' with an exceptional combination of great urban time-depth, high heritage significance and demand for major development. These pressures manifest themselves in a myriad of ways: tall buildings and 'densification' of leafy suburbs change the character and appearance of historic places; deep basements and underground infrastructure threaten the archaeological resource; and even the green belt is impacted by mineral extraction and transport routes.

Over the past thirty years Historic England and its predecessor English Heritage have sponsored projects to encourage better recognition of historic character in strategic planning. 'Historic Landscape Characterisation' (HLC) has covered rural areas whilst in larger towns urban archaeological databases (UAD) or 'Metro-HLC' were supported. Until recently, Greater London largely stood aside from these national initiatives, either because they were not considered suitable or due to governance, financial and logistical challenges.



Above: London Historic Characterisation Thesaurus hierarchy shown with Civic Provision character types. © Historic England & LUC

New Initiatives

The adoption of the Mayor's new London Plan in 2021 placed greater emphasis on understanding local character, recognising it in new design, and securing greater public benefit from the positive management of all heritage assets, including archaeology the focus of this article.

Two related initiatives are currently underway that seek to enhance the Greater London Historic Environment Record by building upon exploratory work carried out intermittently over the last two decades. These are London Historic Characterisation and the London Urban Archaeological Database.

London Historic Characterisation

A classification framework for London Historic Characterisation has recently been set out in a thesaurus prepared for Historic England by Land Use Consultants. It follows the well-established approach of ascribing areas of townscape (or landscape) with a common developmental history to a hierarchy of 'character types' based on 'current character' with more limited recording of 'previous character' (*see above*).

A similar approach (known as 'London Rapid Historic Landscape Characterisation') was tried by English Heritage around 2006 and is now being refreshed by Land Use Consultants to provide a London-wide overview that can be refined by local studies within a consistent framework. A quirk of the Rapid Historic Landscape Characterisation was that much of central London was left blank in recognition that broad-brush characterisation suitable for the urban fringe, suburbia and industrial areas would not be appropriate to the complexity and fine grain of London's historic core. >>

London is an 'Alpha World City' with an exceptional combination of great urban time-depth, high heritage significance and demand for major development.

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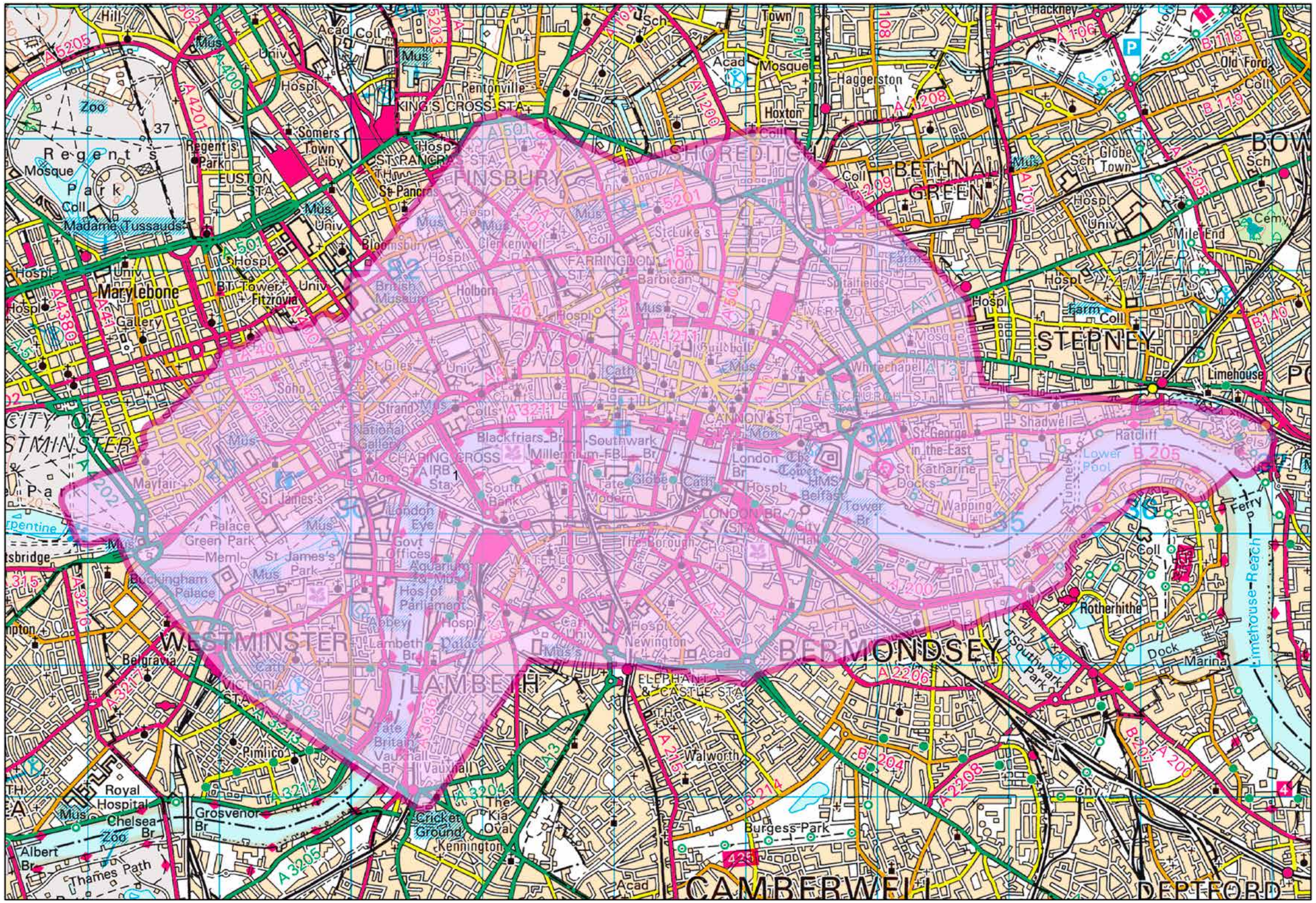

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London Urban Archaeological Database

The London Urban Archaeological Database encompasses the 17th-century built-up area and its immediate environs that were encircled by fortifications during the English Civil War. It therefore has to address the challenges of characterising all periods drawing on a wide range of evidence including built form, human and natural geography, buried archaeology and documentary evidence. Essentially the methodology involves creating a series of 'models' of London's evolution from prehistory to the present day, and the nature of surviving remains of archaeological interest.

In central London the intensity of historic land use is such that one can start with a presumption that something of archaeological interest will probably be present on a site unless removed by modern disturbance. This approach builds on the legacy of 'The Future of London's Past', a seminal publication of 50 years ago that included a set of overlay maps: essentially a Geographical Information System on paper (Biddle and Hudson, 1973).

The London Urban Archaeological Database is a programme of related projects commissioned independently that follow a common methodology. So far these building blocks comprise:

- A pilot study (stage 1) completed by Museum of London Archaeology (MOLA) in 2013.
- Stage 2 completed by MOLA in 2017, which mapped archaeological investigations conducted up to 31 March 2013.
- Stage 3a completed by Essex Place Service (EPS) in 2021, which focussed on the medieval core of Westminster and Whitehall, mapping survival and character in time depth.
- Further stages (3b and on) are planned.
- Work by archaeological consultants Mills Whipp, who are clarifying the location, form and survival of the Civil War defences.
- Several other projects outside the London Urban Archaeological Database area which have used or contributed to methodological development. >>

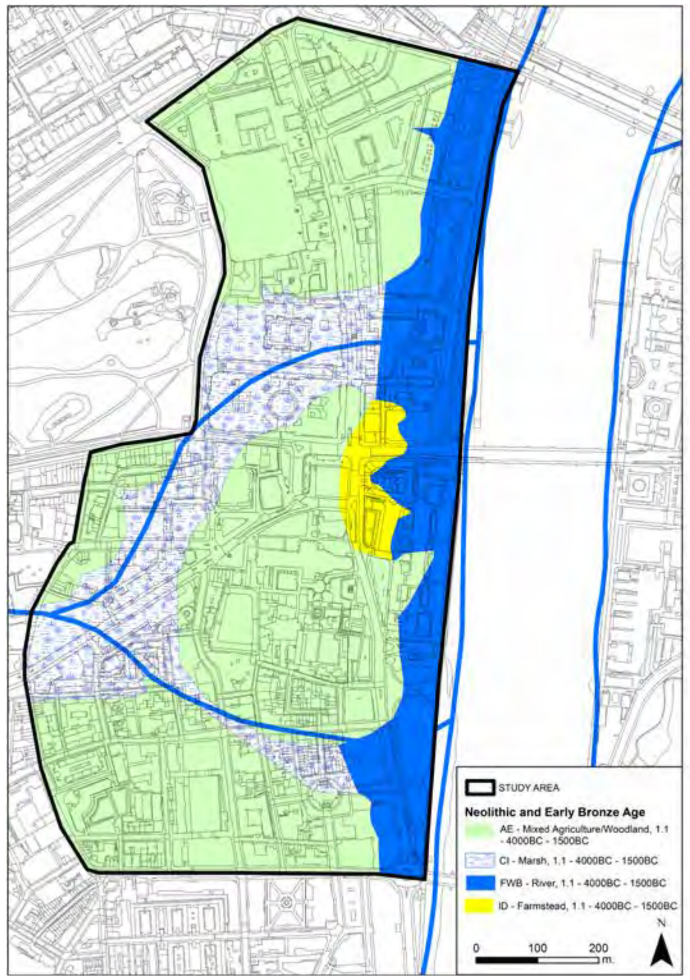
After mapping archaeological interventions, the next step was to adapt existing methodologies to enable deep time-depth characterisation consistent with the London Historic Characterisation Thesaurus. This approach also drew inspiration from 'Complex City', a study of urban character and design: published by Allies & Morrison with support from Historic England (Manning, J. *et al* 2020).

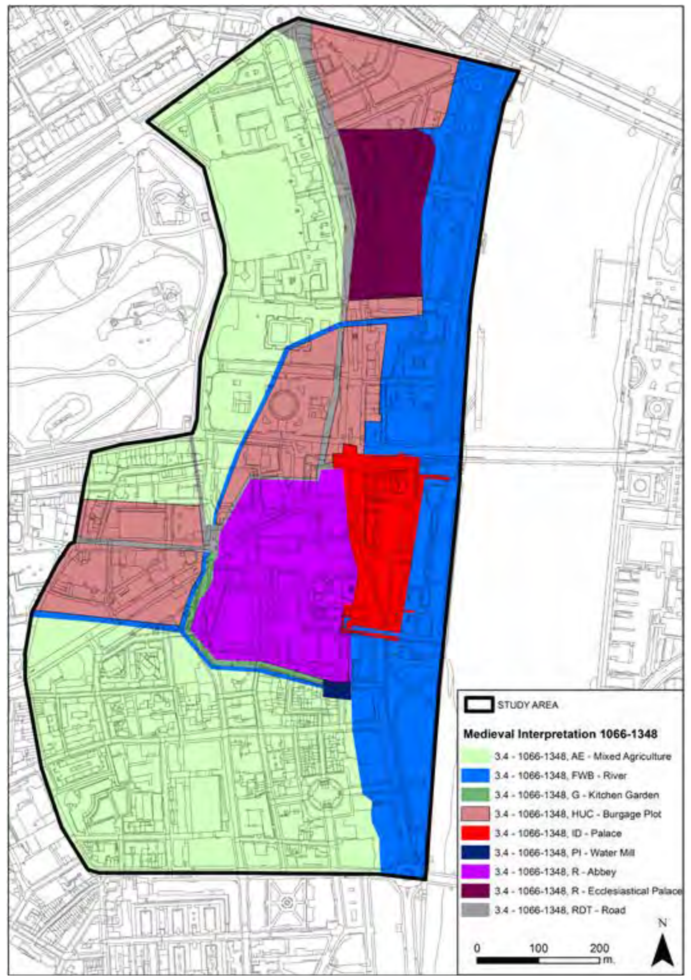
Unlike conventional Historic Landscape Characterisation, the London Urban Archaeological Database has adopted a 'time-slice' methodology consisting of six 'layers' drawn from those recognised by Allies & Morrison as defining the city's long-term development, and then further sub-divided into 21 epochs (*below left*). These epochs cover the pre-urban landscape (2), phases of urban construction (14) and incidents of widespread urban destruction (4). In practice this means each time-slice 'layer' has a GIS layer constructed using the thesaurus within which there are 'previous types' covering epochs before the primary one. Thus, the standard single Historic Landscape Character layer approach was expanded to six (*below right*). >>

Unlike conventional Historic Landscape Characterisation, the London Urban Archaeological Database has adopted a 'time-slice' methodology.

Urban Character Layer (after Allies & Morrison 2020)	Epoch number and defining characteristics	Approximate dates
6 20th Century Modernity	6.4 Globalisation and neoliberal free enterprise	1980 - now
	6.3 Post-war social state – council housing Greenbelt	1945 - 1980
	6.2 Second World War - Destruction	*1939 - 1945*
	6.1 Interwar expansion Metroland suburbs	1919 - 1938
5 Victorian Entrepreneurship	5.1 Victorian: Railways and Imperial Capital Expansion, terraced workers housing	1835 - 1918
4 Georgian Planning	4.4 Georgian & Regency: Post-Fire rebuilding/expansion Great Estates & Rural Enclosures	1667 - 1835
	4.3 Great Fire - Destruction	*1666*
	4.2 Civil War, Commonwealth & Restoration	1642 - 1665
	4.1 Reformation: Dissolution to Civil War Tudor Great Houses After-use of monastic houses	1540 - 1641
3 Medieval London	3.5 Late Medieval: Black Death to Dissolution	1349 - 1540
	3.4 Norman/High Medieval (Londres): Tower & Monastic Houses	1066 – 1348
	3.3 Late Saxon: London burh	886 - 1066
	3.2 Middle Saxon: Lundenwic	600 - 886
	3.1 Early Saxon: Sub/Post-Roman - Abandonment	*410 - 600*
2 Roman Londinium	2.4 Late Roman: Walled Londinium	200 - 410
	2.3 Early Roman: Londinium Post– Boudican/Pre-Wall	62 - 200
	2.2 Boudican Destruction	*60 - 61*
	2.1 Roman Conquest: Pre-Boudican foundation	43 - 60
1 Natural Landscapes (Prehistoric)	1.2 Later Bronze Age and Iron Age	1500 BC – AD 43
	1.1 Neolithic and Early Bronze Age	4000 BC – 1500 BC

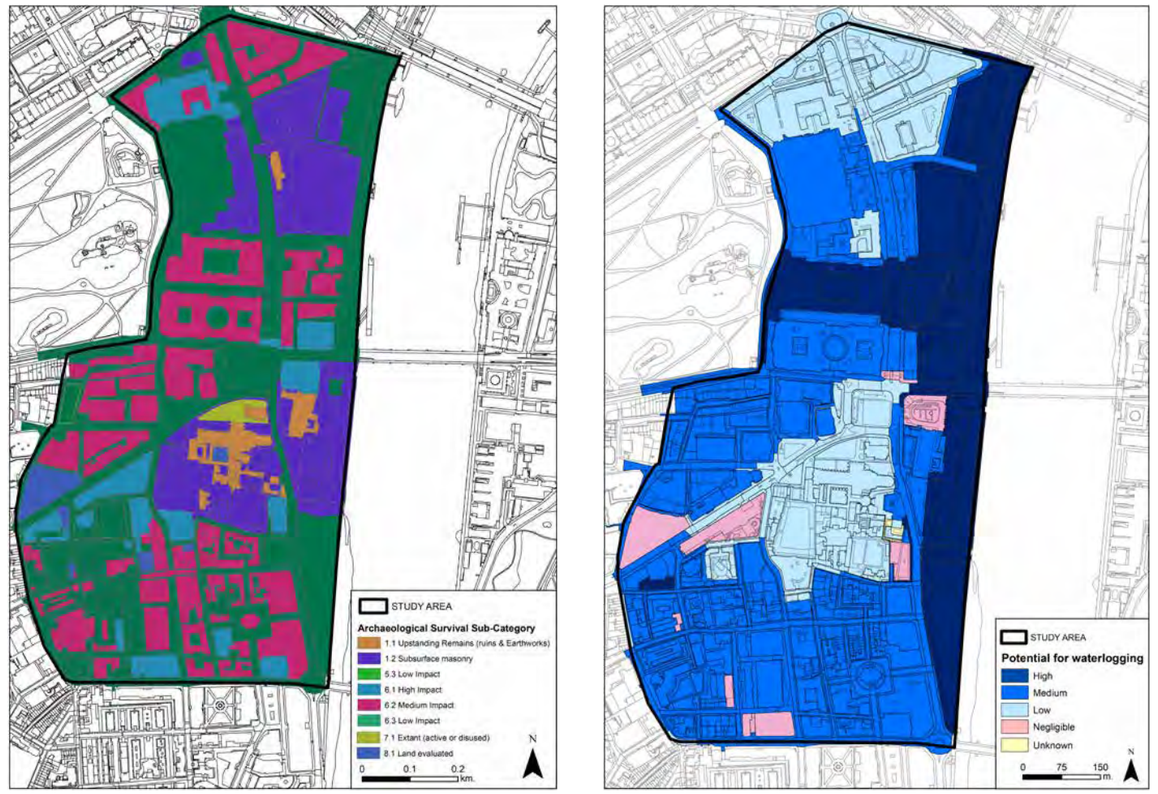
Above left: London Urban Character Layers.





Above right: Examples of Westminster and Whitehall Character Epochs 1.1 (Neolithic and Early Bronze Age) and 3.4 Medieval (1066-1348) left and right respectively. © Historic England

Above left: Preserved masonry revealed beneath Whitehall's streets. © Historic England



Above right: Westminster and Whitehall showing likely degree of archaeological survival (left) and potential for waterlogged remains (right). © Historic England/Place Services

Recording of archaeological survival and potential is rather piecemeal and unsystematic in modern archaeological practice. To remedy this, the London Urban Archaeological Database has tried a characterisation-like total coverage approach. Using a series of 'types' it distinguishes 'upstanding archaeology' (buildings, ruins and earthworks) and known below-ground remains from areas of varying potential reflecting likely disturbance from modern land use. For example, walls are known to survive beneath road surfaces (*above left*). Where deposits are expected to be deep, shallow basements would still be recorded as having potential. Potential for survival of waterlogged remains is assessed from previous interventions and consideration of topography and geology (*above right*). Some pragmatic decisions have to be made such as excluding Pleistocene deposits and 18th century and later buildings.

Mapping significance is probably the most challenging and controversial aspect of this type of study and one that we have yet to fully master for non-designated assets. Nevertheless recent casework has shown that systematic recording of planning-related judgments for major assets such as the city wall, Roman forum or monastic houses would help ensure consistent positions are adopted based on the significance of high-profile assets that normally extend beyond a single planning application boundary. In Westminster and Whitehall we explored character areas based on historical development patterns rated for presence, condition, significance and vulnerability.

In conclusion, the principles of sensitivity mapping can be applied to the finer grain of historic urban areas but methodologies need to be adapted to take account of time-depth and change. Understanding deep time-depth character can challenge popular perceptions of 'heritage' as an almost 'time-less' inheritance. It shows that change is part of urban character and suggest ways people and places can draw inspiration not just from what is around a site but what came before, or lies beneath ■

Sandy Kidd wishes to thank the Wood consultancy and Heathrow Airports Ltd for sharing their methodology for characterising archaeological survival.

The author

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Further information

Globalization and World Cities Research Network https://www.lboro.ac.uk/microsites/geography/gawc/world2020t.html

Historic England London Urban Archaeological database Project webpage https://historicengland.org.uk/services-skills/our-planning-services/greater-london-archaeology-advisory-service/database-project/

Historic England Historic Characterisation pages https://historicengland.org.uk/research/methods/characterisation/

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Archaeological sensitivity mapping

Developing a methodology for understanding where future significant discoveries may be made.

Construction for HS2 near Aylesbury, photographed in 2021.
© Historic England Archive, 35121_005

The planning background

Since 1990 the English planning system has made provision for the assessment of archaeological remains in any location subject to a planning application in order to enable informed decisions on development consent. The present National Planning Policy Framework (NPPF) emphasises the positive contributions the historic environment can make to sustainable development and recognises that heritage assets, a subset of which are archaeological, should be either preserved in situ or recorded prior to harm in order to advance understanding, for the benefit of present and future generations.

This developer-funded system has been a great success story, contributing to the wellbeing of people and communities, boosting public engagement with the historic environment, and highlighting local distinctiveness[1].

In 2020 a government white paper proposed planning reforms whereby areas of land could be pre-allocated for development. This would have put an onus on providing more upfront archaeological information at an earlier, strategic level of spatial planning, in particular the Local Plans produced by local authorities, implying a need for existing evidence to be used more systematically in order to identify locations of greater and lesser potential for significant archaeology.

An area-based approach

Although the white paper's land categorisation has not been taken forward, an area-based approach to mapping potential could still be a useful strategic planning tool and help us to understand the likely impacts of other forms of large-scale landscape change such as afforestation or 'rewilding'. Recent archaeological policy initiatives, including Historic England's project with the Chartered Institute for Archaeologists' '21st Century Challenges', recognise the importance of improving the information available when the principle of development is considered. Making better use in planning of Historic Environment Record information and the wide range of other spatial data now available could help us reduce risk (both to archaeology and developers), tell better stories by promoting research and synthesis, and deliver wider public benefits, for example by taking better account of archaeology in design codes and green infrastructure. >>

Above: Large-scale 'rewilding' of former arable land at Knepp, West Sussex. (Image: J. Last)

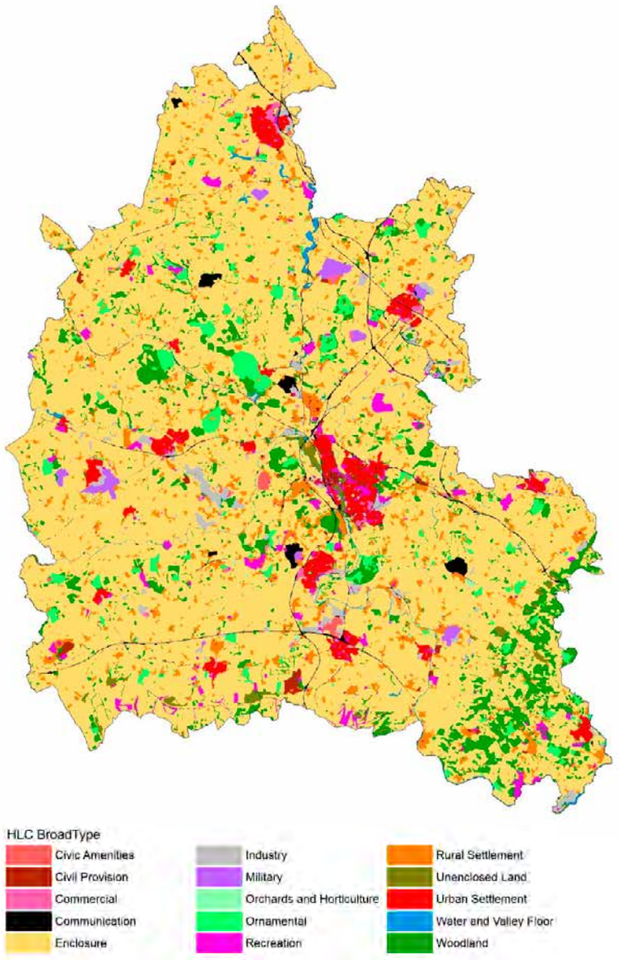
An area-based approach to mapping potential could still be a useful strategic planning tool and help us to understand the likely impacts of other forms of large-scale landscape change such as afforestation or 'rewilding'.

Modelling archaeological potential

Historic England's approach to archaeological sensitivity mapping, developed through a number of pilot studies, therefore aims to provide a broad methodology to ensure archaeological potential receives better and earlier consideration in plan-making, thereby providing greater levels of certainty at plan consent stage and helping local authorities to balance their dual responsibilities for protecting heritage and enabling growth.

Predicting where significant remains are likely to occur is, of course, far from straightforward, and archaeology will always remain in part a process of revealing the unknown.

Predicting where significant remains are likely to occur is, of course, far from straightforward, and archaeology will always remain in part a process of revealing the unknown. Indeed, the 'excitement of discovery' is seen as part of the public value of archaeology, referenced positively in Historic England's Places and Wellbeing strategies. But there have long been efforts to reduce the likelihood of potentially costly unexpected discoveries by approaches that map, characterise, model or predict archaeological sensitivity, potential or risk (the choice of terminology is often dependent on the viewpoint of the user). However, the lack of an established approach to such mapping reflects the varied nature of archaeological data, particularly the highly uneven distribution of current knowledge. The blank zones on traditional archaeological distribution maps conflate areas which are believed (as far as possible) to be lacking in significant remains with areas about which little or nothing is known (pseudo-absences). Experience over the last thirty years has shown there are few large areas in England that are truly archaeologically blank but the character and density of remains varies considerably, as demonstrated by the English Landscapes and Identities (EngLaId) project. We can therefore use the patterns of previous discovery to make evidence-based assessments of potential that attempt to understand where significant discoveries are more likely to be made in the future.

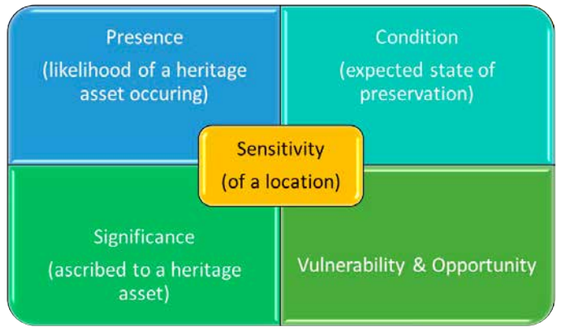


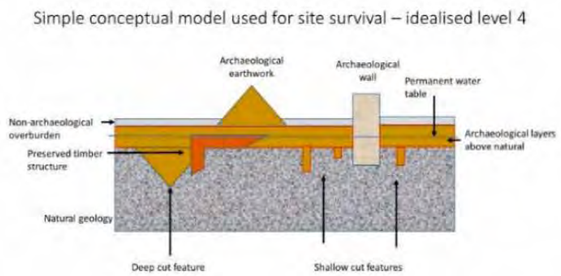
The outputs of such modelling need to look more like historic landscape characterisation, which assigns the entire landscape to a category based on extant historic character, i.e. there are no blank areas. On the other hand, although historic landscape characterisation includes some time depth (maps of 'previous character') this is generally restricted to what can be inferred from post-medieval maps, and therefore provides little evidence for significantly earlier archaeological periods. Developing a form of characterisation for archaeological evidence (of all periods) would emphasise the deeper history of the landscape; remains may vary hugely in significance, survival/condition and visibility but very few areas will have zero archaeological potential.

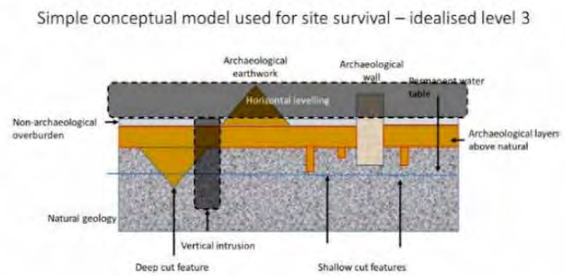
Left: An example of HLC mapping – the Broad Types for Oxfordshire (from https://www.oxfordshire.gov.uk/residents/environment-and-planning/archaeology/landscape-characterisation). © Oxfordshire County Council

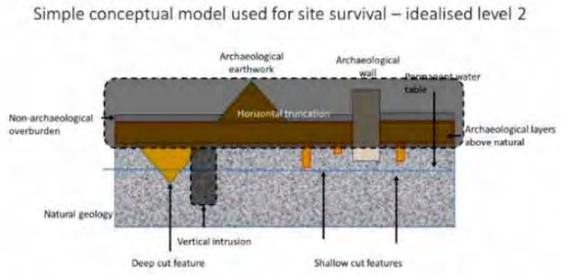
Right: The sensitivity model. © Historic England

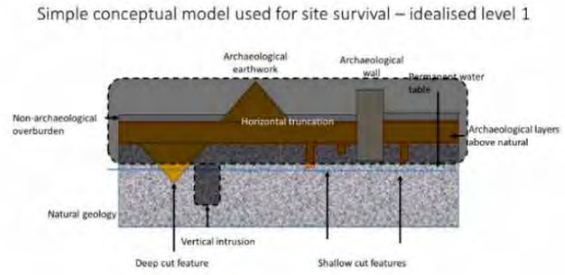
Below right: Conceptual model of different levels of site survival from 1 (heavily truncated) to 4 (well-preserved). © Historic England











Our approach follows landscape assessment techniques in defining sensitivity as a combination of judgements of the value of an asset, or potential asset, and its susceptibility to a proposed or envisaged change.

From potential to sensitivity

However, whether we can develop a sufficient understanding of the character of the continuous archaeological record to determine in advance of development where the 'hotspots' are more likely to be, and thereby target investigation and conservation efforts accordingly, is only part of the question, since 'sensitivity' implies more than just modelling locations. Our approach follows landscape assessment techniques in defining sensitivity as a combination of judgements of the value of an asset, or potential asset, and its susceptibility to a proposed or envisaged change. The model has four components. the first two of which can be characterised as objective qualities of an asset: its presence (whether something is actually there) and condition (related to both the depth of stratigraphy and the burial environment). The other two components are more contextual: significance, which may be related to criteria for national importance and/or current research priorities for an area, and vulnerability/opportunity, which are linked because they both relate to the impact of a given change scenario. >>

None of these aspects of sensitivity is straightforward to analyse, but they can be approached in a systematic manner that goes well beyond a simple plot of Historic Environment Records data. The likelihood of assets of different type or period being present can be assessed by identifying areas that offer the same range of characteristics or affordances where such assets have been encountered in the past. (In this context 'affordances' being the qualities and attributes of a place or environment that provide opportunities for people or other organisms).

The likely condition of an asset, should one be present in a given area, can be estimated from soil characteristics and land-use history. Significance could be mapped by identifying areas with greater likelihood of producing assets of national importance, or potentially in the future by developing research frameworks that are map-based rather than purely textual. Finally, the sum of the different aspects of potential (presence, condition and significance) needs to be assessed in terms of vulnerability to the nature of the proposed landscape change.

None of these aspects of sensitivity is straightforward to analyse, but they can be approached in a systematic manner that goes well beyond a simple plot of Historic Environment Records data.

Above: Map of presence indicators for part of the Vale of Aylesbury, Buckinghamshire: limestone geology (yellow), archaeological notification areas (light pink), historic settlement cores (brown), conservation areas (orange), registered parks (green) and alluvium (blue). The circles represent buffers around scheduled monuments (dark pink), high points (brown), medieval churches (crosses in circles) and listed buildings (turquoise). Base map © Crown Copyright [and database rights] 2023. OS 100024900. Other © Historic England

Clearly the amount and quality of Historic Environment Record data in a given area will influence the usefulness of a model; those produced for our pilot studies have varied from quantitative estimates of the number of assets per square kilometre, where data is extensive, to simply mapping biases in the known data (such as the uneven distribution of previous investigations), where it is sparser.

Any model might therefore identify areas where not enough is known to allow an informed judgement of potential but keys to improvement include the availability of large-area development-led fieldwork results, that can serve as detailed 'case studies' representative of a wider area, and systematic aerial mapping surveys, which provide a consistent baseline level of information.

The pilot studies undertaken in Buckinghamshire, Essex, East Yorkshire and Cumbria suggest that sensitivity models need to cover between about 100 and 300 square kilometres in order to gather sufficient data for pattern recognition without becoming unwieldy or conflating patterns across different landscapes.

While there is more to do to produce models that meet the objectives of being robust, easy to deliver and simple to understand, for example by using more sophisticated spatial analysis techniques, the work so far has demonstrated that such an approach is feasible at the scale of a local plan. It produces results that are more transparent than the application of ad-hoc expert judgement, though all models require verification by such expertise. Sensitivity mapping is a complement to, not a replacement for, established field evaluation techniques because it operates at a larger scale and lower resolution. However, in the context of net-zero policies better upfront assessments could improve the efficiency of evaluation exercises by reducing the outlay on fieldwork. We hope the pilot studies will be seen as inspiration for further model-building that will help ensure the historic environment is fully considered when designing or managing future landscape change ■

The authors

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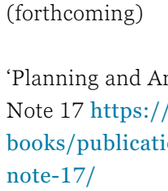

Jonathan is a prehistorian and landscape archaeologist who has worked in various roles for Historic England (formerly English Heritage) since 2001. He is currently Landscape Strategy Adviser in the Archaeological Investigation Team.

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Further information

Kidd S and Last J : 'Archaeological Sensitivity Pilot Projects' **Historic England Research Reports Series** (forthcoming)

'Planning and Archaeology' Historic England Advice Note 17 https://historicengland.org.uk/images-books/publications/planning-archaeology-advice-note-17/

The Roman Landscape Characterisation and Prediction project

Harnessing the potential of existing knowledge to develop predictive models of Roman settlement.

The quantitative and qualitative explosion in archaeological data since the 1990s provides an unparalleled opportunity to improve our understanding of landscapes and to venture into the unexplored field of archaeological site prediction. Interestingly, with the publication of a revised National Planning Policy Framework (NPPF) in 2021 requiring local planning authorities use their Historic Environment Record to 'predict the likelihood that currently unidentified heritage assets, particularly sites of historic and archaeological interest, will be discovered in the future' (paragraph 192), this project gained additional relevance. Of course, the required predictive process can and is being undertaken routinely by local government archaeological officers and other heritage professionals, albeit often on an intuitive basis. However, as the volume of data continues to balloon, the ability of the human brain to reliably process and extrapolate becomes increasingly questionable – machine-based predictive models can provide evidence-based models to assist the decision-making process.

The Roman Landscape Characterisation and Prediction (RoLCAP) project, has developed several models addressing Roman rural settlement in areas across central and southern England. Now in its fifth year, it has two main themes: the characterisation of the Roman rural landscape at a local scale, and the prediction of where yet-to-be-discovered Roman farms and villas might be found. Together they provide a methodological approach to enable informed, landscape-scale responses to land use change. Given sufficient computing power and adequate relevant data, 'characterisation' (the identification of key aspects of farm location and morphology) can be a relatively straightforward, if somewhat time-consuming, process. This essential first step enables a better understanding of the landscape, and, at least until machine learning is let loose at scale on archaeological literature, forms an essential first step to developing predictive models. In short, we need to fully understand the known resource in order to build useful predictive models.

Above: MOLA excavation of Roman farming enclosures at Blaise Park, Milton, near Didcot. © MOLA

Untapped potential

The last decade or so has seen increasing frustration amongst academics and heritage professionals that the dividend of more than thirty years of archaeological investigation has generated plenty of new 'blobs on maps', but has generally failed to move our understanding of Roman agriculture at a regional landscape scale forward; vast quantities of evidence were (and still are) languishing largely untapped.

This frustration saw a team from Reading University and Cotswold Archaeology develop the 'Rural Settlement of Roman Britain Project', analysing published and 'grey lit' excavation reports to inform a wide-ranging reassessment of the countryside of Roman Britain (Smith *et al* 2016).

In parallel, at the University of Oxford, the 'English Landscapes and Identities (EngLaId) project team drew on almost every English Historic Environment Record, Historic England and Portable Antiquity Scheme data to investigate landscape change from 1500 BC to AD 1086, taking account of the influence of 'events' (individual episodes of archaeological work) and the resulting 'characterful' datasets on which archaeological interpretations are based (Gosden *et al* 2021). >>

Exploring Roman farming

Haven't the Roman Rural Settlement Project and English Landscapes and Identities EngLaId projects said it all? Well, not quite - we still know relatively little about the detailed nature of agriculture carried out across Roman Britain, and about whether and how this varied on a regional basis: were these farms engaged in an almost fortuitous mix of arable and stock farming, which, in a good year, generated sufficient surplus to eat well and pay taxes, and in a bad year resulted in hunger and tax defaults. Or had generations of farming experience developed specialised strategies, with stock and crops balanced to soil type, resulting in a regular surplus? Is the often-presented idyllic view of the Roman countryside even vaguely accurate? The Roman Landscape Characterisation and Prediction project aims to better understand the influence of cultural aspects, topographic factors and 'events' on our interpretations, and attempts the prediction, at a variety of scales, of farm locations.

We still know relatively little about the detailed nature of agriculture carried out across Roman Britain.

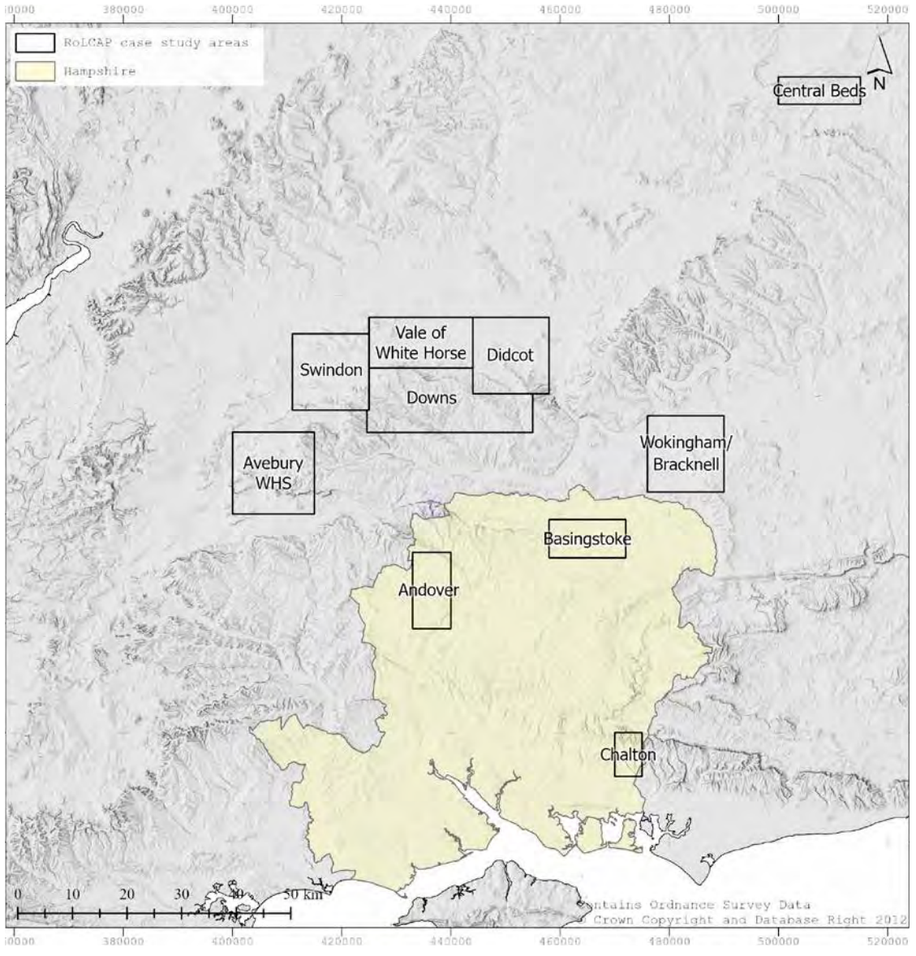
Above left: Lullingstone Roman Villa, Kent. Aerial view reconstruction by Peter Urmston of the villa in its landscape as it may have appeared in the later fourth century. But how comprehensive is the evidence base for images of landscape reconstruction? © Historic England Archive, PLB_W090337

Roman Landscape Characterisation and Prediction Project: Nuts and Bolts

Initially, three Study Areas each 14 kilometres by 14 kilometres (196 square kilometres), centred on urban growth areas in Berkshire (Wokingham/ Bracknell), Oxfordshire (Didcot) and Wiltshire (Swindon) and known to have been subject to numerous 'events' were selected. These were subsequently augmented, as new research questions arose, by further study areas including those linking the Didcot and Swindon Study Areas and complementing data from the 'Atlas of Hampshire's Archaeology'.

For more information see an explanatory GIS 'story map'.

Probably the most significant statistic generated by the project has been the calculation of a series of farm densities per square kilometre by soil type and geology, with a parallel set of density figures for field systems. These figures, once contextualised through a consideration of 'event history' within each study area, underpin the characterisation process and subsequent predictive modelling. >>



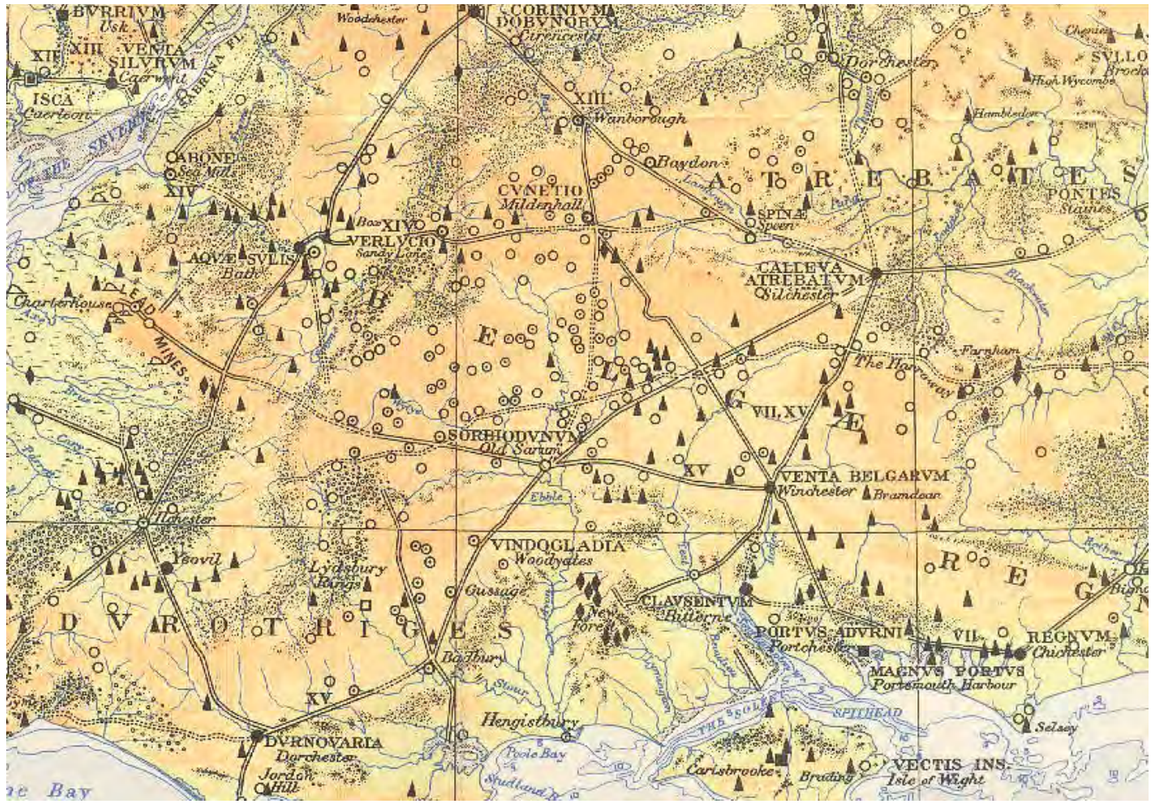
Above right: RoLCAP Study Areas and area covered by the 'Atlas of Hampshire's Archaeology'. © RoLCAP

Towards a better understanding of the Roman landscape

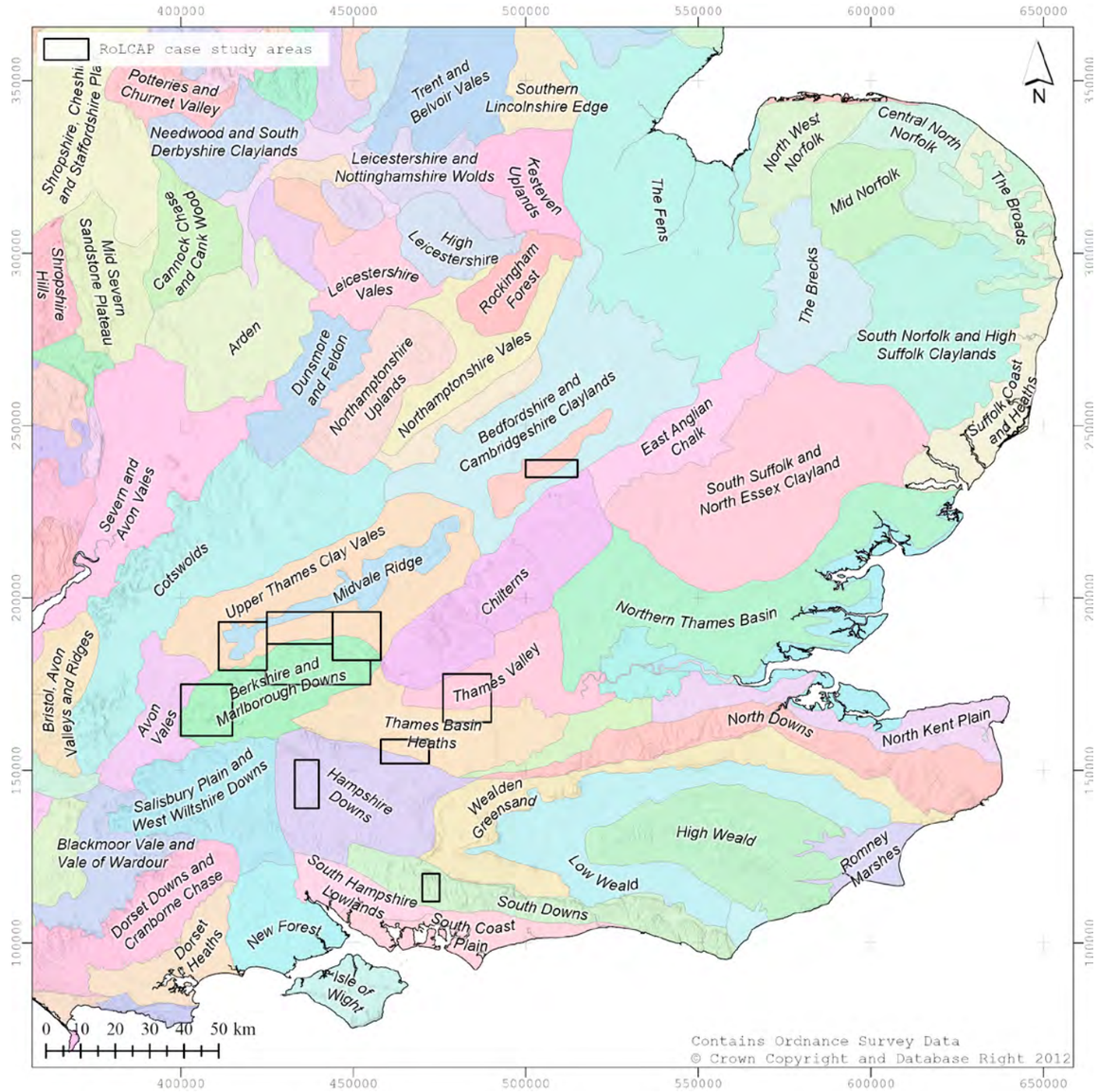
Evidence from Roman Landscape Characterisation and Prediction project's 1,500 square kilometres of Roman rural landscape strongly suggests that the rejection of 'geographic determinism' by geographers and archaeologists in the mid and late 20th century may have 'thrown the baby out with the bathwater'. Thus, whereas in the 1920s and 1930s, OGS Crawford and other landscape-focussed archaeologists took an association between settlement pattern, farming, vegetation, soil and topography for granted (see for instance the Ordnance Survey Map of Roman Britain of 1928 (2nd edition) prepared under Crawford's direction; subsequent generations have largely ignored these interrelationships and somewhat of a theoretical vacuum has pervaded Roman studies. Analysis by the Roman Landscape Characterisation and Prediction project suggests a rebalance is needed; results suggest that geology, soil type and other topographic factors are fundamental to the location of farms and the character of farming across the landscape. >>

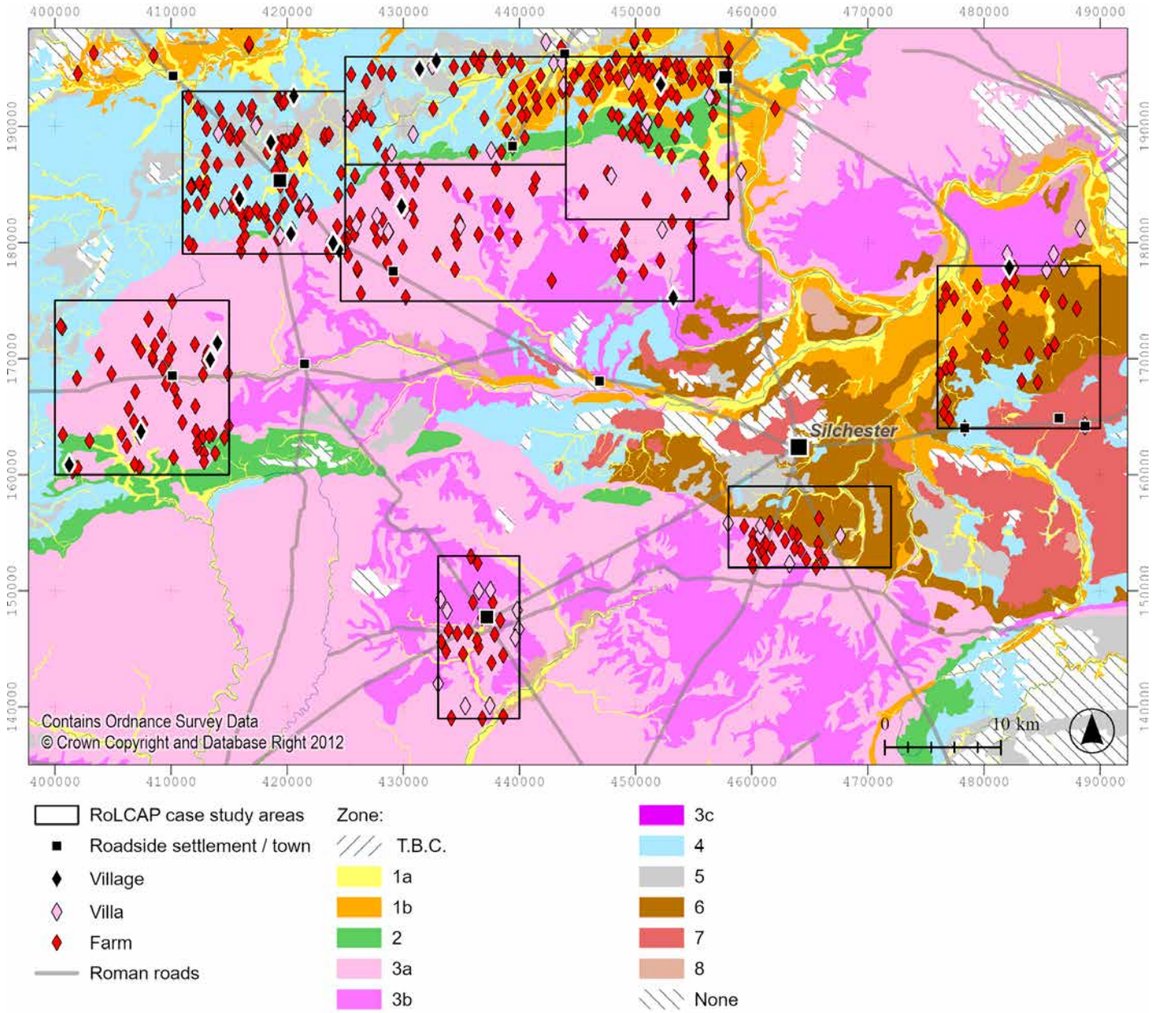
Within the framework provided by Natural England's National Character Areas, the Roman Landscape Characterisation and Prediction project has built a picture of different settlement patterns and farming regimes.

Below left: Ordnance Survey Map of Roman Britain (1928 2nd edition) including portrayal of forest and marshland. The OS note that ''regions of natural woodland (dense or open) are marked and have been restored upon a geological basis''. © Ordnance Survey



Below right: National Character Areas showing RoLCAP Study Areas. © RoLCAP





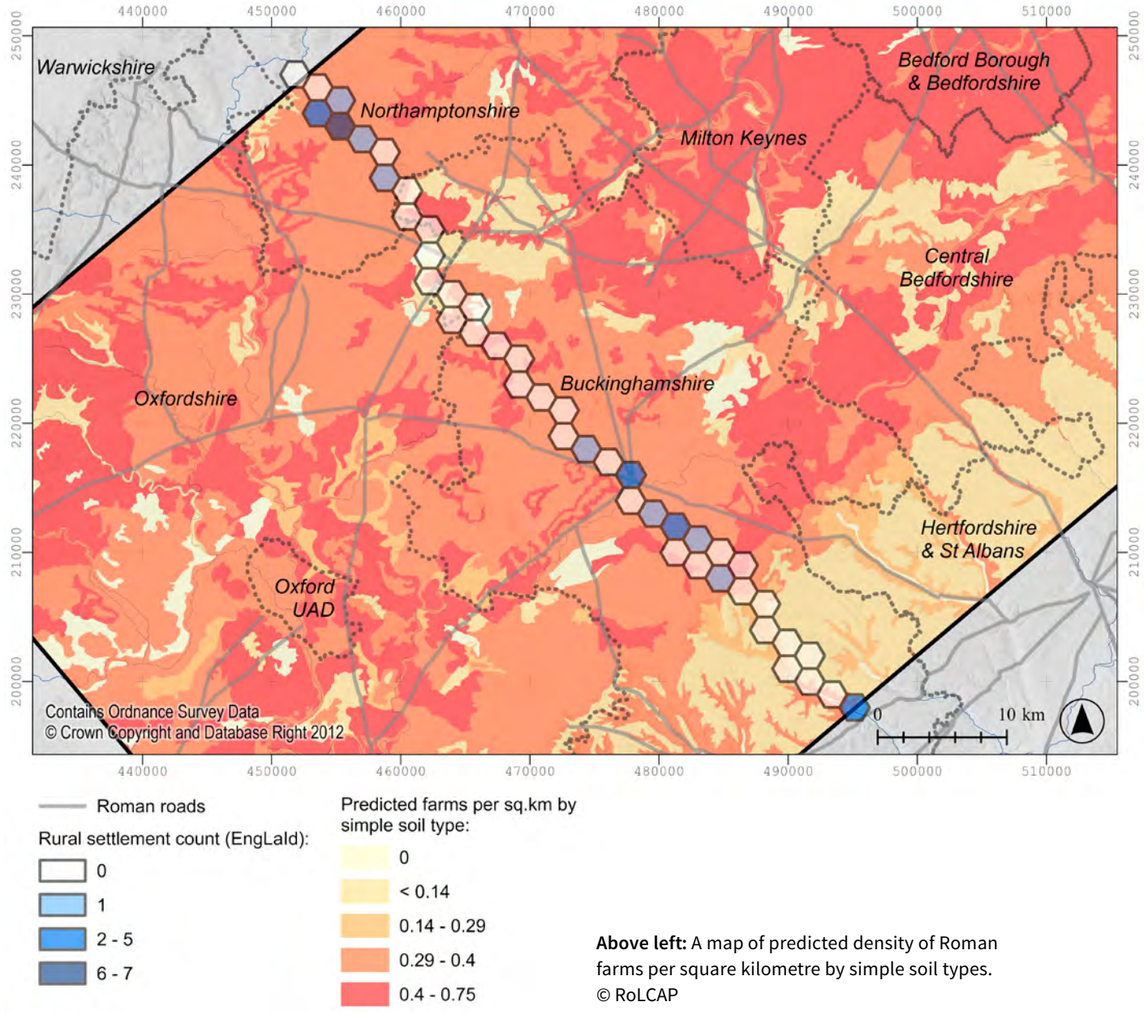
Above: Character Zones (colour-coded) interpreted from farm density data within study areas (Zone 1a: Thames Floodplain; 1b: Thames gravel terraces; 2: Upper Greensand; 3a Berkshire & Marlborough Downs; 3b: Chalk capped by Clay with Flints; 4: Clay Vales; 5: Midvale Ridge; 6: London Clay; 7: Acidic sandy Heathland -3c & 8 not yet characterised). © RoLCAP

Within the framework provided by Natural England's National Character Areas, the Roman Landscape Characterisation and Prediction project has built a picture of different settlement patterns and farming regimes. For instance, Character Zone 1b (Thames Gravel Terraces/Sutton 1 soils) is evidenced by the highest farm density per square kilometre by geology and soil type, a fully settled and farmed landscape by the late Iron Age, with continuity of late prehistoric settlement and field systems until reorganised in the early 2nd century AD. The mid/late Roman landscape comprises an intensively farmed landscape centred on farmsteads, with surrounding field systems, trackways and unenclosed areas of pasture, village-scale settlement and villas. All settlement types have easy access to water supply and access for stock, via trackways, to unenclosed pasture and nearby floodplain hay meadows. Archaeobotanical material evidences a wide range of cereal crops, with some centralisation of crop processing implied by millstones. Farms in this Zone average around 100 hectares and palaeoenvironmental evidence suggests woodland had been completely cleared, with lime and other individual trees probably confined to hedgerows. In contrast, Zone 6 (London Clay) is characterised by a largely empty Iron Age landscape, a low density of artefact-poor (Roman) farmsteads, limited field systems, an absence of villages and villas, and an average farm unit size approaching 1500 hectares – large scale cattle farming within a heavily wooded environment is suggested.

Crystal ball gazing or sound science?

Several innovative predictive models have been developed and tested. Initially, farm densities on nine soil types around Didcot were used to predict the potential number of farms on similar soil types in the Swindon Study Area. Historic Environment Record data for the Swindon area was then used to test the predicted farm values. Interestingly, although farm density values differed subtly between areas, the hierarchy of preferred and less-favoured soils (high farm values and low farm values) was virtually identical, with differences explained (but difficult to quantify) by differing 'event histories' and proximity to the Roman road network.

At a landscape scale, farm densities by (simplified) soil type from around Didcot were applied to similar soil types in the Oxford-Cambridge Arc (an area for which the government is developing a framework for sustainable economic growth). The model generated is rudimentary, and is undoubtedly flawed, being based largely on data from outside the modelled area. However, this obvious short-coming has subsequently been partially rectified by the inclusion of data from a small study area within the Arc (in Central Bedfordshire) and, following the provision of recent archaeological data from the HS2 route across the Arc, further testing and refinement of the model is proposed. Nevertheless, the methodology enables the identification of areas of high, medium and low potential for Roman rural (farm) settlement across numerous local authority areas. >>



Above left: A map of predicted density of Roman farms per square kilometre by simple soil types. © RoLCAP

Where next?

Further work is needed to test the evidence base and characterisation process in other National Character Areas. Meanwhile, an increasing understanding of the pitfalls of predictive modelling gained from the current phase of validation, and the continued flow of new data from excavations will add further refinement, improvement and reliability to this predictive modelling tool.

Conclusions

In addition to providing a much-improved understanding of Roman agriculture across different landscapes in central and southern England, the Roman Landscape Characterisation and Prediction project provides a novel methodological approach to predictive modelling which could assist strategic decision makers assess the archaeological implications of large-scale development proposals and other land use change. The assessment of large-scale landscape change, particularly those extending across several local authority boundaries, is currently hindered by multiple data sources and the uneven distribution of archaeological events resulting often in misleading distribution maps and a likelihood of unexpected discoveries or unrecorded damage to archaeological assets. Needless to say, predictive modelling is unlikely to ever prove 100% reliable, however, it can provide comprehensive evidence-based opportunities at a strategic and local level to identify areas of potential where further survey and investigation might be targeted ■

In addition to providing a much-improved understanding of Roman agriculture across different landscapes in central and southern England, the Roman Landscape Characterisation and Prediction project provides a novel methodological approach to predictive modelling which could assist strategic decision makers assess the archaeological implications of large-scale development proposals and other land use change.

The author

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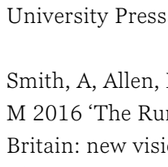

Paul's professional career has spanned the development of archaeological record systems from card indexes and hard copy maps to digital Historic Environment Records (HERs) and geographic information systems (GIS). Following the publication of PPG16 in 1990, Paul became one of the first consultants offering archaeological advice to landowners and developers. Following retirement in 2016, he became a Research Associate at the University of Oxford investigating Roman agricultural landscapes and, with Dr Chris Green, exploring landscape-scale predictive modelling. The RoLCAP project developed these themes and now forms the subject of Paul's DPhil.

Further information

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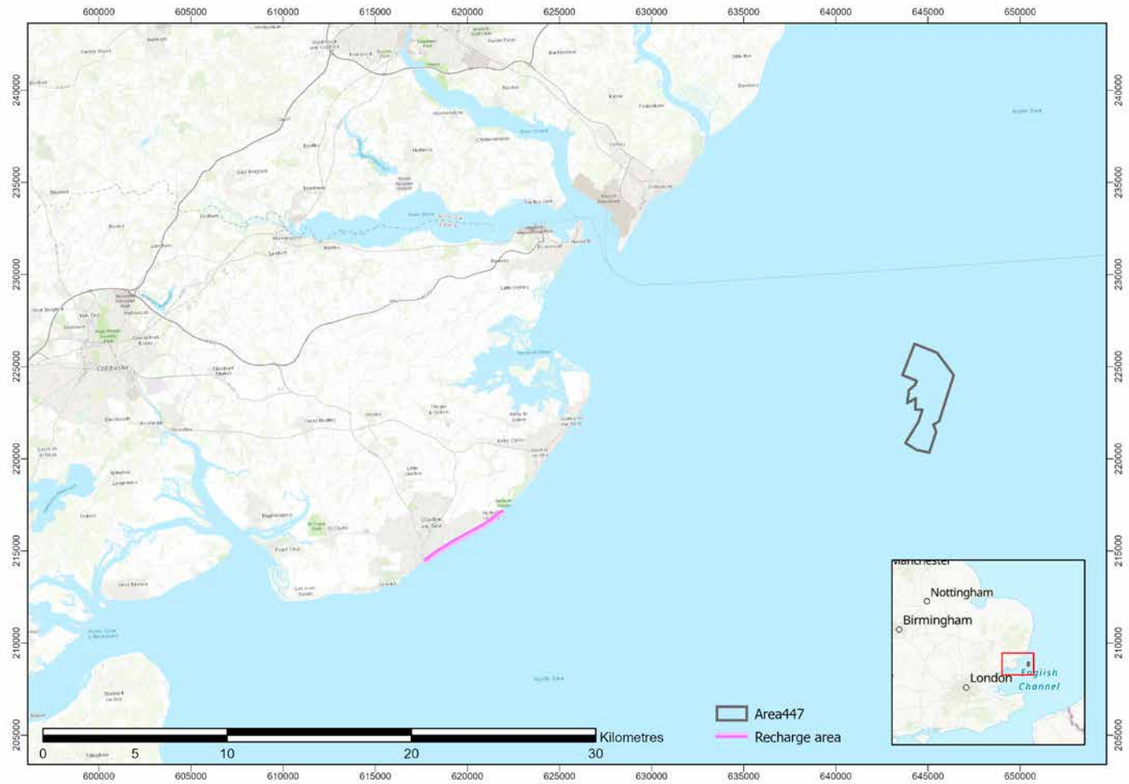
Beach replenishments as windows into submerged Pleistocene landscapes

Evidence of landscapes and lifeways from the distant past brought to light during replenishment of Essex beaches.



Above: Location map showing the extent of the beach recharge and location of Area 447.
© Rachel Bynoe

Introduction

For the last half million years of the Pleistocene, ending about 11,700 years ago, climates fluctuated dramatically in response to glacial–interglacial stages, with cooler temperatures leading to a drop in global sea levels and the exposure of large areas of continental shelf as habitable landscape. These include the North Sea, where for much of the Pleistocene emergent landscapes were criss-crossed by river systems draining the surrounding uplands. Given the high correlation of ancient rivers with Palaeolithic archaeology onshore, it is reasonable to assume that the deposits associated with submerged Pleistocene rivers may also be archaeologically rich. It is these submerged deposits, the archaeology they contain, and the ways that we locate, investigate and protect them, which formed the basis of an investigation funded by Historic England with the support of Tarmac Marine, Hanson Marine, CEMEX and Boskalis Westminster.

How do we gain access to a record that is underneath metres of often murky, inaccessible water? This lack of visibility is a significant issue facing archaeologists interested in submerged prehistoric archaeology but, ironically, it is often destructive commercial exploitation of the seabed that brings the archaeology to light. Much of the sand and gravel targeted by the aggregate industry is derived from these submerged Pleistocene river courses, with an increasing proportion used for beach nourishments to mitigate the threat of coastal erosion. Between 2014 and 2015, the 5 kilometre long shorefront from Clacton Pier to Holland Haven, Essex, received sands and gravels pumped directly from a 9.2 square kilometre area of seabed, 18 kilometres east of Walton-on-the-Naze, called ‘Area 447’ (*above*). >>

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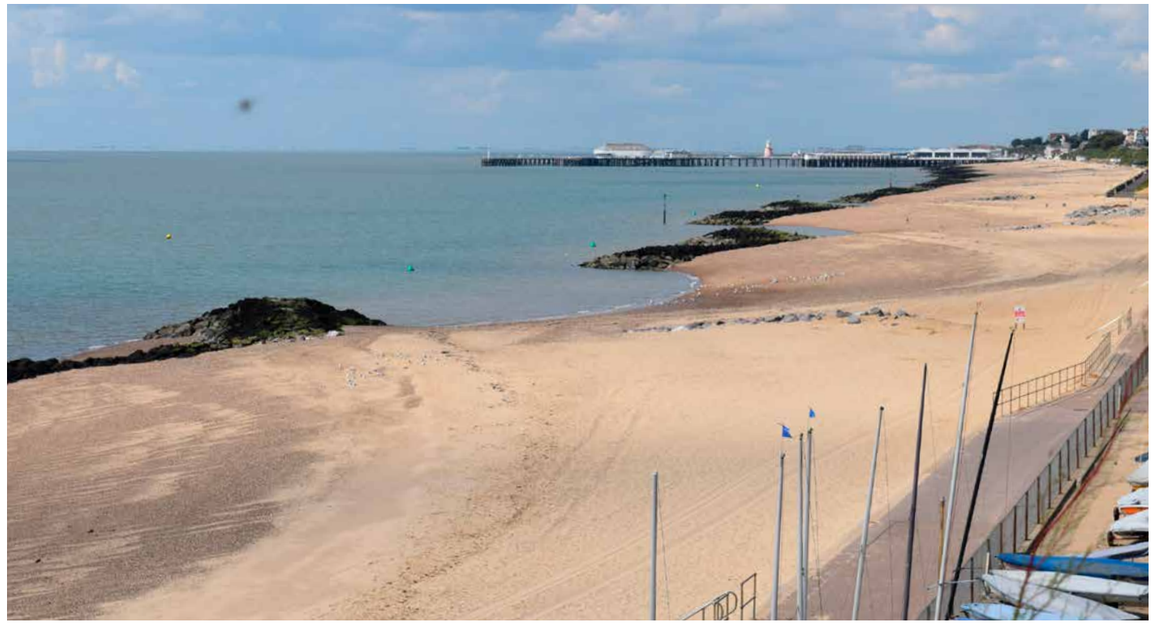

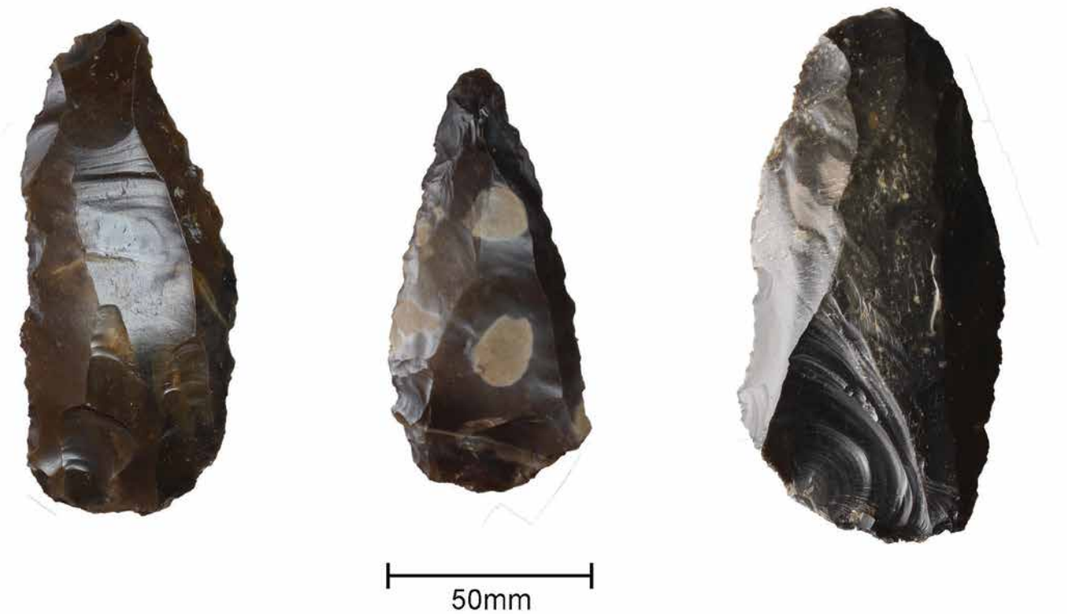

Above left: Comparison photos from before (top) and after recharge (bottom), courtesy of Tendring District Council.

One of the key elements of these nourishment schemes is that they are, by their nature, public and highly visible; the aggregates are spread out over a large area open for people to 'beach-walk' (*above*).

As a result, after the newly formed beach at Clacton re-opened, a community of collectors—subsequently a vital part of this project—began to find large numbers of stone tools and mineralised mammalian remains (*right*). Importantly, a significant component of the stone tools are 'Levallois', a flint-knapping technology that (in Britain) is associated with the Neanderthals, emerging around 300,000 years ago and persisting until around 200,000 years ago, a relatively poorly represented period (*above*). >>

Top right: A small selection of the large numbers of stone tools and bones that have been found. © Rachel Bynoe

Bottom right: Examples of Levallois stone tools from Area 447. © Rachel Bynoe

The archaeology

Levallois technology is interesting not only because it is specific to a particular period, but also for what it implies behaviourally. It has been argued that it reflects increased levels of forward planning and mobility; a different way of perceiving and using the landscape based on the way the raw material is extracted, exploited, transported and discarded. The tools from Area 447 are likely to reflect relatively expedient activity, inferred from the way they have been made, and the relatively fresh condition is also a clue to their depositional environment: this was not a high-energy setting (ie not involving fast-moving, agitated water courses) but something along the lines of a floodplain, where the stone tools experienced little movement after being discarded. A relatively small number of handaxes and non-Levallois stone tools exhibit more abrasion, indicating they are from different deposits and, probably, different time periods.

The species of fauna recovered from the beach are indicative of a cool, open environment dominated by woolly rhino, mammoth, horse and deer (*below*). Mammoth molars appear to be from the last glacial period (after about 115,000 years ago), but some of the horse remains are indicative of larger specimens, found from around 270,000–200,000 years ago. As with the stone tools, that the bones are not all from one period is supported by differences in their condition.

While we therefore appear to have a low-energy location yielding the Levallois material, the wider area that has been dredged comprises deposits from a range of environment types and ages.

How can we understand where this came from?

The significance of this archaeology made its re-contextualisation a priority: could we use aggregate company data to understand its original location, depositional environment and age? The data comprised geophysical data (multibeam bathymetry and sub-bottom profiler- techniques that measure the depth and shape of submerged terrain), complemented by track plots from the dredge head (so we knew where it had been) and logs from sediment coring, with some cores physically available.

From the sub-bottom it appears that the main area of dredging targeted a thin veneer of deposit overlying bedrock (London Clay) cut by a large palaeochannel (an ancient river system) dated by previous work to about 116,000 years ago (*below*). The veneer of sands and gravels must therefore be older than that date, fitting current timeframes for Levallois in Britain. >>

Below left: Examples of bones from some of the prevalent animal species found. © Rachel Bynoe

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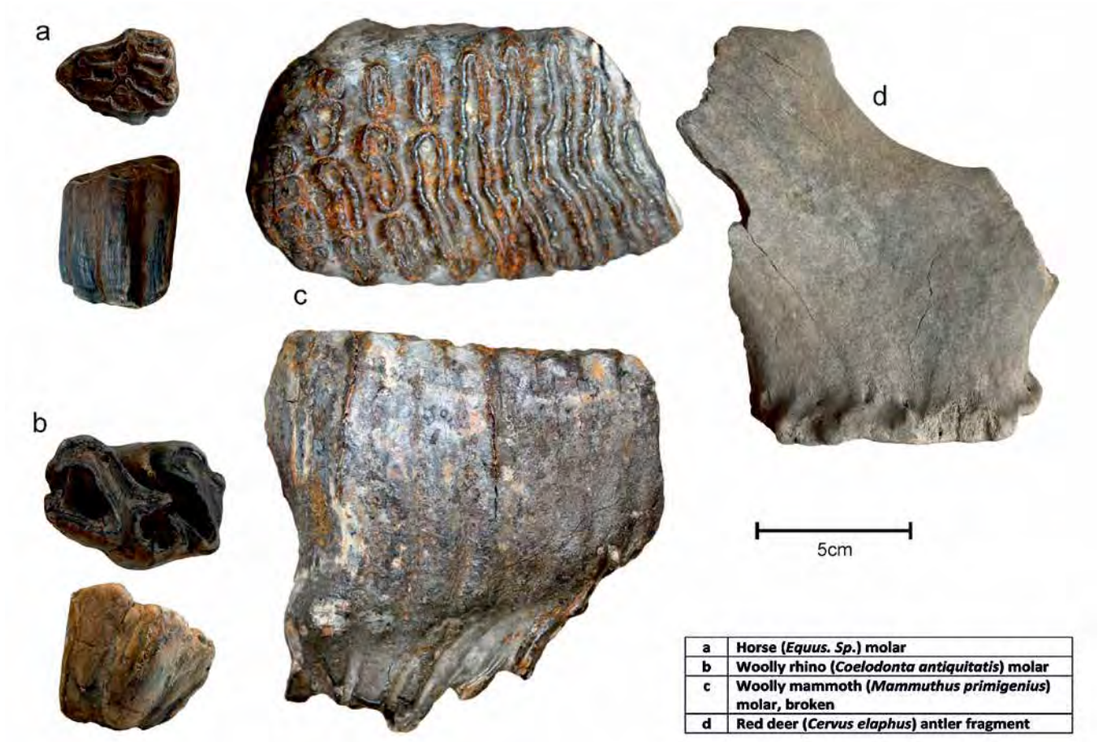
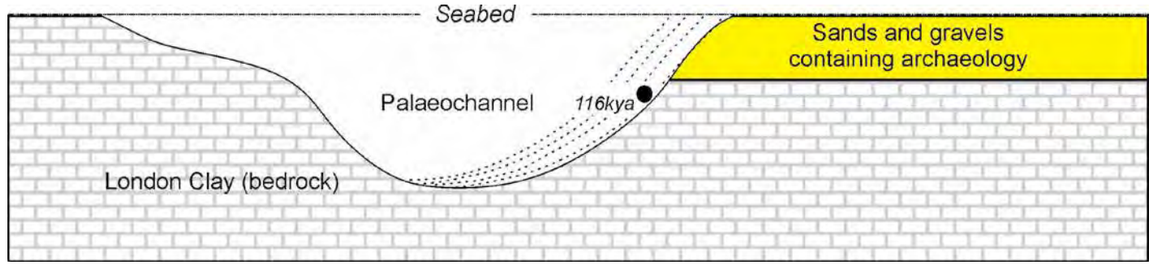
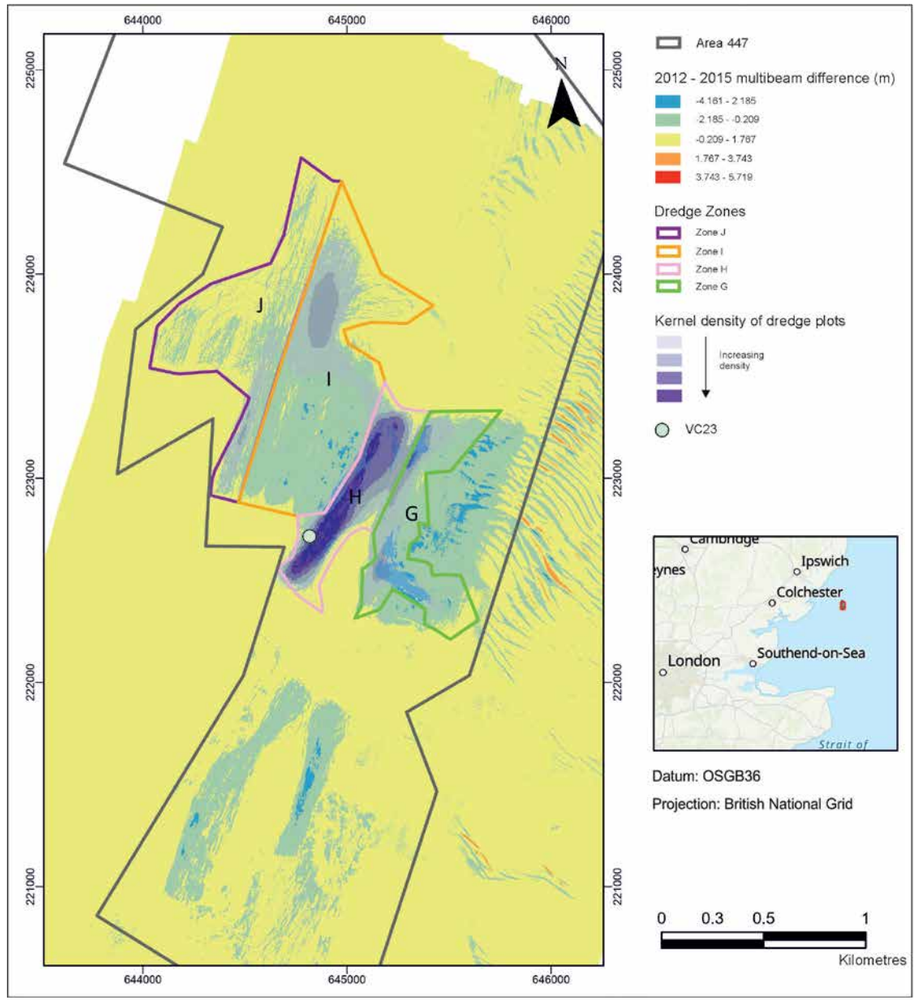


a	Horse (*Equus. Sp.*) molar
b	Woolly rhino (*Coelodonta antiquitatis*) molar
c	Woolly mammoth (*Mammuthus primigenius*) molar, broken
d	Red deer (*Cervus elaphus*) antler fragment



Above right: Schematic showing the relationship of deposits in the main area of interest, with the date taken from deposits associated with the ancient river system, as part of a previous project in the area. © Rachel Bynoe

Right: Close-up of Area 447 showing the main dredging zones, the difference in height between the multibeam bathymetry from 2012 and 2015, and the density plot of dredge head activity. VC23 is also shown within Zone H.
© Rachel Bynoe



Left: Photograph of VC23, courtesy of CMS Geotech, Hanson Marine, Tarmac Marine and CEMEX.

Where within this dredged area, though, did the Levallois archaeology come from? The multibeam datasets showed us where the majority of the seabed had been lost through dredging. Combined with a density analysis of the dredge-head plots, which showed where most dredging had occurred, this pointed to a specific 'zone' from which the majority of sands and gravels had been extracted (*above*).

Assessment of the sediment core logs showed only a handful that contained what looked like low-energy deposits that could have yielded artefacts in a fresh condition. One of these cores–VC23–was chosen for analysis based on its fine-grained, well-preserved, thick sequence (*right*). Significantly, VC23 also sits within the high potential 'zone' identified through the geophysics, and is, as such, a best guess of where the Levallois artefacts originated.

What were the environments like?

Sedimentary and palaeoenvironmental evidence shows that the area represented by VC23 was estuarine with brackish saltmarsh and a mosaic of habitats nearby, from beaches, dunes and floodplains to woodland and marsh; a varied and resource-rich environment. The species present point to a stage late in an interglacial, as the climate was starting to cool.

Importantly, despite the sediment cores being split and stored for five years before sampling, paired mineral luminescence dating was successfully carried out, providing dates of around 200,000, which confirmed this was a period when sea levels were dropping, landscapes emerging and temperatures cooling. >>

Archaeological implications and strategy

The dating is significant for two reasons. First, it places the archaeology at a time just before Neanderthals abandoned Britain for nearly 150,000 years. Second, it is comparable with the reassessed dates of Area 240, another Neanderthal site from the North Sea. Are these sites offering glimpses into the gradual movement of Neanderthals into newly exposed landscapes and towards warmer climates?

These sites also highlight the sensitivity of submerged landscapes to commercial exploitation: the archaeology reported here was found because it was spread across a public space, while Area 240 was found due to a different serendipitous set of circumstances. How much of the record is being otherwise missed? With the increasing exploitation of the seabed, particularly as we move towards Net Zero, and the difficulties of working with a fragmented, ephemeral record at a landscape scale, this is a reasonable concern.

The submerged prehistoric record is challenging to work with, but proposals emerging from this work offer ways to improve our chances of success, alongside adherence to current guidance on best practice. Recommendations include the proactive development of geotechnical sampling strategies for areas of dredging, and engagement with local collectors prior to beach nourishment. This would allow regular beach-walking of newly emplaced sands, with mobile phone GPS records facilitating linking beach areas back to specific points on the seabed. Following current guidance this could then define exclusion zones while archaeological potential is assessed.

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Conclusions

The way we work with submerged landscapes has seen huge progress in recent years, largely driven by evidence for the preservation of a record stretching back into Pleistocene time. However, we are acutely aware of the increasing threat to these landscapes and of the nascent nature of our methods for investigating and protecting them. The location of fragmentary but landscape-scale archaeology cannot be easily predicted, so a combination of proactive and reactive approaches, closer ties with industry, and a flexible outlook to amending methods is key to developing effective mitigation and harnessing the latent potential of these landscapes to tell the story of our hominin ancestors ■

We are acutely aware of the increasing threat to these landscapes and of the nascent nature of our methods for investigating and protecting them.

The author

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Rachel specialises in submerged Pleistocene landscapes.

Further information

Bynoe R, Grant MJ, Justin Dix K, 2022: 'Strategic Support for Marine Development Management: Palaeolithic archaeology and landscape reconstruction offshore' **Historic England Research Reports Series** 90/2022 https://historicengland.org.uk/research/results/reports/90-2022

Assessing sensitivity, capacity and opportunity in the wider historic environment

Can the historic landscape be more fully involved at the earliest stages of planning for large-scale landscape change?

Approaches to change

The European Landscape Convention requires ratifying governments, like the UK's, to care for the whole landscape, including the everyday and degraded. How can the whole historic landscape be more fully involved at the initial and strategic scoping stages of assessing sensitivity to and capacity for large-scale change involving, for example, major industrial development, infrastructure projects (transport, energy, water, etc) and extensive house building? >>

Left: Bright spring leaves highlight areas of new broadleaf planting at Moresk, St Clement, Cornwall: fitted into a medieval pattern of fields containing older hedge trees. © Pete Herring

The historic landscape also has a significant role to play in urgently responding to the climate and biodiversity crises. This was stated succinctly by Historic England's Chief Executive, Duncan Wilson, who said that 'the scale of the climate change challenge can feel overwhelming, but our heritage is part of the solution, and will inspire practical solutions for a more sustainable way of life, today and tomorrow' (**Our Climate Change Strategy**, March 2022).

Many responses to change will be at the heritage asset level. Those who care for monuments, buildings and conservation areas have long drawn on investigation and selection when negotiating change: investigation improves understanding of the development, character and significance of places and features, and selection supports protection and involvement in the detail of decision-making. Responses to the climate change challenge will, however, involve much larger areas and new types of change, including rewilding and various forms of flood alleviation; new vulnerabilities and sensitivities; and, most significantly, new opportunities.

Assessing sensitivity

Historic England commissioned a review (Herring, 2022) of how Historic Landscape Characterisation (HLC) has been used when assessing the sensitivity of different types of place to the effects of particular forms of change (*below*). All approaches to assessment recognise that there is no inherent sensitivity of a place, or type of place, to all change scenarios because the effects of each act differently on character, distinctiveness, patterns and fabric. For example, a medieval field pattern will have different sensitivities to rewilding, installing solar farms, or laying out new roads. Sensitivity assessments therefore concentrate on establishing degrees of vulnerability, and capability, in relation to each form of change.

Historic England supported development of Historic Landscape Characterisation, which describes the whole historic landscape, because it could be used, amongst other applications, as a spatial framework for such strategic assessments. Historic Landscape Characterisation Types are identified through attributes like historically-derived morphology, pattern, age and condition, all relevant when considering the effects of change.

A consolidated approach to sensitivity assessment that will form the basis of forthcoming Historic England guidance involves four stages:

1 Explore the change scenario, especially its likely effects on fabric and character.
2 Consider the vulnerability of each type of place (eg Historic Landscape Characterisation Type) to those effects, or its capability of being positively affected by the proposed change.
3 Assess how the attributes of the HLC Type that contribute to its significance are affected by the effects of the particular form of change.
4 Drawing together the above, present recommendations that guide decisions and action (*below*). >>

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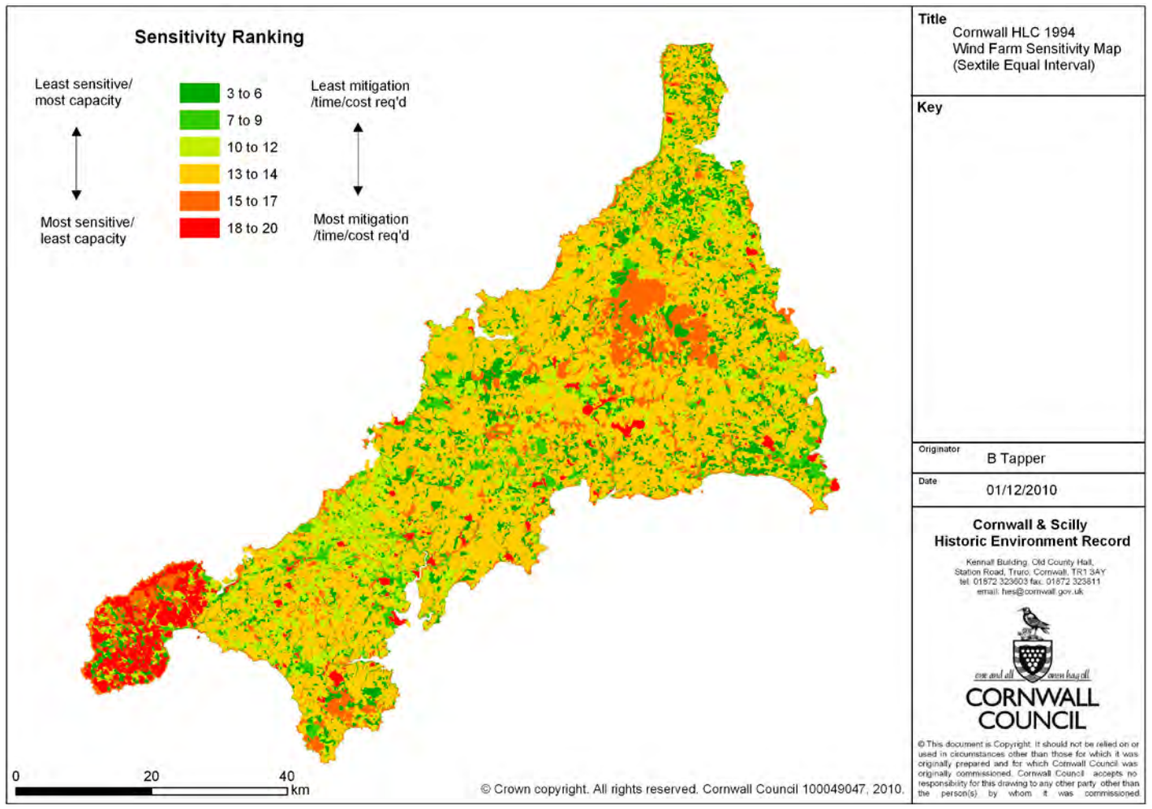


Above left: Wind-farms: Cornwall's HLC showing sensitivity and capacity. Traffic-light scheme (green, amber, red) also summarises expense involved in mitigating impacts on the historic environment. © Cornwall and Scilly Historic Environment Record

Above right: Sensitively slotting modern communication antennae on Ebrington Hill, Warwickshire. © Pete Herring

Opportunity modelling

Historic England and the Environment Agency have recently explored how sensitivity assessment may be adjusted to also support 'opportunity modelling'. This can involve scenarios that address climate change, facilitate environmental growth and carbon sequestration, encourage nature recovery, manage riverine and coastal flooding, or support other initiatives for which there is substantial public support (Herring and Turner et al 2022).

Opportunity modelling would inform the work of a broad range of land managers and decision-makers including agencies like Natural England and the Forestry Commission. It might include woodland creation, biodiversity enrichment and more sustainable land and sea use, including agriculture (*below*) and fishing. It can be linked to and inspired by historical practices, as recorded in Historic Landscape Characterisation and Historic Seascape Characterisation, which may be drawn upon when considering national, regional and local strategies, policies and actions.

Historic England and the Environment Agency have recently explored how sensitivity assessment may be adjusted to also support 'opportunity modelling'. This can involve scenarios that address climate change, and facilitate environmental growth and carbon sequestration.

Opportunity modelling would still consider vulnerabilities to ensure disturbance and damage is minimised, but its emphasis would be on identifying Historic Landscape Characterisation Types capable of accommodating desired types of change by recognising their 'affordances': the qualities and attributes that can facilitate wished-for forms of change.

Affordances may be drawn out by exploration of the requirements of change scenarios and the attributes of Historic Landscape Characterisation Types. For example, when managing excess water in times of flood, relevant affordances can be expected to include the likelihood of there being existing channels or hollows that can be used to either divert or temporarily store the water.

An approach to opportunity modelling was developed through consideration of the effects and requirements of eleven change scenarios, including eight options presented in the Environment Agency's Thames Valley Flood Scheme and three environmental growth scenarios (*see Table*).

Opportunity modelling has just three stages, not four:

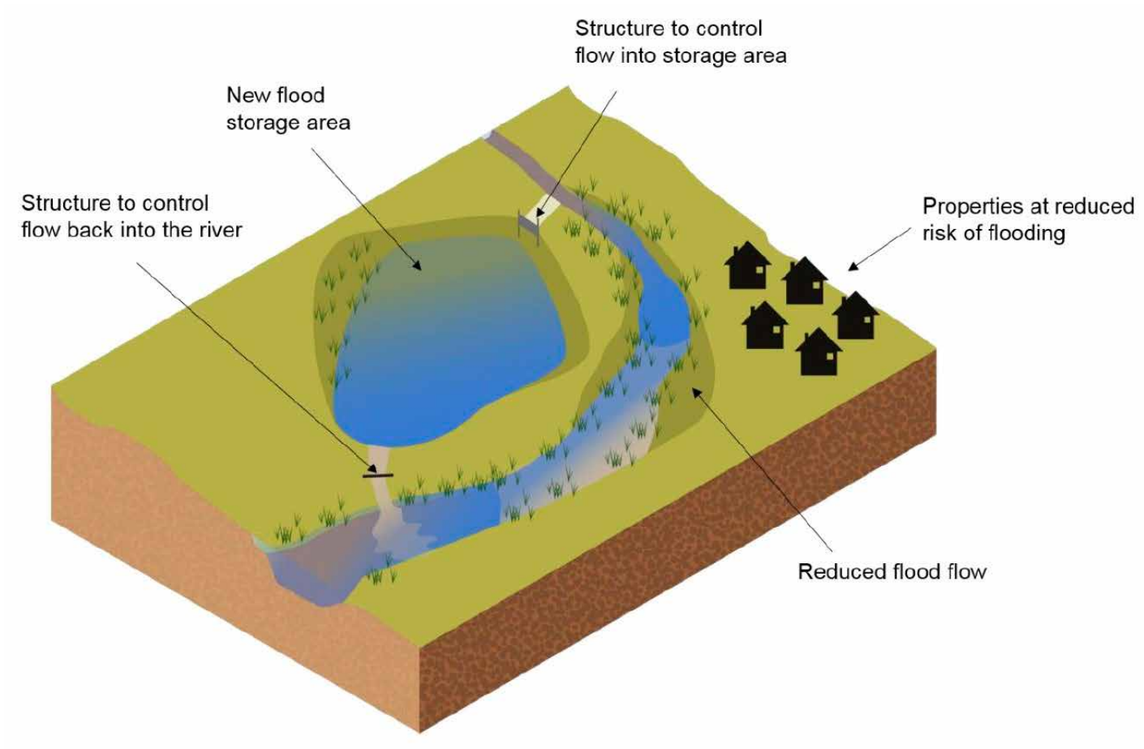
1 Explore scenario: requirements and predictable effects.
2 Assess vulnerabilities of Historic Landscape Characterisation Types to those effects, and the affordances of each Historic Landscape Characterisation Type in relation to requirements.
3 Score and qualify opportunity potential and then present on GIS based mapping, with an accompanying narrative.

Consideration of significance (sensitivity assessment's third stage) as a separate stage was dropped to reduce double-counting: assessment of vulnerabilities and affordances both subsume consideration of the effects of the change scenario on those attributes that contribute to significance. This is also consistent with the insistence that places do not have inherent sensitivity or capacity to all forms of change, and it allows the significance of heritage assets and local places to be called upon later in decision-making, in any formal planning process or when prioritising funding. >>

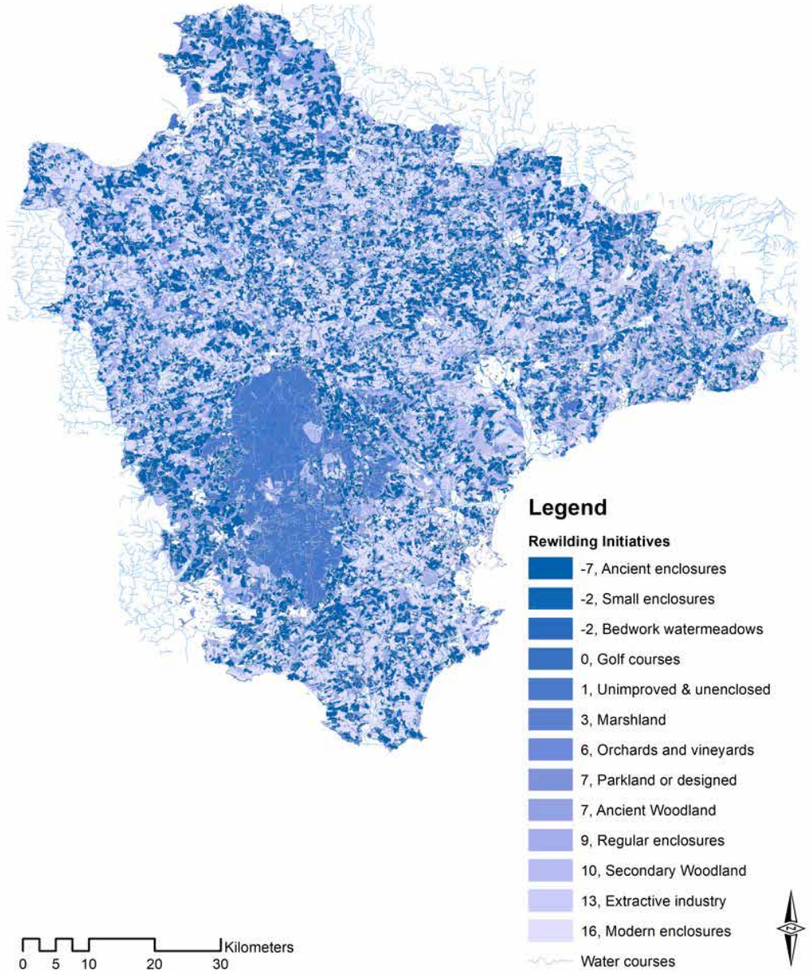
Left: Modern farming in the Chilterns. Sensitivity assessment may stimulate reviews of ongoing land use as well as proposed changes, such as reversion to downland or conversion to woodland. © Pete Herring

HLC Types	Offline Flood Storage	Changes in soil and crop management	River Restoration	Woodland Planting	Hedgerow planting	Flood Relief Channel	Washlands	Wetland Creation		Upland mire restoration	Rewilding and animal initiatives	Establishing Orchards
Ancient Enclosure Types												
Small Enclosure Types												
Regular Enclosure Types												
Modern Enclosure Types												
Water Meadows, Bedworks												
Water Meadows, Catchworks												
Marshland												
Unimproved Land												
Parkland or Designed Landscape												
Golf courses												
Orchards and vineyards												
Ancient Woodland												
Secondary Woodland												
Wood Pasture												
Extractive Industry												
Greatest opportunities												
Least opportunities												

Above right: Table summarising opportunity ratings for flood reduction and environmental growth scenarios for selected HLC types. Some (like Modern Enclosures) may provide many opportunities while others (like Ancient Enclosures) provide few. © Historic England



Hedgerow planting	Totals if scores are at max ; range if wholly pos or wholly neg.	Effects on historic landscape character		Effects on time-depth legibility		Effects on historical land use and land cover / veg		Natural capital opportunities		Historic landscape opportunities		Recreational Amenity (Cultural Services)		Flood Management opportunities	
Approaches /change scenarios		Negative	Positive	Negative	Positive	Negative	Positive	Negative	Positive	Negative	Positive	Negative	Positive	Negative	Positive
Weightings	20; 28 to -8	2	5	3	5	1	5	1	5	1	5				3
	Totalised scores														
Ancient Enclosure Types	20	1	4	1	3	1	4	0	5	1	5				3
Small Enclosure Types	23	0	4	0	3	0	4	0	5	0	4				3
Regular Enclosure Types	15	2	4	1	2	1	3	0	5	1	3				3
Modern Enclosure Types	26	0	5	1	5	1	5	0	5	0	5				3
Water Meadows, Bedworks	-8	2	0	3	0	1	0	1	0	1	0				0
Water Meadows, Catchworks	1	2	1	2	1	1	2	1	2	1	1				1
Marshland	7	1	3	1	3	1	1	1	1	1	1				3
Unimproved Land	-2	2	0	3	0	1	1	1	2	1	2				1
Parkland or Designed Landscape	-2	2	0	3	0	1	0	0	2	1	1				2
Golf courses	17	1	4	2	3	0	3	0	5	1	3				3
Orchards and vineyards	12	1	2	1	2	1	3	1	4	1	3				3
Ancient Woodland	7	0	1	0	1	0	1	0	2	1	1				2
Secondary Woodland	8	0	2	0	1	0	1	0	2	1	1				2
Wood Pasture	20	1	4	1	3	1	4	0	5	1	5				3
Extractive Industry	-1	2	1	3	0	1	1	1	5	1	0				2
Totalised scores are displayed as quintiles:		21 to 31	11 to 20	1 to 10	-9 to 0	-20 to -10									



Two scenarios

The opportunity approach can be illustrated through two scenarios. 'Offline Flood Storage' involves temporary diversion of flood water into a storage area to be released back to the river after the flood (*above*). Its reduction of a flood's destructive power benefits communities, riverside heritage assets and natural environment. Effects and requirements vary depending on the extent to which the water storage area and river-side sluices simply reuse existing features and earthworks.

Woodland planting, a form of rewilding that also addresses flooding, biodiversity and carbon capture, usually transforms character, visibility and biodiversity of green or brownfield land. Assessment involves assessing whether ground preparation would affect archaeological remains and whether vegetation changes can be expected to result in gains rather than losses of biodiversity or landscape character (*top and bottom right*). >>

Above left: Diagram illustrating Offline Flood Storage, one of the potential flood reduction scenarios proposed in the Environment Agency's Thames Valley Flood Scheme. © Environment Agency

Above right: Scoring of Historic Landscape Character (HLC) types for the effects of the 'hedgerow planting' flood-reduction scenario on several variables. © Historic England

Bottom right: Devon Historic Landscape Characterisation displaying areas that may provide the greatest opportunity for rewilding initiatives (palest blue). © Historic England

For each of the numerous Historic Landscape Characterisation Types expected to be affected by the scenarios, professional judgement is used to give positive and negative scores for both vulnerabilities and opportunities in relation to variables like historic character, time-depth legibility, historical land use, natural capital, and flood management opportunities.

Results, initially mechanically derived from those scores and displayed on GIS, stimulate discussion of practicalities and issues, to provide decision-makers with material they can draw on, or that suggest areas requiring further examination or consideration. This is because such high-level, upstream modelling using broad-brush characterisation is not expected or intended to provide detailed advice, but instead to help frame or guide all subsequent stages of flood management or environmental growth, including any further involvement by those who care for the historic environment.

These landscape-based approaches form one of the ways that the historic environment and landscape can be 'part of the solution' by contributing to improved decision-making and more sustainable and locally distinctive forms of change ■

The author

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Pete was formerly a Principal Archaeologist with Cornwall Archaeological Unit, then Characterisation Inspector and Head of Assessment with Historic England.

Further information

Herring, P, 2022 'Strategically Assessing the 'Historic Landscape's Sensitivity and Capacity in Relation to Change', Research Report Series 91/2022, Historic England, Swindon

Herring, P, Turner, S, and Sevara, C, 2022 'The Historic Landscape: Assessing Opportunity for Change', Research Report Series 69/2022, Historic England, Swindon

Above: Upstream woodland planting, marshland restoration, river channel adjustment, and temporary offline flood-water storage may all affect the flow of flood water. Historic environment opportunity assessment for each of these scenarios can then inform flood reduction plans. Stretch of the Great Ouse, Cambridgeshire, in 2014. © Historic England Archive

These landscape-based approaches form one of the ways that the historic environment and landscape can be 'part of the solution' by contributing to improved decision-making and more sustainable and locally distinctive forms of change.

New woodland designed to complement and enhance the historic landscape in the Peak District. © Forestry Commission, David Robertson

Planting trees for the future whilst protecting the past

Developing new datasets to ensure that the right tree is planted in the right place.

To meet the government's ambitions for woodland creation, it is vital that woodland proposers can locate and identify historic sites and landscapes so that they are protected, and potentially enhanced, in any proposals developed. The historic environment is easily damaged, so considering important heritage features as early as possible in the woodland creation process really helps strike the balance between the need to plant new trees and the responsibility to safeguard our past. Easy access to high-quality historic environment data will help achieve this aim by improving woodland design, reducing the risk that woodland creation causes irreversible damage, and alleviating frustration arising from inappropriate proposals. The Forestry Commission's 'National Historic Environment Datasets for Woodland Creation' project intends to develop these much needed digital resources to improve the current situation, and to provide mutual benefits to both the forestry and heritage sectors. >>

The policy background

Against the international background of biodiversity loss and climate change, the government has set a series of ambitious targets for woodland creation across the UK. Under the Environment Improvement Plan 2023, in England the aim is to increase tree canopy and woodland cover from 14.5% to 16.5% by 2050. This is the UK's first ever legally binding tree cover target and means that by 2050 England's tree canopy and woodland cover will be at the highest levels in centuries.

Following the UK Forestry Standard (UKFS), which provides robust requirements and guidelines to support sustainable forest management, the Forestry Commission is very much committed to the concept of putting 'the right tree in the right place'. That, however, is predicated on knowing where 'the right place' is!

The UK Forestry Standard makes it clear that heritage assets should be taken into consideration during woodland creation. Currently, there are robust and easily accessible online datasets relating to designated heritage assets. However, most historic environment bodies would acknowledge the limitations and accessibility issues present in the available online data relating to non-designated heritage assets. Datasets concerning these non-designated assets often vary greatly in their composition and detail and are not always readily sharable online due to their sensitivities, complex nature and, on occasion, technical challenges faced by their curators.

During 2020, the Forestry Commission and partner organisations (including Historic England) started to explore possible options for strategic approaches for considering the historic environment in landscape-scale woodland creation. Then in May 2021, DEFRA published the England Trees Action Plan (ETAP). Action 4.6 of the Plan aims to improve access to historic environment data to aid faster assessment of woodland creation proposals. To meet the objectives of Action 4.6, an options paper was produced in 2021 with input from Historic England, Natural England and the Association of Local Government Archaeological Officers. This paper resulted in three research projects (Projects A-C) being undertaken from late 2021 to early 2022. These explored options for improving existing access arrangements for information and advice on heritage assets, including historic landscapes, historic buildings and structures, and archaeological features. >>

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The UK Forestry Standard makes it clear that heritage assets should be taken into consideration during woodland creation.

Above left: Tree planting in the Cheviot Hills. © Forestry Commission, Jessica Turner

Above right: New woodland planted in North Yorkshire. © Forestry Commission, David Robertson

Supporting research

Two of the projects (Projects A and B), undertaken by Place Services, Essex County Council, assessed how Geographic Information System (GIS) datasets have been or might be used to produce maps that present historic environment sensitivities, historic environment opportunities and historic environment-led targeting for woodland creation, with a view to developing approaches that could be applied relatively quickly and cost-effectively across England. The third project (Project C), conducted by the Forestry Commission, explored the possibilities for Forestry Commission staff to directly access datasets held by local historic environment services using data feeds. A subsequent fourth project (Project D) was commissioned from ArchAI (https://www.archai.io/about) to explore the use of artificial intelligence to identify ridge and furrow earthworks from lidar imagery.

This research demonstrated the need for a comprehensive programme to address issues relating to access to and interpretation of heritage data to inform proposals for afforestation. Thus, in 2022 the National Historic Environment Datasets for Woodland Creation project was born. Using c. £1.1M of funding provided by the government's Nature for Climate Fund, it is a three-year initiative to create and develop digital datasets for use by both the forestry and heritage sectors to help safeguard the historic environment and enable a more efficient woodland design process, where heritage assets can be identified and considered in the earliest stages of proposal development. To date, the project has identified three key approaches:

1 Evolving the Selected Heritage Inventory for Natural England (SHINE) methodology so this dataset can be used to inform afforestation
2 Creating a colour-coded 'Heritage opportunity and targeting for woodland' map by combining multiple historic environment datasets
3 Enhancing the Forestry Commission's existing land sensitivity to woodland creation mapping (available through the Forestry Commission Map Browser) by adding multiple historic environment datasets to boost the consideration and protection of heritage assets. >>

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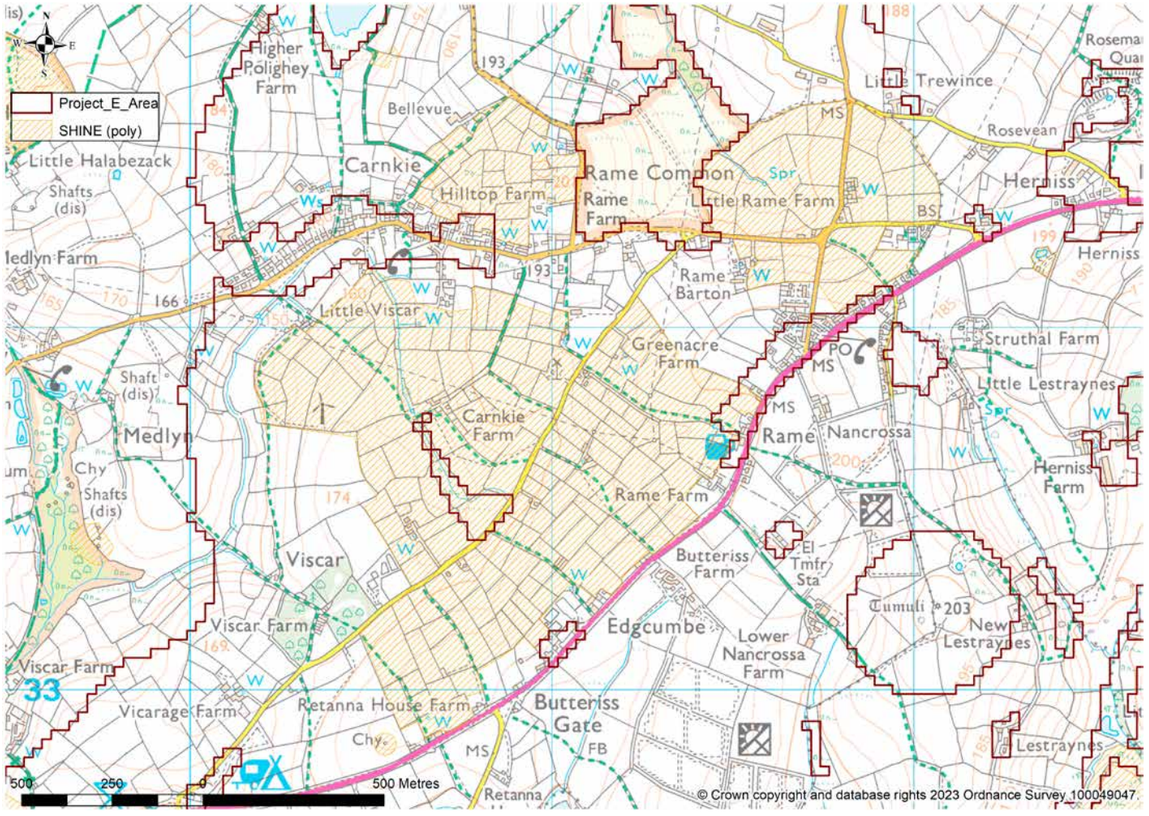
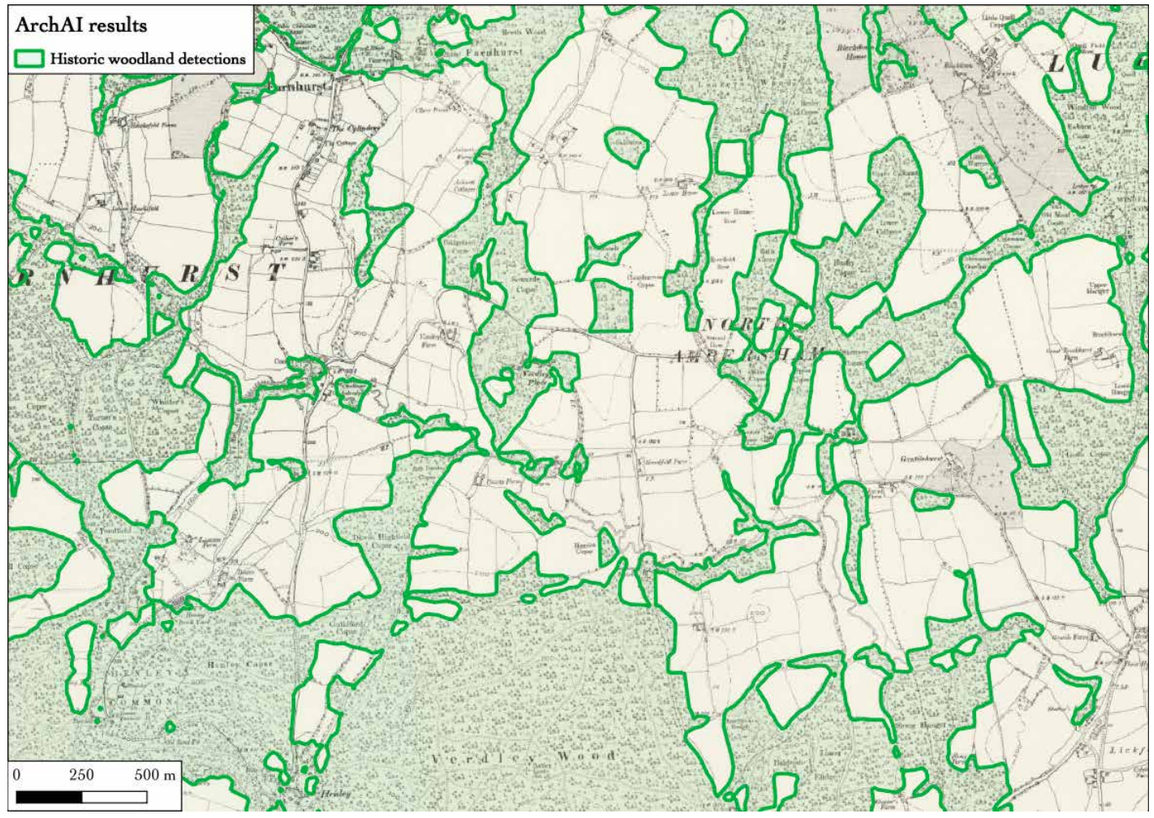
Above: Woodland creation scheme in Warwickshire. © Forestry Commission





Above left: SHINE data showing coherent 19th-century smallholders' fields in Edgcumbe. © Cornwall Council Historic Environment Record

Above right: Historic woodland dataset detections. © ArchAI

Using the Selected Heritage Inventory for Natural England for woodland creation

In 2008 the Association of Local Government Archaeological Officers (ALGAO), Natural England and Historic England produced the Selected Heritage Inventory for Natural England dataset. It is a simple dataset (without the complex detail of Historic Environment Record data) created by local historic environment services which enables land managers to identify key heritage assets for protection and management. This single nationally consistent dataset, which includes selected non-designated heritage assets, is already in use for land management through Countryside Stewardship schemes, and it was, therefore, a stand-out candidate for inclusion in the project. The use of the Selected Heritage Inventory for Natural England in DEFRA's new Environmental Land Management (ELM) scheme added to its appeal, as a significant proportion of the new woodland required by statutory targets will be delivered by the Forestry Commission's flagship woodland creation initiative (England Woodland Creation Offer) which will be part of the ELM scheme from 2025.

As the potential to adapt the SHINE dataset for use in woodland creation became clear, further research on how it could evolve was vital. So, in late 2022/early 2023, the Forestry Commission commissioned two further projects (Projects E and F). Project E involved five local historic environment services (Bedford, Cambridgeshire, Cornwall, Gloucestershire and the South West Heritage Trust) creating new Selected Heritage Inventory for Natural England records, using the existing methodology and data standards but considering how they would need to change for use in woodland creation proposals. Project F saw consultants undertake extensive stakeholder consultation with both the forestry and historic environment sector. This included a questionnaire, one-to-one interviews with users or creators of the Selected Heritage Inventory for Natural England, and workshops to discuss the potential for the dataset to evolve for use in woodland creation. Following this work, an agreement on the nature and usage of the evolved The Selected Heritage Inventory for Natural England dataset was reached in summer 2023, enabling a national roll-out to improve the comprehensiveness and coverage of this data across England from autumn 2023.

Using artificial intelligence

An evolved The Selected Heritage Inventory for Natural England dataset is only one of a suite of datasets being deployed by the National historic environment datasets for woodland creation project.

Two innovative datasets were procured from ArchAI to identify ridge and furrow earthworks (Project G) and areas of historic woodland (Project H). Ridge and furrow is frequently encountered during forestry projects and is thus important to locate and characterise, while areas of lost historic woodland are often good locations in which to consider re-planting. To produce these datasets, ArchAI pioneered the use of artificial intelligence and machine learning to interpret Environment Agency Lidar digital terrain model (DTM) data (for ridge and furrow) and 19th-20th century historic Ordnance Survey maps (for historic woodland) for the entirety of England. This automated approach allowed comprehensive datasets to be built rapidly and to a high level of accuracy and precision. >>

This automated approach allowed comprehensive datasets to be built rapidly and to a high level of accuracy and precision.

Above left: Ridge and furrow dataset detections. © ArchAI

Visual sensitivity mapping

Work on other historic environment datasets continues in-house at the Forestry Commission, aimed at demonstrating how the identification of 'Zones of Theoretical Visibility' would help in the consideration of views from and between designated heritage assets. Building on this concept, the aim is to produce visual sensitivity mapping to illustrate the impact woodland creation could have on one element of setting for heritage assets within proposal areas. Consideration of landscapes less suitable for woodland creation will also be needed and a dataset based on Historic Landscape Characterisation (HLC) data could help to identify historic landscape types that should be avoided when considering afforestation. Working in collaboration with partners will be key to ensuring these datasets are fit for purpose and can be used to guide appropriate woodland creation.

Finally, once all of these datasets have been developed, the project will blend them together to create the tools needed by the forestry sector – the targeting and opportunity map and sensitivity to woodland creation mapping. After all, if opportunities are highlighted and challenges and constraints are flagged early in the woodland creation process it is beneficial to all. While the project still has some way to go, the future relationship between trees and the historic environment is looking more harmonious ■

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The authors

Tom Sunley
National Historic Environment Datasets Project Manager with the Forestry Commission.

Tom joined the Forestry Commission in 2022 but has nearly 20 years' experience in the heritage sector, mainly within Local Historic Environment Services. He has also spent time in publishing and at a charitable trust. He specialises in the application and development of historic environment data and also has a keen interest in historic landscape character. He is interested in how the forestry industry and heritage professionals can share information and experience to enable mutually beneficial outcomes during woodland creation work.

David Robertson
Historic Environment Adviser (national lead) with the Forestry Commission.

David has been advising on the historic environment in forestry for more than 17 years. Initially this was for Norfolk County Council, working on forestry operations, felling licences, deforestation and woodland creation. He spent two years providing historic environment advice for Forestry England in the East District before moving into to his current role with the Forestry Commission in 2020. David now divides his time between advising on forestry policy, guidance, regulation, grant schemes, training and projects, and running his own heritage consultancy. He devised and designed the National Historic Environment Datasets project.

Further information

Forestry Commission 2017: The UK Forestry Standard: the governments' approach to sustainable forestry. Forestry Commission, Edinburgh

Lloyd-Regan, M., Medlycott, M. & Saunders, H. 2022, Project A: Assessing the use of GIS to map zones of woodland creation sensitivity around designated heritage assets, Place Services Essex County Council, Chelmsford.

Medlycott, M. 2022, Project B: Assessing the use of GIS to produce woodland creation historic environment opportunity/ targeting maps, Place Services Essex County Council, Chelmsford.

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UK Government 2023: **Environment Improvement Plan 2023. First revision of the 25 Year Environment Plan**. UK Government, London

Landscape histories for landscape futures

Exploring the evolving role of archaeology in large-scale nature recovery projects.

Above: River restoration by the National Trust at Godrill Beck in the Lake District. (Image: Rose Ferraby)

In the face of accelerating climate and ecological crises, nature organisations and government bodies are devising ambitious new initiatives for landscape adaptation and nature recovery. Defra and Natural England have created the Nature Recovery Network to work towards a target to protect and effectively manage 30% of land for nature by 2030, as outlined in the 25 Year Environment Plan.

Research questions

Within this overall context, the National Trust, as an organisation designed to manage its land for people, nature and heritage, is in a unique position to develop new integrated approaches to landscape stewardship. Nature recovery projects promise to enhance biodiversity, improve climate change resilience and create spaces for wellbeing and health—but they can also reinforce the cultural diversity of the landscape and protect the historic environment. In 2022 the University of Exeter and the National Trust developed the Landscape Histories for Landscape Futures project to explore how archaeology and understanding of past landscape change could inform the Trust's planning for accelerated nature recovery on its properties. The project followed on from the Landscape Futures and the Challenge of Change project, which was jointly led by the National Trust, Historic England, the University of Exeter and University College London.

Landscape Histories for Landscape Futures was designed with the following research questions in mind:

- How can deeper knowledge of landscape history and archaeology inform and activate new directions for future landscape management, in alignment with nature recovery and carbon sequestration goals?
- How can historic and natural environment practitioners (including National Trust staff) be empowered to use this knowledge to help them work together more effectively in their planning and decision-making? >>

Above left: Pond creation at Divis, Northern Ireland. (Image: Rose Ferraby)

Four diverse National Trust sites carrying out different kinds of nature recovery work were chosen as case studies for the project: the Lake District; Divis, Northern Ireland; Killerton, Devon; and Wallington, Northumberland.

We were interested in hearing from different staff and specialists at each site to gather a range of perspectives and understandings around the issues. Some of the sites were further on in projects than others, offering the added benefits of hindsight and changed perspectives.

Rather than produce a written document on the work, the conversations were recorded and used to create a series of podcasts (one for each site, and another in conversation with University of Exeter academics).

The podcast format aimed to give space for the voices of those involved in nature recovery projects to be heard, and to offer an opportunity for people to consume the information in an alternative format. The podcasts are now available as an internal resource at the National Trust for all their staff embarking on or involved in nature recovery projects. An external podcast is planned for later this year, to be made available to all organisations involved in this work. Initial responses from National Trust staff have been overwhelmingly positive.

Above right: Tree and hedge planting at Wallington in Northumberland, which lost many trees in Storm Arwen. (Image: Rose Ferraby)

Practical outcomes

At all the case study sites, the recurring lessons were those around communication and timings. It is vital to involve all specialists at an early stage, to give everyone time to properly understand all perspectives and draw together an approach that works best for the natural environment and existing heritage. These conversations need to take place in person, and if possible out on site. In this way, projects can be developed based on broad understanding from the start, rather than bringing in archaeologists at the end, which often results in parts of the work being limited or cut. At present archaeology is commonly viewed as a blocker in nature recovery projects, rather than a key tool in planning for and imagining landscape change.

The project also identified that communication is often hampered by the use of specialist language, which can be confusing for those from other specialisms. Methods of communication also need to be more nuanced. Mitigation documents and GIS maps, while an essential planning tool, do not always allow for more complex landscape narratives or for flexibility to take into account ecological or natural management in real-world nature recovery projects. From the archaeological side, this includes finding better ways of communicating what past landscapes are, what they can tell us and how we understand them on a broad landscape scale rather than as individual features or areas. >>

Thinking between past and future

There is often an inherent misunderstanding amongst non-archaeological specialists about what archaeology/historic environment/heritage actually is. The historic environment is often seen as a series of discrete features or finds, rather than embracing the complex process of long-term landscape change, with all historic elements integrated into a wider understanding. This is more of an issue in landscapes where the archaeology is vestigial or invisible, such as in peatlands, where we have to base work on what 'might be' or on more cumulative understandings that draw in many different kinds of archaeological research (e.g. paleoecology, geoarchaeology, Environmental DNA).

As archaeologists we need to be better at communicating these broad ideas of what archaeology is, and what it offers in terms of understandings of landscape change. Understanding past change offers a vital mode of imagining possible futures. The long timeframes of human and environmental interactions seen in the archaeological record also allow people to understand broader perspectives of change, thus making nature recovery projects seem less frightening and more positive and acceptable. This is a key area especially when engaging with communities.

Podcast format

The podcast format grew out of awareness that it is difficult for staff to keep pace with the speed of nature recovery projects and the paperwork involved. The episodes can be listened to anywhere, such as in the car travelling to sites. Podcasts bring a more immediate understanding of place and people, and give an opportunity for those involved to have their own voice. Careful editing enables narrative to be created at each of the sites, drawing out the most important issues and lessons. The process of interviewing staff also highlighted the importance of listening, and giving the time to feedback and mull over projects.

Future possibilities

The Landscape Histories for Landscape Futures podcasts revealed the need for more resources for those working within nature recovery projects, including guidance, shared knowledge and case studies for working in particular environments. These projects are driving a new kind of landscape change at an accelerated rate, and therefore it is critical that archaeologists share and develop strategies for effecting positive landscape change which is informed by understanding of the historic environment. Work is now ongoing to create new resources to help integrate archaeological perspectives in nature recovery projects, and share how to best manage past and future landscapes through sensitive change ■

Podcasts bring a more immediate understanding of place and people, and give an opportunity for those involved to have their own voice.

The authors

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Postdoctoral researcher at the University of Exeter.

Rose Ferraby is a postdoctoral researcher at the University of Exeter on the Landscape Histories for Landscape Futures Project. As an archaeologist and artist she is interested in our relationships to landscape through time.

Prof Caitlin DeSilvey
Professor of Cultural Geography at the University of Exeter.

Caitlin is a geographer whose research explores the cultural significance of change and transformation, with a particular focus on heritage ecologies and climate futures.

Dr Hannah Fluck
Senior National Archaeologist at the National Trust.

Hannah oversees the relationship between the historic environment and archaeology and the Trust's ambitious landscape scale programmes for nature and climate. Prior to joining the Trust in 2022 Hannah was Head of Environmental Strategy at Historic England.

Dr Ingrid Samuel OBE
Director of Place-making and Heritage at the National Trust.

Ingrid has worked for the National Trust since 2011. She has held numerous previous roles include Head of Heritage and Architecture at DCMS.

Further information

University of Exeter website
https://www.exeter.ac.uk/business/about/partners/nationaltrust/

Research Reports 2023

An overview of the recent additions to the series between June and August 2023.

Aerial Investigation

These reports cover interpretation and mapping of sites, bringing together information on buried features revealed as cropmarks, soilmarks, parchmarks or features visible on the surface such as earthworks and structures, or features identified through Lidar.

Changing Chalk: Downs from Above. Aerial Survey of the South Downs north of Brighton
E Carpenter, David Knight, F Small

The Downs from Above project is the aerial survey component of the National Trust-led and National Lottery Heritage Fund-supported Changing Chalk partnership. The project focussed on the area of the South Downs National Park to the north of Brighton and Hove. The archaeological remains identified from lidar and aerial photographs on the South Downs ranged in date from the Neolithic to the Cold War. The lidar was particularly valuable in showing the low earthworks that define extensive later prehistoric and Roman field systems across the Downs.

Read the report

Dartmoor and Upper Plym Valley. Aerial monitoring of scheduled monuments on the English Heritage Estate
Katy Whitaker, Olaf Bayer

This project was designed to develop methods and provide baseline data to the English Heritage Trust to enable assessment of change over time. This work focussed on 4 guardianship sites on Dartmoor, Devon: Grimspound, Merrivale Prehistoric Settlement, Hound Tor Deserted Medieval Village and the Upper Plym Valley.

Read the report

Built Heritage

Our reports cover investigations into the built historic environment at different levels of detail. Particular focus points of this research is to support heritage-led regeneration and to inform heritage at risk cases.

The Undercrofts of Westgate Street, Gloucester: Historic Buildings Assessment
Rebecca Lane, Abigail Lloyd

This report examines the evidence for medieval undercrofts surviving on Westgate Street, Gloucester. For the purposes of this study undercrofts are defined as the stonevaulted spaces beneath a building or principal room. In Westgate Street there are three early and well-preserved undercrofts, which potentially date to the late 12th century.

Read the report

Traditional Thatching Materials: Issues Affecting a Sustainable Future
Jenny Chesher

This report presents the results of research into the challenges facing indigenous producers of cereal straw and water reed for traditional thatching. It describes what the sector is already doing to overcome some of these problems and suggests further action to address other issues and help ensure a sustainable supply of thatching material in the future.

Read the report

Scientific Dating

Our reports on scientific dating, including dendrochronology and radiocarbon methods, add new insights to understanding the chronology of buildings and sites.

Church of St Lawrence, Moat Lane, Towcester, Northamptonshire: Tree-ring Dating of Oak Timbers in the West Tower
Dr Martin Bridge, Cathy Tyers

Four large beams supporting the ceiling to the ringing chamber were sampled. Only one was dated, giving a likely felling date range of AD 1468–1501. This may suggest that the tower was constructed in this period.

Read the report

6-8 Silver Street, Wakefield, West Yorkshire: Tree-ring Dating of Oak Timbers
Alison Arnold, Robert Howard, Cathy Tyers

Dendrochronological analysis on samples taken from timbers of this building resulting in the successful dating of eight of them. A wall plate is dated as being felled in the range of AD 1543–68, with a ceiling beam and a king post being a little later, dating to AD 1587–91 and AD 1584–1609, respectively. The other dated timbers are also thought likely to date to the 16th century/early-17th century.

Read the report

10 Church Street (Jennings Carpets), Tewkesbury, Gloucestershire: Tree-ring Analysis of Oak Timbers
Alison Arnold, Robert Howard, Cathy Tyers

Interpretation of the sapwood on the dated samples would indicate that the timbers to the southern bay are derived from trees felled in AD 1467. The timbers used in the central bay were felled at some point during the AD 1450s–60s, possibly slightly earlier than those in the southern bay.

Read the report

Scientific Dating (cont.)

Priests' Room & Annex, Church of St Mary, North Bar Within, Beverley, East Riding of Yorkshire: Radiocarbon wiggle-matching of oak timbers
Alison Arnold, Robert Howard, Cathy Tyers, Michael Dee, Sanne Palstra, Peter Marshall

Independent validation of tentative tree-ring dating for a previously undated site chronology has been obtained by radiocarbon wiggle-matching and it can now be considered as a radiocarbon-supported dendrochronological date, that spans AD 1608–1731DR.

Read the report

Monks Walk, 19 Highgate, Beverley, East Riding of Yorkshire: Radiocarbon Wiggle-Matching of Oak Timbers
Alison Arnold, Robert Howard, Cathy Tyers, Silvia Bollhalder, Lukas Wacker, Peter Marshall

Independent validation of tentative tree-ring dating for a previously undated site chronology. The three-bay front range to Monks Walk was therefore constructed in the early 14th century with significant rebuilding or repair work being undertaken to the building in the late 16th century.

Read the report

Archaeology

We publish a range of reports on archaeological excavations, monitoring, survey work and archive practice.

Hinton St Mary Roman Villa, Dorset: Report on Geophysical Surveys, April 2023
Megan Clements, Neil Linford, Paul Linford, Andy Payne

Earth Resistance and Ground Penetrating Radar (GPR) surveys were conducted as part of wider work to place the Hinton St Mary Roman Villa and mosaic into a greater landscape context.

Read the report

St Stephen's Beacon, St Stephen-in-Brannel, Cornwall: Report on Geophysical Surveys, March 2023
Megan Clements, Neil Linford, Andy Payne

An Earth Resistance and Ground Penetrating Radar survey was conducted at St Stephen's Beacon in the parish of St Stephen-in-Brannel, Cornwall as part of wider ongoing works to remove the beacon from the Heritage at Risk register.

Read the report

Archaeology (cont.)

Castilly Henge, Luxulyan, Cornwall: Report on Geophysical Surveys, February 2022
Neil Linford, Andy Payne

Ground Penetrating Radar magnetic and earth resistance surveys were conducted as part of a project to support ongoing work to remove the monument from the Heritage at Risk register. The survey revealed an arrangement of internal pits within the henge ditch, with a possible indication of recumbent stones.

Read the report

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