Wetland Vision Technical Document:
Overview and reporting of project philosophy and technical approach
Wetland Vision Technical Document: Overview and reporting of project philosophy and technical approach

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Supporting or endorsing organisations:

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Executive summary

The England Wetland Vision partnership consists of English Heritage, the Environment Agency, Natural England, the Royal Society for the Protection of Birds (RSPB) and The Wildlife Trusts. This project sets out a 50-year Vision for freshwater wetlands in England. The scope and detail of the work has been explored with a range of stakeholders and is expressed through a range of maps and supporting materials. The Vision provides a philosophical and technical framework that highlights the potential for wetland creation and supports those who want to make a difference through delivery at the local level. This project re-affirms the partnership’s commitment to the creation and restoration of wetlands and, by sharing the details of our work, we hope others are inspired to do the same.

Wetlands are one of the most important natural resources on Earth. They store and filter water and help control and buffer the effects of flooding. They also give us food, fuel and plant fibre; they capture carbon from the air and lock it up, and support a wealth of fascinating and uniquely adapted wildlife. They form living landscapes that give enjoyment to millions of people, and contain a unique record of our past where the best-preserved archaeological remains exist.

Although wetlands were once common in the English landscape, a long history of drainage, development and pollution means only about 10% of that present a thousand years ago remains. Much of this loss has occurred since the Industrial Revolution, with 100,000 hectares per year drained between 1840 and 1880 alone. Drainage continued into the 20th century, and impacts such as pollution continue to damage the precious remnants. Our impoverished and fragmented wetlands, and the wildlife they support, are struggling to survive just as we are beginning to understand how vital they will be in helping people and wildlife adapt to an uncertain future.

Our Vision is of a future where wetlands are a significant feature of the landscape in which wildlife can flourish. It will be a future in which wetland heritage is recognised and safeguarded; where everyone can enjoy wetlands for quiet recreation and tranquillity. Vitally, it will be a future where wetlands are valued both for the roles they play in helping us deal with some of the challenges of the 21st century and in improving and sustaining our quality of life.
In order to realise this Vision we need to:

- Place existing wetlands at the heart of our vision; enabling them to adapt in the face of climate change by linking new and existing wetlands across the landscape.
- Restore degraded wetlands in the uplands and lowlands (including peatlands, rivers and lakes), so that, in functioning more naturally, they can provide enhanced benefits to society.
- Significantly extend, and in some cases double, many lowland wetland habitats such as reedbed, ponds and grazing marsh.
- Preserve the unique and fragile record of our historic environment by keeping the most important former wetland sites wet.
- Create and restore wetlands wherever they can support wildlife, reduce run-off and pollution, and provide wildlife-rich green spaces for people to enjoy.
- Make wetlands more relevant to people’s lives by better understanding and harnessing the benefits provided by naturally-functioning rivers and wetlands – that can slow and store flood waters, protect water quality, recharge groundwaters and store carbon – and then communicating these benefits widely throughout society.

Our Vision is supported by maps that illustrate how fragmented and threatened wetlands are today and just how extensive they once were. We show, at a national scale, where freshwater wetlands could potentially be restored and created to protect and enhance wildlife, to preserve our wetland heritage and to deliver valuable services to society. Case studies of successful wetland projects demonstrate what has already been achieved. Other maps show areas where a range of different habitat types could be sustained. The maps are one tool to help make choices about where new wetlands could be most effective and desirable. These, together with more detailed local information on opportunities and constraints, should be a powerful tool for those initiating wetland projects.

The project’s maps are technically innovative but they are not the complete story, and do not represent all of our ambitions. So, as well as containing details of the work underpinning the Wetland Vision, we present ways in which the outputs would benefit from further development or local deployment. This report should be viewed in conjunction with the project’s advocacy material and other outputs to be found on the project CD-ROM or website (www.wetlandvision.org.uk).
1 Introduction

1.1 The Wetland Vision Partnership

This project brings together two of the largest environmental Non Governmental Organisations in England with three of the most influential statutory bodies that have duties towards the protection and enhancement of the environment. The partners, together with organisations that have contributed to the project’s Technical Advisory Group, form a strong foundation for the development of joint objectives and commitment to delivery. All partners in the Wetland Vision have a remit to seek and create a richer environment for the future. These are the partnership strengths that the project has drawn on:

English Heritage “Making the past part of our future”. English Heritage exists to protect and promote England’s spectacular historic environment and ensure that its past is cared for, understood and valued.

Environment Agency “Creating a better place”. We are the leading public body for protecting and improving the environment in England and Wales. It’s our job to make sure that air, land and water are looked after by everyone in today’s society, so that tomorrow’s generations inherit a cleaner, healthier world.

Natural England exists “to ensure that the natural environment is conserved, enhanced, and managed for the benefit of present and future generations, thereby contributing to sustainable development”. Natural England is here to conserve and enhance the natural environment, for its intrinsic value, the wellbeing and enjoyment of people and the economic prosperity that it brings.

The Royal Society for the Protection of Birds “A million voices for nature”. The RSPB is the UK charity working to secure a healthy environment for birds and other wildlife, helping to create a better world for us all.

The Wildlife Trusts “Protecting wildlife for the future”. The vision of The Wildlife Trusts is “an environment rich in wildlife for everyone” The mission of The Wildlife Trusts is to “rebuild biodiversity and engage people with their environment”.

Somerset Levels © Richard Brunning
1.2 Project structure and constitution

The project has run for three years with equal financial input from all partners. The Vision has been developed with extensive help from a wide range of stakeholders, and has benefited from the regular input of technical specialists drawn from the wetland conservation and historic environment sector. The Wetland Vision project focused on freshwater wetland habitats found in England.

1.2.1 Wetlands within the Wetland Vision project

The broad Ramsar definition for wetlands is “areas of marsh, fen, peatland or water, whether natural or artificial, permanent or temporary, with water that is static or flowing, fresh, brackish or salt, including areas of marine water the depth of which at low tide does not exceed six metres”. Through this project only freshwater wetlands were considered. The project’s individual habitat maps, and all research surrounding an appropriate expression of these, were almost entirely based on UK priority BAP habitat types (see www.ukbap.org.uk for further detail):

- Wet woodland
- Fen
- Lowland raised bog
- Blanket bog
- Reedbed
- Coastal and floodplain grazing marsh
- Purple moor grass and rush pastures
- A sub-selection of open water habitats
- Ponds (recently adopted as a UK BAP habitat)

Some habitats have been mapped (such as canals) for which there is no priority habitat identified in the UK. Blanket bog, a UK priority BAP habitat, is included within the scope of this project. Brackish habitat types have not been considered, though there are brackish elements to some of the BAP priority habitat types included (e.g. coastal and floodplain grazing marsh). Our maps and text does not include aspirations for wet heath and the new BAP upland flushes habitat. Our “future wetlands” map describes how some freshwater areas may in the future become predominantly brackish, but this is not a Vision for predominantly or wholly brackish wetland types. In addition, we considered the place of rivers in our Wetland Vision though were not able to map opportunities here ahead of further work on river restoration under the Water Framework Directive.

1.2.2 Project history

The project was initiated in February 2005 and housed by the RSPB in its Water Policy team for the duration. The Wildlife Trusts joined the partnership at the start of 2006, and English Heritage in early 2007, both having formerly contributed to the project in a technical capacity.

A project Technical Advisory Group (TAG) was formed early in 2006 to help frame the general approach and ensure products were robust and peer reviewed. The TAG met regularly to tackle technical issues that needed specialist input. The contributing organisations are acknowledged within the accreditations section at the front of this report.

A programme of stakeholder engagement was launched at CIWEM’s World Wetlands Day conference in 2006. A number of workshops were run throughout 2006 addressing various questions and options surrounding how to develop a Wetland Vision. Feedback from workshops was considered in detail, integrated where appropriate, and the outcome relayed to attendees. The project’s stakeholder feedback loop is described below.

1.3 Why a Wetland Vision?

The purpose of the project was to develop a joint 50-year Vision that describes and supports our aspirations for the future of England’s freshwater wetland landscape. It was the first time that the partners have attempted to express a national Wetland Vision, and draw together information on existing regional and local wetland projects.

This project analysed available datasets using ecological principles, using a Geographical Information System (GIS). This allowed a large amount of data to be analysed and mapped objectively. The outputs we have developed can be linked to other maps or spatial plans to create a more detailed picture of the constraints and opportunities that will inform where we choose to create or restore wetlands. The intent was not to replace local or regional visions and projects, but to...
provide a national context to support action on the development and delivery of local work. It is important to stress at the outset that the maps produced are therefore not prescriptive nor predictive, but are statements of potential, where potential exists, rather than what will or ought to be achieved.

1.4 Policy and wetlands conservation context

There have been considerable efforts to conserve and restore wetlands in England over recent decades. Our Vision has emerged from, and its realisation will sit within, a complex policy and conservation arena.

The policy and conservation initiatives with which our Vision seeks synergy include:

These Directives provide a legal requirement for EU members to identify and set conservation objectives for internationally important habitats and species. A key part of this is the designation and positive management of a network of Special Areas of Conservation (SACs) and Special Protection Areas (SPAs), known collectively as Natura 2000 sites. Across the UK and the EU these sites must be managed in an ecologically coherent way. Implementation of the Wetland Vision could contribute directly to meeting the conservation objectives of these individual sites as well as improving the overall resilience and coherence of the network and resilience of the species and habitats they support. The Vision can also help target the creation of new habitat to prevent deterioration, help recovery or identify areas required to meet the obligations to compensate for habitat losses.

The Water Framework Directive (WFD) does not set explicit objectives for wetlands. However, their structure and function can be critical to the Ecological Status of surface water bodies, and objectives for groundwater are linked to the health of wetlands they support. The creation of wetlands will also play a key a role in delivering Good Ecological Status (GES) through their ability to absorb and process sediments and nutrients, and to protect and restore morphology. Our Wetland Vision provides evidence of where broad-scale restoration is feasible or desirable, which could then contribute to the development of appropriate Programmes of Measures (PoM) necessary to achieve Good Ecological Status.

Statutory designations
Land designated for conservation purposes in England includes: Special Areas of Conservation (SACs), Specially Protected Areas (SPAs), Sites of Special Scientific Interest (SSSIs), National Nature Reserves (NNRs), Local Nature Reserves (LRNs), National Parks (NPs), Areas of Outstanding Natural Beauty (AONBs), as well as many locally valuable sites and designations to safeguard the historic environment. These sites, where they include freshwater wetlands, will often form the basis for the locations of freshwater wetlands of the future within the Wetland Vision. By adding to and consolidating on the existing wetland resource, the condition of these sites will be safeguarded and improved.

Climate change
UK Climate Change Programme is the UK’s key strategy for its work on tackling climate change. It sets out the policies and measures which the UK is using to cut its emissions of greenhouse gases. It also explains how the UK plans to adapt to the impacts of climate change. The creation and restoration of wetlands described in the Vision will form part of an adaptation strategy.

Rural development policy
The Rural Development Programme for England (RDPE) 2007-13, part of the EU Common Agricultural Policy (CAP), funds Environmental Stewardship delivered by Natural England, and aims to provide an integrated approach to farm management covering three priorities: biodiversity, water, and climate change. The schemes help to deliver England’s Natura 2000 objectives for wildlife conservation on protected sites, for conserving biodiversity in the wider countryside, and to address requirements of the WFD, e.g. by reducing agricultural impacts and pollution.

Policies and funding for EU supported agricultural, rural development and environmental programmes beyond 2014 will depend on the outcomes of the fundamental review of the EU budget in 2009, and reforms following current reviews of the CAP and EU Regional Policy (the latter now accounts for more of the EU budget than the CAP). The Vision should help identify priorities for RDPE funding for wetland projects in England.

Defra water strategy
The Government’s new water strategy for England, Future Water, was published 7 February 2008. This strategy sets out the Government’s long-term vision for water and the framework for water management in England. The creation and restoration of wetlands described in the Vision may help to deliver aspects of this strategy.
**UK Biodiversity Action Plan (BAP)**
The UK BAP has developed a suite of targets and actions necessary to protect and improve the status of priority habitats and species across the UK, including wetlands. The Wetland Vision is an attempt to express where targets for freshwater wetlands could be met in England. The England devolved Habitat Action Plans (HAP) targets are embedded within the Vision, but this project has attempted to look beyond the current timescale of the BAP.

**The England Biodiversity Group (EBG) and England Biodiversity Strategy (EBS)**
The EBS (expressed through ‘Working with the Grain of Nature’) has developed a suite of targets and actions necessary to protect and improve the status of priority habitats and species in England. The Wetland Vision partners each have responsibilities and actions that relate to the EBS as well as a number of individual species. Our Vision provides evidence of where broadscale restoration is feasible for these habitat types, and therefore where targets can be achieved. The Wetland Vision is a key EBG (water and wetland Special Interest Group (SIG)) output.

### 1.5 Incorporating the wider responsibilities of the partners

The Wetland Vision focuses on the partners’ aspirations for future wetland biodiversity within wetland landscapes that integrate the need to safeguard historic wetlands. Although it was recognised that wetlands have the potential to deliver a range of other benefits, and that where possible opportunities would be sought to factor in these other considerations, they were not central to the original scope of the project.

The inclusion of English Heritage has helped to ensure that the vision reflects the needs of the historic environment sector. Natural England has a much broader remit than its predecessor English Nature, including landscape, access and recreation, placing emphasis on connecting people with the natural environment. It is recognised that the Vision does not reflect the full range of Natural England’s interests, and to some extent those of the Environment Agency. Whilst biodiversity and the historic environment is the focus of this Vision, it will be important to ensure that opportunities are identified to further other wetland interests.

It will also be important to understand how realising our vision will impact on the landscape. The historic loss and modification of wetland habitats has undoubtedly created a less diverse, more homogenous landscape. In most cases, it is likely that an expansion of wetland habitats will have a positive impact on landscape character. As most new wetlands will be created in areas of former wetland, this can be viewed, at least partially, as a restoration of past or remnant landscapes. Where emphasis is given to working with natural processes, this can lead to the creation of new landscapes that give more natural expression to the core physical character of an area.

However, as the Vision is developed at the local and regional level, and is translated into action on the ground, it will be important to understand how any changes will impact on landscape character before work is undertaken.

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*Mixed flora on raised bog, Malham-Arncliffe, North Yorkshire © Paul Glendell / Natural England*
2 The Wetland Vision

2.1 Purpose and content

Wetlands have experienced extreme ecological fragmentation and disruption, and continue to suffer from a suite of pressures known to be affecting their integrity and capacity to provide ecosystem services to society (Natural England 2008a). Drainage and agriculture, in particular, are putting thousands of wetland archaeological sites at risk of damage and destruction.

The demand for land and water to supply food, fuel and to meet the needs of Regional Growth plans is increasing. However, wetlands also have a role to play in a modern landscape, helping provide sustainable solutions to the regulation of floodwaters and recharge of aquifers, the control of diffuse pollution and urban drainage. By presenting a Vision for wetlands, we are presenting options for the creation and restoration of wetlands that will benefit society and help people and wildlife adapt to the effects of climate change.

Our Wetland Vision maps identify those areas where wetland creation and restoration is feasible based on ecological and historic environment criteria. They provide a joint, national level focus for targeting investment and focusing effort for maximum benefit. Wetlands can only be created in a limited area of England, where the topography, hydrology and soils can sustain them over the long term. Unlike built development, wetland creation is reversible and does not constrain future options. We provide details on what these wetlands would be like and where they could exist in 50 years time.

To secure the Wetland Vision we need to deliver these changes:

- Place existing wetlands at the heart of our vision; enabling them to adapt in the face of climate change by linking new and existing wetlands across the landscape.
The project maps use proximity to existing wetlands as a factor in weighting potential. There are limitations to this data but it does allow us to identify where this could be feasible occur across the country, at a broad scale.

- **Restore degraded wetlands in the uplands and lowlands (including peatlands, rivers and lakes), so that, in functioning more naturally, they can provide enhanced benefits to society.**

The project’s maps highlight potential priority areas for delivering some of these outcomes.

- **Significantly extend, and in some cases double many lowland wetland habitats such as reedbed, ponds and grazing marsh.**

The project’s maps highlight priority areas with potential for delivering these outcomes but do not explicitly identify which sites within this potential area should be targeted.

- **Preserve the unique and fragile record of our historic environment by keeping the most important former wetland sites wet.**

The project has developed maps to show where such areas are likely to exist, and how they overlap with priority areas from a biodiversity perspective.

- **Create and restore wetlands in the countryside and in our towns and cities wherever they can support wildlife, reduce run-off and pollution, and provide wildlife-rich green spaces for people to enjoy.**

The project maps identify at a broad scale where wetlands can be created and include areas in and around urban centres. Action to deliver the Vision in urban areas will be small scale, via the provision of ‘wet’ green space and as part of sustainable urban water management techniques. These aspects to the project’s maps could be developed considerably more since our maps are unspecific about the exact locations where wetlands can help reduce run-off and pollution.

- **Make wetlands more relevant to people’s lives by better understanding and harnessing the benefits provided by naturally-functioning rivers and wetlands – that can slow and store flood waters, protect water quality, recharge groundwaters and store carbon – and then, communicating these benefits widely throughout society.**

The project has collated case study information on wetlands shown to be providing some of these services. We highlight the need for much more shared and collaborative research so that the full range of benefits provided by wetlands can be quantified and expressed.

The partners will use the outputs of the project individually and collectively to deliver the Vision. This may be through influencing policy and funding mechanisms, acquiring nature reserves, and developing landscape scale partnership projects working directly with landowners. The outputs are to be integrated with information that the partner organisations use in their day-to-day work to influence decisions about wetlands.

### 2.2 Interpretation of Vision material

*Our Vision is presented through a Vision statement, summarised on page 7, and is supported by national scale maps that give indicative locations of where the Vision has the potential to be delivered. The purpose of the text is to give a broad indication of what the Vision is and what needs to happen. The maps do not explicitly show areas for delivery of every aspect of the Vision but help illuminate potential areas for action.*

The project has developed three overarching maps that show historic and current distribution, and future potential for wetlands. A series of more detailed maps indicate where the different types of wetland habitats could be delivered over 50 years using prioritisation models. Each individual habitat map is supported by text outlining our Vision for that habitat. Other maps which describe issues that may impact on delivery of the Vision have also been developed and are presented in section 5. Each map is explained through an interpretation note.

The maps presented are a synthesis of currently available data, and some indication is given of how able they are to indicate spatial priorities that match our stated Vision for each habitat. For some habitats it has been difficult to narrow down the best areas for future delivery - the maps cannot be very specific and are instead suggestive of areas where the Vision can be achieved. This may be because the habitat concerned has very specific local requirements. They may highlight broad search areas that warrant further investigation at the local scale.

There are more general limitations as to how the maps can and should be used. For example, while wetlands can perform many functions for society, our analysis focuses on biodiversity and the historic environment and does not identify where they should be put to manage flood risk, increase groundwater recharge or maximise opportunities for amenity. Similarly any lines on maps should not be used to direct action at the local scale without local consultation and more detailed appraisal of opportunities and constraints.
Map 1: Our Vision is to restore wetlands for the benefit of society through the conservation of their biodiversity, the preservation of the historic environment and other benefits such as flood mitigation and carbon sequestration. The pale areas on the map show where future wetlands have the greatest potential to benefit biodiversity and the historic environment, and where we should be looking for a range of other socio-economic benefits. These will be the main areas within which we would be looking for significant opportunities for wetland creation and restoration, but other opportunities outside these areas should not be ignored, and can be informed and developed by local data and partnerships.

The data shown are based on an amalgamation of priority areas for wildlife and the historic environment. The current wetland extent (in dark purple) provides context, and in our Vision this will be restored and managed sustainably. Our coast will be impacted by rising sea levels. Adjacent land is therefore unlikely to support new freshwater wetlands in the future, but could support more naturally functioning wetland with both freshwater and brackish habitat present. This map indicates priorities, but should not be viewed in fine detail.
It is also important to note that even the term wetland has different meaning for different stakeholders. A wetland to a historic environment specialist is any area that has supported a wetland habitat at some point in the past, and the physical record of that past habitat is present below ground in the form of preserved wetland deposits. Within detailed habitat maps, there is an assumption that future wetlands would support a recognisable biologically defined wetland community, or a mosaic of such communities, and also deliver historic environment benefits ensuring the preservation of these former-wetland deposits. The ‘future wetlands’ map assumes that a future wetland would be a mosaic of biologically defined communities, and/or appropriate measures to protect archaic wetlands (which may not result in a specific biological community), as well as wetlands providing other benefits to society which overlap with the former to some extent.

Some answers to queries that have arisen during workshops and by stakeholders:

**• Your maps seem to cover very large areas. Do you want all these areas to be covered in water?**

No. All maps represent opportunities rather than areas where action will necessarily take place. Moreover, there are many types of wetlands that are only seasonally wet, e.g. floodplain grazing meadows. Wetlands exist along a continuum from ‘moist’ sites with no standing water in summer through to permanently flooded lakes and ponds. Many of the habitat-specific maps show the extremes of conditions where wetlands might be supported and these areas may be undesirable for delivery of the Vision, which is why they are presented as low priority.

**• Wetlands might not be sustainable in some of the areas in the future.**

There are many issues relevant to the development of a wetland vision, but not all can be adequately described by maps and data at the national scale. Some areas will not be capable of supporting wetlands in the future due to climatic uncertainties and/or because of the land-use choices that will be made. We still feel it is important to show that these areas have theoretical potential whilst acknowledging that detailed decision making must take place at a regional and local scale.

**• My local wetland project doesn’t appear on any of the maps.**

We have collated information on many local projects. The most notable of these from a national perspective, appear on our ‘local visions map’. Those we have been able to gather information on are in an associated database. There will be a few local projects that do not seem to appear within priority areas on our maps. This is because the area they occupy is too small to represent on a map at this scale, or because the delivery mechanism is less easy to predict (e.g. wetlands resulting from after use of mineral extraction sites). The majority of local projects will be encapsulated in at least one habitat map, but if you feel that we have missed an important project please contact us via our website.

**• I can’t see any real detail on the maps and I want to look at them more closely.**

The lines on the maps presented through this project are indicative. Because we have used nationally available data, the information is summarised in a relatively coarse way. The PDF versions of the maps available from the projects website are not suitable for viewing below the detail which can be seen on an A3 print out. Many of the datasets used to the develop maps can be independently downloaded and viewed in detail through websites such as www.magic.gov.uk and www.natureonthemap.org.uk. Contact the relevant partner organisation with enquiries about use of the project’s data.

**• How do these maps relate to ‘nature maps’ already developed in some regions across the country?**

The Wetland Vision maps do not replace regional nature maps. This project’s maps are a resource for these projects to draw upon. How they can be used to inform and supplement the development of nature maps, or similar projects, is detailed in guidance material available through the project’s website.

**• What about the historic environment?**

The interpretation notes associated with the maps describe how priorities for the historic environment have been factored in. Our ‘future wetlands’ map includes priority areas for both biodiversity and the historic environment combined. This is a more holistic way of presenting joint priorities.

### 2.3 Vision audience

The Wetland Vision is intended to be useful to a wide range of audiences involved in wetlands and decisions about land-use.

Our audience is potentially very wide but can be characterised. An indication is provided of which parts of the project are most likely to be of relevance to each:

**Technical specialists:** including those involved in investigating the potential for future freshwater wetlands, particularly those who need to access or understand the application of data. The project’s data and maps will be the most useful outputs.
Policy specialists: including those involved in developing the case for maintaining and enhancing wetlands. The maps and other information can be used to influence the allocation of funds and resources, and to review future targets.

Strategic and delivery partners: the Wetland Vision has defined how the partners would like to see wetlands in 50 years time. The project’s outputs enable discussions to begin around implementation and delivery.

Local practitioners and project officers: both the maps and advocacy elements of the national vision will be useful to local practitioners, although more local data and considerations will need to be used in to the development of local projects. National support for future wetland enhancement may make it easier to gain profile and recognition for existing and new local projects. The local Vision guidance material will be a useful output, together with information about other local projects available on our website.

2.4 Relationship to other initiatives

Many current initiatives will have benefits for future wetlands. The Vision seeks to inform them.

Landscape-scale initiatives
The partners and many other organisations are involved in developing landscape-scale conservation initiatives and wetland projects. These include The Wildlife Trusts’ ‘A Living Landscape’, the RSPB’s ‘Futurescapes’ and the UK BAP targets to create 8 new “landscape scale wetland complexes (four in England)”, and the Vision should help in targeting some of this work. Our Vision supports such initiatives.

Making Space for Water (MSFW)
Making Space for Water is the Government’s strategy for flood and coastal erosion risk management in England. The vision it sets out places a new emphasis on flood and coastal erosion solutions that work with natural processes and deliver a wide range of social, economic and environmental benefits. Our Wetland Vision will help deliver these objectives by informing decision makers as to where flood risk management investment could be targeted to contribute to biodiversity and historic environment objectives.

The Blueprint for Water
This is an Non Governmental Organisation (NGO) led initiative which outlines the steps needed to achieve sustainable water use by 2015, including the need to restore wetlands. One step is to “Retain water on floodplains and wetlands – restore large areas of wetland and floodplain to create vital wildlife habitats, improve water quality and quantity, and reduce urban flooding”. Our Wetland Vision describes where such restoration could be targeted in the future.

Regional nature maps and Regional Spatial Strategies (RSS)
Many regional scale nature maps have been developed to inform the development of RSS. These maps show existing nature conservation resources and areas of opportunity where wildlife can be enhanced. An initial analysis has shown that they broadly show the same areas for action as the Wetland Vision maps, although there are differences which relate to scope and scale (which is available on the project’s website for use by regional partnerships). Where discrepancies exist, the locations for wetlands displayed in regional maps should normally take precedence over broad areas shown through the national Vision maps.

Spatial planning in flood and coastal erosion risk management
The Wetland Vision outputs and associated local vision tools, together with existing local project information, are important data layers that can be used to inform wetland creation options for Shoreline Management Plans (SMPs) and Catchment Flood Management Plans (CFMPs).

Water company investments in land management
Defra’s new water strategy, Future Water, highlights the role of water company investment in securing sustainable land management to protect their most vital asset, water. In the uplands this might mean reversing decades of drainage, over-grazing and managing burning so as to protect water quality. In lowland landscapes water companies might seek to work with land managers to tackle diffuse pollution through various measures, including the creation of ponds and wetlands. Such investment could be a key component to delivering our Vision.

English Heritage strategy for wetlands
This strategy for the heritage management of wetlands is based on four main principles. Management – promoting practical mechanisms to conserve and protect the cultural heritage by developing guidance and best practice for the integration of cultural heritage and nature conservation in wetland management. Outreach – promoting and disseminating understanding and appreciation of the cultural heritage of wetlands by making the results of wetland research easily accessible to the general public, to landowners and managers, and to professional interests. Policy – promoting the cultural heritage interests of wetlands in the work of local authorities, national, international, and intergovernmental agencies. Research – continuing with programmes of survey and excavation as an essential pre-condition for the development of
successful management practices, as well as promoting applied research to underpin good management of wetlands and to inform future policy development.

Our Vision makes a significant and direct contribution to taking this strategy forward in ways which are compatible with other objectives for wetlands.

2.5 Relationship to other land uses

Opportunities for wetland creation are constrained by a range of physical, social and economic factors affecting the way in which land and water is used. These constraints may change in coming decades as society makes tough choices over how to allocate land and resources, particularly in the face of climate change.

Land in England is put to many uses; only a very limited area has supported wetlands or can sustain them into the future. An expansion in wetland area will require land currently used for other purposes to be managed with higher water levels or with more frequent flooding – making space for water. Freshwater habitats will also be lost from the coast and will need to be replaced in more sustainable locations. In the future, spatial planning based on assessment of land-use capability or capacity is highly desirable, and this may provide opportunities for wetland restoration.

Wetlands, small or large, urban or rural, can be created and perpetuated in a wide range of land-use circumstances, and this can often be complementary with these other land-use choices, providing many additional benefits. Our Vision work has not been future-proofed in terms of testing the Vision against a range of plausible futures driven by socio-economic factors and climate change, although the potential effects of a number of such factors on delivery of the Vision have been considered non-quantitatively (see Section 5).
3 Wetlands in England

3.1 The importance of wetlands

Wetlands are a valuable resource for wildlife and can provide services to society in the form of flood water management, the storage of carbon and silt, processing of nutrients, and landscapes attractive for recreation and tourism. The importance of the ecosystem services that wetlands provide are likely to increase in the future under a changing climate. Historic wetlands are also a valuable and irreplaceable resource that helps uniquely to understand how humans interacted with past environments.

In our Vision, the value of wetlands is recognised as key to delivering a more sustainable society, assisting both people and wildlife in adapting to the effects of climate change. Planning for wetlands should be applied wisely to the benefit of both.

The range of wetland wildlife in England continues to remain astonishing, despite the pressures of the past. England supports many rare wetland communities, some of which are both nationally and internationally scarce. England holds approximately 40% of the UK’s fen and lowland raised bog, and over half of the reedbed resource. Nine of the wetland types listed in Annex I to the EC Habitats Directive occur in England (Natural England 2008a). This importance has been reflected in the level of designation afforded to some sites, and the extent of conservation efforts over the past century to ensure they are restored and safeguarded for the future.

The potential for improving our understanding about how people of the past interacted with wetlands is vast. This is testament to how extensive and common these areas once were and how important they were for providing food, water and transportation. The tremendous diversity of archaeological evidence in wetlands exists because of the enhanced preservation of organic materials (wood, leather, textiles, plant remains, pollen etc) that occurs due to the absence of oxygen in these waterlogged deposits. These wetland deposits are rare, and well preserved sites are therefore of national, and in some cases international significance. Bogs, fens and peat soils have captured information about people, their way of life and interactions with the
natural resources and wetland landscapes of the past. Often our best surviving historic landscapes support the richest areas of biodiversity today, linking the richness of the past and possibilities for the future.

Wetlands provide many of these, but not all wetlands in all places. There has been no quantification of the services that they provide across in England to date, though Defra [www.defra.gov.uk/wildlife-countryside/natres/research] are currently funding a series of research projects to help answer such questions.

3.2 Historic extent and decline in wetlands

Wetlands once covered vast areas of England. These wetlands are now small and exist in a fragmented state across the English landscape.

Great expanses of wetland once covered the lowlands of England where rivers meandered freely through mosaics of floodplain, fen, woodland and marshland, often merging with more saline environments on the coast (Bell, M. 1987). The uplands supported uninterrupted swathes of bog, often with heathland and forest (Simmons, I.G. 2003). From these great wetlands water drained naturally into lowland landscapes via streams, rivers and groundwater. Springs emerged through fissures in the rock to support a great variety of flora and fauna.

For much of the last ten millennia, large tracts of shallow wetlands would have covered much of the area shown in ‘Where Wetlands Were’ (Map 2). As areas of wetland became drier (as a result of global climatic changes or more local shifts in floodplain dynamics), these environments became more terrestrial and woodland may have developed. This terrestrialisation was not a one-way process and in many cases inundation or an increase in wetness led to further habitat changes, and the reappearance of peat. This occurred in many wetlands and can be understood through the discovery of bog-oaks within later peat deposits, and through the detailed study of wetland sedimentary archives. In the past our wetlands were clearly highly dynamic with successional processes operating over very long timescales.

Wetland loss has taken many forms, much of which is not documented, especially where this relates to gradual decline in quality and function, rather than destruction of distinct areas. Here is one case study which shows clear retraction of habitat. Between the 1930s and 1980s, two thirds of the coastal and floodplain grazing marsh in the Thames Estuary was lost. Of the 44000 hectares of grazing marsh within the North Kent, East Essex, Foulness and Inner Thames area, 28000 hectares were converted to other land uses. Today the picture is more optimistic with a range of initiatives underway in the area.

Figure 3: Changes in the extent of Thames Estuary grazing marsh. Reproduced from Thornton, D. & Kite D.J. (1990) NCC Report.
Map 2: Wetlands were much larger and more numerous in the past. Drainage, in particular over the last 500 years, has significantly reduced their area. Before then, a variety of habitats would have existed; wet, or sometimes only seasonally wet, and in many cases around the coast subject to saline or brackish conditions.

This map cannot show where wetlands existed at any given point in time because they have fluctuated so extensively over the centuries due to changes in climate and land management. It is not a definitive record of previous extent, but is based instead on underlying soil characteristics, and shows the maximum former extent of wetlands.
Our wetlands have become diminished in extent and in quality. Historic records and archaeological data speak of extensive water meadows, seasonal ponds, beavers, cranes, and people crossing huge expanses of fen, marsh and bog on ancient trackways extending for many kilometres.

One of the most dramatic wetland landscapes would have been found in the East Anglian fens. North of Boston and east of the River Witham, there were three great fens known as Wildmore Fen, West Fen and East Fen. The first two, totalling some 11,000 ha, were predominantly wet grassland where dairy farms had been established in the 12th century. East Fen, of about 5000 ha, was much wetter, with bodies of permanent water, generally thought to have been created by medieval peat-digging.

The decline of East Fen started in the twelfth century and by the late 18th century, wind-powered engines intensified the drainage. Engineering works to straighten the course of the river Witham in the 1760s made further changes possible. Local Acts were passed in 1801 to overcome local opposition to further improvement, and drainage work went on for the following 15 years following enclosure of the entire area. By the end of the 19th century the whole area had come to be counted among the finest agricultural land in the country.
Map 3: Map of major drainage activity on agricultural land 1971-80. This map describes the pattern of drainage on farmland during a period of major agricultural intensification. Between 1971 and 1980, 10% of all farmland in England and Wales had been underdrained. This map represents hotspots of drainage in parishes where at least 40% of farmland was drained using subsurface pipes. The bias towards the East is not solely due to the natural drainage characteristics of underlying soils, but the traditional drainage methods at the local level. Data provided by Mark Robinson at the Centre for Ecology and Hydrology. For further information see Robinson, M. & Armstrong, A.C. (1988) The extent of agricultural field drainage in England and Wales, 1971-80. Transactions of the Institute of British Geographers, vol. 13: pp19-28.
Historic Landscape Characterisation (HLC) can also help in understanding wetland loss. The loss of extent and diversity of wetland landscapes occurred at various points in history as people continued to interact with (and attempted to tame) their environment. The changing patterns of settlements, land-use, modifications to hedgerows and amalgamation of fields are all components of the historic landscape that are charted through the HLC programme. HLC, a national programme funded by English Heritage, maps the historic landscape character for each county. Based on aerial photography, modern and historical maps, an overarching characterisation is produced as a GIS data layer and is designed to be accessible to the nature conservation sector.

The outputs of the Countryside Quality Counts project (CQC), and descriptive information associated with Joint Character Areas (JCAs) can also help us understand how landscapes, wildlife and the historic environment have changed over time, the pressures affecting them and the objectives for wetland biodiversity within each JCA.

There is also information that describes phases of drainage activity across England late in the 20th century (an example is given in map 3). The character of the landscape we see today is therefore a consequence of the colonisation and development of plants and animals over at least 12,000 years, but one which also reflects at least 8,000 years of human activity within that landscape (Vincent, M. 2006).

Examples of recent declines across England

The quality of the Norfolk and Suffolk Broads has been greatly affected by sediment and nutrient inputs, particularly over the past century. Large areas of open fen turned to scrub and woodland after World War II following the reduction in areas harvested for sedge and reed. Restoration measures within the Broads have met with some success, with open fen returning, but they now face challenges of a different kind, most notably related to the likelihood of increased saline intrusion and climate change.

The lakes in the north-west of England are largely of glacial origin, but have suffered from recent nutrient inputs and wider land-use change in their catchment, and from recreational pressures. The Mosses and Meres of north Shropshire, west Staffordshire and Cheshire comprise hundreds of wetlands that occupy depressions amidst the hummocky post-glacial landscape. These often small sites have suffered enormously in the last 100 years, with many sites drained, and in the last 30-40 years subjected to very high levels of nutrient input as land-use became more intensive in their catchments. Many have now fallen outside modern farming systems and are unmanaged and covered in dry woodland or conifer plantations, surrounded by intensive grassland or arable.

Blanket bog is the great upland wetland sponge of England covering large areas (some 255,000 hectares).
Blanket bogs are particularly important in water flow regulation and carbon storage. The natural functioning of these wetlands has been compromised through intensive drainage, afforestation and other intensive land-use practices.

Of course there have been many benefits associated with the conversion of wetland to other forms of land-use. Former wetlands provide some of the most productive agricultural soils in England, and the country’s capital, London, is almost entirely situated on what would once have been natural marshland. However, the economic forces that once maintained most of these wetlands in a state of high ecological quality have declined. Many wetlands have become neglected and overgrown as the traditional management practices that sustained them have ceased (Townsend, D., Stace, H., Rdley, D. 2004).

Rivers have been modified over many centuries to improve land drainage, reduce flood risk and facilitate water abstraction, in order to allow agricultural, industrial and urban development of riparian land and floodplains. These modifications have included moving, straightening, widening and deepening of river channels and their banks, reinforcing banks to withstand erosion, and building impounding structures (Townsend, D., Stace, H., Rdley, D. 2004).

The effects of these changes largely relate to loss of habitat diversity and dynamism, and constraints on the movement of wildlife (especially fish) up and down the river. Many of these modifications are intimately connected to the well-being and safety of our society and can never be removed, for instance structures that prevent flooding of our towns and cities. However, some of these modifications no longer serve a useful purpose or serve a purpose that can now be achieved in other ways.

### 3.3 Threats to wetlands

#### 3.3.1 Today

The quality of remaining freshwater wetlands is under pressure from pollution, the abstraction of water, land drainage and flood defence and coastal flooding. Many of these pressures are likely to increase as a direct consequence of climate change and the choices society makes as it adapts to the prospect of wetter winters and hotter drier summers.

Within the protected site network, wetlands are damaged or deteriorating. By area, 69% of SSSI wetland is in favourable or recovering condition (not including blanket bog). Of this, 21% (52,308 ha) is in favourable condition and 48% (118,671 ha) is recovering. (Natural England 2008a), although there have been some great successes in restoring some sites. Comprehensive data on the condition of wetlands outside the SSSI network are not available for the whole of England.
Threats facing wetlands today include:

- Habitat destruction and further fragmentation of existing wetlands from other types of semi-natural habitat
- Drainage (BRIG 2006a) and development of the natural floodplain (Townsend, D., Stace, H., Radley, D. 2004).
- Continuing effects of environmental acidification of waters.
- Nitrate, phosphate and pesticide pollution (BRIG 2006a), and other toxins present in the environment.
- Climate change which is already affecting individual species life cycles.
- Changes in agricultural management practices (BRIG 2006a).

Buried wetland resources which tell such vibrant stories about our past are also fragile and under threat. Drainage pressures, water abstraction, peat extraction, soil wastage and erosion, uninformed land management practices and future climate change are some of the key causes of the destruction of wetland archaeology. Elevated nutrient levels also accelerate decay of organic remains.

Wetland archaeology is important because having remained waterlogged since they were formed, these deposits contain much more information than ‘dryland’ sites. This is as a result of waterlogging significantly reducing bacterial decay and fungal attack, which usually leads to the loss of organic materials. Therefore artefacts made from wood, leather and other biological materials survive, providing an illuminating insight into the lives of past societies. However, when these sites are drained and are no longer waterlogged, decay will occur on sites, and with them information about the past will be lost. A recent study for English Heritage concluded that more than 10,000 wetland archaeological sites may have been lost or damaged in the last 50 years (van de Noort, R. et al. 2002). Wetland archaeological features are a finite resource that once lost cannot be replaced. That is why this vision also seeks to create favourable conditions for their long-term survival by making areas of former wetland wetter. Guidance is available from local government archaeologists on the best options for managing wetlands so that new wetland features can be created without compromising the evidence of the past.

**Figure 8:** The impact of current threats to buried wetland archaeology (reproduced from Robert van der Nort 2007, presented at a Wetland Vision workshop)

Rivers and other wetlands are currently subjected to a whole range of pollutants. Some forms of pollution involve the enhancement of natural inputs to river systems and groundwater – organic material, nutrients and silt, for instance, are critically important natural features of river ecosystems, upon which wildlife depend. However, when supplied in excessive amounts due to human activity (e.g. from sewage works, industry and intensive agriculture), they lead to severe ecosystem dysfunction. Other forms of pollution include toxins such as sheepdip, herbicides and pesticides. New threats are arising from the high concentration of hormones and hormone-mimicking substances in sewage effluents, which can create reproductive dysfunction in fish (Environment Agency 2000).

### 3.3.2 Future challenges

In some cases habitat re-creation will be needed to meet statutory requirements for replacement of habitat lost to rising sea levels. Our Wetland Vision will help inform this work. We will also need to restore wetlands in the landscape to contribute to climate change mitigation and adaptation. Space should be allocated and protected for future wetland, for example through Regional Spatial Strategies.

Current threats on wetlands are likely to continue into the future. Such future pressures are likely to include:

- The impact of climate change on water quality (increased sediments from more severe storm events) and quantity (more extreme floods and droughts, increased likelihood of summer flooding). (Environment Agency 2005).
Map 4: Freshwater resources on the coast.

This map shows the Wetland Visions future potential map overlain by some information that shows pressures impacting on the coast, and areas that would once have been naturally saline. Where these areas coincide, freshwater habitat delivery may prove unsustainable, or otherwise result in habitat more naturally responsive, with a mix of freshwater and brackish habitats. The full effects cannot be accounted for within the project’s aspirations, and will be locally determined according to the outputs from shoreline management plans (SMPs) and coastal habitat management plans (CHaMPs). Data are derived from the outputs of Futurecoasts project and an extraction on Environment Agency floodmap (2001).
Map 5: Our current wetlands are very different from those of previous millennia, both in function and form. They have a much-reduced presence in the English landscape, being smaller, more fragmented and isolated. Designated sites cover a fraction of the total extent of freshwater wetlands that remain today.

We have used the best nationally available and complete information. Data presented here were derived from statutory site data and elements of national habitat inventories, which can be viewed at www.natureonthemap.org.uk. This map almost certainly under-represents the extent of some wetland habitats, and over-estimates the extent of coastal and floodplain grazing marsh. Some regions have more up-to-date information, and this should be consulted instead where it exists.
Map 6: Map of historic wetland environment priority areas.

Wetlands are important and require specific management strategies for heritage purposes because waterlogged environments offer incredible preservation of archaeological remains and palaeoenvironmental data. This fragile resource cannot be recreated but wetland enhancement and recreation can help to preserve it.

These areas highlighted on the map have a high potential for archaeology and palaeoenvironmental deposits buried beneath later sediments. This provides some indication of the likely survival of materials, as deeply buried deposits will be at lower risk. The data are derived from soils which have a high potential for water logging of archaeological sites, buried 2m deep and where palaeoenvironmental records of national importance exist. Characterisation data was provided by the University of Exeter.
• The impact of climate change on the distribution of species (including invasive, or potentially invasive species) associated with wetlands.
• An increased demand for housing and space for associated infrastructure.
• An increased demand for agricultural land driven by high commodity prices, energy crops and concerns about food security.
• Saline intrusion into freshwater wetlands driven by sea level rise and increased storm intensity.

Some changes in the landscape may have a beneficial impact on wetlands. Opportunities for conservation and rehabilitation may come through planning gain, a trend for "greening" urban environments as well as changes in tourism patterns and the need for more sustainable urban drainage systems.

### 3.4 Designation and protection

Legally designated sites in England provide a critical refuge for wetland wildlife, and a core network of sites is important within the Wetland Vision. The range of designations is outlined in section 1.4.

The majority of today’s biologically rich wetlands are contained within the protected site network. A third of all wetland SSSIs are freshwater wetlands (Townsend, D., Stace, H., Rdley, D. 2004). These designations were made in response to habitat and species declines, in an attempt to identify and protect the best examples. This strategy has helped to maintain the diversity of wetlands we see today. However, much wetland exists outside the statutory network.

The majority of buried archaeology associated with past wetlands exists in non-designated and usually unprotected areas though some wetland archaeological sites are designated as Scheduled Monuments (SAM). In many instances designations for nature conservation may also benefit archaeological sites since the presence and survival of wetland communities often lends itself to the preservation of the archaeological interest.

Because of the threats facing wetlands we recognise the need to identify and manage pressures operating well beyond protected site boundaries (Townsend, D., Stace, H., Rdley, D. 2004). Often this will mean tackling issues at the landscape or catchment scale if we are to ensure the long-term survival of wetland diversity. The need for a more dynamic approach is to conservation is recognised in Natural England’s recent recent Manifesto (Natural England 2008b). This approach involves looking at pressures and activity across the whole catchment with which wetlands exchange water. It also requires an understanding of how wetlands can contribute to a network of viable semi-natural habitats that can support biodiversity into the future and conserve buried archaeology.

### 3.5 Setting targets and future wetland

This Vision has examined other targets and ways of describing future wetlands, beyond the need to comply with legislation or meet BAP commitments.

The historic environment sector has been slow to develop targets to manage wetland archaeology, and although research has been carried out to identify the most significant wetlands sites, and to produce management plans. no specific targets to reduce wetland or wetland site loss have been generated. In part, this is because such sites are often masked by layers of deposits until they are disturbed by agricultural, development or archaeological intervention. Therefore, some of the best preserved wetland archaeology may still await discovery. We must deal instead with concept of ‘potential’, which exists in all areas of former wetland.

So in developing targets for The Wetland Vision we have explored the concepts described below, many of which will need to be developed further.

### 3.5.1 Dynamic and landscape-scale wetlands

This is a Vision for both large and small-scale wetlands, many of high ecological value throughout the landscape, where species can thrive, which people can enjoy, and where land is managed more sustainably. Our analysis has shown that there is theoretical potential for the restoration of large areas of wetlands based on the availability of physical landscape characteristics. We believe that wetlands of the future will need to be more responsive to natural processes that give rise to or can support key wetlands.

All freshwater wetlands in England are affected to some degree by human impacts, and there are few examples where dynamic systems still operate more-or-less naturally at a landscape scale in the UK (Insh marshes, Scotland, perhaps being one exception). Many of our most important freshwater wetlands are actively managed to meet nature conservation objectives. At one time, wetlands would have ‘winked’ in and out of existence across the landscape as natural disturbance and water regimes provided opportunities for them to develop or diminish.

Many of our currently most biodiverse wetlands exist in their current form due to centuries of positive land management. In such cases, we will need to continue to work with land managers who maintain these wetlands and landscapes.

However, as we look to the future our Vision is for new wetlands that are of sufficient scale that natural succession and wetland reversion can take place, minimising the need for significant active management. Rivers properly connected to their floodplains also display proportionally higher biodiversity than those
that are no longer hydrologically connected (Peacock, C. 2003). Allowing natural fluvial dynamics to operate within wetlands usually results in the development of a high degree of structural diversity, which in turn benefits biodiversity. While this is a long-term aspiration, management intervention will still be key in most instances as we learn more about restoration and functioning of natural ecosystems.

Working with natural processes will often provide the key to creating and sustaining wetlands of the future. In our Vision, wetlands will be more aligned with the natural processes that give rise to and sustain them. In particular this could result in:

- **Rivers which meander and flood in a way that stores sediment and nutrients in floodplain soils.**
- **Larger wetlands that can receive floodwaters in a way that supports natural seasonal variation, which characteristic habitats and species depend on.**
- **Vegetation succession within and across rivers on low flood risk river systems, and the natural build up of woody debris where this will not increase flood risk to settlements.**
- **The natural generation and regeneration of peat.**
- **Ephemeral wetland features close to rivers.**
- **A greater range of wetland types across large landscape scale wetlands, and greater transitions between habitats.**

Other benefits associated with more naturally functioning wetlands could include increased tourism to wetland areas, the potential for greater flood attenuation, and species able to move around and have access to a mosaic of habitat types.

Whilst our maps indicate priorities for further specific habitat restoration, it is important to recognise the ecological significance of habitat mosaics and transitions between habitats. In determining locations, priorities for action and approaches to restoration, there will be a need to take into account transitional and alternative priorities for habitats not represented in the Vision (e.g. coastal and terrestrial habitats), and local ecological and practical considerations.

Many current freshwater habitats on coastal floodplains are likely to become brackish or inter-tidal as our coast changes with rising sea levels and increased storms promised by climate change. An approach to coastal management that works with natural processes will provide many benefits and continue to support important semi-natural areas, albeit for a different range of habitats and species. It would be inappropriate to target the expansion of freshwater habitats in these areas unless local studies suggest that they are both feasible and sustainable. There may be great opportunity to create more natural transitional wetland types with both freshwater and saline elements in the future. Areas where extensive transitions exist now are extremely rare, but in our Vision these habitats would be valued and contribute to the overall gain in freshwater and brackish habitat.

### 3.5.2 Vision targets

As part of our Vision existing SSSI PSA and BAP targets for wetlands will have been achieved. The health of the wetland Natura 2000 network will be secure, the contribution made by SSSIs to wetland conservation will be resilient into the future, and wetlands will be playing a key role in delivering Water Framework Directive (WFD) objectives.

There will be a need to further develop targets for freshwater wetland creation. This is needed to reflect our desire to see wetlands play a role in sustainable development and focused on physical areas likely to maximise environmental and social and economic benefits. In the interim, the Wetland Vision project has explored what kinds of targets could be promoted to support the delivery of more sustainable outcomes for some wetland wildlife.

The desirability of Wetland Vision targets was discussed in depth with stakeholders, and through the project TAG. This was in recognition of the value targets can bring in describing outcomes we want in the Vision, within the context of those targets already adopted by the UK Government.

The conclusion was that BAP targets have limitations in describing what we want for wetlands in 50 years time. This is partly because they do not describe processes, ecological functionality or measures of habitat interactions, but also because they are relatively short term, and so insufficient to drive the scale of change needed over the next 50 years. However, few alternatives are readily to hand. Associating targets with the Vision and adopting the BAP targets as milestones is useful and necessary because:

- **BAP targets facilitate access to funding and provide a focus for resources.**
- **They provide a framework against which progress can be monitored and to which Government is already committed.**
- **Targets within the UK BAP are part of a recognised process to which many are committed at the local level. It is important to associate the Vision with these targets in order to support existing conservation efforts.**

A variety of approaches can be used to set long-term targets, many of which have been explored within the
Map 7: The contribution of biodiversity and historic environment priority layers to the final 'future wetlands' map.

Both historic environment priority areas and biodiversity priority areas are included in the final future wetlands map. This map shows the relative contribution from each sector’s priorities to that final map. All priority areas from an historic environment perspective correlate to areas that have potential for delivering for biodiversity, but which are often lower priority on the biodiversity scale. This is largely because the weighting system for enhancing wetland biodiversity uses ecological principles and many priority areas for the historic environment have no or little existing wetland habitat present.
BAP process. These targets typically have timescales no further than a few decades into the future. It is difficult to set realistically achievable targets for longer time scales as policy and delivery mechanisms become less predictable. The specific effects of climate change on habitats and species are also unknown and may impact on the deliverability of some targets. Whilst target setting for habitats and species will remain important, those for wetland delivery are likely to be explicitly linked to wetland function, sustainability in terms of connectivity, and the ecosystem services they provide.

One way in which the Vision project has explored integrating target types spatially is through the production of the ‘future wetlands’ map. This map consists of priority areas from both historic environment and biodiversity perspective and displays them equally (see map 7). Such techniques could be developed in the future to identify targets within the Vision that can deliver across multiple objectives, or for specific ecosystem services.

Our maps do not provide an exact indication of how much habitat we envisage being restored or created by 2058, only priority areas in which future wetlands could be delivered or should be retained. A comprehensive review of corporate plans and strategies yielded very few additional numeric targets that go beyond 2020 UK BAP or legal requirements. The only exceptions are Ponds Conservation’s call for a “doubling of ponds” and work undertaken by RSPB to establish the habitat needs of red and amber listed wetland bird species. These have been adopted as example and interim targets by the Wetland Vision project. The approach warrants further exploration by the partnership, and others, in future.

a) A historically based 50-year target: Ponds

We have adopted an approach developed by Pond Conservation under their ‘Million Ponds’ concept. The Million Ponds project is based on a number of distinctive hydrological, biological and practical characteristics of ponds, which make creating new ponds one of the simplest, most practical and effective ways of enhancing aquatic biodiversity (Williams, P. et al. 1999). New 50-year targets were needed for ponds because:

• Many of the UK’s existing 400,000 ponds are severely impacted by pollution and other damaging impacts.
• Reducing these impacts is often difficult or impossible; the effectiveness of work to mitigate impacts is poorly understood.
• The best wildlife ponds occur in areas where pond catchments are predominantly seminatural (e.g. non-intensively managed grassland, heathland, woodland, moorland). One in four of these ponds supports Red Data Book species.
• As ponds have small catchments it is possible to create clean ponds with semi-natural surrounding catchments in all parts of Britain, including intensively managed agricultural landscapes.
• New ponds can provide oases for plant and animal species now lost from other freshwater habitats – particularly in the largely eutrophicated lowlands.
• Creating new ponds simulates the natural processes that have occurred for millennia – they become rich wildlife habitats, often colonising very rapidly with species of high nature conservation importance.
• Many new ponds today are poorly designed and many are linked to polluted ditches or streams that will reduce their quality and value in the long term.
Creating high quality ponds is straightforward, provided they are located in areas with non-intensively managed catchments. Designs can be improved by simply including a wide natural drawdown zone at the margin, and creating pond complexes or mosaics would greatly improve many existing new pond schemes.

50-year targets for ponds:

1. An approximate doubling of the total number of ponds from the existing c.400,000 to one million ponds. About half of the new ponds will be in clean catchments; the remainder will be in more impacted locations.

2. An approximate quadrupling in the number of ponds having high ecological value.

3. Our Vision map for ponds identifies areas where it will be easiest to create large numbers of new ponds; but ponds can be created throughout the landscape.

Evidence base:
This target reflects the number of ponds in existence around the turn of the 20th century, a time when ponds were very abundant in the countryside and before any major loss began to occur. It is assumed that wildlife associated with ponds was probably at a relative equilibrium and there was sufficient diversity in pond types and successional phases.

b) A 50-year target based on sustainable population outcomes: Reedbed and coastal and floodplain grazing marsh

Many targets set for habitat expansion or improvements are ambitious, and often describe a more sustainable outcome. In some cases, these are clearly not ambitious enough. An alternative and potentially more robust way of deriving such targets was explored for a sample of species and habitats. The RSPB has developed a number of 50-year targets associated with a range of wetland birds and the utility and robustness of the approach has since been explored within this project.

50-year targets for coastal and floodplain grazing marsh and reedbed:

1. An additional 34,500 ha of coastal and floodplain grazing marsh is needed to support characteristic breeding bird species associated with it. This assumes that reserves continue to play a role, but that the species are able to utilise the landscape as a whole where this habitat is dominant.

3. The population of 50 booming male Bitterns (Botaurus stellaris) increases to 300 in 50 years time. To support this population, the current extent of reedbed would need increasing by approximately 5000 ha, which approximates to a doubling from the current extent. These supporting reedbeds would be located in sustainable locations.

4. It is considered that approximately 1.1% (UK wide) of land for wetlands (lowland) is needed to deliver sustainable populations of all birds considered within a calculation by the RSPB (Pers. comm. Jo Gilbert 2007)

5. If these wetlands were delivered exclusively via a reserves based approach, just under a half of the area again would be required to store water in order to support these new areas of wetland (Pers. comm. Jo Gilbert 2007)

Evidence base:
These figures were calculated by determining the required breeding area to sustain various bird species, and extrapolating the area of land that would be required to support a future population that would no longer appear in the red or amber list. Breeding densities were then compared between those of a managed, reserves based landscape, to those found in more natural, or landscape wide areas. The proposed 50-year target for these habitats represents a very small proportion of land capable of supporting these habitat types. The table below describes how the new target for coastal and floodplain grazing march relates to existing targets already adopted under BAP.

Figure 9: Wetland Vision targets for coastal and floodplain grazing march in relation to existing agreed BAP targets. The majority of existing targets relating to this habitat are for habitat restoration within the existing degraded resource, though there are also some targets relating to creation. It is assumed that these qualitative targets will have already been delivered within our Vision.
4 Methodology

We cannot entirely predict the outcome of habitat restoration efforts, but we can direct resource and restoration effort to optimise the outcome for specific habitats and to maximise potential benefit. The Vision maps will help to indicate the broad areas where restoration might best be directed towards encouraging the development of a particular habitat type, but local considerations (ecological, social environmental and economic) should always guide decisions in any specific case. A full outline of the methodology can be found in the project’s GIS report.

4.1 General approach

The project partners aimed to develop a wetland vision that:

- Took an objective approach to the development of maps.
- Identified areas of high potential for future wetlands via a prioritisation system, without prejudicing the potential for wetlands in other areas.
- Incorporated expert judgement in as objective a way as possible.
- Developed joint national aspirations between the partner organisations that express outcomes over and above that which maps can illustrate.
- Takes into account, and references, activities or plans at the local scale.
- Works with existing target setting for wetlands.
- Considers aspirations of others both within and outside the wetland conservation sector.

The Wetland Vision has developed a series of maps describing where the physical and ecological conditions can support wetlands. Three indicative maps describe the former extent of wetlands (a theoretical projection based on soil type), the extent of existing wetlands, and where wetlands could be in 50 years time. Individual habitat potential maps, using ecological and physical criteria, highlight the most suitable areas for each habitat across the country. A sub-catchments database describing 6007 independent units covering England was prepared to encapsulate information.

The GIS approach was employed in three stages. We first identified the basic conditions that support the current range and extent of each wetland type. A search for that
combination of conditions was then extended across the country using the indicative data layers generated as a result. In this way, areas identified as offering the right environmental conditions generated a baseline for wetland potential. Factors that could support future landscape scale wetlands were summarised by sub-catchment and then weighted. These weighting factors include: presence of indicator species, existing priority habitat, statutorily designated wetlands, nature reserves, low extent of urbanisation within floodplains, the grade of agricultural land, and the presence of large contiguous areas. The total score for each sub-catchment was mapped using a simple colour gradient to describe the spectrum from the baseline potential to areas that have been prioritised through our weightings process.

Maps were developed using the criteria and weightings considered in conjunction with the project’s TAG and with stakeholders. These describe the areas of greatest potential across the country, based on comparing information analysed per sub-catchment. The Wetland Vision maps are not prescriptive. The environmental criteria and weightings used were designed to be simple and repeatable, and to provide a basis from which further priorities could be set at the local level.

A range of data were also collated to illustrate or describe the extent of potential constraints on future wetland creation and maintenance. These are not factored directly into the models, but considered and presented within this report as “constraints maps” for consideration. This approach was agreed with stakeholders, and explored in detail with the TAG.

The final digital layers will be available on partner GIS systems, and will be used to support decision making about wetland opportunities. The GIS report, which can be downloaded from the project’s website, details exactly how the maps were produced and the data used. A guidance document outlines how the information can be interpreted at the local level.

4.2 Sample GIS model

Full details of the GIS approach can be consulted through annex material. Below is one example of how data was processed and weighted to produce a vision map for coastal and floodplain grazing marsh.

Figure 10: The two stage GIS model used to develop a vision map for coastal and floodplain and grazing marsh.
4.3 Stakeholder engagement and workshops

The Wetland Vision has been developed in conjunction with a range of stakeholders.

It was recognised early on in the project’s development that there is a wealth of knowledge about, and interest in, wetlands. To acknowledge this and take into account a range of views, the project launched a stakeholder engagement process. We hope that this Vision represents more than our views, though attendance at a workshop does not indicate implicit support for the project’s outputs. We are grateful to many for their considerable input.

Views from stakeholders have had a significant impact on the development of the project, particularly in relation to presentation, the treatment of constraints, and the consideration of local visions. A full record of workshops and detailed feedback on the issues discussed can be accessed via the project website www.wetlandvision.org.uk. This engagement will be an ongoing process as the project partners take forward joint and individual actions to develop, promote and deliver the Vision.

Figure 11: Wetland Vision workshops run throughout 2006 and 2007.

1. Philosophy and targets (June 06)
2. Climate change and other land-uses (Sep 06)
3. Exploring draft maps (Dec 06)
4. Exploring links with the historic environment sector (June 07)
5. Pre-launch stakeholder engagement (Nov 07)

4.4 Local visions

Local Visions are key to delivery of the national Wetland Vision. The Wetland Vision supports and records their existence through a database available on the project’s website (www.wetlandvision.org.uk), and identifies areas in which future local visions could be developed within the project’s maps.

A study was undertaken to gain an overview of local wetland visions that had been developed. This helped us to understand the range of initiatives already in existence, and how specific each has been in describing their aspirations. We identified over 120 local wetland projects and initiatives across the country (though we only present information on a limited number) – this is not a complete record but a snapshot in time to describe the breadth of activity across the country.

In consultation with stakeholders, it became clear that our national vision could not amalgamate local vision data and aspirations into one national vision map. The diversity in approaches did not lend itself to the production of a single national map. A subjective comparison of the local visions to the priority areas on our maps has shown a strong correlation, supported to some extent statistically via a sensitivity analysis, the detail of which can be found in the project’s GIS report. As similar search criteria are often used at the local level to those adopted within our prioritisation models, this is not unexpected. Most local visions, for example, seek to expand the existing wetland resource.

A workshop explored with stakeholders how local visions should be incorporated and the approach adopted is outlined below:

- The diversity of local visions is acknowledged and made available through the national project
- The national Vision ceases to have practical applicability at the local scale – local visions become the expression of the Vision (where they exist)
- The broad aspirations of local visions will be achieved as part of our overall Vision, which provides a national partnership framework for delivery and a context for such work
- The national Vision can inspire the development of new local visions where they do not currently exist
- Local sources of data are often better suited to describe and construct a local scale wetland vision. The national Vision material should not be viewed at a scale below that of a sub-catchment.

The project has produced local vision guidance material (available through the project’s website). This assists in translating general principles associated with the project and its use of data. This also advises on accessing and handling local data sources to guide decision making, as well as developing partnerships. This will not be a checklist for how to create a wetland, but rather sets out some key elements in putting together an inspiring vision that can rapidly move towards implementation.

The ingredients of a successful local vision are:

- Be inspirational
- Have strong partnership working
- Have a long term view
- Be sensitive to the character of the surrounding landscape
- Have a sound ecological basis or biodiversity focus
- Define multiple benefits to other sectors, for example the historic environment
- Be realistically able to deliver on the ground
- Use local expertise and practitioners
- Undergo a local stakeholder engagement process
- Lessons learned are captured and shared
Map 8: Local vision map.

This map shows some of the most successful, or best designed local visions for which data has been collated. This is just a sample. For more details about these local visions visit the project website: www.wetlandvision.org.uk. The project is actively updating this information.
We have developed a robust approach to prioritising areas for habitat restoration at a broad level, but we acknowledge the shortcomings in current data availability. We recognise the need for a range of other ecological and societal considerations to be considered in determining priorities in any given area, and for the need to fully factor in the likely impacts of climate change. We will work as a partnership in the future to better define how various challenges impact on our Vision. Described here are just some of the factors and considerations that may influence how achievable aspects of the Vision are. Others, not considered here, may only be relevant at the local level or unpredictably over time. We describe those issues that can be interpreted at the national level, or for which there are national data. None of these factors were directly incorporated into the Vision maps – a decision made by the partners after consultation with others and exploration through workshops. This is largely because the potential data was inadequate, partial, or at a scale too coarse to apply to our spatial framework. The Vision and its maps are sufficiently broad to be refined in the future (and at local and regional level) without undermining assumptions they are based on. Future changes in policy may impact the delivery of our wetland aspirations, and so we should not restrict our Vision according to existing policies.

5.1 Water quantity and quality

It is not possible to support wetlands without sufficient water. Future wetland expansion can be planned in a way that does not affect overall security of supply, e.g. by capturing rainfall or reinstating seasonal winter flooding, indeed wetlands could have the potential to increase summer resource availability by releasing water to aquifers or rivers through the spring and summer months.

However these design considerations are site specific, and while the Environment Agency’s Catchment Abstraction Management Strategies (CAMS) provide a useful insight into the balance of supply and demand for rivers and aquifers, it does not consider the needs of out of channel habitats. The CAMS data were not made available to the project for consideration. So, in
developing the Vision we concluded there is insufficient information available to the project to predict demands on water supply across England, or on how this may change in the future and affect wetlands. This, together with climate change and water quality, are major considerations that must be examined at a local scale to determine deliverability.

Low river flows and groundwater levels may lead to poorer water quality adversely affecting the wetland habitats and the preserved historic environment (Environment Agency 2005). Many of the habitats and species described in this vision developed in an environment that was naturally nutrient poor and man-made pollutants were rare, if not absent, from wetland systems. Some species can tolerate a wider range of conditions, but many of our rare and endangered species and habitats depend on low anthropogenic nutrient inputs (Townsend, D., Stce, H., Radley, D. 2004).

Widespread eutrophication may limit some opportunities to create highly biodiverse wetlands may be limited. Biodiverse wetlands are likely to be focused around existing sites with high water quality, or, for example, from opportunities resulting from minerals extraction where uncontaminated groundwater tables provide a water source. Wetlands may also be used as a tool to filter and process nutrients and sediments. There is a role within our Vision for wetlands created primarily to improve water quality (e.g. riparian woodlands). However, our primary focus is on creating and sustaining wetlands that are rich in species.

**Main ways this issue impacts on our vision**

**Positive:**
- It highlights the need to manage water more sustainably to meet the restoration needs of functioning sustainable wetland habitat and species
- It is likely to encourage the partnership approach and the seeking of novel solutions to multifunctional wetlands

**Negative:**
- The issue has major potential to limit our capacity to deliver wetlands, or high quality wetlands, and uncertainties could lead to inaction
- There may be increased competition for water between sectors

**5.2 Climate change**

Over the next 50 years, wetland habitats and species are likely to change in response to climate change.

Wetlands have a key role to play in helping society mitigate its impacts on climate and adapt to inevitable change. For example, wetland restoration can reduce carbon loss from peat soils, and buffer the hydrological extremes of floods and droughts. The predicted impact of climate change on water resources presents both challenges and opportunities for implementation of the Vision. No dataset currently available could be directly incorporated into a national Wetland Vision, and this was discussed at length with stakeholders and climate change specialists. This situation is likely to change in the future, and the partnership is committed to exploring the deliverability of the Wetland Vision under climate change as data sources improve.

Species and habitats have tracked climate change in the past and will continue to do so. However, the likely rate of change and the blockages to movement that now exist mean we need to pay particular attention to spatial planning for biodiversity expansion over the coming decades if we are to avoid losing many species (Piper, J. M., et al. 2006). We may be able to add to our desirable species diversity and engender greater understanding of the dynamism of natural systems. We may lose species, or need to adopt new strategies, to enhance management to maintain species in situ.

Climate change is likely to affect our environmental heritage, since further loss or drying out of archaic wetlands damages or destroys wetland deposits and extreme flooding and weather events can damage historic buildings and planned landscapes. This is a major consideration, which the historic environment sector is beginning to address to ensure future preservation (English Heritage 2007).

Wetlands in England may be impacted by climate change in both direct and indirect ways. These will often exacerbate and magnify underlying problems and issues already affecting wetlands, such as nutrient pollution and the spread of invasive species. Evidence and research suggests wetlands are likely to be impacted in a wide range of ways, and have been summarised in (Mitchell et al. 2006).

**Impacts include:**
- Wetlands are likely to suffer negative impacts through increased transpiration, evaporation and reduced rainfall in some regions, resulting in lower soil water table levels in late summer/autumn. Depending on location, rain-fed wetlands are likely to be more significantly impacted than river-fed wetlands and water table levels in wetlands fed by chalk aquifers are likely to be especially severely affected (Pers. comm. Mike Acreman 2007)
Map 10a: River water quality 2000-2005 (biological assessment). This map shows the change in biological river quality in England and Wales between 2000 and 2005 as published by the Environment Agency. The change reflects the difference between the macro-invertebrate communities actually found in the river and that which would be expected under natural conditions. This map indicates the change over 5 years of the response of macro-invertebrates to physical damage to the river as well as water pollutants, indicating overall health of rivers. Maps obtained from www.environment-agency.gov.uk

Map 9a: Winter water availability. This map describes the indicative availability of winter surface water as expressed by the Environment Agency in 2001. Winter water availability may have a different role in delivering and supporting wetlands in the future where wetter winters and drier summers are predicted. Maps obtained from www.environment-agency.gov.uk

Map 9b: Groundwater availability. This map describes the indicative availability of groundwater as expressed by the Environment Agency in 2001. Groundwater availability is critical in supporting and maintaining key habitats and ensuring a high water table that keeps archaeological deposits wet. The availability of groundwater via different aquifer types is likely to change in the future. Maps obtained from www.environment-agency.gov.uk

Map 10b / 10c: River water quality 2000-2005 (nitrate and phosphate assessment). These maps show the change in nitrate and phosphate in rivers in England and Wales between 2000 and 2005 as published by the Environment Agency. The change reflects the trend in both nitrates and phosphates found in rivers over 5 years. Excessive concentrations of both nitrates and phosphates in rivers, originating from human activities such as agriculture and sewerage treatment, can cause eutrophication. Maps obtained from www.environment-agency.gov.uk
Increased variability of climate in the future may have additional impacts on all wetlands (Pers. comm. Mike Acreman 2007).

In the south, rainfall is likely to decrease in the summer and increase in the winter, but some studies suggest overall recharge may be down by up to 34% (Pointer, C. 2005).

As intensity of change increases, the effect of underlying issues already impacting on wetland wildlife will accelerate and become more obvious (pollution, peat loss, drainage etc) (Pointer, C. 2005).

There is likely to be increased potential for saline intrusion into coastal aquifers and shallow aquifers may become more vulnerable to diffuse pollution (Pointer, C. 2005).

Increased competition for water in drought prone areas may result in a presumption against further wetlands creation – or even a removal of water from wetlands further endangering the viability of important sites. Water Resource Management Plans should be key in informing this.

There is likely to be an increased need for the storage of water for managed wetland maintenance, and therefore a greater overall area of land to support current or future wetlands (Spoor, G. 2004). This may apply to difficult to recreate habitats such as fens, or to support transient and migrating species.

Sea level rise, and increased storminess may directly inundate coastal freshwater wetlands (Environment Agency 2005).

Climate change may increase the potential for diseases to (re) appear in England and insects may prove a vector for such diseases.

Climate change may increase the capacity of both native and non-native species to become invasive, and may increase the populations of existing invasive and problematic species.

How achieving the vision will contribute to an adaptation strategy:

At the core of this Vision is the concept of re-building healthy wetland ecosystems that are valued by people. The principles and criteria used to prioritise areas for future wetland potential are based closely on the guidelines developed for UK BAP (Hopkins et al. 2006 Biodiversity conservation and climate change: guidance on building capacity. Report to Defra). Wetlands which are less impacted by pollutants, larger and more connected, will allow species to move and encourage a greater range of niches to become available to climate migrants. Restored wetlands function more effectively and are therefore, in the long term, more likely to provide stores of carbon rather than sources (Lloyd, C, R 2005). Wetlands are a potential solution to mitigating the effects of storm surges, fluvial flooding, and can facilitate the recharging of aquifers. Since the extremities of these events are likely to increase, restored wetlands may play a key role in protecting people and places, and enhancing ecosystem services.

By being proactive and explicit, rather than reactive, in relation to defining a Vision for freshwater wetlands, we can build in resilience in the early stages. The basic soils and geology types necessary to support wetlands are unlikely to change considerably under climate change scenarios, whilst the availability of water is likely to shift.

**Figure 12:** How different wetland types will be affected by climate change across regions of England (provided for use in the Wetland Vision by Mike Acreman, CEH)

<table>
<thead>
<tr>
<th>Type of wetland</th>
<th>North</th>
<th>South-west</th>
<th>South-east</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rain fed</td>
<td>s a w</td>
<td>s a w</td>
<td>s A w</td>
</tr>
<tr>
<td>River fed</td>
<td>s a</td>
<td>s a</td>
<td>s A</td>
</tr>
<tr>
<td>Groundwater fed</td>
<td>Limestone</td>
<td>Sandstone</td>
<td>Chalk</td>
</tr>
</tbody>
</table>

Sp = Spring impact  
S = Summer impact  
A = Autumn impact  
W = Winter impact  
Chalk = aquifer type impacted

Lower case = Less impact  
Upper case = Great impact

The main ways this issue impacts on our vision:

**Positive:**

- Encouragement and acceptance of change.
- Will facilitate and support the need for landscape scale planning.
- An increased appreciation of (and research into) the role of wetlands in supporting aquifer recharge and buffering against both extreme and more regular flood events.
- Will encourage the partnership approach, and seeking novel solutions to multifunctional wetland.
- New desirable species may start to breed in this country.
Negative:

- It may prove a challenge to create wetlands with increasing droughts in some areas, and conversely to maintain wetland types in areas now prone to greater precipitation.
- There may be increased competition for water between sectors.
- Climate change is the most unpredictable of the long term factors which we can’t accurately account for within the Vision.
- The unknown reaction to climate change of unwanted and problematic species.
- Future societies may not value the environment as highly as we do now, and hence wetlands would be discounted further.

5.3 Sea level rise

Sea levels are predicted to rise over the next 50 years and beyond. Some of this will be due to isostatic change, and some will be related to human induced climate change. Sea levels are already about 10cm higher than they were in 1900 (Proundman Oceanographic laboratory).

Shoreline Management Plans (SMPs) have been developed to predict and plan for change in crucial areas around the coast, with CHaMPs available for a number of coastal areas. Second generation SMPs are currently in development and will be completed by 2010. These were not available to the project as a single map.

The consideration of this issue within the national vision can therefore only be very generic. Stronger winter storms and sea level rise as a result of climate change means that flooding across the country will be up to four times greater by the 2080s (Environment Agency 2005). The impact of these changes may be felt well inland since much of our former wetland areas are very low lying and because aquifers may be affected.

Main ways in which this issue impacts our vision:

Positive:

- Increases the need to find sustainable sites for freshwater wetlands inland.
- Offers the potential to create more dynamic and naturally functioning freshwater and saline environments.

Negative:

- Difficulties in creating new wetlands inland which adequately reflect the ecological characteristics of those lost at the coast.
- Major areas of current freshwater wetlands on the coast and the species they support may be irreversibly lost.

5.4 Development pressures and other land-use change

Development pressures over the next 50 years will be varied and many. Historically, development has resulted in increases in pollution and water abstraction, as well as direct loss in wetland area. However, opportunities to integrate wetlands into planning both for agriculture and in urban development already exist. Few sectors have outlined through nationally available maps where development is likely to take place that could be reliably integrated into the maps.

It is estimated that up to 1.2 million hectares of land could be used for growing energy crops in the UK (see www.defra.gov/farm/crops/industrial/energy/). Some of these crops may have a similar need for water to that of wetlands (e.g. coppice), and the potential impacts on wetland wildlife or archaeology are as yet un-quantified. The ways in which new crops are managed, as well as pressure for increasing land for food production, could impact upon the aspirations.
Map 11: The extent of low lying land in England

This map shows areas which, in theory, may be at risk of saline inundation purely from rising sea levels in the future without defences. Freshwater wetland restoration efforts in these areas may be unsustainable in light of sea level rise. The full effects cannot be accounted for within the project’s aspirations and will be locally determined according to shoreline management plans (SMPs). Source: the Environment Agency’s 2005 report “The Climate is Changing.”
of the Vision. The need to preserve and restore soil structure and fertility may have potential as a further driver to increase wetland area, through restoration of peat soils and bringing benefits such as maintenance of soil fertility through natural flooding regimes in traditional water meadows. There are also opportunities to integrate wetlands into modern agricultural production by improving the quality of ditches, sustainable management of uplands, and on-farm management of runoff and pollution.

An expansion in housing is planned to to sustainably provide 200,000 additional homes above previously planned levels by 2016 in key growth areas identified by government. Although there is a strong presumption against development in the floodplain, a proportion of this may continue to be built within natural floodplains. Housing development may in some instances provide significant opportunities for wetland creation for the following reasons:

- The need for green space in proximity to urban and new development areas. There are health and recreational benefits associated with having accessible green space close by.
- The need to sustainably manage water through the creation of drainage systems and pools that manage and contain water (SUDS).
- The creation of wetlands in alternative areas to directly offset development on land that does, or has the capacity to, support beneficial wetlands.
- Visions, like the Wetland Vision, can be used to form a common spatial understanding about where developments should avoid nature development zones.

Any future airport expansion could have implications for deliverability of future wetlands (see annex 3). Birds attracted to wetlands can pose risks to aircraft. There is already a great diversity of wetlands within air safe guarding zones that pose little threat to aircrafts. However, any proposal to create wetlands in these areas will need to give considerable attention to the design in relation to flight paths, and work closely with local authorities at early stages. This level of detailed analysis was not undertaken by the Vision.

This map shows the four main envisaged growth areas across England, together with a number of growth points and the proposed number of new houses. Along with London, the aim is for these areas to sustainably provide 200,000 additional homes above previously planned levels by 2016. Many of these areas are important for wetlands, and may coincide with areas in which future wetlands could become desirable. There may be physical competition for space, as well as competition for water supply. Data are obtained from the Government’s Communities and Local Government website: www.communities.gov.uk/housing/housingsupply/growthareas/
Map 13: Airport zones.
This map shows a 13km radius around safeguarded civic and military airports (dark buffer) and civic licensed airports (light buffer), together with the current extent of wetland. Current Civil Aviation Authority and Town and Country Planning Direction guidance suggest airport operators should, as a precaution, object to planning proposals for new wetland sites within the 13km zone. Objection to new wetlands on these grounds would cover approximately 44% of the area of England, an area already containing much of the wetland resource. This map describes the extent of land that could potentially be excluded from wetland creation under this guidance.
Maps and text have been developed for individual wetland habitats to describe the current resource and our vision for the future extent and values for the habitat. Not all of the detail presented for each habitat is incorporated within our ‘future wetlands’ map, but many high priority components have been included. This selective approach ensured that only the highest priority areas appeared on the future wetlands map, rather than all wetland potential. An explanation of the process is contained within the project’s GIS report. Each map is supported by an interpretation note to aid understanding of what is being presented and how it was arrived at. For the full of detail of how each map was constructed refer to the project’s GIS report.

Much of the future wetland as described through the project’s ‘future wetlands’ map will exist as a mosaic of different habitat types. The envisaged role and location of wetlands across wider landscapes is described in the last section, as are aspirations for rivers. Opportunities for individual habitats overlap significantly in some areas. Principles have been proposed (in consultation with Natural England specialists) which suggest that the rarest habitat, if potential is present, should take precedence (Penny Anderson Associates 2004). The suggested order could be:

1. Lowland raised bog
2. Rich fens
3. Basin fens
4. Purple moor grass and rush pastures
5. Eutrophic or valley fen
6. Coastal and floodplain grazing marsh
7. Reedbeds
8. Wet woodland
9. Base poor springs and flushes

The text and maps should be viewed together because maps only provide part of the vision for the habitat, and are not specific about locations. In all cases local intelligence, modelling outputs and data sources are important in defining what is actually possible in any given area, whilst the vision maps provide context. See the project’s local vision guidance material for more detail on this.
6.1 Wetland habitats

6.1.1 Fen communities

General description of this habitat

Fen habitat can occur on a wide range of soils both peat and mineral based. Fens can receive water from rain, from groundwater and via springs, and can also be directly supported by surface water. Fens range in size from the very small, such as calcareous spring-fed rich fens a few metres square dominated by low-growing sedges and mosses, through to extensive areas of tall floodplain fen, such as that found in Broadland, which covers hundreds of hectares. They can be very species-rich, but some types may be dominated by one or two species, such as reedmace or tall sedges.

Fens are complex habitats, their species composition being determined by, amongst other things, water quantity and chemistry, their position in the landscape and vegetation management. They are found throughout England, but different types of fen tend occur in particular parts of the country, depending on climate, geology and topography. Fens often retain evidence of historical land management, of pathways and peat diggings, and can hold evidence of past environments within sediment. They are often therefore of considerable archaeological interest. Inventory data that describes the extent of the existing fen resource varies in quality across the country.

Description of our Vision for this habitat

Improvement to existing resource

The diversity and landscape value of fen habitats will be improved, meeting relevant SSSI and BAP habitat targets where these relate to existing site condition. The biodiversity of all fen types will be restored, with characteristic fen species thriving. The existing network of fen habitat will be secured into the future, supported and buffered by other wetland and non-wetland habitat, and not threatened by water pollution, abstraction or drainage. Land managers will be rewarded for their sustainable management of fens. Archaeological and palaeoenvironmental material will be safeguarded and used to help promote fen conservation and interpretation.

New extent

2020 BAP targets will have been achieved and target revised upwards. Fen will be a regular feature of the landscape, will exist across the range of possible fen types, and in different scenarios reflecting the range of conditions that can give rise to it. Fen will be both extensive, and within mosaics in lowland landscapes, scattered amongst the meres and mosses in close proximity to bogs and other peat generating habitats.
It will be found around slow and gently sloping backwaters of rivers in the lowlands, and emerging along the sides of valleys. The new extent will have been consolidated and linked around the historical resource, and re-established from habitats where quality had deteriorated from formerly species rich fen community to species poor assemblages. These areas will be managed in a way that secures fen habitat, within both large and small habitat mosaics, into the future. Considerable areas of buried archaeological potential will be safeguarded.

**New value**
Fens will be appreciated as a rewarding and biodiverse wetland habitat, particularly valued for educational purposes. All degraded basin fens will be well on the way towards the restoration of natural water regimes, and to active peat formation and deposition. Fens will be providing improved services to society, such as carbon management, flood storage, where this is compatible with biodiversity objectives and recreational opportunities. The land-owning community will be playing a key role in managing these wetlands. Local sustainable markets will have been re-established where fen-derived products such as thatch and extensively reared meat are sold.

**Examples of projects and visions that are delivering the objectives for this habitat**

**The Little Ouse Headwaters project**
This project has sought to restore and link fen communities of European significance along the little Ouse headwaters near Diss, Norfolk. It will result in restored habitat and sustainable outcomes for the valley fens and for the local community. [www.lohp.com](http://www.lohp.com)

**The Great Fen project**
Delivering this vision will deliver significant gains in fen habitat connecting two fens of international importance. [www.greatfen.org.uk](http://www.greatfen.org.uk)
Map 14: The extent of fen habitat in England.
This map shows the extent of fen habitat across England. These will be a key feature of the wetland landscape of 50 years’ time and their extent will be retained and condition enhanced. The data are extracted from Fenbase and grouped according to a technique developed by English Nature, in conjunction with Faber Maunsell, for the UK Wetland HAP group.

This map shows small pockets (less than 10 hectares) of peat (derived from The National Peatland Resource Inventory) in northern England in close proximity (5km of an existing site) to existing fen of this type. The existing fen habitat of this type is also shown. These areas may have potential for restoration to this habitat type, but detailed local analysis will be needed to determine existing land-use and whether suitable hydrological conditions exist.
Map 16: Wetland Vision map of the potential for base-poor ground water dependent fen habitat creation for England.

This map describes a relative gradient from areas where suitable environmental conditions occur for the habitat (pale colours), through to those areas that could offer the greatest opportunity for wetland delivery (dark). We suggest that the best poor ground water dependent fen could be created in areas: i) based on existing BAP habitat resource; ii) with statutory site and/or iii) nature reserve interest; iv) with a small urban floodplain; v) where re-created wetlands could provide alternative ecosystem services on agricultural land of lower productivity value. Some of the best opportunities may arise after mineral extraction, see map 30.
Map 17: Wetland Vision map of the potential for Base-rich ground water dependent fen habitat creation for England.

This map describes a relative gradient from areas where suitable environmental conditions occur for the habitat (pale colours), through to those areas that could offer the greatest opportunity for wetland delivery (dark). The Wetland Vision suggests that the best rich ground water dependent fen could be created in areas: i) based on existing BAP habitat resource; ii) with statutory site and/or iii) nature reserve interest; iv) with a small urban floodplain; v) where re-created wetlands could provide alternative ecosystem services on agricultural land of lower productivity value. Some of the best opportunities may arise after mineral extraction, see map 30.
This map shows the potential for floodplain and eutrophic fen types across England. Potential is presented in terms of the base ‘richness’ of the likely resultant fen habitat. There is no priority setting applied to the potential since the habitat is widespread and local conditions will entirely determine the probability of its successful establishment. Other fen types can also occur across these areas.
6.2.2 Coastal and floodplain grazing marsh

General description of this habitat

This habitat exists on flat, open and low-lying floodplains largely as a grassland habitat intersected by ditches. It occurs almost exclusively within floodplains (freshwater and brackish), and is at least seasonally wet, sometimes flooded for long periods in winter, and this provides damp soil conditions for much of the year. The grassland is usually grazed or in some places may be cut for hay. Whereas the ditch flora can be rich, the diversity of plants in the grassland is often not very high, although some areas such as the Somerset Levels and Moors support large areas of species-rich grassland. This habitat often supports high numbers and diversity of birds of conservation concern, as well as important and localised ditch flora and fauna. Coastal and floodplain grazing marsh often retains evidence of historical land management practices, relict saltmarsh creeks and field patterns – much of the existing habitat has been managed in the same way for many centuries. Existing inventory for this habitat is widely inaccurate and outdated – this habitat should be a priority for gathering new inventory information nationally.

Description of our Vision for this habitat

Improvement to existing resource

The diversity and landscape value of coastal and floodplain grazing marsh will be improved, throughout the English landscape, meeting relevant SSSI and BAP habitat targets for the existing habitat where they relate to condition. A network of coastal and floodplain grazing marsh will be secured into the future which takes account of sea level rise and is not vulnerable to pollution. The conservation of this habitat, and its characteristic species and archaeological potential, will be incorporated within a landscape scale approach, which enhances hydrological connectivity and integrity of the existing network, and integrated with sustainable coastal flood risk management. Replacement habitat will have been found for that lost to sea level rise. Ditches will function to manage water levels within the habitat, will have good water quality, and will be managed as part of viable farm systems that benefit the unique species and archaeology associated with them. These ditches will often exchange water with rivers and other clean water sources, and will have a brackish character near the coast.

New extent

The overall area of this habitat will have increased by approximately 50%, this being the minimum required to deliver more sustainable populations of currently red and amber listed birds (such as snipe) and other vulnerable wildlife. This future habitat extent will not be exclusively managed for, or by, nature conservation interests, but can instead support species and habitat as part of a landscape scale approach that incorporates a range of complementary land uses. Coastal and floodplain grazing marsh will often exist within a mosaic of other habitats, but large expanses will exist where this is appropriate within the local landscape, and in line with historical records of such habitat.

New value

Some of this new habitat will have unique and valuable transitional habitat across its extent, with both saline and freshwater extremes present. The habitat may be capable of contributing to carbon sequestration, and may be providing floodwater storage benefits. Future landscapes with expansive coastal and floodplain grazing marsh will be high value areas for recreation and education, supporting a wide array of interesting (and possibly newly colonising) species. In many instances traditional and sustainable farming practices will have been reinstated, with large herbivores a key management tool, a potential source of income through the production of quality regional speciality meat.

Examples of projects and visions that are delivering the objectives for this habitat

Lincolnshire Coastal Grazing Marsh project

The vision for the Lincolnshire Coastal Grazing Marsh project is to ensure that there will be, once again, extensive grassland landscapes rich in wildlife, intersected by a distinctive pattern of water courses. This will be a landscape where pastoral farming thrives and local communities have a high quality of life. It will be an area that is attractive to local people and visitors, with year-round opportunities to experience the natural and historic environment through improved access, helping to develop and sustain a vibrant rural economy.
Map 19: Wetland Vision map of the potential for coastal and floodplain grazing marsh habitat creation for England.
This map describes a relative gradient from areas where suitable environmental conditions occur for the habitat (pale colours), through to those areas that could offer the greatest opportunity for wetland delivery (dark). The Wetland Vision suggests that the best grazing marsh could be created in areas: i) where restoration could result in the greatest biodiversity gain; ii) based on existing BAP habitat resource; iii) with associated existing statutory site and/or iv) nature reserve interest; v) with a small urban floodplain; vi) where re-created wetlands could provide alternative ecosystem services on agricultural land of lower productivity value; vii) where large contiguous areas of suitable environmental conditions exist.
6.1.3 Ponds

**General description of this habitat**

Ponds are man-made or natural water bodies, between 1m² and 2 ha in area, which may be seasonally or permanently wet. The Wetland Vision encompasses all ponds that fall into this category.

Ponds given priority habitat status under the UK BAP include those that are of exceptional biological diversity, are minimally impaired, are recognised as priorities in the Natura 2000 system or support species of conservation concern including BAP species, Red Data Book species or exceptional assemblages of nationally scarce species. Special types of ponds, such as pingos or dune slack pools, are also included. Current estimates suggests that perhaps 20% of ponds will fall into these categories (Williams P. et al. 2004). Collectively, ponds make a major contribution to aquatic biodiversity as rivers and lakes (Davies B. et al. 2008).

Ponds may persist in the landscape for tens, hundreds or thousands of years. All age classes can be seen including ponds created during the last glaciation, making them amongst the most ancient features in the present landscape. Pond deposits are often of significant interest to archaeologists and palaeoenvironmental scientists, because they contain a record of past environments and climate change.

**Description of our Vision for this habitat**

*Improvement to existing resource*

Existing high quality ponds will be protected where it is sustainable to do so, and their value and diversity maintained. Many damaged ponds will have been improved. Ponds with significant palaeoenvironmental potential will be managed sensitively. Catchments of many existing ponds will be managed to provide sustainable patches of clean water throughout the landscape.

*New extent*

Large numbers of new, high quality, unpolluted ponds will be created. Numbers of ponds will, after 50 years, be around the 1 million mark: around half of the 600,000 new ponds will be set in clean ‘micro-catchments’ where they will be protected in the long-term from surface water pollution. There will be many ponds close to river corridors that add to habitat diversity along river corridors, and ponds within and around other habitats, both wet and dry. The creation of new ponds will have been sensitive to the preservation of the historic environment.

Many freshwater species (e.g. many amphibians) will be more common than they are now, exploiting the wide range of different types of pond (seasonal, permanent, grazed, wooded, heathland) that will have been created – the rich mix that is essential to maintain and increase catchment biodiversity.

*New value*

The increased density of ponds will increase connectivity between ponds and other waterbodies to provide stepping-stones which will help species move within the freshwater landscape. Many thousands of ponds will also have been added to the landscape to provide ecosystem services such as nutrient and sediment retention, water supply and perhaps also carbon capture.

*Examples of projects and visions that are delivering the objectives for this habitat*

**Pinkhill Meadow**

Beside the River Thames in Oxfordshire, Pinkhill Meadow is a wetland mosaic that includes a range of recently created permanent and temporary ponds. The site demonstrates how complexes of new ponds can quickly become exceptionally species-rich when they are: fed by clean water, have a range of hydrological regimes and are close to, but not connected with, existing wetland mosaics.

Ponds are easier to establish and sustain where there are soils that naturally hold, or will impede the flow of water. They tend to be in higher densities in these areas too, but ponds exist and can be created all across England. This map shows the distinction between these areas, and is based on a combination of soils that are of similar drainage characteristics. Local conditions will determine how important pond creation could be.
Map 21: Wetland Vision map for the types of pond action needed on the ground for England. This map illustrates a range of local conditions and scenarios in which pond creation could be beneficial in a 50 year context. It is desirable to create ponds in: i) in close proximity to other ponds ii) in close proximity to BAP species associated with ponds iii) close to the river channel iv) that contribute to the mosaic of existing wetlands. This map is indicative of the places in which ponds will need to be established within a 50 year context and is based on a buffering of features. More accurate local datasets can illustrate priority areas more effectively.
If ponds are created on land that is less intensively managed, they are more likely to remain clean and support a greater biodiversity. In other areas, the creation of ponds will contribute to the provision of ecosystem services such as flood storage, water treatment and potentially carbon storage. Although not pristine, such ponds will also provide biodiversity benefits by reducing distances between ponds and providing habitat for less sensitive species. This map shows where land is currently less intensively managed and where, unless there are major changes in land-use over the coming 50 years, ponds are likely to sustain a higher level of biodiversity in the future. The data are based on a combination of land use types (derived from Land Cover Map 2000), which suggest semi-natural habitat of some kind.
6.1.4 Wet woodland

General description of this habitat

Wet woodland occurs on poorly drained or seasonally wet soils, usually with alder, birch and willows as the predominant tree species, but sometimes including ash, oak, pine and beech on the drier riparian areas. It is found on floodplains, as successional habitat on fens, mires and bogs, along streams and hill-sideflushes, and in peaty hollows. The boundaries with dryland woodland may be sharp or gradual and may (but not always) change with time through succession, depending on the hydrological conditions and the treatment of the wood and its surrounding land. Therefore wet woodland frequently occurs in mosaics with other woodland key habitat types (e.g. with upland mixed ash or oak woods) and with open key habitats such as fens. The quality of the available inventory data that describes the extent of this habitat is poor.

Wet woodland combines elements of many other ecosystems and as such is important for many taxa. Some wet woodland is ancient and therefore contains a record of past land management practices.

Description of our Vision for this habitat

Improvement to existing resource

Wet woodland will be managed throughout the landscape as part of a more holistic and sustainable approach to land management. A rich ground flora will have returned to formerly species-rich woodlands, and unnecessary or recent drainage reversed. The diversity and landscape value of wet woodland will be improved, meeting relevant SSSI and BAP habitat targets for the existing habitat where they relate to condition. A network of wet woodland will be secured into the future and contributes to wider semi-natural habitat mosaics.

New extent

Wet woodland will be contributing, where soil conditions permit, to habitat expansion around ancient woodlands increasing the diversity of habitats and buffering them. Wet woodland replanted with conifers will be restored to appropriate native species and water supplies will have been restored via springs or ground water seepage. The extent of wet woodland will have been increased, often in areas of poor water quality, or on former agricultural land, and wet woodland will be acting as connecting habitat between more sensitive habitats. New wet woodland will have been incorporated into the mosaic of large wetland complexes and will exist in a range of successional stages across some appropriate floodplains. Wet woodland will be valued feature of more open wetland landscapes. The contribution of wet woodland to woodland BAP targets will have been achieved, but this is likely to have been revised upwards as more opportunity or need for wet woodland creation have been found.

New value

Wet woodland will form a regular component of river corridors, and adds to the general aesthetic appeal of river banks. Future wet woodland sites will be providing essential ecosystem services to society, such as carbon sequestration, soil and floodwater management. Biodiverse wet woodlands will be providing valuable educational opportunities, and some sustainable harvesting of wood will occur where this supports the local community.

Figure 13: Sediment control by woodland. Woodland has been shown to benefit sediment control in the following ways

- Providing physical shelter from the wind
- Reducing water run-off
- Increasing the entry of rainwater into the soil
- Improving soil strength and stability

(Nisbet, T. Harriet, O. and Broadmeadow, S. 2004)

Examples of projects and visions that are delivering the objectives for this habitat

New Forest Life project

An objective of the New Forest Life project is to restore ancient floodplain woodland and demonstrate benefits for flood water management. www.newforestlife.org.uk
Map 23: Wetland Vision map of the potential for wet woodland habitat creation for England.
This map describes a relative gradient from areas where suitable environmental conditions occur for the habitat (pale colours), through to those areas that could offer the greatest opportunity for wetland delivery (dark). The Wetland Vision suggests that the best wet woodland could be created in areas: i) based on existing BAP habitat resource; ii) with statutory site and/or iii) nature reserve interest; iv) with a small urban floodplain; v) where re-created wetlands could provide alternative ecosystem services on agricultural land of lower productivity value. It is possible that wet woodland can be created in other areas, but local conditions will determine this entirely.
6.1.5 Reedbed

General description of this habitat

Reedbed is dominated by common reed (Phragmites australis). The water table is usually at or above the ground for most of the year. It often occurs in close association with coastal and floodplain grazing marsh, wet woodland and fen. Reedbed supports many species of conservation concern including the European bittern (Botaurus stellaris), and species like Bearded Tit (Panurus biarmicus), Marsh Harrier (Circus aeruginosus) and several Wainscot moth species. Historically, reedbed was harvested for thatching material, but this practice has declined significantly and with it the openness of the reedbed habitat.

Description of our Vision for this habitat

Improvements to the existing resource

The landscape value of reedbed will be improved and relevant SSSI and BAP habitat targets for the existing habitat will be met where they relate to condition. A network of reedbed sites will be secured into the future, supporting sustainable populations of bittern and other species of conservation concern, in locations not threatened by sea level rise or pollution. Reedbed will be managed and harvested sustainably, which contributes where possible to the local economy.

New extent

The area of reedbed will have doubled, this being necessary to deliver more sustainable populations of current Red Listed bird species, in particular bittern. High quality replacement habitat will be needed for bitten where reedbed is lost due to sea level rise. Much of this will be formed around existing reedbed, creating large and expansive areas. Reedbed will also be a key habitat in linking other habitats, both wet and nonwet, especially where land around such habitats is of high nutrient status, where reedbed can filter or treat water entering more sensitive sites. Reedbed will often occur within large mosaics of wetlands and fringing naturally meandering rivers, as well as in urban areas.

New values

Reedbed will be a habitat of choice where it has not been possible to create rarer habitats, and especially in areas with poor quality water and low grade agricultural land. It may be a ‘transition habitat’, becoming more biodiverse in time, as well as contributing to the improvement of water quality and assisting in removing or processing nutrients. It may be contributing to carbon sequestration or flood water management. Reedbed will be supporting a sustainable population of bittern, achieved through a linked network of sites. Reedbed will be providing educational opportunities, enabling a better understanding of the natural world in urban areas.

Examples of projects and visions that are delivering the objectives for this habitat

Minsmere Nature Reserve

The reedbed, and other habitats of Minsmere nature reserve offer a fantastic and accessible insight into the rare wildlife associated with restored reedbeds. However, in the long-term many of the freshwater species, particularly bittern, will rely on a new network of sites safe from the threat coastal erosion and flooding.

Lakenheath and Ouse Fen

These reserves show the potential for creating attractive and biodiverse reedbeds.
Map 24: Wetland Vision map of the potential for reedbed habitat creation for England.

This map describes a relative gradient from areas where suitable environmental conditions occur for the habitat (pale colours), through to those areas that could offer the greatest opportunity for wetland delivery (dark). The Wetland Vision suggests that the best reedbed could be created in areas:

1. Where creation could result in the greatest biodiversity gain;
2. Based on existing BAP habitat resource;
3. With statutory site and/or nature reserve interest;
4. With a small urban floodplain;
5. Where re-created wetlands could provide alternative ecosystem services on agricultural land of lower productivity value; and
6. Where large contiguous areas of suitable environmental conditions exist.
6.1.6 Lowland raised bog

General description of this habitat

Lowland raised bogs are peatland ecosystems that develop primarily in lowland areas such as the head of estuaries, along river flood-plains and in topographic depressions. This type of peatland is known as an ‘ombrotrophic’ or ‘rain-fed’ bog. The surface of a healthy lowland raised bog is typically waterlogged, acidic and nutrient-poor. This habitat once occurred throughout the English landscape, but now is largely restricted to the more humid north-west of England, though intensive restoration efforts are underway elsewhere. Lowland raised bogs have great potential to preserve evidence of past environments within peat sediments.

Description of our Vision for this habitat

Improvements to the existing resource

Existing lowland raised bogs will be sustainably secured throughout their current range and natural hydrological regimes will have been restored. These sites will be surrounded by less intensive land use where high intensity land-use no longer impacts on the condition of these habitats, helping to restore hydrological functioning as well as natural transitions to fen lagg habitats. Peat will not be extracted for commercial purposes. The 2020 BAP target will have been achieved and SSSI condition targets delivered. The archaeological and palaeoenvironmental resource held within peat sediments will be safeguarded.

New extent

Lowland raised bog takes thousands of years to form, and decades to restore. Major restoration of highly damaged sites will be underway.

New values

Lowland raised bogs will be sequestering a significant amount of carbon from the atmosphere, as well as potentially offering some capacity to regulate flood or groundwater supplies. They will be highly valued for the unique biodiversity and potential archaeological discoveries that they can yield. The land-owning community will be playing a key and supported role in managing and protecting this habitat through sensitive land-use choices in the surrounding catchment.

Examples of projects and visions that are delivering the objectives for this habitat

Peatlands for People

Natural England, the Royal Society for the Protection of Birds, Cumbria Wildlife Trust, Environment Agency and Solway Coast AONB Unit are working together in the Peatlands for People project to restore the natural wealth of Cumbria’s raised peatbogs and link them to the regions culture, economy and quality of life.
This map shows existing lowland raised bogs across England. These will be a key feature of the wetland landscape of 50 years’ time and their extent will be retained and condition enhanced. This map also shows the extent of the area around lowland raised bogs where land-use change could enhance the hydrological integrity of existing sites, and provide a focus for creating a mosaic of complementary wetlands. The data are based on an analysis undertaken by English Nature, in conjunction with Faber Maunsell, for use by the UK Wetland HAP group.
6.1.7 Blanket bog

General description of this habitat

Blanket bog forms where there is high rainfall, low evapotranspiration and flat or gently sloping land. Growth of sphagnum mosses, and other plants that are adapted to and can grow under these waterlogged conditions eventually leads to the formation and gradual accumulation of peat and the habitat known as blanket bog. It is these waterlogged and anaerobic conditions that prevents the decomposition of the organic material. There is great potential for the continued preservation of archaeological and palaeoenvironmental material.

Description of our Vision for this habitat

Improvements to the existing resource

Blanket bogs will no longer be regularly burned; wildfires will be limited because of the restored water table levels; and grazing will be at low levels that allow a greater diversity and structure in the vegetation cover with characteristic species such as cotton grass and briophytes flourishing. Favourable condition, or markedly improved condition will be achieved on all currently designated blanket bog, and other known areas of deep peat (circa. 255,000 ha) (Natural England 2008a). Species characteristic of naturally functioning and ecologically robust blanket bog will be thriving and carbon will be actively being locked up. The archaeological and past environmental record will be preserved and interpreted where opportunities arise.

New extent

Blanket bog takes many hundreds, if not thousands of years to develop and so there would be no increase in extent within this Vision. Highly degraded areas of blanket bog may also take many decades to once again become fully functioning and actively sequestering carbon. There will have been many opportunities taken forward to restore areas of deep peat, such that it contributes to the hydrological integrity of active blanket bog, and helps to lock up carbon. Large areas will have undergone restoration work in the form of grip blocking and vegetation management, as the need to lock up carbon and retain water and improve water quality in the uplands becomes greater.

New values

Blanket bog will be an exceptionally valued habitat for its capacity to store carbon and to hold water back. Huge areas of restored blanket bog will also be contributing to the production of clean water, as well as restoring a unique habitat and landscape. The buried archaeological potential will also be better understood, valued and promoted.

Examples of projects and visions that are delivering the objectives for this habitat

Sustainable Catchment Management Programme (SCaMP)

This programme, which has been developed by United Utilities in association with the RSPB and Natural England, aims to apply an integrated approach to catchment management within two key areas of United Utilities land: the Forest of Bowland and the Peak District. This will help to deliver government targets for SSSIs, enhance biodiversity, ensure a sustainable future for the company’s agricultural tenants and protect and improve water quality.

Natural England Upland Vision

Natural England is developing an ‘Upland Vision’. There are many other examples of projects that will deliver improvements for blanket bog habitat.
Map 26: Wetland Vision map for blanket bog restoration for England. This map describes priority areas for blanket bog maintenance and restoration in a 50 year context. The extent is shown as three components: the extent of the habitat contained within the statutory site series (dark), the wider BAP habitat resource found outside the statutory site series (intermediate) and deep peat soils that may be able to support blanket bog in the future. The data are based on SSSI extent, the blanket bog BAP inventory (with lowlandaved) and soil data.
6.1.8 Lakes

General description of this habitat

Lakes are a subset of the broad habitat category of ‘open waters’, which includes features such as canals and ponds, together with many wholly artificial water bodies such as reservoirs. England has approximately 6000 lakes over one hectare in size (Hughes 2004). Lakes are either eutrophic (generally in the south and east), mesotrophic or oligotrophic (typically found in the north and west). Many of England’s lakes occur in the three main lake districts of Cumbria, the Norfolk Broads and the Cheshire plain (‘the meres’). Most lakes are of glacial origin occupying topographical hollows, though some, such as the Norfolk broads, are man made. Lakes are affected by both in-lake factors, such as the presence of invasive species, habitat modification and fish stocking, and also by factors within the surrounding catchment which supplies water, sediment and nutrients. A key step in delivering the vision for lakes is to address both sets of factors.

Description of our Vision for this habitat

Improvements to the existing resource

All lakes will be restored to a more healthy and natural ecological status, which can be sustained. Typically water will be clear with extensive submerged and floating plants in shallower areas (<3m) and the lake will support a healthy mixed fish community comprising native species. In-lake pressures will be reduced to levels that are consistent with supporting characteristic communities of plants, invertebrates and fish. The land use of catchments will be consistent with levels of sediment and nutrient inputs to lakes that allow characteristic species to thrive. Invasive species will be managed in a sustainable manner to ensure that further spread of species such as Australian Swamp Stonecrop (*Crassula helmsii*) is prevented and the effects of these species upon native species is minimal.

The Water Framework Directive will drive improvements in water quality for many of our larger and more important conservation lakes. More sensitive and sustainable land management in lake catchments will prevent further deterioration in ecological quality but many polluted lakes will require interventions in lake management to remedy the impact of past nutrient and sediment pollution. Restoration may involve sediment removal, fisheries management, invasive species control or physical habitat restoration.

New extent

Lakes are a relatively fixed resource in England, their distribution being fixed by past glacial activity and other topographical features, but there may be some opportunity to create new lakes where minerals have been extracted.

New values

Work will be underway to determine the reference or pristine state of lakes within England and subsequent prioritisation of these lakes for restoration. Land managers and society as a whole will recognise the signs of healthy lakes, will value lakes in this state and will strive to achieve these conditions. Local communities will become champions for lakes of high conservation interest and will be effective partners in ensuring such sites are restored and safeguarded. Analysis of animal and plant remains preserved within sediment cores (paenolimnology) will allow past, pre-impacted conditions to be reconstructed.

High quality lakes with diverse native fish communities will be promoted as a valuable resource for anglers. There will be a balanced use of lakes for wildlife and recreation with clear zoning (within and between lakes) common in our future lakes, especially those that have a high conservation value.

Examples of projects and visions that are delivering the objectives for this habitat

A range of initiatives are underway within the Lake District and the Norfolk Broads to improve water quality and the ecology of lakes. See for example:

- **Bassenthwaite Lake Restoration Programme**
  - [www.lake-district.gov.uk/bassenthwaite](http://www.lake-district.gov.uk/bassenthwaite)
- **Barton Broad Restoration project**
  - [www.broads-authority.gov.uk/projects/barton-broad.html](http://www.broads-authority.gov.uk/projects/barton-broad.html)
This map represents the majority of existing lakes across England.

These will be a key feature of the wetland landscape in 50 years’ time, and their extent will be retained and condition enhanced. The data shown are from the UK Lakes database.
6.1.9 Canals

General description of this habitat

Canals are man-made watercourses, which played an important role in transporting goods and produce across the UK during the 18th and 19th century. Canals rarely exchange water with the catchment through which they pass, so they rarely reflect local hydrological or geological conditions. However, they often contain a wealth of wildlife, especially where river boat traffic is less frequent, and in many instances act as valuable temporary refuges from otherwise intensive surrounding land-use. There are thought to be around 2,600 km of canals (Ordinance Survey 2007) in England, but their value for wildlife can only be inferred from the extent of the SSSI’s which incorporate canals (354 ha), and more locally through local wildlife site designations. It is likely that all canals, at various times of the year for varying lengths of time, provide habitat for wetland wildlife.

Canals represent a diverse mixture of heritage structures including engineered creations, functional architecture and living accommodation. These unique assets, which include brick accommodation bridges, wooden lift bridges, stone and cast-iron aqueducts, stable blocks, lock cottages, bollards and mileposts, and wartime defence structures, are a fragile and finite resource requiring active conservation.

Description of our Vision for this habitat

Improvements to the existing resource
The wildlife value of the waterway network will be significantly enhanced and a range of recreational uses will be integrated with habitat restoration, delivering biodiversity, social and economic benefits beyond the waterway corridor. Many canals, and their built heritage, will continue to need management, and sympathetic dredging will continue on canals with no boat traffic as this can benefit wildlife. A range of species associated with canals will be flourishing including the rare floating water plantain, pondweeds, water voles, little grebe, dragonflies, stoneworts, grebes, plovers and terns.

New extent
Whilst this Vision has not investigated the potential for the creation of canals, a number of currently disused canals are in the process of being restored. This restoration will be sympathetic to the needs of wildlife and archaeological heritage.

New values
Canals have an increased role as refuge for species adapting to climate change. Restored waterways act as ‘green corridors’ or linear parks where the public can experience and enjoy wildlife and engage in recreation activities consistent with maintaining this biodiversity.

Examples of projects and visions that are delivering the objectives for this habitat

Montgomery Canal restoration project
The Montgomery Canal restoration project fits into this national picture, and has significant value for natural heritage. All parties have signed up to a Conservation Management Strategy which includes objectives for conservation, heritage, recreation and access.

www.britishwaterways.co.uk/montgomery

Canal Head lock, Pocklington Canal, North Yorkshire © Peter Wakely, 1996 t
This map displays the extent of canals contained within the statutory site network across England. It does not show all canals outside these sites, many of which will have biodiversity or historic environment value. Throughout the waterway network, canals offer huge potential for enhancement across a range of uses which include biodiversity conservation and interpretation of the historic environment. The data are sourced from elements of SSSI data.
6.1.10 Purple moor grass and rush pastures

General description of this habitat

This habitat covers a range of vegetation types dominated by Purple Moor-grass (*Molinia caerulea*) and Rushes (*Juncus spp.*), predominantly on peaty gleys and shallow peats at low altitudes, but also extending on to mineral soils. Concentrations of the habitat are found in south-west England, particularly in Devon, southern Wales, south-west Scotland, perhaps extending as far north as northern Argyll, and in Northern Ireland, especially Fermanagh. They are, however, also found scattered throughout the English lowlands and upland fringe. They are often associated with the drier edges of fens, such as the Broads and West Midlands mosses and meres, and the chalk river valleys of southern England.

The vegetation of purple moor grass and rush pastures depends on soils and water chemistry, but what unites these different vegetation types is the co-occurrence of a complex mixture of grassland and fen plant species. The dominance of the fen species is prevented by the relatively dry soil conditions in summer and regular cutting or grazing, and the dominance of the grassland species is prevented by the high winter and spring water levels. The best examples of this habitat contain a wide range of plant communities. These often occur in mosaics, together with patches of wet heath, dry grassland, swamp and scrub. Data that describe this habitat are often poorly accurate.

Description of our Vision for this habitat

Improvements to the existing resource

The diversity and landscape value of purple moor grass and rush pasture will be improved, and relevant SSSI and BAP habitat targets for the existing habitat will be met where they relate to condition. A network of habitat will be secured into the future, supporting sustainable populations of butterflies such as Marsh Fritillary (*Euphydryas aurinia*) and Small Pearl-bordered Fritillary (*Boloria selene*) and other species of conservation concern, and in locations not threatened by sea level rise or pollution. Purple moor grass and rush pastures will be managed as part of a landscape scale approach to conservation, often existing within a mosaic of complementary habitat and other agricultural land-use.

New extent

The purple moor grass and rush pasture habitat will have increased in the landscape to at least the 2020 BAP target, but this may have been revised upwards as the full potential for restoring and creating this habitat is explored. This habitat will make a substantial contribution to the provision of habitat linkage between wetlands, and across other habitat throughout the landscape. It will be a particular feature of floodplains, where it is contributing to improved hydrological functioning of floodplain areas and flood risk management.

New values

There will be healthy populations of species associated with this habitat (such as Marsh Fritillary and Small Pearl-bordered Fritillary), securing their status over the much longer term. This habitat will be providing improved ecosystem services to society that may take the form of carbon sequestration, as well as flood water storage and management. As part of a mosaic of restored wetlands, it will provide aesthetically pleasing landscapes that will be used for recreation. The land owning community will play a key and supported role in managing this habitat for all these purposes.

Examples of projects and visions that are delivering the objectives for this habitat

Re-connecting the Culm

The future of the Culm grassland of Devon and North Cornwall is uncertain due to changes in agricultural practices. The ‘Re-connecting the Culm’ project aims to support land-owners in the management of culm habitats by providing farming and wildlife advice across holdings. [www.butterfly-conservation.org/downloads/265/reconnecting_the_culm.html](http://www.butterfly-conservation.org/downloads/265/reconnecting_the_culm.html)
Map 29: Wetland Vision map of the potential for purple moor grass and rush pasture habitat creation for England.

This map describes a relative gradient from areas where suitable environmental conditions occur for the habitat (pale colours), through to those areas that could offer the greatest opportunity for wetland delivery (dark). The Wetland Vision suggests that the best purple moor grass and rush pasture could be created in areas: i) based on existing BAP habitat resource; ii) with statutory site and/or iii) nature reserve interest; iv) with a small urban floodplain; v) where re-created wetlands could provide alternative ecosystem services on agricultural land of lower productivity value.
6.2 Wetlands throughout the landscape

6.2.1 Floodplain wetlands

Floodplain wetlands rely on the periodic inundation of water from rivers and include many types of grassland, marsh, fen, reedbed woodland and open water habitats. Rivers are an endlessly varying habitat, from upland headwaters to the meandering channels of lowland floodplains. Each type, from crystal-clear chalk streams to energetic, ever-shifting gravel-bed rivers of upland areas, supports its own characteristic flora and fauna adapted to the conditions the river provides. The natural release of river waters on riparian and floodplain land creates a wealth of additional freshwater and wetland habitats supporting an even wider array of plants and animals. The biological communities of rivers are only fully expressed when human impacts are controlled to ecologically acceptable levels. Many floodplain wetlands of today are wholly or partially disconnected from regular inputs of floodwater.

In the future, our Vision is for floodplain wetlands which are more expansive and receive water more aligned with natural cycles and flooding intensities, allowing the re-establishment and reconnection of wetland floodplain features such as wet grasslands and standing waters. In many instances, this could lead to a more sustainable floodwater management, where naturalised floodplains can reduce flood risk to population centres downstream by reducing the rate at which water is released from the upper catchment (Rose et al. 2005). Many fen habitats, ponds and reedbeds may benefit from being re-integrated into a functioning floodplain where they can exchange water (where it is clean enough not to damage existing wetland ecology) and exchange propagules of plants and invertebrates. The resultant diversity of habitats is also needed by the different life stages of lowland fish species, without which they are poorly buffered against adverse environmental and biotic conditions, extremes of weather and longer term climatic trends. Greater connectivity between rivers and their floodplains, and a general increase in water tables will, in some places, also result in improved preservation of the historic environment. Whilst such restoration could prove costly, much can be achieved by removing some key constraints on the river channel and allowing it to restore itself with its own energy.

Agricultural production will continue to be a significant land-use within these floodplains, but will contribute to hydrological restoration and functioning where appropriate, and may benefit from the effects of floodwaters on soil productivity. Public enjoyment of rivers and riverside land will be increased through improved water quality and clarity, more diverse and interesting river landscapes, and restored diversity of riverine and floodplain wildlife including sustainable fish populations.

Examples of restoration projects that are restoring floodplain function include the New Forest Life project (www.newforestlife.org.uk) which is reinstating floodplain forest. The On Trent Project (www.ontrent.org.uk) is restoring habitat connectivity along the river channel and also providing flood water retention. Internationally, the restoration of the River Skjern in Denmark is a good example of a restored low lying floodplain (www.therrc.co.uk/projects/skjern).
Map 30: Wetland Vision map for wetland delivery through mineral extraction after-use for England.

This map represents the extent of wetlands that could be delivered through mineral site after-use on currently mined sites. It has been demonstrated that wetland habitat creation on former mineral sites has potential to make a significant contribution to biodiversity and BAP habitat creation targets (Davis, A. M. 2006). Wetland after-use offers opportunities for recreation and green space for health and wellbeing. Local decisions on after-use will depend also on competing, sustainable priorities for alternative types of after use, recognising the requirements for high quality agricultural land and sustainable use of surplus soil resources. This map describes wetland potential sites from minerals after-use which are adjacent to other existing wetland (dark – priority 1) and those that are within 1km (light – priority 2) of existing wetlands sites. Data do not include peat extraction sites. Inset: Former mineral sites in Dorset. Based on data supplied from www.afterminerals.com
6.2.2 Wetland mosaics

In our Vision wetland and wetland landscapes will be better integrated with other land-uses and land-use planning across England. Wetlands will exist throughout the landscape, contributing to a network of more connected semi-natural habitat, and a landscape more permeable to wildlife and providing important transitions between freshwater wetland and other habitats. Freshwater wetland will exist in close proximity to heathland and woodland, and amongst farmland in the shape of ponds and ditches. Wetlands will exist in urban areas, and will have developed from sites where minerals extraction is currently taking place. Many regional ‘nature maps’ already integrate wetland visioning as part of a holistic approach to producing a vision for all types of wildlife.

Figure 14: In the South West region, a range of partners have come together to present a ‘nature map’ to guide strategic planning for nature areas. This integrates a vision for a range of habitats and species (see www.swenvo.org.uk/nature_map). Source: The South West Nature Map.

6.2.3 Wetland catchments

In order to deliver our Vision’s aspirations we need a better understanding of how the land-use and management within and across a catchment affects the quality and quantity of water within and downstream of a catchment. This is because catchment land-use can affect the quality of water entering wetlands and rivers, and the flow and nutrient load of water moving into rivers and ground water. Changes in land management will restore the habitat integrity of rivers and their floodplains and further enhance the ecosystem services provided (Hitch, C. J. B. 2003). Rainfall infiltration to groundwaters will be enhanced through better soil management (see www.defra.gov.uk/environment/water for further reading on this and related topics), catchment landscape quality will be improved through targeted re-recreation of semi-natural habitat and reduced agricultural intensity, leading to greater enjoyment of the wider countryside and additional opportunities for tourism. Such land-use changes across catchments will provide opportunities for the re-creation of both terrestrial and wetland semi-natural habitats, including small wetlands like ponds.
7 Next steps

Creating this Vision is just a starting point. The partnership is committed to collectively making a real change on the ground. We need to work with others to develop and realise the aspirations of our Vision.

The Vision should be seen as a living document that will need updating and re-evaluating as:

- Data are refined, and new information becomes available.
- Our understanding of how climate change will affect the feasibility and ecology of wetlands improves.
- We improve our understanding of the provision of wetland ecosystem services and match them to peoples’ needs and willingness to pay.
- There are significant changes in policy in the future.

As a partnership, we will:

1. Use the Wetland Vision maps to inform our conservation, restoration and creation work so that effort and resources are targeted in the areas with the most potential.

2. Secure the funding for large-scale wetland habitat creation within a modern landscape.

3. Deliver the Wetland Habitat Action Plan (WHAP) target for landscape-scale naturally functioning wetland ecosystems, extending them where appropriate.

4. Ensure where we can that these areas provide multiple benefits – for recreation, health and the historic environment as well as wildlife.

5. Promote the vision by:
   - Raising awareness of the importance of wetlands.
   - Encouraging more people to experience wetland green spaces.
   - Providing information to farmers, landowners and planners.
   - Supporting new partnerships locally and nationally.

6. Develop the Vision further by working with others to set new long-term targets for wetland restoration and creation designed to both increase the resilience of wetland wildlife to change, and to provide valuable ecosystem services for people.

The partner organisations will also:

**English Heritage** will develop priorities for the historic environment elements of the vision, and identify those sites where immediate (short term) change will have the most benefit. We will use the Vision, on a policy and practical level, to advocate where biodiversity and historic environment interests coincide.

**The Environment Agency** will work to share outputs from the Wetland Vision with our own Habitat Creation work to promote collaborative opportunities for landscape scale habitat creation. We will also use the Vision to inform action to deliver our strategy for achieving a better quality of life for people and an enhanced environment for wildlife, Creating a Better Place.

**Natural England** will use the outputs from this Vision to inform our agri-environment targeting and to help identify potential areas for Natural England funding for new wetland habitat creation. It will be valuable in informing our work on climate change adaptation, including the development of habitat networks. The Vision outputs will also help to inform the development of our wider aspiration to create a 50-year Vision for the natural environment, to include the wide range of ecosystem services it provides.

**The RSPB** will use the Vision to inform priorities for reserve acquisition and large-scale wetland partnership projects. We will use the outputs to champion wetland restoration and creation as part of a modern, wildlife-rich countryside, and develop partnerships through our advocacy and advisory work on the ground.

**The Wildlife Trusts** will use the work to inform our ‘Living Landscapes’ initiatives at a national, regional and local scale. The tools and concepts of the Wetland Vision will be used to add value to existing local partnerships championed by local and regional Wildlife Trusts across England.
8 References


Multi Agency Geographic Information for the Countryside (MAGIC) spatial information programme website http://www.magic.gov.uk/


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