



Historic England

Strategy for Water and Wetland Heritage



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Strategy for Water and Wetland Heritage

December 2012

INFORMATION GRID:	
Author(s):	Jen Heathcote
Derivation:	English Heritage Strategy for Wetlands (2002), comments on Head of Research Policy strategy papers and previous versions.
Origination Date:	31.03.11
Reviser(s):	Jen Heathcote
Date of last revision:	December 2012
Date Printed:	
Version:	3
Status:	Approved by Research Advisory Panel
Summary of Changes:	Refreshed language in light of legislative change, addressed comments from internal consultation and Research Advisory Panel.
Circulation:	
File Location:	
Required Action:	Mounting on EH website

SUMMARY

1. The Strategy for Water and Wetland Heritage is one of a series of Thematic Research Strategies outlining what more we need to know about specific subjects in order to address English Heritage's objectives. The present version has been aligned with English Heritage's Corporate Plan for 2010-2015¹ and the National Heritage Protection Plan (NHPP),² which forms a key part of the delivery of the Corporate Plan.
2. The Strategy is primarily intended to serve English Heritage's needs by identifying activity which underpins corporate objectives. However, English Heritage works in close partnership with many other organisations, and the Strategy has therefore been developed through a review of current Research Frameworks (see Appendix 1) and targeted consultation.
3. Dissemination and implementation of the Strategy is intended to ensure the effective use of English Heritage resources by directing support to the most critical aspects of research or operational activity within the context of NHPP. It provides a framework that will contribute to the understanding, enjoyment and protection of (fresh)water and wetland heritage.
4. The document sets out the need for a Strategy for water and wetland heritage and relates it to the threats facing these assets. It locates the Strategy within the wider English Heritage Research Agenda, identifies key research topics for the present Corporate Plan period, provides guidance on establishing research projects and criteria for prioritising them, and explains how the Strategy will be reviewed and updated.
5. The Strategy is arranged in two main sections:

Part 1 outlines the place of research in English Heritage, sets the Thematic Research Strategy series within this corporate framework, and explains how they will be implemented and refreshed. This part also explains that this particular Strategy serves both research and operational agendas.

Part 2 presents the Strategy for Water and Wetland Heritage and summarises the underlying principles that have led to the identification of seven key Themes:

- Understanding the distribution, character and value of wetland and waterlogged archaeology.
- Prospection and evaluation of wetland and waterlogged archaeology.
- Understanding the value and significance of assets designed to exploit and manage water.
- Research into the viability, sustainability and implementation of *in situ* preservation for water-dependent archaeology.
- Long-term ecology: developing knowledge transfer from palaeoecology.
- Understanding threat from climate change and environmental management.
- Improving protection for water management and water-dependent assets.

Topics addressing these Themes and their supporting Objectives will contribute to: providing the evidence base for better understanding and protection of the resource; informing mitigation of threats to vulnerable asset types; supporting skills and processes; enhancing Historic Environment Records and other heritage databases; and achieving greater public appreciation of water and wetland heritage assets. Appendix 2 provides details of Topics and suggested areas for project development mapped against NHPP Measures.

Finally, guidance is provided on establishing research projects consistent with MoRPHE³ guidelines.

¹ <http://www.english-heritage.org.uk/about/who-we-are/corporate-information/corporate-strategy/>

² <http://www.english-heritage.org.uk/professional/protection/national-heritage-protection-plan/plan/>

³ <http://www.english-heritage.org.uk/publications/morphe-project-managers-guide/>

Strategy for Water and Wetland Heritage

PART ONE: THE CONTEXT OF RESEARCH AT ENGLISH HERITAGE

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APPENDICES

- 1 Research Frameworks
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PART ONE: THE CONTEXT OF RESEARCH AT ENGLISH HERITAGE

I Introduction to English Heritage research policy

The value of England's historic environment is acknowledged in many Government programmes and has been set out in planning guidance⁴ which emphasises its importance to our cultural heritage and its contribution to key policies such as sustainable development. English Heritage exists to identify, protect and promote nationally significant aspects of the historic environment. These functions are underpinned by a broad spectrum of research activity, which falls into a number of categories described by the Frascati definitions⁵, covering basic research, applied research and experimental development.

Research carried out or supported by English Heritage is directed towards achievement of the organisation's aims and objectives, as set out in the **Corporate Plan** for the period 2010–2015⁶. The strategy is built around the concept of the 'heritage cycle' (Fig. 1).

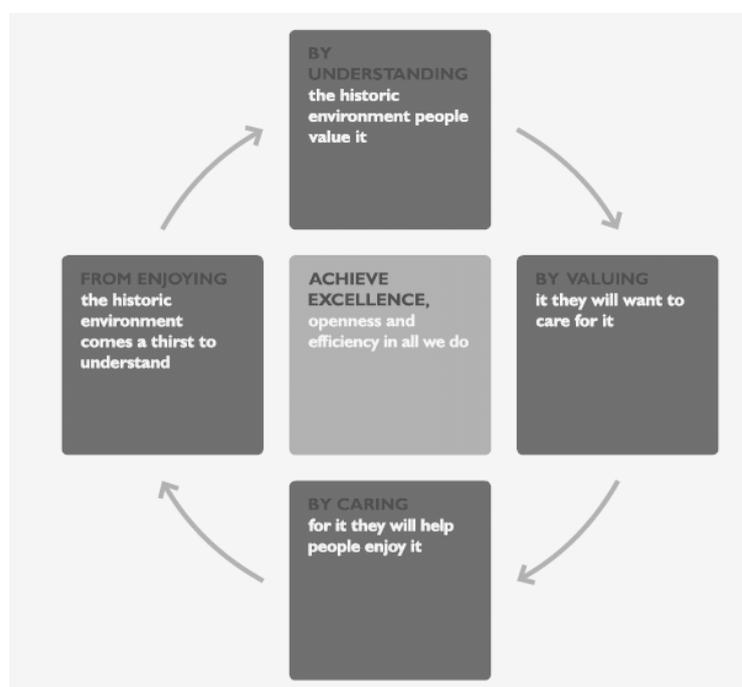


Figure 1

The Heritage Cycle diagram

⁴ DCLG, 2010; see <http://www.communities.gov.uk/publications/planningandbuilding/pp5>

⁵ see *SHAPE 2008: A Strategic Framework for Historic Environment Activities and Programmes in English Heritage*, p 96

⁶ <http://www.english-heritage.org.uk/about/who-we-are/corporate-information/corporate-strategy/>

The five high-level aims for the plan period are to:

1. Identify and protect our most important heritage (Understanding)
2. Champion England's heritage (Valuing)
3. Support owners, local authorities and voluntary organisations to look after England's heritage (Caring)
4. Help people appreciate and enjoy England's national story (Enjoying)
5. Achieve excellence, openness and efficiency in all we do (Excellence).

The first of these aims is addressed in detail by the **National Heritage Protection Plan (NHPP)**⁷, which provides a framework to ensure more effective protection of the historic environment, bringing together work by English Heritage and other partners within the sector. The NHPP will frame much of English Heritage's research activity in the period ahead; it is organised as a number of *Activities* grouped under eight *Measures*:

1. Foresight
2. Threat: assessment and response
3. Understanding: recognition and identification of the resources
4. Understanding: assessment of character and significance
5. Responses: protection of significance
6. Responses: managing change
7. Responses: protecting and managing English Heritage historic properties
8. Responses: grant aid for protection.

In addition, a number of functions have been identified which can legitimately be described as directly supporting the NHPP but which do not fall directly within any of the Measures. These are grouped as five *Supporting Actions* linked to aims 2 to 4 of the Corporate Plan:

- A. Establishing Value: ensuring that the public understand and agree that looking after our heritage is important both in terms of the economy of the country and the well-being of its people
- B. Building Capacity: ensuring that the right skills exist and that the right tools and advice are available to those engaged in looking after our heritage
- C. Local Empowerment: ensuring that the right systems exist for encouraging local communities to get involved in decision-making and in delivery of protection
- D. Accessing Knowledge: ensuring that information management and knowledge transfer is as good as it can be so that what we learn can be used to its greatest benefit
- E. Engaging with the Past: ensuring that as wide a range of people can and do enjoy the heritage which we are working so hard to protect, now and in the future.

2 Thematic Research Strategies

Earlier drafts of the **Thematic Research Strategies** informed the development of the NHPP and the revised versions which respond to it will continue to guide its implementation. They provide more detailed analysis of key aspects of the historic environment, informed by sector research frameworks and the philosophies that underpin planning guidance and English Heritage's **Conservation Principles**⁸, set out the intellectual basis for English Heritage's research response to current threats and opportunities, and situate relevant research within the framework of the NHPP. The Thematic Research Strategies are complemented by a number of **Operational Strategies** which set out the threat-led responses to sector needs and specific conservation issues. The Water and Wetland Heritage Strategy combines these two

⁷ <http://www.english-heritage.org.uk/professional/protection/national-heritage-protection-plan/plan/>

⁸ *Conservation Principles: Policies and Guidance for the Sustainable Management of the Historic Environment* (English Heritage, 2008)

approaches, as did the original English Heritage Strategy for Wetlands⁹, and as a result, topics for both research and operational action are considered (cf. Appendix 2).

This Strategy is, therefore, primarily intended to serve English Heritage by identifying action which furthers corporate goals. However, since English Heritage shares its responsibilities with many other agencies it also seeks to express wider concerns and reflect views from the different communities engaged in understanding and managing the historic environment. The aim is to ensure that English Heritage activity makes a difference to the protection and enjoyment of the historic environment, whether through new understanding, better support for partner organisations, wider public engagement or more effective conservation.

English Heritage will seek to implement the Thematic Research Strategies through supporting research programmes and projects in a number of ways. These include:

- Using English Heritage staff resources
- Using English Heritage's grants programmes for funding external projects
- Collaborating with universities and academic funding bodies (AHRC, EPSRC, ESRC, NERC)
- Assisting local authorities and local plans
- Working with Government agencies
- Working with developers and owners
- Working with amenity groups and societies
- Working with museums and the education sector
- Working with the voluntary sector
- Providing training to develop expertise and skills

The publication of the Thematic Research Strategies is intended to encourage debate about priorities since the drivers for research will inevitably evolve as circumstances change. The exercise of a foresight function to anticipate threats and opportunities is essential to maintain the Strategies' relevance and their periodic refreshment will be informed by ongoing consultation and horizon-scanning to understand developing academic, conservation, planning and political trends, and identify the changing needs of the sector. The Strategies therefore represent iterative documents under periodic review; on-line progress reports and updates will be provided on a regular basis. These will in turn contribute to reviews of the implementation of the NHPP.

⁹*English Heritage Strategy for Wetlands* (Van de Noort and Olivier, 2002)

PART TWO English Heritage Thematic Strategy for Water and Wetland Heritage

Wetlands are landscape features valued for their habitat and cultural heritage characteristics. They comprise fragile, biodiverse environments such as mires, ponds, rivers and their floodplains and estuaries. Their deposits may be predominantly organic (i.e. peat) or mineral (i.e. alluvium) but the characteristic common to all is that they are seasonally or permanently waterlogged. This facilitates excellent preservation of organic and some inorganic remains, which is why they are of special value to archaeologists. Waterlogged deposits may also be found in places other than wetlands, buried at depth beneath agricultural or urban land where there are no clues to their presence at the ground surface; these deposits can be extensive and of exceptional significance, providing unique insights into past activities and ways of life.

The quality and quantity of material culture and associated environmental remains tends to be greater than that found on dry sites and the materials preserved (e.g. leather, basketry, textile, wooden artefacts and biological remains) more varied. These factors have implications for the skills and resources needed to deal with such sites and consequently they are expensive and labour-intensive to record. Wetland and waterlogged deposits also preserve evidence of past environments that can help us to understand human impact on the environment, long-term ecological change and climatic trends. Where deposits accumulate gradually, e.g. peat growth, long sequences with detailed chronological resolution can develop. A vertical section through undisturbed peat may represent a detailed record of environmental change through hundreds of years, revealed through the study of pollen, plant, insect remains and other proxy data contained within the deposits.

Wetlands and waterlogged deposits are dynamic systems that are dependent on water to support those characteristics for which they are valued, and can be river fed, surface-water fed or groundwater fed. Water supply is therefore critical to their functionality as habitats; their archaeological preservation potential; and their sustainability as niche environments. Their protection cannot be afforded by designation alone and we need to understand each site within its landscape and hydrological context to determine the most appropriate mitigation when they are threatened. In particular, the option to preserve remains *in situ* should be considered with respect to whether it is appropriate according to the character and remaining information content of the material culture and associated environmental remains; viable according to the hydrological behaviour of its burial environment; and sustainable in the face of climate change. Understanding the hydrological setting of such places is fundamental to assessing their vulnerability to change and establishing appropriate management regimes to help protect them where possible. This requires consideration of how water behaves in the landscape, how it is being manipulated in accordance with societies' current needs and aspirations and what environmental constraints exist. Consequently, this iteration of the Strategy considers wetland and waterlogged deposits within the broader context of water management and its scope has expanded to include material culture that is directly involved in the management of water both as a resource for exploitation and as an environmental threat.

I The need for a strategy

The first English Heritage Strategy for Wetlands¹⁰ developed from analysis of a number of English Heritage projects conducted over the past thirty years, including extensive survey and assessment of the archaeology of the main lowland wetland areas of England (the Somerset Levels, the Fens, North-West England, and the Humberside Levels). It indicated the need to move away from management that

¹⁰ *English Heritage Strategy for Wetlands* (Van de Noort and Olivier, 2002)

focussed on individual sites towards one that included their hydrological context and broader landscape setting and it contained four key areas for activity:

- Policy: promoting historic environment interests in wetlands to local authorities, national, international and intergovernmental agencies.
- Management: developing guidance and best practice for integration of nature conservation and historic environment.
- Research and data acquisition: using survey, excavation and applied research to inform management and develop policy.
- Outreach and education: broadening understanding of historic environment assets in wetlands.

Whilst many of the tools needed to advance the Strategy for Wetlands (2002) are now in place and some of the recommendations have been addressed, implementation has not yet been fully realised. In addition, it is now 10 years old and in that time a significant body of relevant new work has been undertaken in a variety of contexts, refining our understanding of the lowland peatland and alluviated floodplain resource, expanding into new wetland environments and making methodological and conceptual advances.

Alongside these advances, changes in European and domestic legislation (e.g. EU Water Framework Directive (WFD)¹¹, EU Floods Directive¹² and Flood and Water Management Act 2010 (FWMA)¹³) have introduced new potential threats to the resource as well as opportunities for protecting it. Underpinning these changes is a fundamental shift in philosophy about the way water is managed in the environment, moving away from piecemeal control (i.e. building defences) towards whole catchment management to reduce the risk of high energy flood events whilst at the same time improving water quality. In large part, this change is influenced by predictions of the impact of climate change on rainfall, storm events and groundwater conditions. In practice this means that much more attention is being paid to the connectivity of natural processes in the environment, including how managing processes in one place can be used to influence the outcomes of water behaviour elsewhere in the catchment (e.g. slowing flood water flow upstream to reduce water energy and its impact downstream) so that although flooding still occurs, the consequences may be less severe. The approach will have both positive and negative impacts on the historic environment and has also started to challenge us to think about threats to categories of asset (e.g. weirs, cascades and reservoirs) that have, until now, rarely given cause for concern. Equally, some of the changes may facilitate a degree of protection, e.g. through promoting changes in water management to raise groundwater levels over large areas that would not be possible using heritage protection mechanisms alone.

At the same time, the natural environment sector has developed a more pro-active approach to conservation dealing with large areas rather than focussing on discrete, protected places. Previously, emphasis was placed on creating a network of National Nature Reserves and Sites of Special Scientific Interest in favourable condition. Although this is still important, effort has now moved towards managing landscapes. Following the publication of the DEFRA Natural Environment White Paper¹⁴, twelve Nature Improvement Areas (NIAs)¹⁵ have been defined where actions will be undertaken over thousands of hectares to create more and better-connected habitats. Over half of these NIAs have a significant focus on wetlands, for example creating new wetland habitats such as reed beds or altering upland hydrological regimes. Building on the work of the Wetland Vision¹⁶, this presents an opportunity to raise the profile of

¹¹ http://ec.europa.eu/environment/water/water-framework/index_en.html

¹² http://ec.europa.eu/environment/water/flood_risk/index.htm

¹³ <http://www.legislation.gov.uk/ukpga/2010/29/contents>

¹⁴ *The Natural Choice: securing the value of nature* (DEFRA, 2011)

<http://www.defra.gov.uk/environment/natural/whitepaper/>

¹⁵ <http://www.naturalengland.org.uk/ourwork/conservation/biodiversity/funding/nia/default.aspx>

¹⁶ *Wetland Vision Technical Document: overview and reporting of project philosophy and technical approach*. C Hume (2008) <http://www.wetlandvision.org.uk/dyndisplay.aspx?d=downloads>

both specific wetland heritage issues within the context of managing the natural environment and to identify areas where our interests overlap significantly with theirs so that protection of the natural environment can be used to supplement our own purposive actions. However, there is still a challenge to improve consultation between the natural and historic environment sectors at all levels of planning to ensure that landscape adaptation projects really do deliver multiple benefits with no detriment to heritage assets.

Consequently, this revised Strategy for Water and Wetland Heritage encompasses a range of *freshwater* environments and assets, taking a catchment approach. However, estuary and coastal wetlands are excluded for practical reasons and fall within the province of the Marine Research Strategy¹⁷. Discrete sub-groups within 'wetland archaeology' are considered, comprising the range of contexts identified in the original Strategy for Wetlands, all of which are characterised by surface wetness, and include river channels as well as their floodplains (Table 1). In addition, buried waterlogged archaeological and palaeoenvironmental deposits are included which are characterised by permanent or fluctuating groundwater levels but no surface water and a key component relates to urban environments where the waterlogged archaeology can lie at considerable depth beneath the ground surface.

Table 1 Sub-groups defined for wetland and waterlogged archaeology.

Sub-group	Brief description	Scoping for inclusion in Strategy for Water and Wetlands
Peatlands	Surface peats in uplands and lowlands	Included
Relict peat	Buried peat (e.g. beneath alluvium, colluvium, solifluction or glacio-fluvial sediments) on land; inter-tidal and sub-tidal peat deposits.	Included: terrestrial buried peat. Scoped out: inter-tidal and sub-tidal peat deposits (covered in Marine Research Strategy)
Freshwater coastal wetlands	Land-claim; grazing marshes	Scoped out (covered in Marine Research Strategy)
Small wetlands	Less than 10ha, e.g. kettle holes, ponds	Included
Rivers and river valleys	River channels, riparian zone and floodplain; including palaeochannels and the original Strategy for Wetlands category, alluviated lowlands)	Included
Waterlogged urban deposits	Includes waterlogged deposits at depth.	Included
Artificial water bodies	Water features (parks and gardens), moats, ditches and canals.	Included
Palaeoenvironmental deposits	Although these will automatically belong to one of the other sub-groups, they deserve special mention to ensure their value is recognised and to maintain focus on this specific historic environment resource.	Included
Natural lakes and tarns	Much of the potential and many of the issues cross-over with artificial water bodies and small wetlands.	Included

¹⁷ see <http://www.english-heritage.org.uk/professional/research/strategies/research-strategies/marine-and-maritime/>

A wide range of features, both prehistoric and historic, is significant for wetland and waterlogged archaeology, including all surviving physical remains of past human activity as well as landscaped, planted or managed vegetation. For example, some large expanses of upland and lowland peatlands may have considerable heritage value because of their associated archaeological remains (artefacts, features, bog bodies) as well as the peat matrix, itself an archive of environmental history including human influence on, and response to, environmental change. Alternatively, river reaches may only have heritage significance at a particular crossing point or in a remnant palaeochannel infill. In urban environments, the significant waterlogged archaeological or palaeoenvironmental deposits may lie several metres beneath the surface but still be vulnerable to change. For all of these, water-saturated ground – the more permanently the better - lacking oxygen promotes the excellent preservation of remains for which the deposits are valued.

Whilst we may be able to assign value and understand significance in some places we are well aware that even if we can designate places, this will not necessarily facilitate their protection. In addition, particularly with respect to assets associated with rivers, e.g. a bridge or weir, whilst historic significance may be high, the potential to conserve and protect the feature may be compromised by safety, habitat or water management requirements that cannot be countered.

Also there are the water management assets concerned with controlling the water resource itself for human consumption and sanitation; harnessing power to generate energy; improving agricultural yield; or simply regulating flow, sometimes for aesthetic reasons alone within designed landscapes. These features are of relevance because of a) the new approach to water management which promotes changing factors in one place to deliver multiple benefits more widely within the catchment; b) imperatives to improve the ecological status and water quality of rivers, groundwater and other bodies of water; and c) addressing the predicted increasing pressures on water infrastructure as a consequence of both population growth and climate change.

2 Identifying opportunities, risks and priorities

This Strategy identifies those areas (Themes and Objectives) that are currently of primary concern to English Heritage which are:

- Theme 1 Understanding the distribution, character and value of wetland and waterlogged archaeology.
- Theme 2 Prospection and evaluation of wetland and waterlogged archaeology.
- Theme 3 Understanding the value and significance of assets designed to exploit and manage water.
- Theme 4 Research into the viability, sustainability and implementation of *in situ* preservation for water-dependent archaeology.
- Theme 5 Long-term ecology: developing knowledge transfer from palaeoecology.
- Theme 6 Understanding threat from climate change and environmental management.
- Theme 7 Improving protection for water management and water-dependent assets.

These have been derived from analysis of Regional Research Frameworks (RRF) for England and comparable documents (see Appendix 1). Broadly, there are two types of research initiatives identified within most of the resources, and both are considered here:

- Reactive research: threat-led or relating to the legacy of past work.
- Pro-active research – relating to protection, management and conservation and 'pure' research.

In addition, an internal English Heritage workshop was held in 2010 to discuss issues arising from wetland and waterlogged archaeology casework around the country and, more broadly, to think about our

current approach to the protection and management of wetland and waterlogged archaeology. A key issue was to assess whether the current philosophy is appropriate, viable and/or sustainable given changes driven by social, economic and environmental factors. Further questions tabled included: is protection of any sort an option; how do we justify our approaches within our limited understanding of the resource; if we do want to do it differently, what might that look like and what are the implications? The results of that meeting have helped to shape both the Water and Wetland Heritage Strategy and the NHPP, particularly with respect to identifying situations where we have influence and can be proactive to counter impacts on heritage assets, as well as those where loss of the material remains is inevitable.

A further level of analysis then examined the alignment of the identified Themes and topics with the NHPP to identify critical priorities: these are shown in Appendix 2. However, a number of issues were identified that do not fit within the current version of NHPP despite their relevance and currency. Therefore, we will need to identify ways that the sector may advance understanding and address these issues.

A number of threats for wetland archaeology - drainage, water abstraction, conversion to arable agriculture, peat wastage, peat erosion (uplands), peat extraction, development – have previously been identified¹⁸. Subsequent work has also identified the following areas of concern: natural processes and environmental change (including climate change); changes in resource management, exploitation and land-use (e.g. de-watering at quarries may influence groundwater over a much wider area than simply the quarry footprint); mitigating habitat loss; and recreational pressure. With respect to the latter, upland wetlands can come under particular pressure from erosion due to walkers or the inappropriate use of recreational vehicles.

With respect to climate change, both direct and indirect impacts are relevant. Direct impacts of climate change will include: regional and local changes to groundwater availability and quality for groundwater-fed wetlands; increased erosion in river valleys due to altered river channel behaviour; increased frequency and magnitude of pluvial, fluvial and groundwater flooding; changes to vegetation composition and thus landscape character; and peat desiccation and erosion particularly impacting later Holocene (medieval and later) portions of sequences. A key indirect impact that will probably, at least in the short-term (i.e. 5 years), be of greater significance, are actions carried out by other actors, principally nature conservation and flood risk managers, to adapt to or mitigate predicted climate change or habitat loss. Other factors include increased competition for available groundwater, especially in East Anglia and South East England; and increased visitor numbers and length of tourist season, particularly for upland peatlands.

Threats from domestic peat extraction should diminish in the mid-term with the current plan to phase out extraction for horticulture by 2030¹⁹. Elsewhere, threat and opportunity go hand-in-hand. The reactivation of water meadow systems is under consideration in some areas to help meet biodiversity targets for wet grassland²⁰. This should be encouraged as active management can maintain the integrity and visibility of these heritage assets but guidance is needed to promote heritage-sensitive management regimes.

The demand for renewable energy generation will continue to grow; the use of biomass crops (with high water demands) can affect localised hydrology of wetlands and the building of the associated power stations can directly threaten the archaeology; windfarms and their associated infrastructure (e.g. access

¹⁸ *Monuments at Risk in England's Wetlands* English Heritage Research Project (Van de Noort *et al.*, 2002)

¹⁹ *The Natural Choice: securing the value of nature* (DEFRA, 2011)

<http://www.defra.gov.uk/environment/natural/whitepaper/>

²⁰ wet grassland is defined as one of the priority habitats for nature conservation protection under the *UK Biodiversity Action Plan*; cf. <http://jncc.defra.gov.uk/page-5718>.

roads) can cause erosion on upland peat sites; for water courses, the increased interest in micro-hydroelectric power generation can be beneficial in bringing historic mills and weirs back into good repair and re-use as long as adaptation and refurbishment is done sensitively.

On-going, attritional issues can only be addressed by reinforcing existing national and strategic relationships and growing local, operational relationships. Such issues are those brought about by the impact of habitat creation or restoration work that lie outwith the planning system: establishing and maintaining relevant relationships can be time consuming but the protection returns are potentially very high.

A consultation carried out to inform the early development of the NHPP suggested the following issues for freshwater wetlands needed research or improved operational processes:

- enhance criteria to recognise that which is of exceptional value across all types of wetland, waterlogged and water management assets.
- identify new ways of working and promoting access to new funding streams to facilitate investigation of sites/assets.
- produce better mechanisms for flagging important wetland and waterlogged archaeology to raise awareness of its value to ourselves and others outside the sector.
- improve understanding of wetland, waterlogged and water management assets amongst curatorial and commercial heritage professionals and the issues particular to them and their setting.
- refine understanding of thresholds and sustainability to achieve preservation *in situ* management with confidence and equally, to identify where it is not a viable option.
- develop approaches to prioritise resources to deal with that which is of exceptional value, threatened and where preservation *in situ* is not a viable option.
- review prospection methods for wetland and waterlogged archaeological sites.
- promote methods to highlight areas of higher potential for encountering wetland/waterlogged archaeology and so reduce risk of unexpected discovery.
- promote appreciation (to nature conservation sector) of the value and significance of palaeoenvironmental data and their role in understanding past landscapes and their human influences.

3 Research themes and objectives

Theme 1 Understanding the distribution, character and value of wetland and waterlogged archaeology
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Objective 1.1 Bring knowledge of other wetland/waterlogged categories to levels comparable with lowland peatlands and alluviated lowlands, prioritising those under particular pressure.
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There is a large body of survey data and research providing a good understanding of the distribution and management issues of wetlands and waterlogged archaeology in certain types of wetlands, i.e. lowland peatlands and river valleys. Our understanding of other categories of wetlands, e.g. upland peatlands, river channels, floodplains above 10m OD and urban waterlogged archaeology, is less developed or absent so we are unclear about the severity of management issues, risks and threats that may be associated with such landscape components. Bringing our level of understanding of the character and issues facing under-represented wetland and waterlogged contexts to a comparable level with lowland peatlands and alluviated lowlands is a priority.

Objective 1.2 Enhance dissemination of extant data on wetland and waterlogged archaeology and make it available to new audiences.

Building on the work of 'Heritage Management of England's Wetlands' project (HMEW)²¹, a publicly available inventory of important wetland and waterlogged sequences/deposits is urgently needed to promote understanding of the distribution of important places and flag their presence in the planning system and to others with interests in environmental management.

Objective 1.3 Improve understanding of the value and significance of wetland archaeological assets in terms of a) particular site-types and b) their contemporary, regional archaeological contexts.

There are some types of wetland site that are reasonably well understood, for example prehistoric trackways and causeways, whilst others require synthesis to better understand their significance²². Such sites comprise isolated finds, small scatters of material, sites with no obvious local analogue or places that provide a focus for particular activities such as votive deposition in wetlands and standing water. Many wetland and waterlogged remains have been discovered during small-scale commercial excavations and there is a need to synthesise these to understand better the use of landscapes during different periods and in different places around the country.

Without this level of synthesis, it will be difficult to refine aspects of the research strategy any further, particularly with respect to improving our understanding of the distribution of specific categories of site or evaluating the significance and meaning of newly discovered sites. Attention would be particularly usefully focussed on the character and distribution of the scattered, ephemeral Mesolithic wetland archaeological/palaeoenvironmental resource of England, and also on Post-medieval deposits where peatlands and floodplains in particular contain potential archives of information on the impact of industrialization on the environment. As many of the upper levels of sequences that would contain this information have been disturbed or truncated, any examples that remain are a particularly valuable resource. In addition, there is also a need to better promote and integrate the contribution that wetland and waterlogged sites can make to understanding period-specific and/or regionally-specific archaeological questions for all periods²³, including Post-Roman, medieval and industrial.

Objective 1.4 Develop new ways of working and targeting resources towards advancing our understanding of high quality (in terms of evidence-base) and/or vulnerable sites.

The resources required for excavating, analysing, conserving and curating the archaeological and palaeoenvironmental remains that are often associated with wetland and waterlogged archaeology are expensive compared to most dryland archaeology: this adds a level of complexity to setting up research-funded projects. Despite this constraint we need to advance archaeological knowledge at both regional and period-specific levels, by excavating sites that have levels of preservation that allow meaningful data sets to be recovered. Defining the criteria for selection, and identifying appropriate candidate sites for excavation, as recently produced in a research agenda for Scottish wetlands²⁴, is an essential first-step in targeting resources so they are used most effectively to promote as vibrant a research arena as possible, both to advance academic knowledge and to transfer that understanding into curatorial decisions.

²¹ *Heritage Management of England's Wetlands*, English Heritage Research Project 3225 (Van de Noort, *et al.*, 2004)

²² e.g. *Shared Visions: The North-east Regional Research Framework for the Historic Environment* p210 (Petts and Garrard, 2006)

²³ e.g. Burnham *et al.* Themes for urban research, c 100BC to AD200 p79 In *Britons and Romans: advancing an archaeological agenda* (James and Millett (eds), 2001) CBA Research Report 125

²⁴ *The Scottish Wetland Archaeology Programme: setting a research agenda* (Historic Scotland, 2006)

Objective 1.5 Improve the identification and registration of water-dependent heritage, enhance understanding of management options and promote or enable changes to land management to reduce risk where possible.

We know that wetland or waterlogged sites are vulnerable to changing environmental and burial conditions; that many are already in terminal decline; and that for some, preservation *in situ* is unlikely to be viable in even the mid-term (25 years). We need to identify clearly which sites are most at risk, for what reasons and whether the threat can be countered or mitigated. The HMEW project²⁵, which ran in the early 2000's, provided a resource assessment of threat to a number of designated and undesignated key wetland sites, producing draft management plans for a sample of those of national importance. This work provides a platform from which to develop site-specific understanding of threat in particular places, to improve our ability to manage that threat and to consider the value of the (remaining) resource at vulnerable sites. Additional work is needed to assess the changes that will have taken place in the decade since the research was undertaken, and to assess the site-specific relevance and viability of the changes to management proposed to improve protection. It should include determining priorities, based on significance and viability, for preservation *in situ*, identifying what assets have lost a significant part of their evidence value; and identifying those sites that, whilst preservation is compromised, could still yield sufficient data and are of such significance that targeted programmes of recording and analysis are urgently required.

Following on from this largely desk-based assessment of situation and conditions, a subsequent programme of work is required to evaluate the physical condition of remains, burial environment and hydrological and landscape setting of the key sites. Resources are limited and prioritisation will select the most critical places requiring detailed work to understand their preservation and the nature of archaeological and palaeoenvironmental information that survives. Although English Heritage has limited resources, it is well-placed to foster the development of partnerships across the sector to address this objective.

The results of investigation should identify and publicise sites in time-critical condition and provide supporting information to either promote changes in management (e.g. through targeted Higher Level Stewardship options; the environmental programme components of Water Resource Management Plans) or to support third parties in applications for external recording funding (e.g. Heritage Lottery Fund, research councils, European funding programmes). Where non-critical but vulnerable sites are identified, these should become subject to strategic assessment of condition and preservation potential. These sites may also need a placed on a register that identifies they are at risk, regardless of whether they are designated assets or not.

Theme 2 Prospection and evaluation of wetland and waterlogged archaeology.

Objective 2.1 Modelling to improve understanding of the risk of encountering deposits with high wetland or waterlogged archaeological potential in specific places.

Many sites are unexpected discoveries but there are methods of survey and landscape analysis that can be used to highlight areas of higher potential for wetland/waterlogged archaeology by modelling the sub-surface deposits in terms of their depth, character and chronology and creating risk maps of known and extrapolated archaeological potential. Such geoarchaeological approaches can be used to identify a wide range of contexts, not just wetlands, to assess the potential of a place to contain archaeological or palaeoenvironmental deposits of particular ages or in particular depositional environments. The approach is not new and has been used for many years as a component of both research-led and developer-

²⁵ *Heritage Management of England's Wetlands* English Heritage Research Project 3225 (Van de Noort *et al.*, 2004)

funded archaeology. In the latter, it has formed part of the evaluation tool-kit, being particularly helpful in reconstructing buried landsurfaces within alluviated floodplains and allowing the identification of old river channels and topographic high points, thus helping to decide the appropriate placement of evaluation trenches. A major factor invigorating the approach was the Aggregates Levy Sustainability Fund (2000-2010) where landscape evaluation approaches were necessary to be of use at a scale relevant to minerals' planning. This funding resulted in a large number of studies that also helped make methodological advances in remote sensing, landform analysis and borehole investigation to model geoarchaeological potential.

New applications to enhance our understanding of wetland/waterlogged deposits faced with development (e.g. infrastructure development, growth points or other large-scale planning), environmental threat (land-use change or climate change) or indirect threat arising from the policy decisions of others (e.g. flood risk management; WFD) should be promoted. This would improve resolution of the known distribution of the resource which in turn will increase our understanding of the significance of specific deposit types. Applications should also include urban centres to understand the research potential of deposits encountered through key-hole interventions and contextualise them within their immediate buried, relict landscape which may, for example, limit over-sampling of deposits with low research potential or in well-understood places and target places to plug gaps in understanding of either distribution or condition.

Objective 2.2 Improve accessibility – intellectual and physical - to the results of geoarchaeological deposit models that identify wetland/waterlogged archaeological potential.

Developing new ways of making this information available to the sector, particularly curatorial archaeologists, should be a priority, perhaps through modules added on to Urban Archaeological Databases as well as enhancing Historic Environment Records with information on waterlogged deposits. Archiving strategies and guidance²⁶ for geoarchaeological deposit models also needs to be enhanced to ensure that the results are easily accessible for future consultation and refinement.

Objective 2.3 Improve understanding of the potential and constraints of prospection approaches at both site-specific and landscape scales.

Alongside the increased application of the deposit modelling approach - which may help to reduce risk of unexpected discoveries - we also need to develop guidance on its use to aid local authority curators in setting planning conditions and briefs. In addition, training is needed to increase capacity in the sector for constructing robust deposit models that can be used with confidence. Guidance and training should include information about appropriate dating and sampling strategies, data presentation and understanding the limitations of such models.

Objective 2.4 Explore the potential to further develop techniques for site-specific prospection.

Whilst significant advances have been made in identifying areas of higher potential for waterlogged and wetland archaeology (particularly archaic, organic deposits) our ability to detect and delimit discrete sites has not advanced to the same extent. There is a need to determine whether we can improve prospection techniques to identify anthropogenic activity, particularly organic artefacts buried within organic deposits. Key issues that need to be addressed are distinguishing materials (e.g. waterlogged wood) that have near-identical composition to their burial matrix and identifying deeply buried sites that are masked by thick deposits of peat or alluvium.

²⁶ building on 'Guidelines for the Addition of Archaeological Science Data to Historic Environment Records'
<http://www.helm.org.uk/upload/pdf/ArchSciDat.pdf>

Synthesis of the current state of knowledge with respect to the application of geophysical and geochemical survey, airborne and satellite based remote sensing techniques is needed, as is dissemination of best practice guidance. There is still capacity for exploring the potential of new techniques.

Theme 3 Understanding the value and significance of assets designed to exploit and manage water

Objective 3.1 Review our understanding of water utilities heritage, assess its currency and refresh our understanding of threat levels.

The water supply and sewage industries were included in a national strategic status review under the Monuments Protection Programme (MPP) which considered supply, distribution and discharge systems²⁷. It included reservoirs and pumping stations but little on sewage and water treatment works and did not cover water towers which were the subject of a separate report. New EU Directives, domestic legislation and policy²⁸ will place increasing pressure on some categories of asset, such as water supply reservoirs, that were the subject of detailed assessment of their character and significance under this MPP project. Establishing which recommendations have been implemented, together with a review of the currency of those that are outstanding should be a key priority. Actions to address recommendations that are assessed to be significant should be developed, particularly where they coincide with categories of asset that are likely to be under threat from upgrading or adapting inherited infrastructure. Management guidance, potential for enhancement work and best practice case studies for water utility companies' assets is needed. In addition there is scope to develop and/or refine principles of selection for designation of different asset types, particularly for 19th century sewage and water treatment works which are poorly represented on statutory lists. Tools for local communities to both understand the value and significance of certain asset types (e.g. water works) and help monitor their condition should also be developed.

Objective 3.2 Improve our understanding of the distribution of water meadows and their associated irrigation networks, establish a national contextual overview of the asset type and ensure other sectors are aware that, regardless of designation status, we value them and why.

Water management to supply or drain water for agricultural purposes has resulted in a range of assets including wind-powered and water (steam)-powered pumps used to drain land, extensive drainage ditch networks that contribute to distinctive historic landscape character features and water meadows. For water meadows, despite their value and significance, designation as heritage assets is not always appropriate, and we recognise that the best protection for these increasingly rare landscape features can be their active management for nature conservation which, if sensitively handled, may also benefit historic elements of the landscape. Scheduling of large agricultural landscapes is always likely to be unusual and English Heritage recognises that good management is often the best long-term option. In some exceptional instances, heritage designation of water meadows has occurred, although the current group of eleven designated as Scheduled Monuments does not include some of the most well-known and best preserved examples.

There is a need to prepare an audit of known designated and undesignated assets to understand better the distribution of both bedwork and contour water meadows. Whilst there are detailed regional studies, a national overview is lacking and would help to provide a context to promote understanding of the value and significance of the asset type. There is an active programme, funded by Natural England, to promote management of water meadows to support specific wet grassland habitats that are on the UKBAP list of priority habitats for conservation. It would, therefore, be timely to deliver tools for

²⁷ *English Heritage Water and Sewage Industries Step 4 Report* (Chitty, 2001)

²⁸ e.g. EU Water Framework Directive 2000; Flood and Water Management Act 2010; Waste Water NPS (DEFRA, 2011)

planning, local communities and nature conservation groups interested in meadow habitat restoration to understand the heritage value and significance of water meadows and their associated water supply systems and to monitor their condition.

Objective 3.3. Improve understanding of water mills and their functional water supply systems.

Small-scale and micro (<100 kW) hydroelectric power generation has not realised its full potential and could make a significant contribution to government targets for renewable energy generation²⁹. To this end, the UK Government has launched a series of initiatives to increase the amount of micro hydropower generated as part of its wider renewables programme and historic structures can have a valuable role to play. Water mills are obvious features which have potential for the scale of project that the government is interested in promoting. There is a significant potential resource under statutory protection (>900 water mills), and clearly many more undesignated assets will exist. Issues that need to be addressed relate to the nature of refitting, impacts on setting of designated assets and the implications of adaptive works required under WFD to grant the relevant licences. Action is, therefore, required at national levels to influence the content of the Environment Agency's Hydropower Good Practice Guidelines³⁰ and locally through the provision of consistent advice regarding individual proposals. Overall though, if handled sensitively, the programme does provide an opportunity for successful re-use of redundant buildings.

In addition to the water mills themselves, their water supply systems contain features (e.g. leats, aqueducts, sluices and weirs) that control water flow and these are often much less well understood than the mills they serve. Weirs have a variety of forms and associated functions leading to a lack of clarity about what is of listable quality or interest. Where designation does occur, this can be based on either architectural or technological merit. Until recently, little consideration was given to these features as threat was low, however we now need to improve our understanding of these features as they are increasingly under threat from development (for hydropower generation), replacement or demolition. One of the drivers is to improve the ecological status of rivers by enabling fish (particularly eels) and invertebrates to move further upstream by removing barriers; weir demolition, rather than adaptation through the creation of fish passes, is often the most economic solution.

A summary typology, resource assessment and synthesis of current understanding of the designated assets is urgently required to a) identify the categories under statutory protection; b) assess these against the range of architectural and engineering features recognised as significant; c) identify gaps in understanding; and d) as a whole, present a statement of value and importance of weirs, i.e. what they represent and why they are of interest.

Theme 4 Research into the viability, sustainability and implementation of *in situ* preservation for water-dependent archaeology

Objective 4.1 Better understanding of triggers and rates of decay for different archaeological materials.

A recent report stated that "Even though we have a basic... understanding of the mechanisms involved in various processes of deterioration... our ability to determine the rates at which these processes might occur... is less assured"³¹. There is a reasonable understanding of the thresholds of certain parameters at

²⁹ http://www.decc.gov.uk/en/content/cms/news/pn10_113/pn10_113.aspx

³⁰ <http://www.environment-agency.gov.uk/business/topics/water/126571.aspx>

³¹ National Heritage Science Strategy: <http://www.heritagesciencestrategy.org.uk/>

which conditions shift from a reducing to an oxidising environment and beyond which deterioration is to be expected³²:

- pH > 6.5
- redox potential > 200mV
- dissolved oxygen > 5 mg/l
- electrical conductivity < 1000 μ S/cm

We also have a relatively good knowledge of the processes of decay and deterioration of different organic and inorganic materials, although the role and recognition of microbial activity would benefit from further research and consideration of the 'in combination' impacts of these individual mechanisms would be useful.

However, gaps remain in our understanding of deterioration rates in different burial environments and under different hydrological and hydrogeological conditions and we lack understanding of whether the processes are cyclical, episodic or gradual. Overall, there is a need to produce a research agenda that identifies the critical gaps in knowledge in a little more detail and provides a framework to drive forward research projects to address these.

Objective 4.2 Improve understanding of the influences on and behaviour of, groundwater in urban contexts.

Research is needed to improve understanding of groundwater behaviour beneath urban centres containing waterlogged archaeological deposits (e.g. London, York, Carlisle, Canterbury, Nantwich). Unlike rural sites, where it can be relatively straightforward to identify and quantify the influences on the hydrological regime, understanding the dynamics of, and factors influencing, groundwater level and quality in urban contexts is highly complex. This is because groundwater gradients and thus flow pathways can be complicated due to the variable sources of water input, variable sub-surface sediments, numerous obstructions (i.e. basements, foundations, piles) and limited relationship with the surface water system³³.

More broadly, work is needed to identify the additional processes affecting the preservation potential or decay mechanisms that can operate in urban (or industrial) contexts and to describe the additional factors influencing their vulnerability. This includes the increasing use of groundwater heating and cooling systems with attendant accelerated groundwater removal or recycling in the burial environment, a new area of potential impact that awaits investigation.

Objective 4.3 Improve understanding of hydrological contexts of wetland sites and landscapes and their management options.

In relation to preservation, we know that both the quantity and quality of water in the burial environment is important for determining the preservation of archaeological remains of wetland and waterlogged sites. Consequently, understanding the active or potential decay processes requires an understanding of its wider hydrological context and a thorough understanding of both the site (location and depth of archaeology, burial sediments, artefact materials) and also 'normal' seasonal fluctuations in groundwater level and quality is needed to determine appropriate management. Guidance on monitoring standards, data collection and interpreting hydrological assessments is needed to support curatorial processes and decisions for individual cases. However, managing groundwater levels, in particular

³² 'Wetland Vision: Adapting Freshwater Wetlands to Climate Change.' English Heritage Research Report 5917 (Van de Noort in Acreman *et al.*, 2011). This was an historic environment module within an Environment Agency-funded consortium project. Final product available at http://www.ceh.ac.uk/sci_programmes/water/wetlands/form/license.aspx.

³³ A Howard *et al.* 'The impact of climate change on archaeological resources in Britain: a catchment scale assessment' p411 (*Climate Change* 91, 2008)

seasonal fluctuations is challenging in most contexts and is likely to become unsustainable in some regions with climate change (see Theme 6).

In order to consider preservation *in situ* as an option, we need to understand the relationship between the site and its hydrological context as well as have the ability to manage sites on a landscape-wide basis. Regardless of whether new legislation to designate archaeologically-sensitive wetland deposits can be introduced, protecting blocks of landscape can only be achieved by refining management tools, which includes enhancing partnership work with those engaged in water management whether this be through water resource management or meeting nature conservancy targets (see Theme 7).

Objective 4.4 Improve our ability to identify and respond to critical conditions in the burial environment.

We lack consolidated understanding of the information limitations of different categories of artefact and ecofact whose preservation has been compromised, i.e. at what point have they deteriorated to the extent no valuable information can be gained? Procedures are needed to evaluate the information remaining in both palaeoenvironmental sequences and material culture remains. We also need to agree criteria beyond which remains are deemed to be of limited or no value other than to indicate presence/absence. This has implications for determining whether preservation *in situ* is an appropriate management option for individual sites and will also be a material consideration in addressing some of the issues identified elsewhere (e.g. Objective 1.5).

Where preservation *in situ* is an option, there needs to be better use of management plans that:

- have assessed the hydrological setting and explicitly indicate the minimum conditions that are required to keep the burial environment stable.
- monitor conditions to ensure that the parameters remain within agreed limits.
- identify trigger points for taking action.
- define options at those trigger points, e.g. what action would be taken if water quality deteriorates significantly and for a prolonged period?

Of course, this means we also need to decide how to define 'significant' and 'prolonged' which will not be easy.

More fundamentally, there is a need to accept that *in situ* preservation is not always an appropriate solution for the conservation of wetland archaeology, and that the potential management of sites on this basis has been over-emphasised in the past. Specifically, as a sector, we should acknowledge the limitations of *in situ* preservation as a conservation strategy for wetland archaeology in some contexts and accept that in order for it to be viable there is often a need for significant research to establish the current burial conditions and, where these promote preservation, their resilience to change.

Theme 5 Long-term ecology: developing knowledge transfer from palaeoecology.

Objective 5.1 Improve communication of information between palaeoecology and neo-ecology.

Wetland and waterlogged deposits, and in particular peat sequences, are archives of palaeoecological information that is of value to both historic and natural environment sectors. Deposits can contain plant and animal remains that allow past ecological communities to be identified. Where these deposits support high resolution dating potential, detailed information may be recovered regarding the behaviour of those communities over long periods of time; identifying short- and long-term (i.e. > 50 years) processes within ecosystems; quantifying peat accumulation rates; demonstrating that biodiversity is dynamic and how it has changed through time; and presenting data about the resilience and status of

native species³⁴. Promotion of the value of the palaeoecological archive to address current critical ecological management questions would also improve the profile of these deposits within the natural environment sector that is, at present, better placed to afford their protection through formal mechanisms and negotiation of sensitive working practices. Partnership work is needed to identify specific places with high quality research potential (defined by age, depth and condition) and a thematic overview of the issues is also required to raise awareness of the value of this approach to policy-makers and strategists engaged in environmental management.

We also need to improve others' access to our data and show them how relevant it can be to their issues. For example, recently the RSPB has begun to investigate the use of information from archaeological bird bone assemblages in the East Anglian fens to support proposals for the reintroduction of particular species to the region.

We need better understanding of which groups we want to engage with and understand what tangible results we want to achieve from the relationship. This requires the targeting of more sophisticated messages to specific audiences, i.e. there are different messages for different groups, according to whether they are policy makers, local communities, conservation practitioners, site managers.

Objectives 5.2 Promote the use of palaeoenvironmental research to improve understanding of past environmental change, climate change and human impact.

Palaeoenvironmental sequences can also illustrate how land management (e.g. tree clearance or arable agriculture) and climate change might influence natural processes and human responses to these, in upland and lowland catchments³⁵. Whilst the peat archive provides an opportunity for long term (>50 year) monitoring of change and adaptation, there is one key caveat. It has to be recognised that large variability exists even within individual bog systems and that it is very difficult, if not impossible, to entertain the idea of a representative place within a particular area of peatland.

Objective 5.3 Improve understanding of the role of human agency in shaping the natural environment, including high quality wetland landscape features.

A further challenge is the need to improve public and other sector professionals' appreciation and understanding of the role of human agency in shaping the natural environment and high quality wetland landscape features. At present, there is little appreciation of wetlands, particularly upland peatlands, as historic landscapes by the public, other stakeholders or natural environment policy-makers.

Information about the influence of past land use practices, e.g. burning, on habitat development and the need for human intervention at specific times and in specific ways to maintain certain habitats requires reinforcement and needs to be disseminated more widely to both strategic and operational natural environment managers. Specific case studies – e.g. the use of palaeoecology to inform the management plan for newly created sedge-fen at the National Trust's Wicken Fen – should be used to illustrate the potential.

³⁴ e.g. K Willis 'What is Natural? The need for a long-term perspective in biodiversity conservation' p1261 (*Science* 314, 2006); P Hughes *et al.* 'Decline and localized extinction of a major raised bog species across the British Isles: evidence for associated land-use intensification pp1033-1043 (*The Holocene* 18, 2008); K Willis and S Baghwat 'Questions of importance to the conservation of global diversity: answers from the past.' pp1139-1162 (*Climate Past Discussions* 6, 2010)

³⁵ A Howard *et al.* 'The impact of climate change on archaeological resources in Britain: a catchment scale assessment.' (*Climate Change* 91, 2008)

Theme 6 Understanding threat from climate change and environmental management

Objective 6.1 Improve understanding of threat from direct and indirect impacts of climate change.

Direct impacts on waterlogged archaeology and wetlands resulting from climate change are likely to be:

- groundwater change (with implications for the preservation of waterlogged remains).
- changes in river channel behaviour leading to altered incision, lateral channel migration and flow rates all of which change erosion patterns.
- flood events from groundwater, tidal and surface water flooding increasing in both frequency and magnitude.
- changes in lowland and upland vegetation composition altering the character of some landscapes.

In particular, we need to begin to think about the implications of climate change for river behaviour and the impact that it may have on historic environment assets throughout catchments, both within river channels and in the adjacent floodplains. Built structures (e.g. bridges, weirs, river-side buildings) and buried archaeology may be affected by changing patterns in river flow, erosion or even channel morphology.

To understand the implications at a scale appropriate for exploring management options, new methods of working will be required that allow a) the behaviour of particular rivers or sections of their catchments to be modelled under different scenarios and b) comparison of the resulting river behaviour models to the known historic environment record. Similar research is needed to look at the vulnerability of freshwater wetlands to climate change and investigate the impact on buried organic archaeology and palaeoenvironmental remains³⁶. However, many of the most critical impacts of climate change on the historic environment will be created in the course of others' actions to adapt to or mitigate predicted climate change, by enforced changes in land-use or managing flood risk in new ways.

Objective 6.2 Improve understanding of threat from flooding and flood risk management.
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Effects of flooding on the historic environment encompasses both the direct impacts of inundating waters on landscapes and structures, and the indirect impacts of actions undertaken to manage flood risk. Whilst in the past, building flood defences may have been both economically viable and the preferred option, there has been a shift towards increasing the use of adaptive strategies – e.g. creation of washlands and temporary flood water storage on floodplains – to reduce the likelihood of flooding in high risk areas and to minimise the impacts when it does occur. Rewetting in the upper parts of catchments, the creation of flood alleviation channels and the development of sustainable drainage systems (SuDS) are all solutions that may impact the historic environment and which require guidance to ensure heritage-sensitive implementation. Strategies and dissemination of best practice for increasing the resilience and recovery rate, and guidance on the appropriate repair of designated structures need continued publicity to reach relevant audiences: property owners, flood recovery companies, loss adjusters and the insurance industry.

We also need to improve understanding of the risk of flooding to the English Heritage estate, designated assets and the broader historic environment and develop tools to make this information more easily accessible to curators and to local authorities tasked with creating the new generation of flood risk management plans.

³⁶ e.g. *Wetland Vision: Adapting Freshwater Wetlands to Climate Change* Environment Agency Consortium Project (Acreman *et al.*, 2011) http://www.ceh.ac.uk/sci_programmes/water/wetlands/form/license.aspx

Objective 6.3 Improve understanding of the relative risk from Water Framework Directive (WFD) implementation

The EU Water Framework Directive (WFD), introduced in 2000, has set short-term (2015) and medium-term (2025) targets to improve water quality in those waterbodies deemed to be failing on grounds of water chemistry or ecological status. Consequently, all new environmental management strategies, plans and projects must be WFD-compliant and a significant range of actions are being considered or implemented to make the necessary improvements. These are set out in River Basin Management Plans prepared by the Environment Agency, of which there are eleven covering England and Wales³⁷. Actions to improve groundwater may impact buried, waterlogged archaeology and palaeoenvironmental deposits, usually positively through reduced abstraction rates; those to improve river channel management may affect both historic structures and buried archaeology. Additionally, a contributory factor to diffuse source pollution, one of the pressures on water quality, has been identified as industrial archaeology features present in historic mining landscapes. The Environment Agency has suggested the legacy of coal and metal mining in the UK could be a significant barrier to achieving WFD objectives. Pilot remediation is already underway in Wales to investigate the feasibility of remedial options at the most polluting sites, some of which are designated historic environment assets.

Although we understand the broad issues and actions that have been set out in River Basin Management Plans, we need to:

- improve understanding of how these are to be implemented and over what time-frame (i.e. by 2015 or 2025).
- enhance our understanding of the risks posed to heritage assets through WFD actions.
- develop regionally-specific partnerships to understand risk and develop mitigation strategies.
- identify opportunities for knowledge exchange and best practice guidance.

Theme 7 Improving protection for water management and water-dependent assets

Objective 7.1 Realise the potential of partnership protection with the water industry.

The privatised and strongly regulated (by Ofwat) industry enjoys significant annual investment (currently £4 billion), which includes a component to deliver environmental improvements or protection. All water companies produce a Water Resource Management Plan which outlines their planned investments and within these lie opportunities to deliver better protection to some wetland assets. We need to explore opportunities for linking important wetland archaeological sites to wetland habitats that qualify for action under the environmental programme to ensure hydrological conditions do not deteriorate. Key drivers for these actions are the WFD and delivery of nature conservation objectives under the Habitats Directive, so we need to prioritise actions where we know they can be aligned with those that are to be explicitly targeted for other, more legally compelling reasons.

³⁷ <http://www.environment-agency.gov.uk/research/planning/33106.aspx>

Objective 7.2 Realise the potential for protection using environmental stewardship management options.

Protection of the historic environment is explicitly recognised within both Entry Level Stewardship (ELS) and Higher Level Stewardship (HLS) agri-environment schemes, both of which contain specific options for management of historic environment and landscape features³⁸. Within HLS, four options directly address the protection of wetland archaeology and associated landscape features, namely:

- maintaining high water levels to protect archaeology (HD8)
- maintenance of designed/engineered water bodies (HD9)
- maintenance of traditional water meadows (HD10)
- restoration of traditional water meadows (HD11)

However, these options have low take-up across all regions with only one agreement currently signed for maintaining high water levels to protect archaeology. There has been some increase in uptake over the past five years but it is clear that they are not popular and it would be useful to investigate the reasons for this more closely to determine whether anything can be done to improve the situation. Equally useful would be an examination of those situations where successful agreements for HD8, 10 and 11 have been made, and to assess whether there are any commonalities.

As the new HLS round has recently started and requires targeting priority places, this presents a good opportunity to re-examine the potential use of HLS options to protect wetland assets and to identify and promote candidate places. Particular challenges include how we identify appropriate places when we have limited tools available to flag up either wetland archaeology sites (see Objective 1.2) or water meadows (Objective 3.2), both of which have very limited designated examples. Improvements to existing mechanisms are also needed (i.e. improving the presence of wetland heritage assets on Historic Environment Records as well as the increased use of designation for wetland sites) to ensure others are aware of the places we value for wetland archaeology.

Objective 7.3 Develop clear messages and guidance about appropriate and proportionate use of evaluation, assessment and mitigation methods for potential impacts on the historic environment and produce guidance for implementing conservation works.

Standards and protocols need to be agreed across the various levels within organisations to ensure that both planning and delivery ends of the process are working consistently and with the same set of assumptions of what is important and appropriate. This is true for government agencies, non-government organisations and third sector groups. Peatlands, upland and lowland, can contain well-preserved archaeology but our understanding of archaeological distribution within them is partial and in many places needs to be improved to enable better understanding of real risks in particular places under particular management options such as those proposed to rewet upland peatland. Whilst parts of the sector call for regional and/or site-specific assessment of archaeological value of all sites prior to restoration or habitat creation work, we need to establish broad agreement on the levels of appropriate assessment (desk-based versus field investigation) and proportionality. There is much work to be done on aligning the appropriate and proportionate use of evaluation, assessment and mitigation methods for potential impacts on the historic environment and producing guidance for implementing conservation works.

³⁸<http://www.naturalengland.org.uk/ourwork/farming/funding/es/>

Objective 7.4 Develop clear position statements with regard to our aspirations for the protection of the historic environment in wetland contexts.

We need to understand and articulate what we value about particular categories of asset, and about the historic environment resource in relation to particular wetland environments. These should not only be used to help identify areas of harmony and conflict between the aspirations and working practices of natural and historic environment managers³⁹, but also to ensure that consistent messages are delivered to other stakeholders from policy-making to delivery levels.

4 Establishing projects

The Strategy identifies those areas (Themes and Objectives) that are currently of primary concern to English Heritage. Topics for action have been identified for each Theme (see Appendix 2) and those that are strongly aligned to NHPP have been prioritised.

We welcome collaborative research with other agencies and groups. If you are interested in developing a project, we encourage informal discussion as a preliminary to submitting your proposal and the primary point of contact is:

Dr Jen Heathcote, Historic Environment Intelligence Analyst (Environmental Impact), English Heritage (jen.heathcote@english-heritage.org.uk)

Guidance on developing a research proposal compatible with current guidelines (MoRPHE and SHAPE) is provided on the English Heritage website: <http://www.english-heritage.org.uk/professional/funding/grants/grants-available/nhpcp/>.

³⁹ 'Peatlands and the Historic Environment.' IUCN UK Peatland Programme (B Gearey *et al.*, 2010) <http://www.iucn-uk-peatlandprogramme.org/>

APPENDIX I RESEARCH FRAMEWORKS

1 English Regional Research Frameworks: Resource Assessments, Agendas and Strategies

(NB, consulted between June 2009 and March 2011, status may have subsequently changed; *Resource Assessment only; **under revision)

- *An Archaeological Research Framework for North West England: Volume 1 Resource Assessment; Volume 2 Research Agenda and Strategy*. Edited by Mark Brennand (2007) Cumbria County Council <http://www.liverpoolmuseums.org.uk/mol/collections/archaeology/arf/index.aspx>
- *Shared Visions: the North East Regional Research Framework for the Historic Environment*. David Petts with Christopher Gerrard (2006) Durham County Council <http://www.durham.gov.uk/pages/Service.aspx?ServiceId=6666>
- *The Archaeology of Yorkshire: an assessment at the beginning of the 21st century*. Edited by T G Manby, S Moorhouse and P Ottaway (2003) Yorkshire Archaeological Society.* <http://www.english-heritage.org.uk/publications/yorks-arch-res-framework-agenda/>
- *The Archaeology of the East Midlands: an archaeological resource assessment and research agenda*. N J Cooper (2006) Leicester University Press. ** Updated version can be found here: <http://tparchaeology.co.uk/east-midlands-research-strategy.htm>
- *Research and Archaeology: a Framework for the Eastern Counties: Volume 1 Resource Assessment* Edited by J Glazebrook (1997); and *Volume 2 Research Agenda and Strategy* Edited by N Brown and J Glazebrook (2000) East Anglian Archaeology.
- *Research and Archaeology Revisited: a Revised Framework for the East of England*. Edited by M Medlycott and N Brown (2008). East Anglian Archaeology
- *A Research Framework for London Archaeology 2002* (Museum of London, 2002)**
- *An Archaeological Research Framework for the Greater Thames Estuary* (Essex County Council, 1999)**
- *Solent-Thames Archaeological Research Framework* http://thehumanjourney.net/index.php?option=com_content&task=view&id=553&Itemid=277
- *The Archaeology of South-West England: resource assessment and research agenda* (Somerset County Council, 2008) <http://www1.somerset.gov.uk/archives/hes/swarf/Index.htm>
- *West Midlands Regional Research Framework for Archaeology* <http://www.birmingham.ac.uk/schools/iaa/departments/archaeology/research/wmrrfa/index.aspx>

2 Other Research Agendas, Assessments and Strategies

- *A Review of Geoarchaeology in the Midlands of England*. M Canti (2009) English Heritage Research Department Report Series, 17. <http://www.english-heritage.org.uk/professional/research/research-reports>
- *Draft English Heritage Research Strategy for Preservation of Archaeological Remains in situ* (J Sidell and I Panter (2006) Unpublished Internal Paper.
- English Heritage Thematic Research Strategies: *Prehistory* (J Last, 2010); *Draft Roman-period* (P Wilson, 2010); *Urban historic environment* (C Giles, 2010); *Historic Industrial Environment* (K Falconer, 2010) <http://english-heritage.org.uk/professional/research/research-strategies>
- *Monuments at Risk in Somerset's Peatlands*. Somerset County Council Heritage Service (2008) English Heritage Project Report 3191.

- *The Heritage Management of Wetlands in Europe*. Edited by B Coles and A Olivier (2001) EAC occasional paper, 1.
- *Upland Peats: managerial assessment. Volume 1*. Oxford Archaeology North (2009) English Heritage Project Report 2974.
- *Wetland Archaeology: present status and practical recommendations*. English Heritage (2005) Unpublished Internal Paper.
- *Wetland Management: a survey for English Heritage*. B Coles (1995) WARP occasional paper 9, Exeter.

APPENDIX 2 THEMES, OBJECTIVES AND PRIORITISED TOPICS FOR ACTION

Objective	Topic (emboldened and highlighted cells are prioritised due to their clear mapping across to NHPP high-scoring issues. Scores for NHPP issues were determined formally as part of separate programme of work).	NHPP Activity	Research Project (R) or Operational Action (O)	SHAPE sub-programme	
Theme 1 Distribution, character and value of wetland and waterlogged archaeology			description		number
1.1 Address large-scale gaps in understanding	▪ character and distribution of archaeology in upland peatlands		R	Understanding Place: Assessing the national resource	11111.140
	▪ archaeology of river management	3A5; 4B3	R		
	▪ archaeological record in fluvial contexts		R		
	▪ distribution of waterlogged urban archaeology	3A5	R		
1.2 Improve data dissemination	▪ widen access to existing data identifying key wetland heritage assets	3A5	R	Systems research for HERs	41161.110
	▪ develop resources to improve management of key wetland heritage assets	3A5	R		
	▪ streamline incorporation of statutory historic environment data into FCERM strategies and plans		O	Information management innovation	14162.110
1.3 Improve understanding of value and significance of wetland archaeology	▪ advance understanding of site-types (e.g. timber platforms, post alignments)		R	Understanding Place: Assessing...	11111.140
	▪ wetland sites and landscapes within their broader contemporary setting		R		
	▪ synthesise grey literature and provide regional contextual analysis		R		
	▪ the role of wetlands in advancing understanding of the Mesolithic period in England	4G1	R		
	▪ impact of industrialization on the environment		R	Strategic Designation Research	31111.110
▪ designation of key wetland sites to ensure their value is recognised and understood by others		O			

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Theme 1 Distribution, character and value of wetland and waterlogged archaeology (cont.)			description		number
1.4 Address specific gaps in understanding	▪ publish list of high quality and/or vulnerable sites for targeted investigation	3A5	R	Understanding Place: Assessing...	11111.140
	▪ identify artefacts or assemblages for revised analysis with new techniques or within new conceptual frameworks		R		
	▪ establish condition and research potential of material remains at specific sites	3A5	R		
	▪ guidance on procuring dating evidence and refining chronologies		R	Guidance for practitioners...	42224.110
1.5 Improve understanding of risk to water-dependent heritage	▪ nature and magnitude of threat	2CI	R	Heritage at Risk: Monitoring surveys	32141.110
	▪ potential for site-specific preservation i <i>n situ</i>	3A5	R		
	▪ partnership work with EA to produce register/GIS layer of water-dependent heritage assets		O	Information management innovation	14162.110

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Theme 2 Prospection and evaluation					
2.1 Deposit modelling for high wetland/waterlogged potential	<ul style="list-style-type: none"> ▪ explore airborne remote sensing data for detection and evaluation of waterlogged ground ▪ expand use of geoarchaeological approaches to model wetland and waterlogged potential of landscapes ▪ guidance on geoarchaeological deposit modelling in peatland and alluviated contexts <i>NB. should be component of broader guidance on deposit modelling; relevant to Activities 3A3, 3A5 and 4G1.</i> ▪ develop protocols for archaeological risk mapping in peatland and alluviated contexts ▪ advice on sample requirements for scientific dating of lowland valley mires and palaeoenvironmental sequences 		R	Fresh toolkits: Methodological and theoretical research and innovation	14171.310 and 42224.110
		3A5; 4G1	R	Guidance for practitioners...	42224.110
			R		
			R		
			R		
2.2 Improve accessibility to results of geoarchaeological deposit models	<ul style="list-style-type: none"> ▪ enhance HERs/other databases with information about zones of high wetland and waterlogged potential 	3A5	R	Systems research for HERs	41161.110
2.3 Understanding potential and constraints of prospection approaches	<ul style="list-style-type: none"> ▪ develop guidance and training for curatorial and commercial professionals 		O	Guidance for practitioners...	42224.110
2.4 Develop techniques for site-specific prospection	<ul style="list-style-type: none"> ▪ synthesise current knowledge on the potential of geophysical techniques to find sites in wetland contexts ▪ explore the use of geochemistry to find sites in wetland contexts 	3A5	R	Fresh toolkits: Methodological and theoretical...	14171.310
			R		

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Theme 3 Water management and resource					
3.1 Utilities and infrastructure	▪ review understanding of water industry heritage and implement relevant MPP recommendations	4BI	R	Understanding Place: Assessing... and Strategic Designation Research	11111.140 and 31111.110
	▪ establish framework for character and significance of waste water heritage		R		
	▪ develop tools for community engagement to monitor condition of assets		R	Community Involvement and Awareness	51311.110
3.2 Water and agriculture	▪ synthesise distribution, character and significance of water meadows	4BI	R	Understanding Place: Assessing...	11111.140
	▪ produce guidance for heritage-sensitive habitat restoration of water meadows	4BI	O	Guidance for volunteer and community gps	43215.110
3.3 Power and Industry	▪ assess English hydropower heritage and produce national contextual overview		R	Understanding Place: Assessing... and Strategic Designation	11111.140 and 31111.110
	▪ improve understanding of the form and function of water mill landscapes	4BI	R		
	▪ produce EH position statement and guidance for owners on sensitive re-use of historic structures for micro-hydropower generation	4BI	O	Conservation Guidance for Landowners	33215.110
3.4 River management	▪ flood defence heritage		R	Understanding Place: Assessing...	11111.140
	▪ heritage significance of weirs	4BI	R	Strategic Designation Research	31111.110
	▪ mitigation guidance for EA on actions under WFD	2CI	O	Guidance for practitioners...	42224.110
3.5 Water and transport	▪ waterways heritage: understanding assets associated with navigation routes	4B3		Understanding Place: Assessing...	11111.140
	▪ mitigation guidance for actions carried out to improve safety of navigation routes	4B3	O	Guidance for practitioners...	42224.110

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Theme 4 Preservation <i>in situ</i> of water-dependent archaeology					
▪ revise and publish EH draft strategy on in situ preservation: <i>NB this would provide context for the water-dependent component identified below</i>					
4.1 Decay and deterioration	▪ better understanding of rates of decay	2C2	R	Technical Conservation Research	33143.110
	▪ improve understanding of 'in combination' effects		R		
	▪ decay products of modern materials and their impact on burial conditions		R		
4.2 Preservation in urban and industrial contexts	▪ groundwater influences and behaviour in urban contexts		R	Technical Conservation Research	33143.110
	▪ processes specific to urban and industrial burial environments		R		
4.3 Understanding and managing hydrology	▪ hydrological context and dynamics at key sites	2C1	R	Guidance for practitioners...	42224.110
	▪ guidance on monitoring and interpretation of hydrological behaviour	2C2	O		
	▪ develop and implement management plans for keys sites (building on HMEW research)		O	Developing Management Plans...	31521.110
4.4 Understanding and responding to critical conditions	▪ protocols and standards for evaluating the condition of material remains	2C2	R	Technical Conservation Research and Guidance for practitioners...	33143.110 and 4224.110
	▪ identifying and responding to critical conditions	3A5	R		
	▪ guidance for evaluating the condition of material remains	3A5; 2C2	O		
	▪ guidance on monitoring burial conditions, identifying critical conditions and determining responses	2C2	O		

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Theme 5 Long-term ecology: palaeoenvironmental sequences					
5.1 Learning from palaeoecology	<ul style="list-style-type: none"> identifying long-term (>50 years) processes within ecosystems quantifying peat accumulation rates resilience, status and distribution of 'native' species 		R R R	Understanding ancient environments and ecologies	11111.420
5.2 Improved understanding of past environmental change and human impact	<ul style="list-style-type: none"> identifying past environmental and climatic change human responses to environmental and climatic change 		R R	Understanding ancient environments...	11111.420
5.3 Improve understanding of human agency shaping the natural environment	<ul style="list-style-type: none"> role of human activity in maintaining desired habitats 		R	Understanding ancient environments...	11111.420
Theme 6 Threat from climate change and environmental management					
6.1 Direct and indirect impacts of climate change	<ul style="list-style-type: none"> direct and indirect impacts on wetlands and waterlogged archaeology understanding relative risk and resilience of assets to direct impacts 	2CI 2CI	R/O R/O	Heritage at Risk: Identifying threats arising directly from climate change...	32142.110
6.2 Improve understanding of threat from flooding and flood risk management (FCERM)	<ul style="list-style-type: none"> implications of changes in flood risk management for historic environment Flood Risk Impact Assessment for English Heritage Estate guidance for lead local flood authorities on considering historic environment when preparing local FCERM strategies/plans guidance for local authorities and industry on impacts of sustainable drainage systems (SuDS) deliver training for heritage professionals in flooding and flood-risk management planning 	2CI 2CI	R R O O O	Heritage at Risk: Identifying threats (other than climate change)... Guidance for practitioners... Local authority training	32142.210 42224.110 41241.110
6.3 Improve understanding of relative risk from WFD implementation	<ul style="list-style-type: none"> understand the timing and planning context of WFD actions 	Measure 1, 2CI	R	Heritage at Risk: Identifying threats (other than climate change)...	32142.210

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Theme 7 Improved protection for water management and water-dependent assets					
7.1 Realising the potential of partnership protection with the water industry.	<ul style="list-style-type: none"> identify opportunities improve management of wetland sites through Ofwat's environmental programme 	Measure 1	R	Advocacy of key historic environment issues	22343.110
7.2 Realising the potential for partnership protection using environmental stewardship, protection and enhancement mechanisms	<ul style="list-style-type: none"> improve access to information about location and character of wetland sites identify opportunities to improve management of wetland sites through Higher Level Stewardship options Promote use of existing management tools (e.g. Wetland Vision) Promote better understanding of character and value of water-related and wetland heritage to other sectors through engagement at national and local levels 	Measure 1, 2C1, 3A5	<p>R</p> <p>O</p> <p>O</p> <p>O</p>	Advocacy of key historic environment issues	22343.110
7.3 Guidance on mitigation for biodiversity and conservation programmes	<ul style="list-style-type: none"> deliver guidance to agencies and NGO's on heritage-sensitive change and recording 	2C1, 4B1	R/O	Guidance for practitioners...	42224.110
7.4 Define aspirations for protection of wetland and waterlogged archaeology.	<ul style="list-style-type: none"> agree aspirations/pragmatic limits for different wetland contexts and prepare position statements. First focus on burning in upland peatlands (needs drafting) and rewetting (review, re-brand and disseminate existing guidance more widely). bring draft statement on peat extraction to publication 		<p>O</p> <p>O</p>	Advocacy of key historic environment issues	22343.110

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