

Monuments at Risk in England's Wetlands

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For:
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The **English Heritage Strategy for Wetlands** is available on the English Heritage website, at: www.english-heritage.org.uk/archaeology/wetlands

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Note to this draft

This is the third and final draft of the Monuments at Risk in England's Wetlands project. It follows from a widely distributed consultation document (v. 2) and this draft incorporated comments from a range of organisations, including the Peat Producers Association, The National Trust, and the CBA and a number of individuals.

1. Monuments at Risk in England's Wetlands: assessment

1.1 English Heritage has in the past 30 years commissioned surveys and research into the main wetlands of England, i.e. the Somerset Levels Project, the Fenland Project, the North West Wetlands Survey (NWWs) and the Humber Wetlands Project. The total extent of the remits of these surveys is estimated at 887,000 ha, although the area studied in the field is estimated at 450,000 ha. The English Heritage commissioned surveys were concentrated on lowland peatlands and alluviated lowlands – upland peatlands have not been the subject of specific survey projects sponsored by English Heritage. The total costs of English Heritage sponsored work in wetlands is estimated at £7M for this period.

1.2 This desk-based assessment of the Monuments at Risk in England's Wetlands (MAREW) was commissioned by English Heritage on 1 August 2000. It was aimed to provide a general picture of the condition of England's rural, terrestrial, wetland archaeological resource, principally on the basis of the English Heritage surveys and the risks it faces. It was also to create a benchmark against which future changes in England's wetlands can be monitored. In particular, it was to address the effect of hydrological changes on the waterlogged organic archaeological and palaeoenvironmental remains in wetlands and the impact of peat extraction on this resource, while also addressing the impact of forestry and urban and industrial expansion onto wetlands. The project was also to collate and assess information on governmental and non-governmental policies pertaining to wetlands and wetland archaeology, and formulate recommendations for further discussion within English Heritage (EH) and the wider archaeological community. The project did not involve any new field or laboratory research or analysis and relies on published data and information provided by individuals and organisations.

Differences in the use of terms such as 'wetland', 'monument', 'site' and 'find', have resulted in the data presented here reflecting regional variations, but with variable conformities on a national scale. All 'national' estimates of monuments, monument densities and of wetland destruction over the last 50 years presented here are minimum estimations.

1.3 The significance of wetland monuments lies in (a) the preservation of organic archaeological remains that are usually not found in free-draining soils, (b) the presence of a sedimentary matrix that provides additional protection against physical destruction and (c) the palaeoenvironmental material in the matrix or the context of the resource that allows for dating and environmental reconstruction. This resource includes some of the best and most celebrated archaeological sites and finds from England, such as Star Carr, Glastonbury Lake Settlement, Sweet Track, Flag Fen, the Roos Carr figurines and Lindow Man. It also includes thousands of less well-known sites in the Somerset Levels, the East Anglian Fens, the peatlands of the northwest, the Humber wetlands and several hundred smaller landscapes, as well as sites on the upland peats in areas such as Cumbria, Northumberland, the Pennines, Exmoor and Dartmoor; each can be viewed as an 'archive' of palaeoenvironmental material.

1.4 The preservation of organic archaeological and palaeoenvironmental remains results from saturation of the ground and the exclusion of oxygen. In most undisturbed wetlands, this anoxic environment inhibits the activity of certain microbes thus impeding the natural process of breakdown of organic remains. The high water table also excludes the disturbing activities of burrowing animals and limits the rooting activity of plants and

trees. When wetlands are drained, or when peat is cut, oxygen is reintroduced into the burial environment and the microbial activity will recommence. The draining of wetlands will usually be followed by changes in the land use, including the introduction of agricultural practices and their damaging impact on the buried archaeological resource.

- 1.5 The most visible and widely recognised threat to the wetland archaeological resource is peat extraction, and several organisations including the Council for British Archaeology have campaigned against the continued extraction of peat. However, the greatest impact on the wetland archaeological resource is from the drainage of land for agriculture and the subsequent drying out of the archaeological remains and peat wastage from agricultural land. Other threats include urban and industrial expansion onto wetlands and the eutrofication of peat through agricultural fertilisation.
- 1.6 For the purpose of this project, wetlands are defined as:

'the peatlands and alluviated lowlands in England'

These wetlands have been mapped on a scale of 1:1,000,000 for the project's analysis and archive, based on the Soil Survey of England and Wales lowland peat survey (Burton and Hodgson 1987), and the 1:250,000 and 1: 1,000,000 Soil Survey of England and Wales maps (Figure 1).

Specifically excluded from this study are intertidal estuarine and coastal wetlands, waterlogged urban deposits, and the river valleys outside the alluviated lowlands, usually lying above the 10 m Ordnance Datum.

The intertidal estuarine and coastal wetlands fall outside the remit of English Heritage. The need for a future desk-based assessment of intertidal deposits and develop a complementary strategy which can be integrated with the results of this project is recognised.

The value of waterlogged archaeological urban deposits is evident from research in London, York, Hull, and elsewhere. Waterlogged urban deposits may have originated from rural wetlands, or are the effect of deeply burying of the archaeological resource beneath younger developments, and occasionally by deep alluvial sediments and peat. Consequently, the 'urban wetlands' are masked, and the data is not comparable to the rural wetlands. However, the need to carry out a desk-based assessment of the waterlogged urban deposits and develop a complementary strategy which can be integrated with the results of the current programme of extensive and intensive urban surveys is recognised.

River valleys above to 10 m OD were excluded from this study because the range of threats to this resource were considered significantly different from the other rural wetlands. These river valleys add an additional 550,000 ha of land with the potential to preserve waterlogged archaeological remains, albeit recognising that such preservation is localised and dependent on the past river development. The need for a desk-based assessment of riverine wetlands above the 10 m OD and develop a complementary strategy which can be integrated with the results of this project is recognised.

- 1.7 Within this defined area, wetlands can be divided into three major groups: upland peatlands, lowland peatlands and alluviated lowlands. The definition of these groups has

been primarily based on soil associations. These land units cover c. 1.1M ha, broadly divided as follows: upland peatlands: 150,000 ha; lowland peatlands: 210,000 ha and alluviated lowlands: 740,000 ha.

Within each broad category, further subdivisions on the basis of type of ecosystem can be made, for example the lowland peatlands include fen peatlands, raised mires and valley mires (Robertson and Jowsey 1968; Caldwell and Richardson; Taylor 1980; Coles and Coles 1988; Burton and Hodgson 1987; Howard-Davies et al. 1998; Hall and Coles 1994; Van de Noort and Davies 1993). Lowland peatlands incorporate a range of mire types. Depending on internal and external factors, different mires develop in succession. Archaeological data, held by SMRs and otherwise, is not commonly linked to the type of environment contemporary with the archaeological site. The classification of lowland peatlands has been used to encompass this range of mires.

- 1.8 The main wetlands for each of the English Heritage regions may be characterised as follows:
- *North East*: upland peatlands in Northumberland and County Durham
 - *North West*: lowland peatlands, investigated by the NWWs, and upland peatlands in Cumbria, Lancashire, Greater Manchester and Cheshire
 - *Yorkshire*: upland peatlands in the Pennines and North York Moors, lowland peatlands at Thorne and Hatfield Moors, and alluviated wetlands in the Humber wetlands and Vale of Pickering
 - *East Midlands*: upland peatlands in the southern Pennines, alluviated wetlands on the Lincolnshire Coast and in the Fens
 - *West Midlands*: isolated lowland peatland sites, upland peatland in Staffordshire
 - *East of England*: lowland peatlands and alluviated lowlands in the Fens, alluviated lowlands in Essex
 - *London*: alluviated lowland including Wennington Marsh, Rainham Marsh, Thamesmead and Crayford. The water urban deposits in urban London include a range of prehistoric and historic waterlogged monuments, but for reasons stated above, these fall outside the remit of the current project
 - *South East*: alluviated lowlands, and several smaller areas of lowland peatland, along the coast
 - *South West*: upland peatlands on Dartmoor, Bodmin Moor and Exmoor, lowland peatland in the Somerset Levels and elsewhere and alluviated lowlands in Somerset and Avon
- 1.9 The data sources consulted during this project are principally the monographs published by the English Heritage commissioned wetland surveys - as articles in 15 volumes of the Somerset Levels Papers and five additional monographs, in 11 monographs from the Fenland Project, seven county-based monographs of the NWWs and seven monographs of the Humber Wetlands Project. This was supplemented by additional published research, consultation with a large number of organisations and individuals, two questionnaire-based surveys and Sites and Monuments Record searches to complement data on archaeological sites in wetlands.
- 1.10 Appreciation of the wetland resource in the archaeological community was assessed by a short questionnaire sent out to all curatorial archaeologists. On the basis of the responses (60 out of 87 questionnaires were returned - 69%), 43 archaeologists (72% of respondents) stated that wetlands existed within their local government area, and 40 (67%) recognised that these wetlands included an archaeological resource or potential.

Only six of the 43 local authorities with wetlands (14%) had policy procedures in place to deal with wetland-specific matters, although the type of procedure ranged from detailed statements that were taken into account in the planning process (e.g. Avon and Somerset) to some additional requirements in briefs for archaeological work.

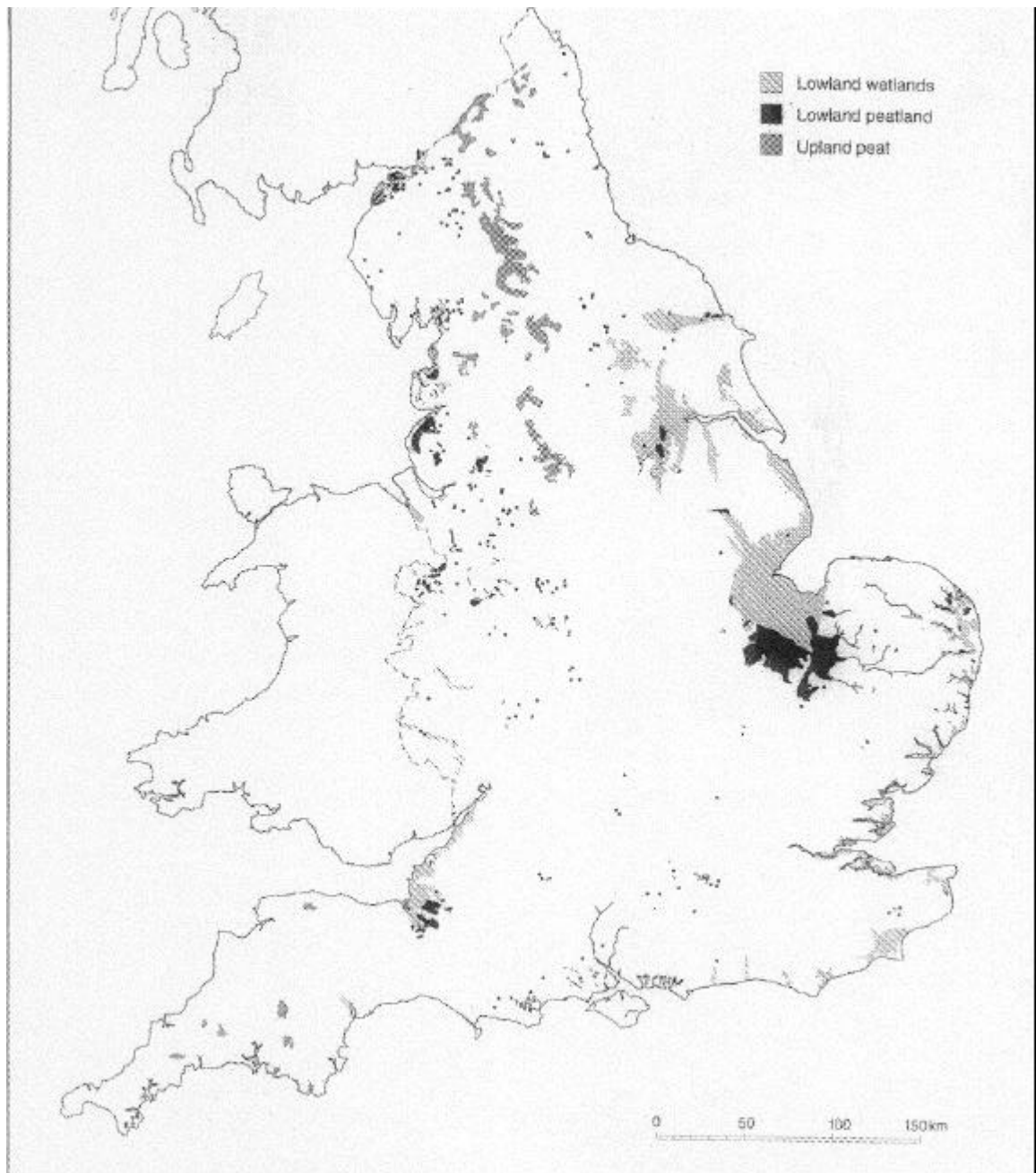


Figure 1: Distribution map of the wetlands of England

2. England's Wetland Archaeological Resource

- 2.1 For this study, the archaeological resource for the three wetland categories was assessed using the results from the English Heritage commissioned wetland surveys - these provide uniquely large-scale systematic survey data which allow for extrapolation to cover the wetland categories. The Fenland Survey and the Humber Wetlands Survey predominantly represent alluviated lowlands, and the Somerset Levels Project and the NWS represent lowland peatlands. Two SMR searches (each comprising areas of 4 km²), were obtained for cross-referencing samples of data from each wetland survey and to provide a context of the impact of the wetland surveys on the archaeological record. Additional SMR searches and a range of smaller-scale studies available complement the data collection.

For upland peat areas, where no comprehensive surveys have been undertaken, the SMR data from County Durham (northern Pennines), Peak National Park (southern Pennines) and Devon (Dartmoor), each comprising areas of 4 km² was used with additional material provided from the Pennines (Garton unpubl.; Spikins 1999).

The figures on the wetland archaeological resource are calculated from the current knowledge of wetland monuments in England. It is widely agreed that this knowledge and data on wetland monuments is inadequate, thus the conclusions drawn must be considered within the context of the limitations of the data.

- 2.2 The available data varied considerably in terms of usefulness for the current project. This includes the (a) varying definitions of common terms such as 'site' and 'monument', (b) different types of information recorded, and (c) varying origin of the data. The latter includes the different research methodologies adopted by the English Heritage funded wetland surveys. For example, the Somerset Levels Project surveyed the whole 100% of the Levels once, with frequent and repeated visits to the 89% of the Somerset Levels affected by peat extraction, while the Fenland project assessed 60% of the Fenlands mainly by field walking areas once. The research methodologies have provided us not only with different sets of data, but also with different biases. For example, excavations or assessments were minimal in the NWS, and the information on wet-preservation of archaeological remains is not available from this work.

This variability in research methodology has been considered within the site density calculations presented below.

- 2.3 Monument density and distribution in wetlands was difficult to determine. The two main issues are the problems of site classification and the masking of archaeological monuments beneath deep peat and alluvial sediments. In terms of site classification, the regional variability has been respected, e.g. a small scatter may in one region be discounted as 'background noise' while in another region, because of context, it is considered a significant site. The issue of masking of monuments beneath deep peat and alluvial sediments has not been resolved, as no reliable data exists for this. Therefore, an unknown number of archaeological monuments remains buried beneath deep sediments. This issue also affects many of the urban waterlogged deposits, many of these have not been surveyed by the Soil Survey of England and Wales, making any attempt at extrapolation most unreliable.

2.4 *Upland peatlands*

The three SMR searches encompassed a 12 km² area within which a total of 31 archaeological monuments were found. However, the Dartmoor area provides 29 of these sites, the northern Pennines two and the southern Pennines none, clearly reflecting the long-standing research interest in Dartmoor and the near-absence of such research in the Pennines. Further analysis of this data shows that 14 sites (all on Dartmoor) are of prehistoric date, with one recorded as 'beneath deep peat'. All other sites concern upstanding buildings and monuments. No data is available on wet-preservation on any of these sites, and it is assumed that the prehistoric sites predate the main onset of blanket mire formation. A small-scale, but systematic survey of 30 areas of 1 ha each in the southern Pennines (Garton unpubl.) found 18 find groups and 44 individual finds, all of Mesolithic date, providing a density of 6 find groups/km²; this cannot be translated into a monument density and this figure has not been included below. None of these sites contained wet-preserved remains, and the sites predate the onset of mire formation. Nevertheless, the preserved peats are an integral part of the site. The survey also looked at erosion of upland peat from aerial photographs, and found that in some areas up to 30% of the former blanket peat had eroded between 1953 and 1968, but the rate has slowed in the period to 1988, although different areas are affected. For the present purposes, we exclude the upstanding buildings and monuments, as these are not affected by the key causes of monument destruction assessed in this project, thus providing a monument density of 1.2/km².

It is characteristic of most upland peatlands that the archaeological resource is either of earlier prehistoric, or of late and post-Medieval date, with the later Bronze Age, Iron Age, Roman period and earlier Middle Ages wholly absent from this wetland type. Blanket mires formed as the result of overgrazing in the Bronze Age, as argued for Dartmoor, or as the result of forest burning in the later Mesolithic, suggested for the Pennines (cf. Phillips *et al.* 1981). Blanket mires did not offer suitable environments for agricultural societies, and not until the later Middle Ages, with need for peat for fuel, and increased pressure for grazing land and shooting grounds, were the blanket peats reoccupied and utilised.

On the basis of this analysis, the identifiable wetland archaeological resource extrapolated for upland peatlands is *c.* 1800 monuments, of which only a very small proportion may include wet-preserved remains; the protective nature of prehistoric sites under blanket peat is, however, recognised as an important asset. An additional number of unidentifiable sites, most of early prehistoric date, remain deeply buried within the peat.

2.5 *Lowland peatlands:*

The data from the NWWs, cross-checked against searches from the Greater Manchester and Lancashire SMR's, provide 253 sites from 71% of the total surveyed area, estimated at 37,000 ha, or a monument density of just below 1/km². Here, only 23 sites (or 9% of all sites) are described as 'wet'. The Somerset Levels Project, cross-checked against the results of the Somerset SMR searches (one from the Brue valley, the other from Sedgemoor) found 750 sites in 300 km² surveyed. However, where peat extraction allowed for the three-dimensional survey of the lowland peat, for example in the Brue valley, the monument density rises to 3.4/km². In this part of the Somerset Levels, 16 sites (59%) were waterlogged archaeological structures, all discovered during peat extraction. The monument density from the NWWs, which is based principally on field walking data, is undoubtedly too low (presumably a function of the predominant pasture

land use), while the Somerset Levels are recognised as a particularly rich area for archaeological research. For the present purpose, the density of monuments in lowland peatlands in England is calculated as an average of 2.2/km².

The date-range of the lowland peats is overwhelmingly prehistoric; in the Somerset Levels the sites range from the Neolithic (the Sweet Track) to the later Iron Age (Glastonbury and the Meare Lake villages). A marine transgressive phase during the Roman period explains the absence of archaeological finds from the wetlands in this period, while later structures in the upper stratigraphies are likely to have been destroyed in early peat cutting or wastage. The sites from the wetlands in the northwest of England predominantly date to the Mesolithic, Neolithic and Bronze Age. The Medieval and Post Medieval periods are also well represented. It is possible that sites of later date have been destroyed by peat extraction; the discovery of Lindow Man in the 1980's illustrating the potential for discoveries of later prehistoric date.

On the basis of this analysis, the identifiable wetland archaeological resource extrapolated for lowland peatlands is estimated at 4200 monuments, of which a significant proportion are likely to include wet-preserved remains. An additional number of sites remain deeply buried by peat. If the data of the Brue valley is extrapolated for all lowland peatlands, this additional number of buried monuments would be *c.* 2940.

2.6 *Alluviated lowlands*

The results from the Fenland project were cross-checked against data from the Lincolnshire and Norfolk SMR. The Fenland Project found 2510 sites on 252,000 ha walked, a monument density of 1/km². A selection of 150 sites were identified for management; 59 sites are expected to be scheduled and 41 sites were evaluated, 31 sites were found to be wholly destroyed. Eleven (27%) evaluated sites contained wet-preserved material. The results from the Humber Wetlands Project were cross-checked against SMR searches in East Yorkshire and Nottinghamshire (neither holding Humber Wetlands Project data at the time of the search). Circa 35,500 ha, or 11% of the 330,000 ha forming the Humber wetlands were field walked, resulting in the discovery of 360 sites. This also equates to a monument density of 1/km². During the HWP survey, 24 sites (7% of the total sites found) were assessed, and 13 assessed sites (54% of the sites assessed) were found to contain waterlogged elements. Two (8%) assessed sites were found to be completely destroyed.

The character of monuments in the Fenlands and the Humber wetlands is similar; the Mesolithic, Early Neolithic, later-Iron Age and the Roman periods being well represented. Bronze Age sites however, are numerous in The Fenlands but not in the Humber wetlands. This similarity is reflected in the overall site density figures for the two surveys.

On the basis of this analysis, the extrapolated identifiable wetland archaeological resource for alluviated lowlands is *c.* 7400 monuments, of which possibly up to one-third is likely to include wet-preserved remains. An additional number of unidentifiable sites remaining deeply buried has not been estimated, although smaller-scale studies of the Wissey embayment (Healey 1996) in the Fenlands show that the number of deeply buried sites may increase the total number of sites in alluviated wetlands by a factor of 2 or more.

- 2.7 The identifiable archaeological resource of England's wetlands is estimated at 13,400 monuments, including:
- 1800 monuments in upland peatlands
 - 4200 monuments in lowland peatlands
 - 7400 monuments in alluviated lowlands

In addition, England's wetlands include a significant number of unidentifiable monuments that remain deeply buried, mainly in the alluviated lowlands, and also an extensive body of palaeoenvironmental source material, forming either matrices of archaeological sites, or separate 'archives'. A recent survey of lowland peatlands, for example, identified 309 mires in England, many of these less than 10 ha in extent, but each providing important material for the reconstruction of the natural history of their regions (Burton and Hodgson 1987).

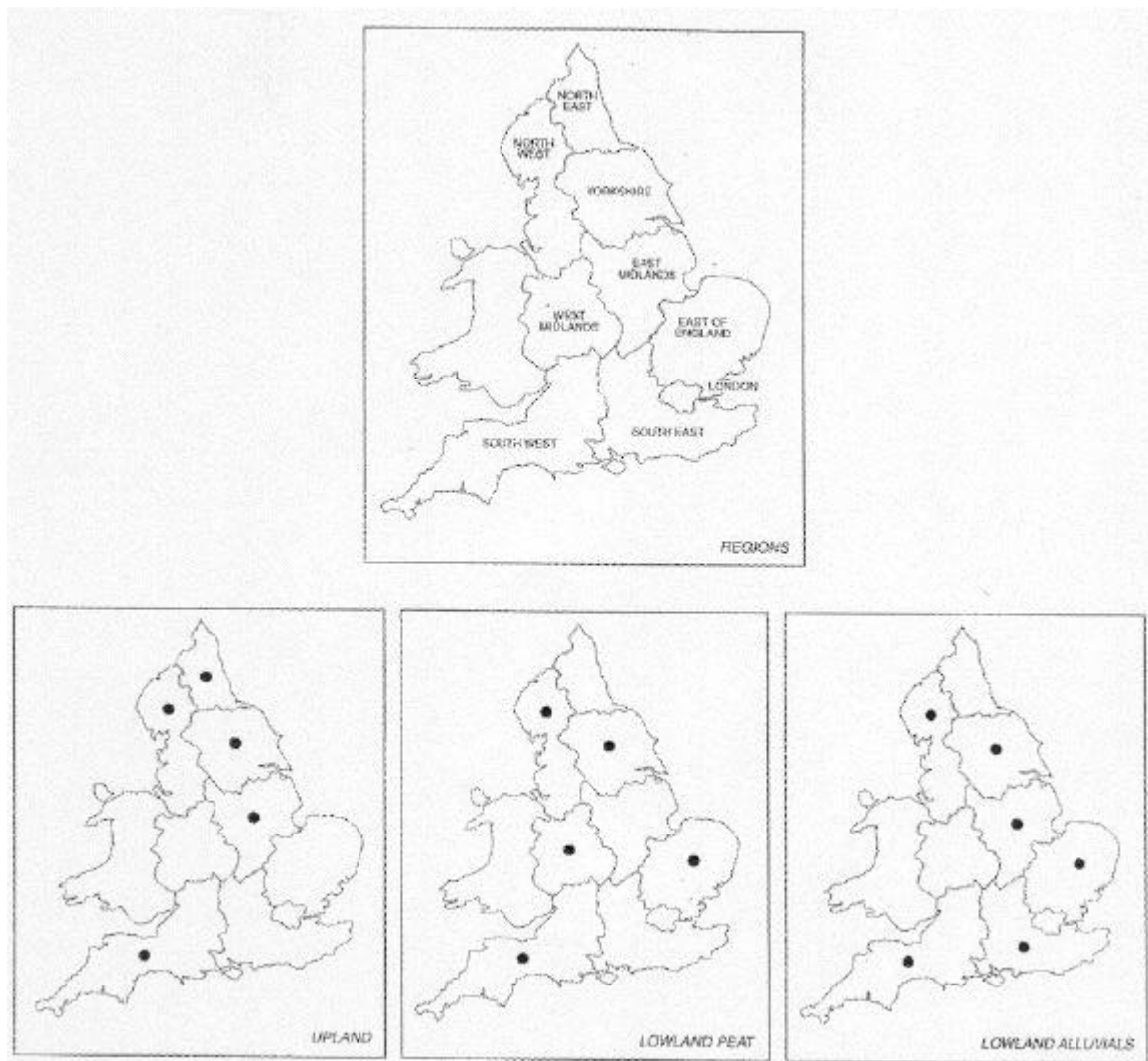


Figure 2: Main types of wetlands present in English Heritage Regions

3. Monuments and Land-use

- 3.1 A database that enables an accurate assessment of land-use change for the different wetland types from 1950 to 2000 does not exist. However, the Farming and Rural Conservation Agency (FRCA) is expected to develop a database for the analysis of census data before 1991 later this year, and it may be possible to obtain an insight into land-use change from c. 1970 later this year. This data will be based on a parish or ward level, and at its highest resolution is therefore likely to include both wetland and dryland in any calculation. This data will also come with a standard error of between 15 % and 23% (Miles pers. comm.).
- 3.2 Analysis from the Humber Wetlands Project has been used for understanding land-use change and continuity; this analysis is based on the First Land Utilisation Map Stamp 1930s, and ITE (now part of the Centre for Ecology and Hydrology -CEH) data from Lands taken in the early 1990s. This provides the most detailed and accurate account of land-use change over the last 50 years. Additional data from other areas has been included, whenever possible, and includes data on land-use contained within the wetland survey reports.
- 3.3 Outline figures on land-use change in England's wetlands for 2000 are estimated at:
- arable: 72% (an increase of 8% of total land use since the 1930s);
 - pasture 12% (a decrease of 15% of total land use since the 1930s);
 - developed land: 9% (an increase of 5% of total land use since the 1930s)
 - forestry: 2% (no change);
 - semi-natural/nature conservation area: 2% (no change)
 - unclassified: 3% (increase of 2% of total land use since the 1930s).

Note that these figures represent the wetland areas only.

- 3.4 Agriculture remains the dominant land-use in most wetland areas. Arable land use has been increased by 8% as a percentage of total land-use since the 1930s. This involves, significantly, the lowest lying areas that could only be converted in the last 30 years as a direct consequence of the use of pumps, replacing gravity-based drainage. The conversion of pasture into arable land involves deeper drainage to increase the land capability, ploughing and aeration of the upper 40 cm of the soil. Apart from the physical destruction of archaeological monuments through ploughing and the increasing desiccation rates, a particular concern is wind erosion in lowland peat under arable. The alluviated lowlands in Yorkshire, the East Midland, East of England and the South East are all predominantly arable, as are the lowland peatlands in Lancashire in the North West.
- 3.5 Pasture land has decreased considerably, with main losses occurring through urban expansion onto wetlands and conversion to arable land use. Pasture is a preferred land use on archaeological monuments in wetlands and remains a significant land-use in the lowland peat wetlands of the South West and in certain parts of the North West, but is only sparsely represented in the wetlands in Yorkshire, the East Midland and East of England. The absence of ploughing and the high yields that may be obtained from pasture land with relatively high water tables (i.e. <50 cm below the surface) are commonly mentioned in favour of pasture on archaeological sites. However, concerns exist regarding two aspects of this land use: (1) the widespread use of chemical oxidants (nitrates and phosphates) which accelerate the oxidation and desiccation of organic

matter, including archaeological remains and peat, and (2) the actual water table trends, which vary considerably with higher water tables in winter and lower water tables in summer (e.g. Kenward and Hall 2000; Van de Noort *et al.* 2001).

- 3.6 Urban and industrial expansion onto wetlands comprises 9% of the total land in our wetlands, up from 4% in the 1930s. Development has a significant impact locally, for example in Yorkshire (in particular around the Humber estuary and Doncaster), the East Midlands (along the Lincolnshire coast), East of England (including a number of expanding conurbations such as Peterborough), the London region (e.g. especially to the east of London) and the North West (especially in Greater Manchester, Merseyside and southern parts of Cheshire). Expansion normally means the wholesale destruction of wetlands and their archaeological resource. To provide an illustrative background to this point (Bergkamp & Orlando 1999) state that 'estimates of the loss of wetland in industrialised regions indicate that up to 60% of these have been destroyed in the last 100 years due to drainage, conversion, infrastructure development and pollution'.
- 3.7 The period 1950–2000 saw an initial increase of forestry on wetlands (1950-1980) followed by a period of decline (1980-2000). In terms of total land-use, forestry takes up 1-2% of wetlands. The expansion of forests onto peatlands, in particular upland peatlands in the North East, North West, East Midlands and South West, involved the use of fertilisers, ploughing and drainage permitting afforestation of the deeper peats. The impact of forestry, particularly on the upland peats, should not be underestimated despite the land-use figures. The increased evapotranspiration and the activities associated with forestry management are recognised as additional factors detrimental to the archaeological resource. The recent decline in planting of new forests and of existing forests in wetlands follows the Forestry Commission's policy promoting nature conservation, archaeology and protection and enhancement of wetland areas. In some wetland areas, damage from existing woodlands, and from the processes of afforestation and deforestation, will however have had an adverse effect.

Short Rotation Cropping (SRC) may pose a future threat to wetland archaeological remains. The Energy Crops Scheme, part of the England Rural Development Programme, run by a partnership between MAFF and the Forestry Commission, aims to have planted 21,700 hectares of short rotation coppice by 2006-2007. Poplar and willow, the principal SRC crops have extensive and penetrating root systems, require deep moisture retentive soils for growth and are likely to contribute to lowering of the watertable through increased evapotranspiration. Willow in particular is suited to wet soils as it can withstand waterlogging. Research into the potential effects of SRC root activity is currently being undertaken by the Forestry Commission with a view to publishing the results in spring 2000. It is interesting to note that although traditional woodland planting on wetlands is in decline and is generally discouraged by the Forestry Commission, SRC is on the increase and may impact severely on marginal wetlands with archaeology.

- 3.8 Areas of semi-natural land, and wetlands that are under active nature conservation management, constitute less than 1% of the total wetlands in England, although much larger areas are under schemes that benefit from land management and conservation regulations and subsidies that recognise and enhance the wetlands as habitats, including Special Areas of Conservation (SAC), Special Protection Areas (SPA) and Sites of Special Scientific Interest (SSSI). These include the lowland peatlands of the South West (Somerset Levels) and the upland peatlands that fall within the National Parks in the North East (Northumberland), North West (Pennines), Yorkshire (North York Moors and

Pennines), East Midlands (southern Pennines) and the South West (Dartmoor, Exmoor), and some alluviated lowlands in East of England (Norfolk Broads). In most cases, nature conservation land and semi-natural land will benefit the protection of the archaeological resource through the discouragement of conversion of pasture into arable land. Nevertheless, the use of fertilisers on permanent pasture and the variable watertable that is achieved under such schemes (with the watertable high in the winter but lower in the summer), continue to pose threats the waterlogged archaeological resource. Co-operation between nature conservation agencies and the archaeological community has been slow to develop.

Nature conservation agencies are diverse, and encompass both small specialised interest groups, and larger national and international organisations. Many of the agencies involved are landowners, or manage wetland habitats in one form or another. The policies of the regionally based Wildlife Trusts were surveyed by questionnaire. Of 48 trusts contacted, 25 (52%) responses were received, of which 23 have responsibility for wetlands, 2 of which were recently created. Eleven of the remaining 21 recognised wetland archaeology as a specific issue, but of these only 3 had policy or 'best practice' guidelines addressing the potential of wetland archaeology. Other organisations actively campaign for the safeguarding of peatlands and the restriction of agricultural and horticultural usage (e.g. Friends of the Earth - FoE, Royal Society for the Protection of Birds -RSPB), yet have no specific archaeological theme in their agendas.

- 3.9 Peat extraction utilises a relatively small area of England's wetlands (c. 0.5% of all current wetlands), but its impact is particularly great on the remaining raised mires of Yorkshire (Thorne and Hatfield Moors), the North West (e.g. Wedholme Flow) and the South West (Somerset Levels). Peat extraction in England affects 4,240 ha, and takes place on some of the best preserved raised mires; in all 3518 ha (83% of the area under peat extraction) takes place on areas that have been designated as SSSIs or have otherwise been identified for their nature conservation value (DETR 1988). Recent transfer of peatlands decommissioned by peat extraction companies and handed over to English Nature account for c. 1500 ha.

More significantly, peat extraction causes wholesale damage to the archaeological resource. Where block-cutting is undertaken, good opportunities for the identification of archaeological remains exist, but the increasingly common method of peat milling offers few, if any, such opportunities. At present, most larger-scale peat extractions include mitigative actions for archaeology, following the 1995 review of planning permissions for the peat industry. Across the country these are varied, ranging from a one-in-five years walkover survey in Cumbria, annual walkover survey in Somerset to a strategy in South Yorkshire and the East Riding of Yorkshire that is to involve research, monitoring of the peat workings, education of the peat cutters and open access for archaeological and palaeoenvironmental researchers. The strategy has not yet been completed, but is also likely to include PPG16-style mitigation for new discoveries of archaeological sites found within the current workings.

4. Land-use and ownership

4.1 Four main categories of land usage and ownership of wetland areas have been identified for this study: the farming community, which includes individual farmers and larger landowning estates, members of the peat extraction industry who own land with extraction rights, land held for conservation including the National Trust, and 'agri-environments', where farming and conservation management are integrated.

4.2 *Agriculture*

By far the greatest land use issue concerning wetlands is agriculture. The conversion of wetland to farmland through drainage, land enhancement, and reclamation has affected the majority of England's lowland wetlands. The practice of reclamation has been taking place in the Roman period and since the tenth century, but large-scale reclamation began around 1600. However, more recently, a marked increase in drainage and land use change has occurred, with MAFF policies encouraging expansion and drainage schemes. Significant changes are identified in this period from the two land utilisation mapping series of Stamp (1933) and Coleman in the 1960s. The largest contributory factor to the degradation of lowland wetlands is the conversion of land to arable, through ploughing, deep drainage, and land improvement. Land conversion to pasture also has detrimental consequences through drainage and application of chemical fertilisers. Agricultural policy has also affected upland areas to a certain degree with grazing and erosion being the most significant issues.

4.3 *Peat extraction*

Peat extraction varies both in the scale of operation, and on a regional basis. In 1997, an estimated 0.95 million m³ of peat were extracted in England, from lands owned specifically for the extraction of the resource, usually from permissions dating back several decades. The largest operator in England is Scotts (UK) Ltd. A number of smaller organisations have commissions, and together with Scotts form the Peat Producers Association (PPA). Current concerns include the scale of extraction, the process by which peat is extracted, and the destruction of environmental and archaeological resources. The largest areas of extraction are in the Somerset Levels, Thorne and Hatfield Moors, Ashton Moss and other areas including Wedholme Flow in Cumbria.

4.4 *Conservation*

A number of organisation own land with the principle purpose to conserve wetlands. Amongst these are the Nation Trust, the Royal Society for the Protection of Birds (RSPB) and English Nature

The National Trust is currently the largest non-governmental landowner in the country, managing both conventional land tied up in estates and farms, but increasingly a wide variety of land blocks, which include upland areas, coastal zones and alluviated lowlands. The Trust actively supports the restricted use of peat; the Trust uses no peat products within its estates, and encourages environmentally beneficial farming regimes. The trust has an active archaeological department responsible for developing policies and responses to archaeologically sensitive issues. The specialist needs of conservation and wetland archaeology are clearly recognised by the Trust.

The RSPB is the UK charity that takes account for the conservation of wild birds and their environment. It owns a wide range of wetland habitats, including reserves on the coast and within estuaries, in lowland peatlands and alluviated lowland, and is involved

in the creation of new wetlands to benefit migratory birds. It hosts the EU-LIFE environment project Wise Use of Floodplains.

English Nature is the Government funded body whose purpose is to promote the conservation of England's wildlife and natural features. It owns, manages or grant-aids a large number of prime examples of wetlands designated, for example, as National Nature Reserves (NNR). In addition, English Nature is a major landowner of worked and previously worked peatlands, receiving c. 1500 ha of lowland peatland from Fisons (Levington) Horticulture. Part of this land is leased back to Scotts (UK) Ltd

4.5 *'Agri-environmental' landuse*

Agri-environmental landuse is a crossover between farming and conservation. The most important agri-environmental landuse is the stewardship scheme, administered by the FRCA. There are four main categories on which an application can be assessed for its eligibility: Wildlife and conservation, the enhancement of landscape, access and amenity, and the protection of historic landscape and archaeology. In addition to stewardship, the FRCA as an advisory body provides opportunities to develop protection schemes such as ESAs and work closely with landowners to achieve a greater degree of co-operation. The schemes are operated under agreement from organisations such as MAFF, EH, Farming and Wildlife Advisory Group and local planning authorities. Approximately five million pounds is available annually for such new projects.

5. The key-causes of monument destruction

- 5.1 We recognise seven key-causes of monument destruction in England's wetlands: drainage, water abstraction, conversion of pasture into arable land, peat wastage, peat erosion, peat extraction and urban and industrial expansion onto wetlands. Forestry currently appears not to be a key-cause of destruction, although on a local scale, the introduction of woodland can have significant effects on wetlands and archaeological monuments within the wetlands. The growth of SRC is a case in point.
- 5.2 *Drainage*: Land is drained in order to increase the agricultural capability of the land or to convert semi-natural or permanent pasture into more profitable arable land. Drainage encompasses an 'arterial' drainage system of ditches, canals and pumping stations allowing for the accelerated run-off of water, and underfield drainage that accelerates the run-off of rainwater from fields into the arterial drainage system. Hydrographs from the Environment Agency can be used to show general changes in ground water tables. On the basis of this data, it is clear that the groundwater table has been lowered by 2 to 3 m over the last 50 years in the alluviated lowlands in Yorkshire, East Midlands and East of England, and between 1 and 2 m in the alluviated lowlands of the North West and South West. No data on water tables in upland peats was available. Although few hydrographs exist with information predating 1960, it seems that the main fall in the water table occurred after 1970. This fall in the water table affects the full extent of the alluviated lowlands in the east of the country (i.e. the Humber wetlands and the Fenlands). Data from the west of the country, with a larger number of smaller wetlands, is more ambiguous. Virtually no lowland peatlands or alluviated lowlands remain completely free from the effects of drainage.
- 5.3 *Water abstraction*: The effect of increased water abstraction, that is significant lowering of groundwater tables, affects the waterlogged archaeological resource in much the same way as drainage. Currently there are 50,000 Environment Agency water abstraction and impoundment licences, mainly for the water companies. These licenses are granted with regard to environmental needs, but seemingly not to archaeological needs. Groundwater abstraction constitutes 30% of the overall supply of public freshwater for England and Wales. Between 1989-1997 total abstraction was between 7 and 8 billion litres per day. The proportion of groundwater abstracted is far greater in the south and east of England; using 1997 as an example, 118 billion litres were abstracted in the north west region compared to 585 billion litres in the London region. Furthermore the groundwater/surface water abstraction ratio for the south east in 1997 was 358:149 billion litres/year. The EU's Water Framework Directive, requiring sustainability of surface- and groundwater use by 2015, will provide opportunities to address this threat.
- 5.4 *The conversion of pasture into arable land*: Based upon the data presented above, as much as 165,000 ha of pasture land in England's wetlands may have been converted into arable land over the last 50 years. The majority of these areas lie in the alluviated lowlands and peatlands in the North West, Yorkshire, East Midlands, East of England and the alluviated lowlands in the South West.
- 5.5 *Peat wastage*: When peat humifies, it becomes a structure-less dust-like substance, that is easily blown away by wind. Peat wastage occurs as a result of drainage and desiccation, and coincident oxidation, in combination with much increased micro-biological action (Burton and Hodgson 1987, Crowson *et al.* 2000). Where lowland peat is under arable land use, the wastage of peat through drainage, ploughing and

erosion is estimated by the Soil Survey for England and Wales between 10 mm/year in western England and 13.7 mm/year for eastern England, although case-studies occasionally show much higher rates of peat wastage. For example, a figure of 30 mm/year is mentioned for Chat Moss in Greater Manchester (Hall *et al.* 1995). This means that, with 72% of lowland peatlands under arable, the annual loss of peat is between 15.1 million and 20.7 million m³, for 10 mm and 13.7 mm annual wastage respectively. Over the last 50 years, the volume of peat lost through wastage lies between 755 and 1035 million m³.

This translates into a peat wastage figure of between 0.5 m and 0.69 m over the last 50 years, or to 1.5 m for selected areas such as Chat Moss. If the rate of peat 'growth' is 1 m/millennium (or 1 mm/year), then in the last 50 years, between 500 and c. 700 years of archaeology and palaeoenvironments have been lost, and as much as 1500 years in the case of Chat Moss.

The Soil Survey for England and Wales (Burton and Hodgson 1987: 50-51, illustrating the northern Lancashire peatlands) provide another figure of peat wastage, i.e. a loss of one-fifth of the extent of peatlands under agriculture over a 20 year period (1967-1987), or a 1% lateral loss of lowland peatlands per year. Similar figures are presented by Middleton (1999). The loss of this Grade 1 land is significant concern to MAFF.

- 5.6 *Peat erosion in uplands:* assessment of upland peats (blanket mires) for Britain shows that c. 18% remains as natural landscapes, 16% is afforested, 16% is eroded (Phillips *et al.* 1981), slightly higher (21%) in the case of the southern Pennines (Garton unpubl.). The remaining 50% is used for grazing and game hunting, and small-scale peat extraction, and can be described as degraded.
- 5.7 *Peat extraction:* Peat use in the UK in 1999, the last year for which data has been published stood at 3.43 million m³ (DETR 1998, 2000). It is estimated that in 1999 c. 2.2 million m³ came from outside the UK, and that c. 79% of the peat extraction (measured by surface area extracted) in the UK takes place in England, with the volume of peat cut in 1999 estimated at 0.95 million m³. The figures show a rapid increase in peat production between 1993 and 1996, but peat consumption has levelled off since. No detailed information exists on the development of peat extraction in England over the last 50 years, although it is clear that peat use (and extraction) has risen considerably over that period.

Another way of quantifying peat extraction as a key-cause of wetland destruction is to calculate the total extent of land from where peat has been extracted. Currently 4240 ha of lowland peatlands are under peat extraction, down from 5790 ha in 1996, which accounts for the transfer of land to English Nature. Over the last 50 years a similar area may have been worked and 'decommissioned' by peat extractors in the North West (e.g. Fenns and Wixhall), Yorkshire (c. 60% of Thorne Moors), East of England and South West (in what are now called the 'Avalon Lakes')- indeed, peat extraction measured by area has contracted, but the intensity of working has increased. In other words, up to 11,500 ha of lowland peat have been destroyed by peat extraction.

The UK is a main importer of peat for horticultural use. In 1999, over 2.2 million m³ of peat was imported.

- 5.8 *Increase in urban and industrial expansion onto wetlands:* From the data available, the total loss of wetlands to urban and industrial land in the last 50 years is c. 5% of the total wetland acreage, or 55,000 ha. This change has affected the alluviated lowlands and peatlands in parts of the North West, Yorkshire, East of England, London and South West regions, but unaffacting the upland peatlands.
- 5.9 *Climate change:* Research in this field is to date limited, and as a result, the response of wetlands to climate change is inadequately understood. As such, wetlands and climate change is an issue which can only reliably be expressed in global terms, but concerns for the effects of climate change on world wide wetlands, will also concern England's wetlands to a greater or lesser degree. As a consequence, the changing roles for the wetlands within this climatic shift will have a negative 'knock on' effect for archaeology and devalue wetland economics. Wetlands are one of the largest 'sinks' of terrestrial carbon in Britain, (Paterson and Anderson 2000). In global terms, were wetlands cover an average 8 – 10 % of the land surface, they amount to a store of approximately 10 – 20 % of the carbon (Intergovernmental Panel on Climate Change 1996). The carbon in an active healthy and growing wetland will increase over time, but ploughing, land reclamation and drainage will create emissions and release the carbon held, contributing to the higher CO₂ levels

In terms of effects of climate change on wetlands, it has been suggested, (Bergkamp and Orlando 1999) that the major issues that will affect temperate regions are sea level change, changes in weather patterns and changes to the hydrological cycle, with changing water temperatures of wetland bodies and the accumulative affect on wetlands, of landuse change and water usage caused by climatic shifts.

Sea level change: It is generally agreed that the biggest impact of sea level change is increased coastal erosion (IPCC 1996), and that this will directly affect wetlands (Bergkamp and Orlando 1999) and archaeology (Long and Roberts 1997). Increased erosion means loss of habitat, flooding and, with that, changing of fresh water environments to saline through the tainting of new areas of coast. Although coastal archaeology and wetlands are outside of the remit of this project, increased coastal erosion will indirectly alter other wetland systems further inland by changing patterns of salinity in estuaries and rivers, changing aquifers and pushing marginal coastal zones further inland (Bergkamp and Orlando 1999). The effects of this can be expressed in similar archaeological terms for both wetland sites and non-wetland sites alike.

Changes in weather patterns and the hydrological cycle: Wetlands are likely to be affected through change and fluctuations to a number of interlinked processes that make up the hydrological cycle. These are precipitation levels, evaporation and transpiration, runoff, and the level and recharge rates of ground waters. All of which are integral for the development and continued health of wetlands. The changes could affect both surface and ground water systems and impact upon the economic use of those resources, compounding the problem.

Changing patterns of water temperatures: although it is estimated that the greatest effects would be at high latitude and low latitude boundaries where the marginality of biodiversity would be affected by any temperature changes (IPCC 1996), any overall temperature changes will increase stress on wetlands in temporal latitude, and is likely to downgrade the preservation environment for which archaeology relies.

The knock-on effects of climatic change is also seen as indirect threats to wetlands and in particular to archaeology. It is postulated that change in the hydrological consumption patterns as a response to climatic shifts could put increased pressure on the fragile wetland economic resource (Bergkamp and Orlando 1999). An increase in the requirement of irrigation water could for example, increase drainage, decrease ground water, and encourage land reclamation. Any change in the economic use of wetland will affect the archaeology within.

6. Monument Survival figures

6.1 The overall loss of monuments of the individual threats in England's wetlands is estimated as follows:

Agents of wholesale destruction:

- *peat extraction*: estimated loss over the last 50 years: **230** monuments. Currently 5790 ha are under peat extraction, and over the last 50 years a similar size area been worked and 'decommissioned', resulting in a (in part ongoing) destruction of 11,500 ha of lowland peat, or 230 monuments (monument density of 2.2/km²).
- *urban and industrial development*: estimated loss over the last 50 years: **700** monuments. This is calculated as follows: assume 55,000 ha of new urban and industrial development has affected alluviated lowlands and lowland peatlands proportionally, then 40,150 ha of alluviated lowland and 14,800 ha of lowland peatland have been developed. This results in 403 monuments in alluviated lowlands (monument density of 1/km²) and 297 monuments in lowland peatlands (monument density of 2.2/km²).
- *peat wastage*: estimated loss over the last 50 years: **2020** monuments. This is calculated as 50 years of a 1% annual loss of 183,700 ha of lowland peatlands (=210,000 ha -11,500 ha lost to peat extraction and -14,800 ha lost to urban and industrial development); monument density of 2.2/km². Alternatively, peat wastage is responsible for the loss of 500 to 600 years of wetland monuments in the last 50 years.

Agents of damage:

- *conversion of pasture into arable land*: damaged over the last 50 years: **2180** monuments; this figure overlaps with the monuments already affected by drainage. This is calculated as follows: assume conversion of pasture to arable has affected alluviated lowlands and lowland peatlands proportionally, then 120,450 ha of alluviated lowland and 44,450 ha of lowland peatland (totaling 165,000 ha) have been converted. This results in 1200 monuments in alluviated lowlands (monument density of 1/km²) and 980 monuments in lowland peatlands (monument density of 2.2/km²).
- *peat erosion*: damaged over the last 50 years: **360** monuments. This is calculated as 20% erosion of 150,000 ha of upland peat (monument density of 1.2/km²); note, however, that it is not clear if erosion dates solely to the last 50 years, or whether it is accelerating or decreasing in pace.
- *drainage*: damaged over the last 50 years: **5000 additional** monuments not already destroyed through peat extraction, peat wastage and urban and industrial expansion, or damaged through conversion of pasture into arable land and peat erosion. It should be noted, however, that that the combined effects of drainage and conversion of pasture into arable land can be extremely damaging to wetland sites.
- *water abstraction*: this affect an unknown number of monuments, but it is a contributing factor in the desiccation of the 9,710 monuments that are already at risk from drainage. Furthermore, it may affect an unknown number of monuments that are masked beneath deep peat and alluvial sediments.

- 6.2 Over the last 50 years, the number of wetland monuments that have suffered from wholesale destruction is estimated at **2950**. This includes mainly sites in lowland peatlands that have been destroyed through peat wastage (2020 monuments), peat extraction (230 monuments) and urban and industrial development (estimated at 700 monuments). Peat wastage, resulting from agricultural practices including drainage and the conversion of pasture to arable, has been the greatest single cause of wholesale destruction of wetland monuments over the last 50 years.
- 6.3 Over the last 50 years, the number of wetland monuments that have suffered from damage, desiccation and partial destruction is estimated at **7500**. This includes mainly sites in alluviated lowlands and lowland peatlands that have been damaged through drainage (5000 monuments), and ploughing (2180 monuments suffering from drainage and desiccation are now also under arable instead of pasture), while 360 sites are no longer protected by upland peat. Drainage, in particular for agricultural use, has been the greatest single cause of damage, desiccation and partial destruction of wetland monuments over the last 50 years.
- 6.4 The total number of wetland monuments destroyed or damaged in the last 50 years is estimated at **10,450**, or **78%** of the total identifiable recourse (n=13,400)

7. Monument Condition 2000

- 7.1 A wealth of undiscovered archaeological sites and landscapes, many containing wet-preserved archaeological and palaeoenvironmental remains of early prehistoric date, continue to lie buried within and beneath England's wetlands. The majority of known wetland monuments in England have increasingly suffered from partial destruction and desiccation. Furthermore, a considerable number of monuments have been completely destroyed in the last 50 years. Despite this, the extent of unsurveyed wetland areas in England including the intertidal wetlands and much of the urban waterlogged deposits - (see 1.6), and their associated archaeological potential, necessitates the rapid formulation of mitigation strategies. The outstanding archaeology discovered in the area of the Somerset Levels which has been subject to archaeological investigation, alone, demonstrates why development of an effective research framework remains essential.
- 7.2 Hydrodynamics of the remaining wetlands and the archaeological monuments contained within them is the major concern. This affects all, or nearly all lowland peatlands and alluviated lowlands, with only a fraction of the former wetlands of England in a semi-natural state. Hydrodynamics are responsible for the waterlogging of archaeological and palaeoenvironmental remains and their long-term survival. Drainage results in the introduction of bacterial activity to previously waterlogged remains, and is closely linked to peat wastage and the conversion of pasture to arable land use; it also facilitates peat extraction. Only occasionally is re-wetting possible, and concern for the archaeological resource in its own right may not be sufficient to achieve the objective of *in situ* preservation of archaeological monuments in England's wetlands. Therefore we need to find new approaches to do this which resonate with the nature conservation world.
- 7.3 The visibility of archaeological monuments in wetlands remains an important issue. The existing methods of assessment and evaluation of wetlands, in advance of development and elsewhere, are insufficient for the identification of monuments. Within the planning process, this may result in the placing of inappropriate archaeological conditions, or even a complete lack of archaeological mitigation. The development of new prospection techniques, to make wetland monuments 'more visible' would improve this situation.
- 7.4 Accessibility to wetland monuments remains restricted, with Flag Fen effectively the only *in situ* wetland monument that can be visited by, and is displayed to, the public. Other wetland monuments, including the Sweet Track, Glastonbury, Stonea Camp and Sutton Common contain waterlogged elements that remain inaccessible to the public. The Peat Moors Visitor Centre in the Somerset Levels offers access to reconstructed wetland archaeological remains. Furthermore, the wetland component of archaeology in museums is limited. If the public's imagination is to be captured, perceptions must be changed and wetland archaeology made more accessible to a wider audience. Abroad, notable examples of accessible wetland archaeology are the Corlea trackway visitors centre in Ireland (with its display of an 18 m long section of the Corlea I trackway within a visitors centre), and at Céide Fields (a visitor centre and multidisciplinary wetland management display), and in Poland at Biskupin (reconstructed fortified lakeside settlement, attracting 250,000 visitors annually).
- 7.5 Current designations (for example scheduled monuments) are insufficient to safeguard the waterlogged components of wetland monuments. A change in the legislation is required or, more feasibly, a change in the application of designations is required ensuring more effective protection. Proposed amendment to the Heritage Bill/ Culture

and Recreation Bill, will extend the basis for scheduling sites with viable anthropogenic deposits, e.g. peat bogs containing monuments.

8. Wetland Monuments at Risk

- 8.1 This preliminary study of the monuments at risk in England's wetlands provides an assessment of the archaeological resource, land-use, land-ownership, causes of destruction and monument survival. The monuments in England's wetlands are all to varying degrees at risk, depending on the type of wetland and type of land-use. We define two types of risk: Immediate risk and non-immediate risk.
- 8.2 Immediate risk; this group includes wetland monuments at risk from physical destruction or at risk of deterioration through desiccation and ploughing, or are exposed by peat erosion. Monuments at immediate risk are located in areas of peat extraction, industrial and urban expansion onto wetlands, selected areas of upland peatlands or in lowland peatlands and alluviated lowland under arable land-use. This group also includes selected sites found some time ago for which no satisfactory management solution has been found (e.g. Meare lake villages in Somerset).
- 8.3 Non-immediate risk; this group includes wetland monuments that are currently not at risk of immediate destruction or desiccation. Monuments at non-immediate risk are located in remaining areas of upland peatlands, lowland peatlands and alluviated lowlands under pasture, within areas under nature conservation, and possibly areas under forestry, but not SRC. This group also includes monuments that are deeply buried beneath alluvial sediments.
- 8.4 Peat extraction is clearly the most visual threat to wetlands and the archaeological monuments contained within the peatlands that are extracted, despite its relatively minor role in destruction of wetlands. However, the most significant threats to the wetland archaeological resource are drainage, peat wastage and the conversion to arable land are not particularly 'visible'.
- 8.5 The regional variations are summarised below:
- *North East*: wetland monuments in the upland peatlands in Northumberland and County Durham have suffered from erosion, but the damage, and indeed knowledge, is limited;
 - *North West*: a majority of sites in NWS were found on sand islands surrounded by areas of peat, former peatlands or near former watercourses; the sites survive but have lost much of their palaeoenvironmental matrix. Peat extraction, urban and industrial expansion onto wetlands and peat wastage all affect the wetlands in this region
 - *Yorkshire*: wetland monuments in the upland peatlands in the Pennines and North Yorkshire Moors have suffered from erosion, but the damage is limited; the lowland peatlands at Thorne (40% of the total area) and Hatfield Moors are continually under extraction, and a considerable part of the archaeological and palaeoenvironmental resource has been destroyed; the wetland monuments in the alluviated wetlands in the Humber wetlands suffer from deep drainage, affecting the whole of the lowland area, while the conversion of pasture to arable and urban and industrial expansion onto wetlands continue to affect the wetland resource;
 - *East Midlands*: wetland monuments in the upland peatlands in the southern Pennines have suffered from erosion, but the damage is limited; wetland monuments in the alluviated wetlands on the Lincolnshire Coast and in the Fens suffer from deep

drainage; peat erosion is affecting the lowland peatlands, and urban and industrial expansion onto wetlands the alluviated lowland;

- *West Midlands*: monuments in the smaller lowland peatland sites suffer from peat wastage, and few sites found by NWWWS survived as wetland sites;
- *East of England*: the monuments in the lowland peatlands of the Fens are affected by peat wastage; the alluviated lowlands in the Fens are deeply drained, and urban and industrial expansion onto wetlands affect the archaeological resource here and in the alluviated lowlands in Essex;
- *London*: the wetland monuments in the London Region (outside the City of London) include drainage (e.g. Rainham Marsh), and a rampant urban and industrial expansion. Water abstraction and the effects of climate change are likely to impact on the wetland archaeological resource
- *South East*: the wetland monuments in the alluviated lowlands, and several smaller areas of lowland peatland, along the coast are mainly affected by urban and industrial expansion onto wetlands and drainage.
- *South West*: monuments in the upland peatlands on Dartmoor and Exmoor have suffered from erosion, but the damage is limited, the lowland peatland in the Somerset Levels continue to be affected by peat extraction, but the effect of drainage on the ESA is limited; however drainage affects the alluviated lowlands in Somerset and Avon, where large-scale urban and industrial expansion onto wetlands threatens monuments in the alluviated lowlands.

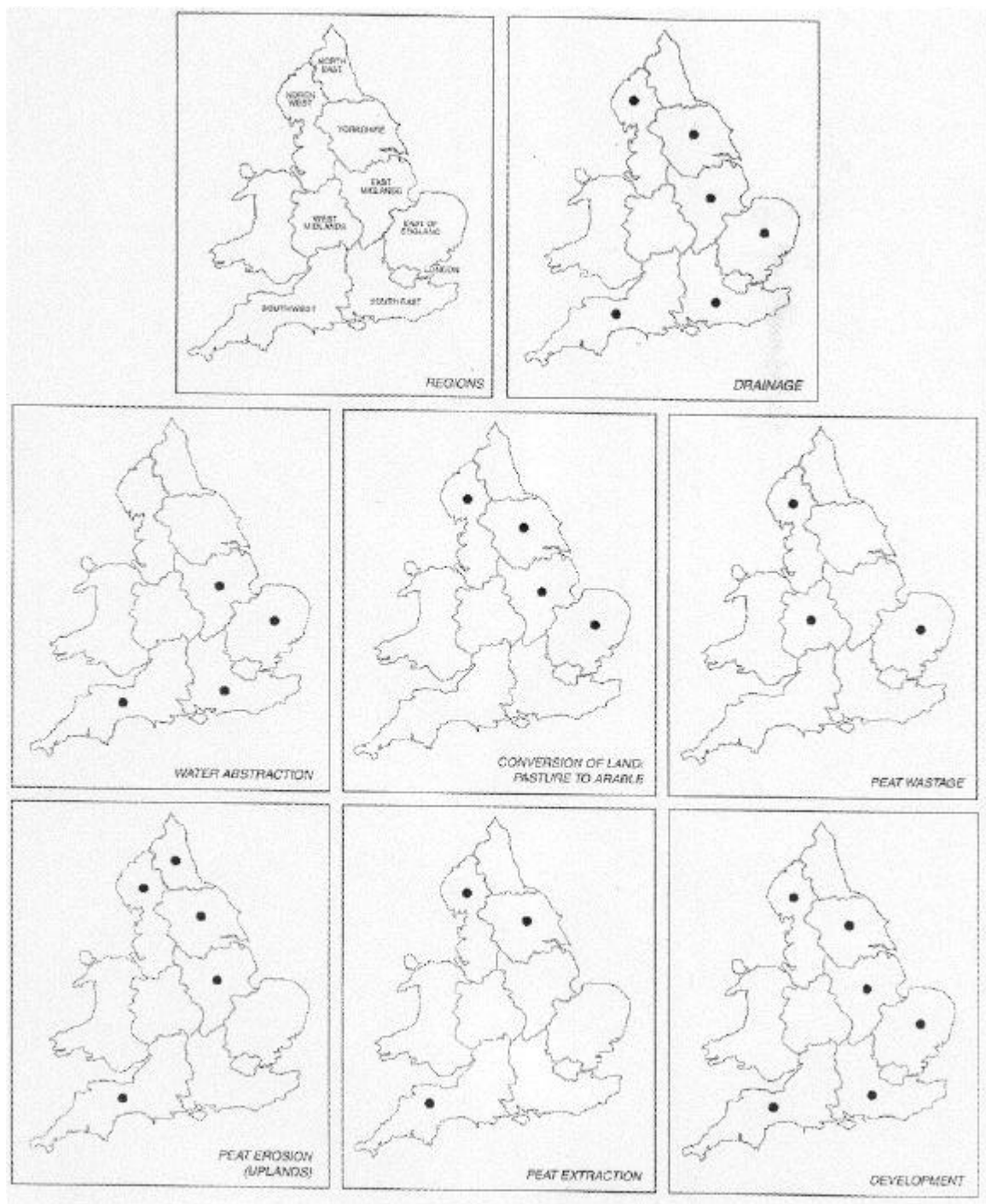


Figure 3: Main types of threats to wetlands present on English Heritage Regions

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Appendix 1 Acronyms and abbreviations

CA	Countryside Agency
CEH	Centre for Ecology and Hydrology (formerly the ITE)
DEFRA	Department for the Environment, Food and Rural Affairs
DETR	Department for the Environment Trade and the Regions
DoE	Department of the Environment
EH	English Heritage
EN	English Nature
FC	Forestry Commission
FoE	Friends of the Earth
FRCA	Farming and Rural Conservation Agency
HLF	Heritage Lottery Fund
IDBs	Internal Drainage Boards
ITE	Institute for Terrestrial Ecology (now the CEH)
MAFF	Ministry for Agriculture, Fisheries and Food
NWWS	North West Wetlands Survey
PPA	Peat Producers Association
RSPB	Royal Society for the Protection of Birds
SAC	Special Areas of Conservation
SMR	Sites and Monuments Record
SPA	Special Protection Areas
SSSI	Site of Special Scientific Interest