

FENS FOR THE FUTURE

**A Strategic Plan for Fenland:
A Proposal for an Enhanced Ecological Network
Final Report**

June 2012

Mere Oak Ecology

Mere Oak Farm

Rowley

Westbury

Shrewsbury

Shropshire

SY5 9RY

T. 01743 891492

mereoakecology@gmail.com

The preparation of this plan has been largely funded by the Environment Agency and Natural England with additional financial contributions from Lincolnshire Wildlife Trust, National Trust, RSPB and Bedfordshire, Cambridgeshire and Northamptonshire Wildlife Trust. All the financially contributing partners plus the Centre for Ecology and Hydrology, Witham Forth District Internal Drainage Board and Norfolk Wildlife Trust formed a sub-group of the Fens of the Future Partnership to steer the preparation of the plan.

The Fens for Future Partnership Steering Group:

Anglia Ruskin University

Bedfordshire, Cambridgeshire and Northamptonshire Wildlife Trust

Cambridgeshire County Council

Centre for Ecology and Hydrology

Country Land and Business Association

Environment Agency

Lincolnshire Wildlife Trust

Middle Level Commissioners

National Farmers Union

National Trust

Natural England

Norfolk Wildlife Trust

Peterborough City Council

Rex Sly (individual farmer representative)

Royal Society for the Protection of Birds

Smiths Gore

Wildfowl and Wetlands Trust

Witham Forth District Internal Drainage Board

Contents

Acknowledgments.....	i
Executive Summary.....	i
SECTION 1 – BACKGROUND, BIODIVERSITY AND NETWORKS	1
1 Introduction	2
2 Background	3
3 A step change.....	6
4 Current policies for biodiversity.....	8
5 Ecosystem services.....	13
6 Biodiversity	15
6.1 Data on Fenland biodiversity	16
6.2 County Biodiversity Action Plans	18
6.3 Fenland Species.....	21
6.4 Fens Biodiversity Audit	22
6.5 Previous approaches to habitat creation on Fenland	23
6.6 Requirements for the re-creation of wetland habitats.....	24
7 Ecological networks	25
7.1 Strategic River Corridors	26
7.2 Green Infrastructure	27
8 An enhanced ecological network for Fenland	30
8.1 Core areas	31
8.2 Corridors	31
8.3 Stepping stones.....	32
8.4 Restoration areas	32
8.5 Buffer zones	32
8.6 Sustainable use areas.....	33
SECTION 2 – OTHER CRITICAL FACTORS.....	34
9 Other critical factors	35
9.1 Sustainable agriculture	35
9.1.1 Environmentally friendly farming	36
9.1.2 Farmland birds	38
9.1.3 Conclusion.....	39
9.2 Peatland soils	40
9.3 Water management.....	46

9.3.1	Water availability	47
9.3.2	Water quality	48
9.3.3	Flood risk management – Catchment Flood Management Plans	50
9.4	Recreation and tourism	54
9.5	Health and quality of life	59
9.6	Living above the water line: the importance of fenland archaeology	60
9.6.1	The ancient environment	61
9.6.2	Archaeological Survival	63
9.6.3	Conditions for preservation	65
9.6.4	New opportunities	66
9.7	Geodiversity	66
9.8	The local economy	67
9.9	The Fenland landscape	70
9.9.1	Key characteristics	70
9.9.2	Landscape character	71
9.9.3	Physical Influences	72
SECTION 3 – THE NEED FOR CHANGE: ANALYSIS AND WAY FORWARD		74
10	The need for change	75
10.1	Rationale for intervention	75
10.2	SWOT analysis	78
10.2.1	Summary of key issues	79
10.3	Results of the data collection exercise	80
10.4	Analysis of strategic options	81
10.5	Strategic alignment/fit	83
11	Vision, mission, aims and objectives	84
11.1	Vision	84
11.2	Mission	84
11.3	Aims and objectives	84
11.4	Future Actions	96
12	Partners and governance	97
12.1	Fens for the Future Partnership – Terms of Reference	97
12.1.1	Membership	97
12.1.2	Membership of the Steering Group	97
12.1.3	The Role of the Steering Group	98

12.1.4	Frequency of steering group meetings	99
12.1.5	Decision Making.....	99
12.1.6	Competent Authority	99
12.1.7	Role of any Project Officer that may be appointed	99
13	Funding	100
13.1	Major capital expenditure	100
13.2	Project development.....	102
13.3	Possible future funding mechanisms	102
13.3.1	Payments for Ecosystem Services (PES).....	102
13.3.2	Biodiversity offsets.....	103
13.3.3	Carbon sales	103
13.4	Other recommendations.....	103
13.5	Monitoring and evaluation	104
14	Recommendations for missing information	105
15	References	106
16	Appendices.....	109
	Appendix 1. Ecosystem Services:	110
	Appendix 2. Key Fenland Biodiversity Statistics	131
	Appendix 2a. Area of land with particular conservation designations.....	131
	Appendix 2b. Condition of SSSIs	131
	Appendix 2c: Classic agri-environment schemes.....	132
	Appendix 2d. Overlap between character area and HLS Target Areas.....	132
	Appendix 2e. Overall take-up of ELS and HLS (together with OELS and OHLS):	133
	Appendix 3. UK BAP species associated with fens and fen vegetation in Cambridgeshire	134
	Appendix 4. UK Biodiversity Action Plan Species associated with fens and fen vegetation that are known from Wicken Fen	135
	Appendix 5. Examples of species believed to be extinct at Wicken Fen	138
	Appendix 6. BAP priority species associated with ponds, lakes and reservoirs in Cambridgeshire and Peterborough according to the Million Ponds Project	139
	Appendix 7. Rare species associated with drainage ditches in Cambridgeshire	141
	Appendix 8a. Area of Washlands in use in the early nineteenth century	142
	Appendix 8b. Examples of drained meres on Fenland	143
	Appendix 9: Photographs from Must Farm	144
	Appendix 10. SWOT Analysis: Raw Data	146
	Appendix 11. Results of the data collection exercise	151

	Appendix 11a. Extent of Core Areas	151
	Appendix 11b. Extent of re-creation areas and stepping stones.....	151
	Appendix 11c. Extent of potential new sites	152
	Appendix 12. Original membership of the Fens IBDA Steering Group	153
	Appendix 13. Potential project funding sources.....	154
17	Maps	159
18	Map of Proposed Enhanced Ecological Network.....	169

Acknowledgments

This Plan has been prepared by Richard Keymer of Mere Oak Ecology, with support from Steve Brayshaw of R S Brayshaw Ecological Consultancy.

The author would like to thank members of the Fens for the Future Strategic Plan Steering Group for their oversight, particularly Catherine Weightman of Natural England and Graham Elliott from RSPB, who managed the contract; Kasia Gdaniec from Cambridgeshire County Council who kindly authored the section on Fenland archaeology; and Carrie Mackay-Payne from Natural England for her support in the production of the mapping.

Executive Summary

This Strategic Plan is intended to help the *Fens for the Future Partnership* identify the top priorities for biodiversity action and assist with subsequent funding bids across the 'Inland Fens' of the Fens National Character Area.

The Need For Change: Analysis and Way Forward

The rationale for intervention: Only eight main wetland sites extending to 4,792 ha (1.4%) remain in the Fens. Although action is being taken by conservation organisations and some of the fen habitats are still remarkably diverse (Wicken Fen has 8,459 recorded species) these habitats remain vulnerable and are still losing species. Urgent measures are needed to address this situation.

The recent national policy documents relating to biodiversity such as the Lawton Report, *Making Space for Nature: A review of England's Wildlife Sites and Ecological Network* and the subsequent White Paper *The Natural Choice: securing the value of nature* **provide the strategic steer** for this Plan's approach. Lawton sets out the actions needed to enhance the resilience and coherence of England's ecological network in four words: more, bigger, better and joined. *Biodiversity 2020: A Strategy for England's Wildlife and Ecosystem Services* aims to halt overall biodiversity loss, support healthy well-functioning ecosystems and establish coherent ecological networks, with more and better places for nature for the benefit of wildlife and people.

The need for urgent biodiversity action is only part of the picture as **other ecosystem services** such as the increase of carbon loss from peat wastage; water quality and availability are issues that have both medium and long term implications for local communities.

Vision

*The Fens was England's largest wetland. Now less than 1% of the original wetland habitat remains. The **Fens for the Future Vision** is to see sustainable wetlands restored, re-created and reconnected across the Fens for the benefit of people, our natural and historic heritage and the rural economy. Sustainable wetlands will help reduce storm effects, make available clean water and retain peatland soils so helping mitigate the effects of climate change, while at the same time offering a haven for wildlife, protecting our historic heritage and providing exciting areas for people to visit. Recreational access and tourism increases with more people taking exercise in the countryside. The diversity of the local economy widens and opportunities for employment in local communities are created.*

The Fens remain nationally important for modern productive farming. The provision for wildlife in the farmed landscape increases significantly with the uptake of environmentally friendly farming practices; sensitive ditch and drain management, thus creating a network of wildlife habitats extending throughout Fenland. The variety and abundance of farmland wildlife increases and iconic Fenland species thrive.

Mission Statement

*The Fens for the Future Partnership **Mission Statement** is to make the Fens one of the main UK landscape scale wetland complexes by 2020, within a matrix of sustainable agriculture.*

Aims

1. Key wetland sites, such as Wicken, Woodwalton and Holme Fen, remnants of the original Fen, together with the great Washlands, will form the **Core Areas** of our Vision for Fenland. This partnership will support the enhancement, enlargement and buffering of these core areas, increasing the connectivity between them and ensuring that their natural processes are able to function effectively.
2. **In addition to the existing Core Areas**, extensions at Baston Fen, Great Fen and the Wicken Vision, as well as entirely new areas such as Lakenheath Fen, Needingworth and the Wissey Wetland will be developed to provide sufficient areas of wetland habitats to improve sustainability. Increasing capacity in Lincolnshire will be a focus as it has such a small area of Fenland at present. These new wetlands will also need to be buffered and connected to support their natural processes.
3. We will **increase connectivity** by enhancing the main rivers, waterways and riverside habitats to create a web of habitats that help species disperse and increase resilience. The Fens Waterways Link project and the Water Framework Directive offer exciting ways to help achieve this aim. This work will build on existing work by the Environment Agency and the Drainage Boards.
4. We will further **increase the network of habitats** by enhancing water courses, ditches and the wider countryside helping species disperse. Farmers are already joining agri-environment schemes providing habitat for farmland wildlife and helping farmland birds, while enhancing the wider environment through resource protection, aided by targeted conservation advice from key partners. This Partnership will seek to extend this by working to deliver the Water Framework Directive objectives for Fenland waterbodies, encouraging more farmers to adopt *environmentally friendly farming*¹ and Drainage Boards to further develop their management practices. Water Framework Directive funding will be utilised to help achieve this work.
5. We will draw on the expertise of academic partners to continue research into the role of different types of **connections and buffers** in enabling species dispersal and increasing resilience as the climate changes. The results will inform our strategy for enhancing the network. Monitoring is required to establish the effectiveness of the ecological network in Fenland.
6. **We will work with farmers, Drainage Boards, local communities, developers, mineral companies, academics, Local Authorities and relevant organisations** to understand and establish multifunctional wetlands that support biodiversity, maintain our historic heritage, reduce flood risk and improve water resource availability. We will also work to reduce barriers

¹ Environmentally friendly farming can be described as Environmental Stewardship Plus. In other words, taking actions for the environment that go beyond the requirements of the Environmental Stewardship Scheme.

to the establishment of these multifunctional wetlands and in particular explore new options to improve water storage.

7. We will work to **promote climate change adaptation** both through the implementation of our strategy to create a coherent and resilient ecological network in Fenland and by our encouragement of environmentally friendly farming and the delivery of Water Framework Directive measures for Fenland waterbodies.
8. We will **encourage and enable people to sustainably enjoy the natural and cultural heritage of the Fens**. The establishment of wetland networks will enable people to engage in a wide variety of outdoor activities, both formal and informal, contributing to their health and wellbeing. This will also promote the Fens as a unique landscape to both live in and visit.
9. **The Fens for the Future Partnership, together with the Fens Waterways Link Project, will work to increase and diversify the Fenland economy through the recreation and tourism sectors.** This will be achieved by the further development of large connected wetlands, each of which is capable of attracting tens of thousands of visitors a year²
10. We will **raise the profile of the Fens for the Future Partnership** to obtain wider recognition for its work. We will work to encourage greater inward investment to Fenland and will develop and promote the Strategy to keep all Partners and Stakeholders informed of progress and so that they have regular opportunities to influence its future development and direction.
11. We will **monitor and evaluate the implementation of our Strategy** to ensure that it is meeting its aims and objectives and is proceeding in an effective manner that meets the requirements of the Partners.

Partnership working is the best way to achieve the *Fens for the Future* Vision and its eleven aims and associated objectives. It is critical that the Partnership quickly embeds the appropriate **governance** for *Fens for the Future*, develops effective means of communication and employs staff to progress this strategy with stakeholders. Sources of possible **funding** to achieve the Projects vision are identified.

Background, Biodiversity and Integrated Approach

The origins of the Fenland partnership began with *Wet Fens for the Future* project in the 1990s which looked at opportunities for large scale wet fenland creation. This was followed by the EU Life+ *Wise Use of Floodplains* project (1999 to 2002). Thereafter there was a step change in the approach adopted and the emphasis shifted from strategic approaches across the Fens to actual individual large scale habitat restoration projects such as the Great Fen, the Wicken Vision and the Lakenheath project.

This Strategic Plan endeavours to put the new biodiversity policies such the Lawton ‘more, bigger, better managed and more inter-connected sites’ into practice in one of the best suited places in

² Welney WWT on the Ouse Washes already receives 45,000 visitors a year and Wicken Fen 50,000. The Fenland Waterways Link Project estimates that the additional recreation and tourism encouraged by this Project alone could result in an additional £14 million a year revenue generation from one million visitors.

England. The Plan also provides an overview to the added benefits that improved ecological networks or ecosystem approach can offer society.

By reviewing all four fenland county **Biodiversity Action Plans** this plan suggests that a wetland restoration target of 20,000 ha by 2062 is needed and considers the contribution that 'nature maps', 'strategic river corridors' and 'green infrastructure networks' have made to the development of **ecological networks**.

Peat soils in 1987 covered 24,000 ha of Fenland, but are still being eroded through drainage and cultivation at a rate of 2.0 cm a year and releasing CO₂ into the atmosphere. Only 10,500 ha are estimated to have peat deeper than one metre and roughly a quarter of this area is located in nature reserves or under grass in flood relief washlands.

The majority of the Fens soils (89%) are **Grade 1 or 2** and are responsible for growing 1/3 of England's vegetables and 1/3 of the country's bulbs and flowers as well as providing approximately 7% of Fenland employment. The food and drink manufacturing sector in the Fens is worth approx. £1.7 billion and with associated packing and distribution businesses employs around 17,500 people (7% of fenland employment). Environmental Stewardship Scheme (ESS) is the main scheme supporting **environmentally friendly farming**. 2011 figures indicate that only 6.3% of the area is currently in ESS although 16% of the Plan's area is important for arable birds.

Much of the fens are below sea level and the high agricultural productivity relies on the **pumped drainage system** that is jointly managed by the Internal Drainage Boards and the Environment Agency (EA). The area has two Catchment Sensitive Farming Priority Catchments where **water quality** has been identified as a concern. There are opportunities for the Environment Agency to be more ambitious when developing their Catchment Flood Management Plans (CFMPs) and local Catchment Abstraction Management Strategies (CAMS) and look at options that integrate the design of the proposed ecological networks and allow more winter and storm runoff to be stored and made available to users at a later period. These new 'wetlands' could contribute significantly to the creation of an enhanced fenland ecological network, meet *Biodiversity 2020* and ecosystem services objectives and Water Framework Directive (WFD) targets.

Recreation and tourism are major sectors of Fenland's economy. In 2010 Cambridgeshire's and Peterborough's tourism supported 18,131 FTE jobs with a value of almost £1.9 billion. The *Fens Waterways Link* Project which aims to create a new navigation ring through the cathedral cities of Lincoln, Peterborough and Ely has the potential to boost recreation, tourism, leisure and the local economy in the Fens. It will also help create the enhanced ecological network which will enhance access to greenspace and improve communities and visitors **Health and quality of life**.

Local Enterprise Partnerships that cover the Fens and their priorities are captured and any links between natural resources and services and GDP and job creation are emphasized. The UK Government push to stimulate green growth combined with its existing agendas aimed at promoting rural growth, and halting the loss of biodiversity in the UK, makes a powerful case for local investment in conservation.

The Fens have a distinct **landscape character** as well as being **archaeologically and palaeoenvironmentally** important. Re-wetting areas to encourage the formation of peat, reducing

peat erosion and contaminants will benefit the underlying archaeological remains and help manage the area's character. The Fens **geological sites** help demonstrate the cyclic succession of peats, estuarine and marine clays deposited in past terrestrial and marine environments from which we can learn today.

SECTION 1 – BACKGROUND, BIODIVERSITY AND NETWORKS

1 Introduction

Partnership plans to address Fenland issues are not new and indeed ground breaking work was carried out in the 1990s by 'Wet Fens for the Future' and 'The Wise Use of Floodplains'. These were widely based landscape scale partnerships that did excellent work to link with local communities but they are now largely forgotten. This demonstrates the importance of 'capturing the moment' and that should certainly be now with the Lawton Report, Making Space for Nature: A review of England's Wildlife Sites and Ecological Network, published in September 2010, the subsequent White Paper The Natural Choice: securing the value of nature, published in June 2011 and a new England biodiversity strategy being published in July 2011, Biodiversity 2020: A strategy for England's wildlife and ecosystem services. Given the new policy context for biodiversity in England now must indeed be the right time to produce a new Strategic Plan for Fenland. One of the key elements of this Plan is a proposal to create an enhanced ecological network for the Fens.

Fenland has a number of major issues that need to be addressed over the period of this Plan. These include the wastage of the peat soils, the need to provide sustainable sources of water for different functions in what may be a warming climate, the benefits of using more natural processes to reduce the effects of flooding as the climate becomes stormier, diminishing biodiversity due to the very small size of the remaining fenland nature reserves and the benefits of more people getting fresh air, exercise and enjoyment in the Fenland countryside while at the same time helping the local economy.

There are many positives about Fenland such as fantastic landscapes uniquely fashioned by man, historic market towns with many festivals, wonderful churches and cathedrals and fascinating history from Flag Fen to Hereward the Wake and the sailing of the Mayflower to America. Great people are associated with Fenland such as Octavia Hill who was born at Wisbech, Sir Joseph Banks at Revesby and of course Sir Cornelius Vermuyden, who was sponsored by the Earls of Bedford to undertake the first effective large-scale drainage works. Some of the most productive farmers and land managers in England farm on the high quality soils and some of the most experienced drainage engineers work for the Drainage Boards. There is also great writing celebrating the huge skies and cultural landscapes by authors such as Sybil Marshall, Edward Storey and Graham Swift.

The challenge for everyone is to work in partnership together across the Fenland basin as a whole in order to secure a sustainable environmental future for all interests. Unless action is taken now then we will risk losing further iconic fenland species, as has already happened with the large copper and swallowtail butterflies and much more besides.

2 Background

There has been a Fenland partnership working to secure better outcomes for biodiversity on the Fens since the early 1990s. Called **‘Wet Fens for the Future’** it was a large partnership of at least fifteen organisations and was very successful in getting its name well known, largely as a result of producing a colourful and informative booklet (1996). This booklet set out the Partnership’s Vision and the benefits that new wetlands would bring.

The Partnership sought to promote the following objectives over a fifty year timescale:

- To maintain, enhance and create wetlands to contribute to the delivery of UK Biodiversity Action Plan targets and the preservation of landscapes, cultural and archaeological features.
- To build a strong sense of local pride in the area’s wetland past and positive support for the creation of new wetlands.
- To ensure that wetland resources play their full part in social and economic development.
- To ensure that water resource and flood defence planning takes full account of current and future needs and benefits of existing and new wetlands.

The Partnership commissioned Cranfield University in 1994 to produce Phase I and II of a Feasibility Study into ‘the creation of new wet fenland on a large scale within Fenland’. The Partnership had an initial target to increase the area of wet fen by 600 ha by the year 2020. A final report for ‘Wet Fens for the Future’ was produced by the RSPB in 1998.

This initiative was followed by a £1.5m EU Life-Environment Project called the **‘Wise Use of Floodplains’** which was a trans-national partnership involving government departments, research organisations and non-government organisations (NGOs) in six project areas throughout England, Ireland, Scotland and France. There were sixteen major partners to the project, with the RSPB holding the contract from the EU to manage the project on behalf of the partners. The objective of the project was to demonstrate how floodplain wetlands could contribute to the sustainable management of water resources within river basins. The results were to help catchment managers across Europe to implement the EU Water Framework Directive.

‘The Fens Floodplain Project’ was one of two English case studies (the Somerset Levels and Moors Parrett Catchment was the other). The Project operated from December 1999 to March 2002. It was funded by a partnership of the following organisations, with matching funds from the European Union LIFE environment programme: Cambridgeshire County Council, Countryside Agency, English Nature, English Heritage, Environment Agency, Fenland District Council, Lincolnshire County Council and RSPB. These partners formed the steering group for the work of The Fens Floodplain Project. They were also the steering group of the ‘Wet Fens for the Future’ initiative, which had been formed some years previously (see above). The role of the Steering Group was to oversee the work of the Project Officer and to ensure that the tasks allocated to ‘The Fens Floodplain Project’ were completed satisfactorily.

The Fens Floodplains Project aimed to take forward wetland restoration by providing answers to the questions:

- What needs to be done to restore wetlands?
- Who needs to be involved?
- How do they do it?

The Project produced a series of technical reports and publications which are still available on the Project website www.floodplains.org. This included a pack of six guidance Notes which includes the 'Fens Floodplain Project' Case Study and a full 65 page technical report on 'Restoring the Fens – the report of The Fens Floodplain Project, 1999 - 2002'. There is also a PowerPoint presentation about the whole EU Life-Environment project available on the website.

In addition to the Wet Fens Vision Map, the full technical report contains seven case studies including:

- Fens Waterways Tourism Regeneration Project (now being delivered as the Fens Waterways Link).
- Needingworth Quarry Hanson RSPB wetland creation project.
- Ouse Washes pilot Wetland Project.
- Woodwalton Fen National Nature Reserve (NNR) expansion project (now the Great Fen).
- Wicken Fen extension (now the Wicken Vision).
- Lower Witham.

The project also produced a list of the Top 10 policy and funding findings, established a Fens Water Forum and set out the Wet Fens Strategy.

The Wet Fens Strategy for 2002 – 2005 promoted:

- the creation of more large wetland sites for multiple benefits;
- improvements to river corridors to allow people and wildlife to travel between the large sites, especially along routes of the Fens Waterways Strategy; and
- raising the quality of the wider floodplain by promoting:
 - the extension of agri-environment schemes;
 - improved management of drainage ditches for landscape and wildlife; and
 - creation of reedbed waste-water treatment plants by local businesses.

The strategy could be considered as a strategy for sustainable development based on wetland creation and waterways improvements to attract sustainable tourism and contribute to economic sustainability.

The costs of the projects on the Wet Fens Vision Map were estimated to be around £100m. This was equated to £2m a year, over the 50 years of the vision. Public bodies were considered to be spending more than this on maintaining the current landscape, agriculture and water management of the area, without the additional benefits that the strategy sets out.

Since 2002 **'The Wet Fens Partnership'** has produced a leaflet 'The restoration of fenland for people and wildlife' (2004) which contained a vision and, sets out a number of benefits from creating large scale wetlands.

3 A step change

Action thereafter by conservation organisations changed direction to focus much more on delivering the discrete, large scale habitat re-creation schemes that various studies had suggested were the most effective means of delivering better outcomes for biodiversity on Fenland, probably one of the best places in England to carry out such wetland schemes. Indeed there has been excellent progress during this first decade of the new century with the Great Fen, Wicken Vision, and the Great Ouse Wetland all becoming well established.

Another significant development was an ecological network mapping project that the Norfolk Wildlife Trust undertook on behalf of the Biodiversity Partnership in 2006. The maps produced by the project identified the most important existing biodiversity areas in Norfolk as well as opportunities for enhancing, creating and linking habitats (see Biodiversity section). The conclusions of this project are relevant to influencing the approach adopted in this Plan.

The introduction of the Integrated Biodiversity Delivery Area (IBDA) programme in early 2010 was a response to the Report 'Securing Biodiversity' (Natural England, 2008), which provided a framework for the delivery of management to enhance priority species and habitats, as well as fulfilling commitments made under the England Biodiversity Strategy (Natural England, 2002). Eight IBDA's were selected in Spring 2010 as demonstrations of how better delivery for biodiversity might be achieved, as one of a suite of approaches to delivering biodiversity at a landscape-scale. They were recognised as learning opportunities which would deliver significant improvements for biodiversity delivery, contributing towards our biodiversity targets. The Fens IBDA developed from the existing wetland vision partnership.

The proposal was that the IBDA's would deliver a suite of ecosystem services, in addition to biodiversity, and would contribute to other social and economic agendas. In practice the Fens IBDA has never had a designated project officer and limited financial input from the lead partners NE and EA. There was the potential for IBDA's to unlock novel funding sources, from which all biodiversity projects and partners can benefit. The lack of resources within the IBDA programme was generally seen as a barrier to progress. IBDA's were superseded by the launch of Nature Improvement Areas in *The Natural Choice: securing the value of nature*.

The Partnership produced a Fens IBDA Action Plan with Aims and Objectives in June 2011 and submitted a bid for Nature Improvement Area funding in 2011, which was unsuccessful. It was this lack of success that persuaded the organisations in the Partnership that it was time to look again at the benefits of a Fenland wide strategy which would aim to highlight to funding organisations where the greatest priorities for action for biodiversity currently are on the Fens. This was the rationale for the production of this Plan.

The boundary for this Plan (see Map 1) is based on the Fens National Character Area (NCA) and comprises the sub-divisions 'Inland Fens', that is the 'Settled Inland Fens' and the 'Open Inland Fens' where associated habitats are dependent on freshwater systems. The 'Open Coastal Marshes' and 'Drained Coastal Marshes', which are coastal in nature and whose conservation has been led by two long-standing partnerships: the *Wash Estuary Strategy Group* and the *Wash and North Norfolk Coast European Marine Site Partnership*, are deliberately omitted. Map

2 shows the current administrative arrangements for local government on Fenland to demonstrate the complex nature of administrative arrangements in the Plan area.

4 Current policies for biodiversity

What has become known as the Lawton Report, ***Making Space for Nature: A review of England's Wildlife Sites and Ecological Network***, submitted to the Secretary of State on 16 September 2010 and the subsequent White Paper ***The Natural Choice: securing the value of nature***, published in June 2011, have changed the policy context for biodiversity in England.

The Lawton Report argues for a step-change in our approach to wildlife conservation, from trying to hang on to what we have, to one of large-scale habitat restoration and recreation, under-pinned by the re-establishment of ecological processes and ecosystem services, for the benefits of both people and wildlife. The Report summarises what needs to be done to enhance the resilience and coherence of England's ecological network in four words: *more, bigger, better* and *joined*. There are five key approaches which encompass these, and also take account of the land around the ecological network. We need to:

- Improve the quality of current sites by better habitat management.
- Increase the size of current wildlife sites.
- Enhance connections between, or join up, sites, either through physical corridors, or through 'stepping stones'.
- Create new sites.
- Reduce the pressures on wildlife by improving the wider environment, including through buffering wildlife sites.

The Report states that a larger network of more wildlife sites, bigger sites, better managed and more heterogeneous sites and more inter-connected sites are needed to halt and reverse the collapse of England's wildlife. Some of the greatest gains will be where all these are achieved, alongside reducing the pressures on the wider environment by working at a landscape-scale.

The Report recognises that the next few years are going to be a time of budgetary constraint, when additional resources are unlikely to be available and that it will not be possible to take all necessary action immediately, or even soon. It does however stress the need to plan for the medium and longer term and *Make Space for Nature*. To quote 'amongst this uncertainty, there is one thing of which we can be certain: the sooner we act to establish a coherent and resilient ecological network, the lower the eventual cost and the greater the benefits for us all'.

The Report emphasises the need to properly plan ecological networks, including restoration areas. Restoration needs to take place throughout England. However, in some areas, both the scale of what can be delivered to enhance the network, and the ensuing benefits for wildlife and people, will be very high. These large areas should be formally recognised as *Ecological Restoration Zones* (ERZ), using all the economic, social and environmental levers at our disposal. ERZ are the gold-standard for places where we should focus efforts to achieve the shift to the restorative phase of nature conservation. Ecological Restoration Zones reappear as Nature Improvement Areas (NIA) in *The Natural Choice: securing the value of nature*.

Establishing a coherent and resilient ecological network requires careful planning to ensure the contributions made by existing network components are maximised and new components, such as planned restoration areas, corridors and buffers, are in effective places, thereby ensuring we use precious resources and land in the most efficient ways.

An improved ecological network also offers society additional benefits to enhancing biodiversity. Ecosystem service provision is a clear example, where society's need to maintain water-quality, manage inland flooding, deal with coastal erosion, and enhance carbon storage (to name but four), can be greatly enhanced by the creation of a more effective ecological network.

The Report talks about the effect of climate change on efforts to enhance England's ecological network. It threatens our wildlife, but it also, paradoxically, creates opportunities and requires some advances in our thinking about the designation of sites and their management. A larger, more effective ecological network is one of the mechanisms that will help society cope with climate change, by restoring hydrological processes for instance (for more information on the likely effects of climate change see the UK 2012, Climate Change Risk Assessment).

This Plan is a proposal to plot a course for the establishment of a robust ecological network on Fenland which builds on the principles set out by the Lawton Report.

'The Natural Choice: securing the value of nature' contains encouraging words about the approach which needs to be taken to enhance biodiversity. It states that "Past action has often taken place on too small a scale. We want to promote an ambitious, integrated approach, creating a resilient ecological network across England. We will move from net biodiversity loss to net gain, by supporting healthy, well-functioning ecosystems and coherent ecological networks".

In addition the Government will "create new Nature Improvement Areas (NIA) to enhance and reconnect nature on a significant scale, where the opportunities and benefits justify such action. Local partnerships will come together to form NIA. We will set up a competition to identify 12 initial areas and will provide £7.5 million to support this". These were announced in early March 2012 and although the Fens was not successful, future opportunities will almost certainly arise and can certainly be developed through partnership working.

'The Natural Choice: securing the value of nature' recognises that human health and wellbeing depend on biodiversity; its conservation and enhancement are critical for society and the natural environment alike. The fragmentation of natural environments is driving continuing threats to biodiversity. The previous global target to reduce significantly the rate of loss of biodiversity by 2010 was not met.

The role of biodiversity in underpinning ecological services is recognised and the recommendations of the Lawton review are endorsed.

The Government sets out its ambition as "to improve the quality of our natural environment across England, moving to a net gain in the value of nature. We aim to arrest the decline in habitats and species and the degradation of landscapes. We will protect priority habitats and safeguard vulnerable non-renewable resources for future generations. We will support natural

systems to function more effectively in town, in the country and at sea. We will achieve this through joined-up action at local and national levels to create an ecological network which is resilient to changing pressures”

This Strategic Plan for Fenland seeks to make a significant contribution to achieving this ambition on Fenland. It is encouraging that the leading nature conservation organisations have already achieved so much to restore lost habitats on Fenland and help make the remaining core areas viable. Yet all partners would probably agree that much more remains to be done to achieve a viable functioning ecological network on the Fens.

In July 2011 a new England biodiversity strategy was published ***Biodiversity 2020: A strategy for England’s wildlife and ecosystem services***. The ground breaking UK National Ecosystem Assessment (NEA) published in June 2011 was taken as a starting point for the strategy. The NEA provides a comprehensive account of how the natural world, including its biodiversity, provides us with services that are critical to our wellbeing and economic prosperity. However, the NEA also showed that nature is consistently undervalued in decision-making and that many of the services we get from nature are in decline. Over 40% of priority habitats and 30% of priority species were declining in the most recent analysis. Eight priority species were lost entirely from the UK between 2002 and 2008.

The strategy states that “Our challenge is to halt this decline – for the benefit of this and future generations”.

The mission for this strategy, for the next decade, is: *to halt overall biodiversity loss, support healthy well-functioning ecosystems and establish coherent ecological networks, with more and better places for nature for the benefit of wildlife and people.*

These outcomes will be delivered through action in four areas:

- a more integrated large-scale approach to conservation on land and at sea;
- putting people at the heart of biodiversity policy;
- reducing environmental pressures; and
- improving our knowledge.

The strategy acknowledges the findings of the Lawton Report and proposes a more integrated large-scale approach to conservation on land and at sea because establishing such a network would effectively conserve biodiversity and ecosystem services, delivering many benefits to people, while also making efficient use of scarce land and resources.

The strategy recognises that “effectively establishing coherent and resilient ecological networks on land and at sea requires a shift in emphasis, away from piecemeal conservation actions and towards a more effective, more integrated, landscape scale approach”.

There is a heading in the strategy ‘Reducing environmental pressures’ and the recognition that “we need to ensure biodiversity is taken into account by decision-makers within sectors which have the greatest direct influence on our biodiversity, and we need to reduce direct pressures

on our biodiversity. The approach will vary from sector to sector, covering a variety of uses of land and sea”.

The key sectors that the strategy will work with are identified as are the actions that will be taken.

These include:

Agriculture: We will improve the delivery of environmental outcomes from agricultural land management practices, whilst increasing food production by, for example, reviewing how we use advice and incentives, and how we use agri-environment schemes.

Planning and Development: Through reforms of the planning system, we will take a strategic approach to planning for nature. We will retain the protection and improvement of the natural environment as core objectives of the planning system. We will pilot biodiversity offsetting, to assess its potential to deliver planning policy more effectively.

Water Management: We will protect water ecosystems, including habitats and species, through a river basin planning approach. We will also promote approaches to flood and erosion management which conserve the natural environment and improve biodiversity.

As far as Fenland is concerned there is a need to continue to develop the debate with these sectors as to how to take forward implementation of an ecological strategy in a way that these sectors feel part of, as to be successful it has to be a properly integrated strategy. A range of factors may encourage such debate and lead to action, including in particular the impacts of climate change.

Following the publication of the *Natural Environment White Paper* a *ThinkBIG* report was jointly written by representatives of the conservation, landowning and farming communities together with statutory agencies who collectively make up the England Biodiversity Group. It sets out why the England Biodiversity Group supports the White Paper’s move towards landscape-scale conservation and the significance of linking this to an ecosystem approach. It also provides advice on how to implement the recommendations of the *Making Space for Nature* review, which calls for ‘more, bigger, better and joined’ places for nature. The report does not go into policy detail but rather summarises the case for such an approach, highlights examples of where a landscape-scale approach is already being implemented and illustrates some lessons learnt.

The *ThinkBIG* report is intended to provide background and supporting information to local authorities, land managers, farmers, communities and Government agencies to support their delivery of the White Paper’s recommendations. Anyone wanting further information on ‘a landscape scale approach’ to conservation and to see how they can help is recommended to look at this report.

ThinkBIG describes ten key features of a successful landscape-scale project:

- Information – knowing the current state of the environment and having information about its potential.

- Partnership – collaboration between and across different organisational, political and administrative areas.
- Co-ordination – namely the need for a project coordinator.
- Carrots and sticks – regulation and financial incentives are needed.
- Strategic and local – the local drive that gets things done is coordinated and achieved in a sustainable way.
- Managing conflict – through careful planning and land-use decisions.
- Protect – existing designated sites.
- Buffer – sympathetic management of land surrounding existing sites.
- Enhance – to maximise biodiversity and ecosystem services.
- Connect – to enable species to move in response to climate change/ pollution.

To summarise the importance of creating larger and better connected areas of natural habitat is now recognised as a key strategy for maintaining biodiversity and enabling wildlife to adapt to climate change. Many organisations are now promoting the creation of ecological networks and the use of landscape-scale approaches to conservation. Current initiatives include the RSPB's *Futurescapes* and the Wildlife Trust's *Living Landscapes*. In response to Sir John Lawton's review of England's wildlife sites, *Making Space for Nature*, the Government has also made a commitment to, and has now announced, the establishment of twelve large-scale Nature Improvement Areas.

5 Ecosystem services

The additional benefits that an improved ecological network offers society in terms of ecosystem services have been referred to above. The Lawton report gives examples of these benefits ranging from simple and obvious things like food, clean water and many materials, to more complex things like the regulation of climate through carbon sequestration or of flooding through water storage. There are also less tangible aesthetic and recreational services that it provides such as places to relax, seek inspiration or exercise. These benefits that humans receive from the functions of the natural world have been called ecosystem services. They are the direct and indirect result of past and present ecosystem processes such as soil formation, water and nutrient cycling and primary production (harnessing energy from sunlight). Biodiversity (a convenient technical term that has entered broader usage to capture the diversity of the whole living world, from genes and individual species, through to plant and animal communities and entire biomes) plays a critical role in all of these processes and as a result is often viewed as the vital underpinning (or supporting service) for most, if not all, ecosystem services.

As the pressures on our land and water are likely to continue to increase we need to learn how to manage these and all finite resources in ways which deliver multiple benefits, for example, achieving profitable and productive farming while also adopting practices which enhance carbon storage, improve flood water management and support wildlife”.

It is worth setting out what ecosystem services are. They can be divided into four different types as set out in Table 1.

The contribution that Fenland *should* be making to the delivery of these ecological services, as opposed to the contribution that it *is* actually making, is a major point for consideration in this Plan.

A table bringing together information regarding ecosystem services on Fenland is presented in Appendix 1. This is derived from Natural England’s draft National Character Area (NCA) profile for the Fens.

See also Table 14 in Section 10.1 which summarises the significance of ecosystem services on Fenland.

Table 1. Examples of ecosystem service provided by category	
Category	Example of ecosystem service provided
Provisioning services	• Food • Fibre and fuel • Biochemicals, natural medicine and pharmaceuticals • Genetic resources • Ornamental resources • Fresh water
Regulating services	• Air-quality regulation • Climate regulation • Water regulation • Pest regulation • Disease regulation/health • Erosion control • Water purification/detoxification and waste treatment • Natural hazard protection • Pollination
Cultural services	• Spiritual and religious value • Inspiration for art, folklore, architecture etc. • Social relations • Aesthetic values • Cultural heritage values • Recreation and tourism
Supporting services, necessary for the production of all other ecosystem services	• Soil formation and retention • Nutrient cycling • Primary production • Water cycling • Production of atmospheric oxygen • Provision of habitat
Source. ThinkBIG - How and why landscape-scale conservation benefits wildlife, people and the wider economy (September 2011)	

6 Biodiversity

Fenland was England's largest wetland but major drainage schemes undertaken by amongst others Cornelius Vermuyden, on behalf of the Fourth Earl of Bedford and Companies of Adventurers, in the 17th and 18th centuries. So successful were they that today less than 1% of Fenland remains as part of this original fenland habitat.

It is worth recalling a contemporary account of the riches of these wetlands by Thomas Pennant, in the vicinity of Spalding in 1769: *"It is a vast tract of morass, intermixed with numbers of lakes, from half a mile to two or three miles in circuit, communicating with each other by narrow reedy straits: they are very shallow, none are above four or five feet in depth; but abound with fish...stickle-backs... move up the river in such quantities as to enable a man to ...to earn, for a considerable time, four shillings a day, by selling them at a half-penny per bushel. They were used to manure the land...The fen is covered with reeds, the harvest of the neighbouring inhabitants, who mow them annually; for they provide much better thatch than straw, and not only cottages, but many good houses are covered in them...The birds which inhabit the different fens are very numerous: I never met with a finer field for the zoologist to range in".* Earlier, Willoughby (1678) had written that nearby *"to one fowling sometimes you shall have four hundred boats meet. We have heard that there have been four thousand Mallards taken at one driving in Deeping Fen".*

As well as fenland habitats there were meres and mosses in parts of Fenland, including England's largest lowland lake, Whittlesey Mere, and all these meres and mosses were also drained.

On the other hand certain of the Great Washlands that were created by the drainage schemes to carry highland water across Fenland developed to become internationally important sites for biodiversity. Land ownership has played a crucial role as the Ouse Washes retained its interest, while the Nene Washes has had a chequered history although it is now a superb wetland and the Welland Washes has not flooded since 1953, when a flood relief channel was opened around Spalding. It is now almost all arable farmland.

Those few sites that remained owe much to a handful of people. Charles Rothschild, who did more than anyone else to establish the practice of nature conservation in England was instrumental in saving Holme Fen and Woodwalton Fen. The first gift of land to the National Trust at Wicken was in 1899 but G.H. Verrall made the single largest single gift of land in 1911. Charles Darwin collected beetles at Wicken Fen in the 1820s. These were the first nature reserves to be established in Britain. Not only that but they were also the sites where the first ecologists such as Arthur Tansley and palaeo-ecologists such as Harry Godwin helped establish their science. As such these are iconic places in England's culture.

It is important to note the great diversity of the fenland habitat. This is demonstrated by the fact that 8,459 species (excluding subspecies) have been recorded from Wicken Fen, of which invertebrates make up 74.4% of the species. A total of 40 species have been added to the Wicken list in the last two years, nearly all invertebrates.

6.1 Data on Fenland biodiversity

Mountford and Redhead (2012) brought together a great deal of information for a Fens NCA Workshop on 5 December 2011 and I have selected from this data-pack information for the Plan area. The data regarding designations in general and SSSI and their condition in particular, together with data on agri-environment schemes is presented in Appendix 2. The condition of the core Fenland SSSI in the Plan area is shown in Table 2.

Table 2. The condition of the core Fenland SSSI						
Core SSSI	% Area meeting PSA target	% Area favourable	% Area unfavourable recovering	% Area unfavourable no change	% Area unfavourable declining	% Area destroyed / part destroyed
Holme Fen	99.83%	268.95ha 99.83%	0.00%	0.45ha 0.17%	0.00%	0.00%
Woodwalton Fen	97.91%	111.16ha 53.28%	93.11ha 44.63%	4.37ha 2.09%	0.00%	0.00%
Wicken Fen	100.00%	120.07ha 47.08%	134.96ha 52.92%	0.00%	0.00%	0.00%
Nene Washes	100.00%	303.85ha 19.95%	1219.05ha 80.05%	0.00%	0.00%	0.00%
Ouse Washes	19.13%	391.13ha 15.56%	89.66ha 3.57%	2023.79ha 80.87%	0.00%	0.00%
Baston and Thurlby Fens	100.00%	35.42ha 64.88%	19.17ha 35.12%	0.00%	0.00%	0.00%
Chippenham Fen	100.00%	113.01ha 72.65%	42.55ha 27.35%	0.00%	0.00%	0.00%
Cam Washes	73.84%	122.96ha 73.84%	0.00%	0.00%	43.56ha 26.16%	0.00%
Total: 5,137.22ha		1,466.55ha	1,598.5ha	2,028.61ha	43.56ha	0.00

This table indicates that all is not well even with the core sites in Fenland. This is no surprise as the problems of summer flooding on the Ouse Washes, the adverse effects of poor quality floodwater on the Woodwalton Fen drains and ditches and scrub invasion on sites due to lack of management are all well-known and are being addressed by current restoration initiatives.

Nevertheless it is a salutatory reminder of the work needed to make sure these sites reach favourable condition and stay there. Only a section of the Cam Washes is still declining.

Table 3 shows the areas of priority habitats by subzone and is based upon habitat inventories undertaken by Natural England (percentages indicate the proportion of that subzone under that habitat), after Mountford and Redhead, 2012.

Table 3. The areas of priority habitats in Fenland (also see Map 1)		
Priority Habitat	Subzone	Settled Inland Fens [Area (Percentage)]
		Open Inland Fens [Area (Percentage)]
Reedbed		0ha (0%)
Fen		653.3ha (0.24%)
Purple Moor-grass and Rush Pasture		37.7ha (0.14%)
Coastal and Floodplain Grazing Marsh		1,796.8ha (0.66%)
Lowland meadows		5387.7ha (1.97%)
Lowland Calcareous Grassland		11.1 0.02%
Dry Acid Grassland		14.5 0.02%
Lowland Heath		0ha (0%)
		9.4ha (<0.01%)
		7.2ha (<0.01%)
Area of all priority habitats in subzone		25.6ha (0.04%)
		12,101.8ha (4.4%)

It is notable from the above table and from the information in Appendix 2 what a small proportion of the 'Settled Inland Fens' has any Priority Habitats, 25.6 ha or 0.04%, nor any designations, 6.5 ha of SSSI and 51.1 ha of AONB (the only area of AONB in the Plan area). This area has perhaps the most productive agricultural land in England.

Mountford and Redhead, 2012 also present information about changes during the 20th and 21st century by comparing the *First Land Utilisation Survey* (1937) with the situation shown by the latest *Land Cover Map* (2007). Though already dominant prior to World War II, the proportion of arable increased from 68% to 83.7%, with the main decline being in grassland and grazing (from 22.4% to only 8.6%). The urban area has remained largely unchanged but the extent of woodland has almost doubled (from 0.7% to 1.22%) reflecting numerous plantings. The extent of orchards has witnessed a marked decline.

Although Priority Habitats only account for 4.4% of the 'Open Inland Fens', they include internationally important areas of fen, reedbed, purple moor-grass and rush pastures, lowland meadows (the washes) and grazing marsh.

6.2 County Biodiversity Action Plans

Information on the extent of wildlife habitats is often difficult to obtain and this certainly applies to Fenland. The information in Table 4, which shows the current extent of fenland habitat by County, is taken from the four County Biodiversity Action Plans (BAP) that cover Fenland:

Table 4. Current extent of fenland habitat by County			
County	Fen	Reedbed	Floodplain Grazing Marsh
Lincolnshire	100 - 150ha with 35ha at Baston Fen	100ha (mostly outside the Fens, on the Humber)	700ha +
Cambridgeshire and Peterborough	c 1050ha	No estimate of area	c 2900ha (Ouse and Nene Washes, Ouse Washes part Norfolk)
Norfolk (Fenland)	n/a	n/a	n/a
Suffolk (Fenland)	n/a	n/a	n/a
Total	c1,100ha	n/a	3,600ha +

The above table shows that only c4700 ha (c1.4 %) of the Plan area now contains national BAP habitat. In other words since the 17th century there have been enormous losses of wet fenland habitats in the Fens. The consequence is that the range of specialist animals and plants associated with the Fens are now rare or threatened with extinction.

We have also sought to bring together information on BAP targets from the four County BAPs and Regional Biodiversity Strategies (See Tables 5a-e).

Table 5a. BAP targets to 2015			
Target to 2015	Maintenance	Restoration	Creation
Lincolnshire			
Fens (revised 2011)	Maintain extent	95% of sites achieve favourable condition	280 ha (of fen, swamp and wet reedbed). Also develop and promote two large-scale (100ha+) fen habitat exemplar sites with public access and interpretation.
Reedbed, revised 2011.			
Floodplain grazing marsh (revised 2011)	Maintain extent	800 ha	800 or 1000 ha

Cambridgeshire			
Fens, updated 2009*	Maintain extent (1050 ha)	Maintain in favourable condition. Restore 50 ha.	Support landscape scale wetland projects Wicken Fen, Great Fen and Kingfisher Bridge.
Reedbed, updated 2003, targets to 2010.			
Floodplain grazing marsh, updated 2003, targets to 2010.			
* No habitat creation objectives are included in this plan. This is because it is felt that the grand fen restoration schemes are not only providing a most effective vehicle for the re-creation of fen habitats in Cambridgeshire but also because the non-prescriptive nature of those schemes renders the setting of targets in terms of timing and areas meaningless. The emphasis of this plan is therefore on the maintenance and restoration of the existing fen resource.			

Table 5b. BAP targets to 2020			
Target to 2020	Maintenance	Restoration	Creation
Lincolnshire			
Fens		95% of sites achieve favourable condition	1000 ha. Create/extend at least one 100ha fenland habitat each in the Witham peatlands zone, and the Stickney and Deeps historic fenland zone, and at least two sites within the South Lincolnshire Fenland target area.
Reedbed		95% of sites achieve favourable condition	500 ha
Floodplain Grazing Marsh		2000 ha	2000 ha
Cambridgeshire	n/a	n/a	n/a
Norfolk	n/a	n/a	n/a
Suffolk	n/a	n/a	n/a

Table 5c. East Midlands Regional Biodiversity Targets						
	Manage /restore to 2005	Creation to 2005	Creation to 2010	Manage/restore to 2015	Creation 2015	Creation 2020
Floodplain grazing marsh	5000	800	N/A			17,285
Fen	500	N/A	1000			2675
Reedbed	100	300	N/A			87

Table 5d. East of England Regional Biodiversity Targets						
	Manage /restore to 2010	Creation to 2010	Creation to 2010	Manage/restore to 2010	Creation to 2010	Creation to 2010
Floodplain grazing marsh				1900 (1023)*	2500 (2377)	
Fen			400 (566)			
Reedbed					1000 (515)	
*Figures in brackets relate to progress on targets to 2010						

Table 5e. Analysis of current habitat creation on Fenland					
Core areas	Target re-creation areas – total area	Area already re-created	Area currently being re-created	Area with re-creation planned	Area where no re-creation is currently planned
4740.45ha	11,792ha	574ha	1534ha	1233ha	7864ha

This is not the only wetland re-creation that has been undertaken as at one stage the Nene Washes comprised more than 25 – 30 % arable land (Thomas et al, 1981) and much of this area has been restored to wetland habitats.

Taking into account that the total size of the target re-creation areas identified to date is 11,832 ha, of which the area with re-creation either completed, underway or planned is 3,341 ha, **then a target for this Plan of 20,000 ha by 2062 seems appropriate to allow fenland habitats a viable future.** This recognises that targets need to combine both realism and ambition. This figure only relates to re-creation areas – it does not include the land necessary for the creation of connections between areas.

It is not necessary in this Plan to reiterate the value of the different BAP habitats that are found on Fenland. However Appendix 3 shows the UK BAP species associated with fens and fen vegetation in Cambridgeshire and Appendix 4 shows those that occur at Wicken Fen, both

from the Cambridgeshire and Peterborough BAP. Appendix 5 lists the species that have become extinct at Wicken Fen

Similarly the BAP priority species associated with ponds, lakes and reservoirs in Cambridge and Peterborough according to the Million Ponds Project are shown in Appendix 6.

Reedbeds support a diverse fauna, including 6 nationally rare Red Data Book bird species (including bittern, bearded tit and marsh harrier) as well as 5 GB Red Data Book invertebrates which are closely tied to this habitat (including reed leopard moth and swallowtail butterfly).

Sea level rise is expected to change or destroy large areas of coastal reedbed, especially in Norfolk and Suffolk. As indicated in the UK BAP, compensatory reedbeds should be created to reduce the net loss. Cambridgeshire already holds areas of reedbeds, and the potential for expanding these or creating new reedbeds on Fenland is likely to become very important in future years. Indeed this is precisely what the Environment Agency's Regional Habitat Creation Scheme is doing; the Wissey sites for example are part of this scheme.

Fenland drainage ditches are a widespread and characteristic feature right across Fenland but unfortunately they have not been surveyed to any great extent and knowledge about the distribution of different types of ditches is very limited. There is a very good description of this habitat outlining key species present in the Cambridge and Peterborough BAP (see list of rare species associated with this habitat in Appendix 7).

6.3 Fenland Species

It is surprising that as far as I can find there is no authoritative recent account of changes in the species composition of the main habitats on Fenland; fens, reedbed, floodplain grazing marsh, fenland ditches and farmland. In fact some of the main past losses have been associated with the loss of raised bog that used to occur in some areas and now is really only found in rudimentary form at Holme Fen. An account of the losses from Wicken Fen is provided in Appendix 5. It is hoped that the Fenland Biodiversity Audit (see below) will remedy this situation. Probably the best account remains Godwin, 1978.

See also Section 9.3.2 which makes reference to changes in the aquatic macrophytes at Woodwalton Fen NNR, due to declines in water quality.

There are iconic Fenland species that promote the case for conservation on Fenland which include; crane, whooper and Bewick's swans, bittern, bearded tit, wet grassland birds (mainly waders, e.g. black-tailed godwit, snipe, lapwing, redshank, yellow wagtail) otter, water vole, eel, fen violet, giant spearwort, marsh-pea, marsh sowthistle, sweet-gale, sphagnum mosses, saw sedge, Norfolk hawk dragonfly, swallow-tail and large copper butterflies and the Lesser Silver Water Beetle.

The Swallow-tail butterfly is an interesting case. This wetland species was lost from Wicken Fen in the 1950s, as all of the land around the Fen was drained for arable agriculture, and the Fen itself began to dry out. Three attempts at re-introducing Swallowtails have failed (1950s, 1970s, 1990s). By the 1950s, the isolated island habitat of Wicken Fen was simply too small, and too isolated from other swallowtail locations, to enable the species to survive. No further

attempts to re-introduce this species will be attempted until the extent of suitable habitat has increased to well over 1000 ha (S. Warrington, pers.com.).

The water vole at Wicken is also interesting. It became extinct at Wicken in 1998 but re-colonised in 2008 and has since spread across the whole site, from the old fen to the ditches and pools in the restored land. It seems to have escaped from the debilitating impacts of mink, once it had over 750 ha of Wicken Vision land to spread across, and was no longer restricted to the 250 ha of the old fen (S. Warrington, pers.com.).

6.4 Fens Biodiversity Audit

The Fens for the Future partnership has commissioned the Audit to develop an evidence-based approach to conservation management in the Fenland, by understanding what species are present in the area and which are of conservation concern, and through understanding the requirements of these priority species, provide guidelines for their conservation. The project will make an important contribution to our understanding of fenland species and the implications for their management. Financial contributions have been made by Natural England, Environment Agency, Norfolk Biodiversity Partnership, Cambridgeshire & Peterborough Biodiversity Partnership and National Trust but many partners have contributed their time.

This project has three elements that will draw together evidence and expertise from partners in order to: describe all the taxa that have been recorded within the Fenland NCA, including those that are extant and regionally/nationally extinct, and identify species important for conservation action (including BAP, RDB, Nationally Notable, Rare and Scarce, and species nationally restricted to Fenland); group species into guilds, defined by species shared requirements for physical structures and ecological processes and using the same methodology derived for the Breckland Biodiversity Audit; and then make land management recommendations in order to benefit the broadest number of species groups and assemblages.

The Cambridgeshire & Peterborough Environmental Records Centre have collated approximately 1 million records for 13,000 taxa, including more than 50 species found almost nowhere else in the UK. The team from University of East Anglia are currently assessing the ecological requirements of more than 1,500 species of conservation and defining the guilds. Once the guilds have been defined, the Wildlife Trust for Bedfordshire, Cambridgeshire & Northamptonshire will assess the effectiveness of current land management to deliver the largest proportions of biodiversity and mapping the distribution of guilds will enable targeting of further management and landscape restoration.

The Fens Biodiversity Audit is very much a partnership project; the Fens for the Future partnership is founded on a broad partnership of stakeholders, Lincolnshire and Norfolk Record Centres have provided large numbers of records and the National Biodiversity Network has been extremely helpful in obtaining National datasets for the project. The audit has not only harnessed the recording effort of very large numbers of amateur naturalists, many recorders and taxonomic experts have also contributed knowledge of species ecologies and distributions, and 20 experts attended a Fenland Species Workshop in January 2012.

When this information is collated and analysed it will provide good additional information to help develop the proposed ecological network for Fenland and a yardstick to help judge its effectiveness. What will then be required is further survey work to look at the many areas of Fenland that have never been surveyed.

6.5 Previous approaches to habitat creation on Fenland

A Report was submitted to Wet Fens for the Future in December, 1995, '*Feasibility Study, Phase I, Wet Fens for the Future*' by the School of Agriculture, Food and Environment, Cranfield University which may have had input from Institute of Terrestrial Ecology and Atkins (Mountford, pers. com.). The primary aim of this study was to determine "the feasibility of creating high quality, sustainably managed wet fenland on a large scale within the study area, which includes parts of the Cambridgeshire, Lincolnshire, Norfolk and Suffolk fenlands. A target for the feasibility study was to identify at least five sites of > 20 ha each by December 1995 where the various aspects of fenland creation can be explored in detail. The approach suggested was to identify areas of search within which appropriate fenland creation could be possible by looking at a wide variety of datasets, rather than identifying specific sites".

While this report is of interest in its own right and should be more widely known, it is of particular interest in referencing a dataset for washlands that does not appear to be referenced anywhere else and is likely to be of particular significance for wetland creation on Fenland. To quote this part of the Report "Although drainage of the washlands began in earnest after the mid-1600s, over 6000 ha remained by the early nineteenth century distributed amongst 24 separate sites (see Appendix 8a). Of these sites the major part of 11 and a substantial part of another two were under arable crops by the late 1970s. Indeed approximately half of the 6094 ha of washland that existed in 1825 has been converted into arable, nearly all of which is no longer flooded in winter. The remainder of the washland is mainly rough grassland, some of which has been agriculturally improved".

They go on to note that "There is good correspondence between the distribution of these former washlands and the distribution of significant watercourses in general and in particular in areas of peat. The advantage of restoration of wash grasslands over extension or creation is twofold. First, there is the perception that the area used to be wash grassland, perhaps in the lifetime of the current farming generation. The second advantage is that much of the necessary infrastructure (in the form of banks, bunding, ditches, etc.), may still be in a usable condition".

These are likely to be significant points in relation to development of the proposed ecological network and being able to locate and access this data set would be helpful. There are other key data sets that we have tried to access to help develop the network without success, such as the distribution of hydrological catchments on the Fens.

Atkins have developed a GIS based approach to identify suitable areas for wetland creation which is used by the Environment Agency to progress their Regional Habitat Creation scheme but at this stage it has not been possible to investigate this further.

6.6 Requirements for the re-creation of wetland habitats

To summarise, wetland re-creation on the Fens needs:

- Peatland soils - the establishment of wetland habitats and the encouragement of fen formation is greatly facilitated by the presence of peatland soils, although reedbeds and floodplain grazing marsh can be created by raising water tables in almost any low lying areas or by holding water up by some means. Peatland soils are likely to contain propagules that will help wetland vegetation establish, as well as being good at holding water for drier periods. There are maps available of peatland distribution on the Fens (e.g. Holman, 2011). The peatland soils are generally located in an arc around the south western edge of the Fens (see Table 9 and Fig 2). In Lincolnshire they are restricted to a few limited areas such as East Fen, the Witham valley, the Baston Thurlby area and the Welland Washes. There are restoration projects proposed or taking place in all these areas.
- Elevation – the establishment of wetland habitats really needs to be undertaken in low lying areas. As such it is useful to know where earlier waterbodies were located, such as the historic meres on Fenland, of which Whittlesey Mere is the best known example. Examples of historic (drained) meres are shown in Appendix 8b. There were also 24 Washlands on Fenland (see Section 5.5 above) and again when planning wetland restoration it will be easier to work where structures remain from such washlands. As referred to in Section 5.5 above Cranfield University have used a dataset which located these but we were not able to relocate it. The best remaining example of a Washland that is now mainly intensively farmed is the Welland Washes. LIDAR is a technique that can provide remarkable insights into topography that would be invaluable in planning restoration work.
- Water availability – as noted in Section 8.3 the artificiality of the drainage system on the Fens and the fact that the ground is generally pretty level means that the normal rules of riverine systems do not apply and the IDBs can move water around the system with considerable ease. As such the location of restoration areas next to a source of water is not essential but it certainly helps. It is convenient that the peatland soils generally are located in an arc around the western and northern edge of the Fenland basin, where the main rivers enter Fenland and also where sources of good quality spring water are often available. While water maybe becoming less available the construction of wetlands maybe an excellent way of making use of winter rainfall that would otherwise be lost from the system and making it available to various users later in the year. A number of studies have been carried out on the availability of water for wetland creation on fenland.
- Proximity to other nature conservation sites such as SSSI or Local Wildlife Site – while not essential the effectiveness of action will be greater if there are other sites nearby.

Areas where these factors occur together are likely to be potentially good places for wetland creation.

7 Ecological networks

At the start of the new century various areas and counties had been producing 'nature maps', indicating where the most important habitats were and how they could be joined up to create larger connected areas. Such areas would provide better opportunities for biodiversity to flourish and greater chances for species to be able to move to adjust to the changing climate. Norfolk was one of the counties that undertook an ecological network mapping project and their Biodiversity Partnership reported on it in 2006 *'Report of ecological network mapping project for Norfolk - Presentation of methodology and draft maps for consultation'*.

The maps produced by the project identified the most important existing biodiversity areas in Norfolk as well as opportunities for enhancing, creating and linking habitats.

Some of the points from that study bear repetition:

- Fens - River valley corridors would have some functional value for fens because of the mosaics of wetland habitats and associated species they support. In many cases the priority may be to buffer the fens from adjacent land use by other semi natural habitat such as grassland.
- Grazing marsh - Corridors are shown as the major river valleys (e.g. Wensum, Wissey and Waveney) which would also act as a link between the Broadland and Fenland sites. For the purposes of the map these are shown as habitat creation areas.
- Reedbed - Enhancement and habitat creation areas are in the areas (not Fenland), although the longer term impacts of sea level rise need to take account of coastal flood defence strategies. The creation of reedbed in the middle reaches of Broadland rivers to enable them to adjust to rising water levels caused by sea level rise would be desirable. The greatest opportunity for reedbed creation is in Fenland and some of the lower valleys of Broadland e.g. associated with the development of more naturally functioning rivers.
- Wet woodland - The existing wet woodland in Broadland is at risk from sea level rise. There is significant potential for creating large expanses of woodland *inter alia* on Fenland primarily, but not exclusively, on areas of peat soils.
- "The farmed landscape outside the ecological network - Over much of Norfolk agriculture will remain the dominant activity within the countryside. This land use supports a number of BAP habitats such as cereal field margins and ancient hedgerows. The farmed landscape, however, is recognised as having a major impact on wildlife habitats through, for example, diffuse pollution. The sympathetic management of all farmland will be essential to the success of the ecological network in the long term. It is important to recognise that habitat creation and enhancement can occur throughout the County especially through the progressive implementation of agri-environment schemes.
- Buffering of habitats and sites - Buffering of sites is an important part of the ecological network. A number of initiatives are underway that will help to buffer sites from

external impacts. An important policy driver will increasingly be the Water Framework Directive and also the need to achieve favourable condition for European protected sites and SSSIs. Currently, much of the effort is being targeted at water quantity (e.g. review of abstraction consents affecting European protected sites) and water quality (e.g. catchment sensitive farming projects).

- Relatively little attention, however, is paid to the physical buffering of sites from adjacent land use. A very large proportion of designated sites such as SSSIs as well as CWSs are bounded by intensively managed farmland with the threats from adjacent land use being insidious and often unrecognised. In these cases, buffering can take the form of 'no spray zones' for agricultural pesticides, lower input farming or other, more sympathetic, land use.
- More attention needs to be paid to the adverse impact from these external threats and the requirements of habitat buffering need to be more widely applied. Currently, this requirement is not explicitly mentioned in BAP habitat targets, although BAP actions may seek to address some at least of these threats. The indicative maps do not address buffering needs. It is recommended that more discussion is required in order to determine the specific needs of habitats for buffering”.

The area of Fenland in Norfolk was identified as 'a Zone of large-scale wetland habitat creation and enhancement' on their final indicative ecological network map. In addition the area of Fenland in Norfolk was identified as an indicative enhancement area for reedbeds, wet woodland and floodplain grazing marsh as well as being defined as Strategic River Corridor. The area of Fenland in Norfolk around the Wissey valley was identified as an indicative enhancement area for fens.

A key point in relation to large scale habitat creation on Fenland is that it is unlikely that effort will be expended on the creation of specific BAP habitats, with the exception of reedbed. It is much more likely that the aim will be to create a mosaic of wetland habitats such as wet grassland / grazing marsh and reedbed areas with appropriate water levels and hope that fen habitats will become established over time in some areas. Other areas may be planted as wet woodland or simply not be managed as open habitats, so that woody growth will be accepted as willows etc. become established. Ditch and river systems would then form webs through all these habitats.

One of the drivers behind developing an ecological network is the recognition that change will occur as a result of climate change (UK 2012, Climate Change Risk Assessment) and the approach outlined in the previous paragraph in effect recognises this. An aim is likely to be to develop more naturally functioning wetlands than can occur on the remaining precious core fenland areas. This is likely to influence the types of habitats that will or can be created.

7.1 Strategic River Corridors

Further work that is relevant to the establishment of ecological networks is the development of policies for River Corridors, such as took place in the East Midlands. The East Midlands Regional Assembly produced a *Vision Statement for Strategic River Corridors* in October 2003.

The Policy that was included in the Regional Planning Guidance issued by the Secretary of State in January 2002 read:

Policy 34: Regional Priorities for Strategic River Corridors

Development Plans and other strategies of Local Authorities and other agencies should seek to protect and enhance the natural and cultural environment of the Region's strategic river corridors of the Nene, Trent, Soar, Welland, Witham, Derwent and Dove, along with their tributaries.

Actions of agencies and other bodies including those of adjoining Regions should be co-ordinated to maintain and enhance the multi-functional importance of strategic river corridors for wildlife, landscape and townscape, regeneration and economic diversification, education, recreation and managing flood risk.

A document was produced in February 2004 to provide guidance to Local Planning Authorities on the implementation of this Policy and a project was initiated to help implement it. The project evolved since its conception when it focused primarily on improving biodiversity and flood defence schemes. It was recognised that river corridors must be considered holistically, so that this undervalued natural asset is developed. Rivers, canals and lakes were seen to provide a significant untapped resource that could be harnessed to provide true sustainable development. The environment, people and wildlife could all be winners if organisations work together to deliver this sustainable future.

It was noted that “rivers have been a central element of people’s lives in the past and have shaped the development of our built and natural landscapes. Some of our most important habitats are those that have been around for many hundreds of years. An integrated approach to managing rivers that aims to create natural river channels and the re-instatement of floodplains and wetland landscapes will increase the variety of aquatic and terrestrial habitats within the river corridor. The last ten years has seen a dramatic improvement in the water quality of the region’s rivers. It is now the case that the limiting factors to improving wildlife near rivers are the surrounding habitat quality and physical constraints on rivers. River corridors will also continue to have a key role in contributing towards landscape character and the quality of urban environments”.

While Fenland is very different from a river channel flowing through a wide valley and it is not appropriate to think of fenland rivers being released from their flood banks, this paragraph does have a lot to say of value in treating rivers and surrounding areas sustainably and in creating washlands and wetland landscapes alongside our rivers.

7.2 Green Infrastructure

More recently a number of Green Infrastructure Studies have been published that cover parts of Fenland. These are large complex documents and there has not been time in this study to examine them in any detail. Examples of the approach they adopt are given below using ‘The Wash and the Fens Green Infrastructure Plan’ (W&FGIP) published by the Wash Estuary

Project in 2011 as an example. The W&FGIP is a major piece of work covering all aspects of fenland within their Plan area of the eastern Lincolnshire Fens.

The Vision for the Plan is:

To create and positively manage an integrated network of high quality and where practicable, multifunctional green infrastructure within urban and rural environments that delivers:

- *Enriched and robust habitats with greater connectivity*
- *Enhanced and sustainable public access to the countryside and urban green space for the benefit of all who live, work in and visit The Wash and Fens.*

Within the W&FGIP, green infrastructure features have been broken down into three broad categories. These are:

- Biodiversity green infrastructure features
- Publicly accessible green infrastructure features
- Functional green infrastructure features

Eight types of green infrastructure were identified through their mapping process. They were:

- Habitat (recorded)
- Linear public pedestrian access (pedestrian have access to bridleways and cycle ways)
- Site based public pedestrian access
- Rivers and drains
- Environment Agency flood banks and flood storage areas
- Railways (for their banks/verges)
- Historic features
- Navigable waterways.

The more types of green infrastructure found in each 1km grid square the higher the rating given to that square and thus a darker shading of green on the maps. Very light green has been used to show where no green infrastructure features were recorded. The maps for the W&FGIP are available as static maps in the form of pdf files on the Wash Estuary Strategy Group website and as interactive maps on the Lincolnshire Research Observatory (LRO) website: www.research-lincs.org.uk. However, the maps are only available to partners of Lincolnshire County Council - to view the maps you will have to register with the LRO.

The Plan contains habitat network maps showing areas where there are potential networks and those that are isolated from existing, recorded green infrastructure.

Due to the time available and that mass of data that these maps hold it has not been possible to examine them in any detail.

The Green Infrastructure Strategy for Cambridgeshire by Cambridgeshire Horizons was originally published in 2006 and an updated version was published in July 2011. A King's Lynn and West Norfolk Green Infrastructure Strategy, Stage 1, was commissioned November 2008. Neither of these has been consulted in the preparation of this Plan.

In conclusion it is worth making the point that such studies have particular significance where fenland adjoins major urban areas such as Cambridge, Peterborough or Kings Lynn as linkages from the town into fenland can be reinforced or created to support many types of functional networks which will benefit both local populations and visitors to the area. That is not to say that linkages around smaller settlements and villages are any less significant.

8 An enhanced ecological network for Fenland

At the outset it is useful to refer to the work of Wetland Vision, a partnership of English Heritage, Environment Agency, Natural England, RSPB and the Wildlife Trusts which set out a 50 year Vision for freshwater wetlands in England. 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. Those that are interested in the topic will certainly benefit from looking at the technical document that supports the Vision (Hume, C. 2008). Right at the start the actions that are needed to realise the Vision are set out. Most of the information is set out in easy to understand maps of England. Some of the most important maps are where wetlands were, where they are now and areas with future potential for wetland creation. Not surprisingly Fenland figures prominently as an area with potential for future wetland creation. It also figures as a priority wetland area for the historic environment.

There is also a map showing local visions but unfortunately the legends relating to different projects have become muddled during production. Nevertheless it does show a number of projects on Fenland.

We have based our proposals for an enhanced ecological network on Fenland on the recommendations in the White Paper *'The Natural Choice: securing the value of nature'*, which in turn are based on the Lawton report.

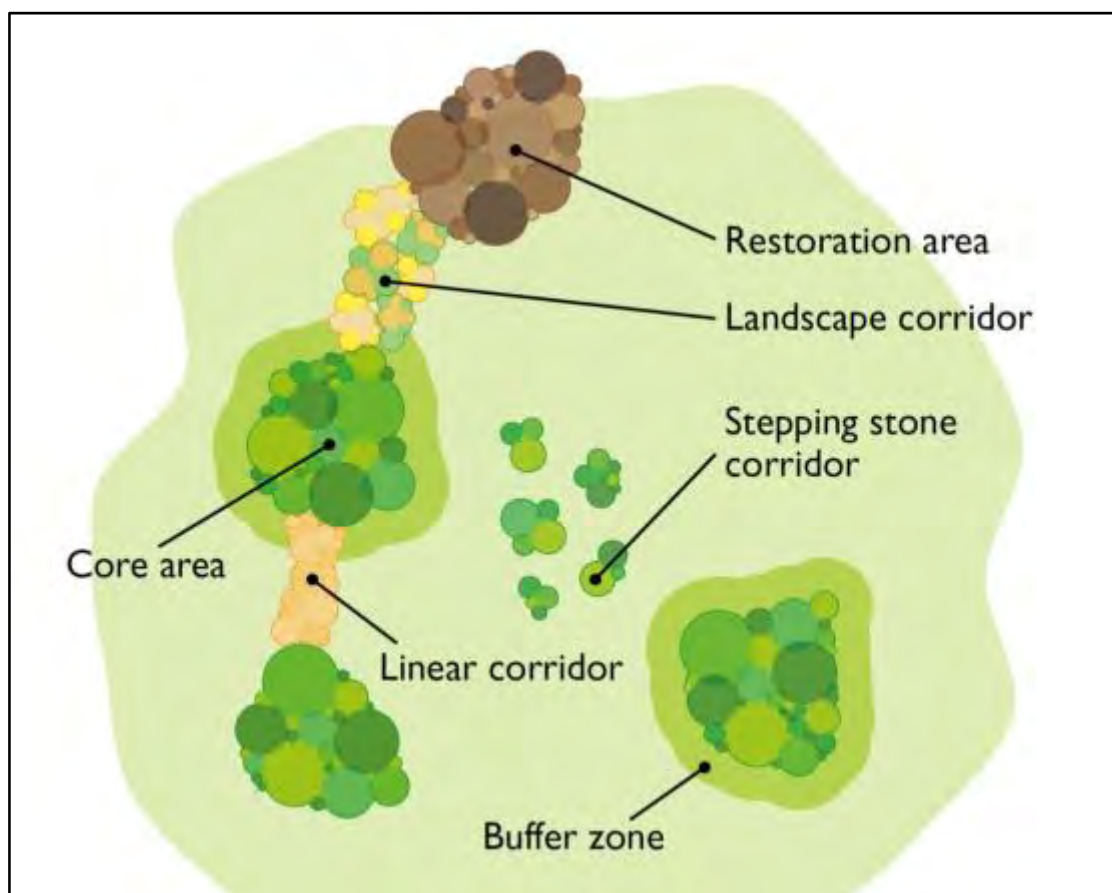


Fig 1. The Components of an Ecological Network

The Report considers that “establishing a coherent and resilient ecological network requires careful planning to ensure the contributions made by existing network components are maximised and new components, such as planned restoration areas, corridors and buffers, are in effective places, thereby ensuring we use precious resources and land in the most efficient ways”.

The proposed Fenland network would have the following five elements based on the recommendations of the Lawton report. We have added one by separating off as a separate element stepping stones, giving six in total:

8.1 Core areas

These are areas of high nature conservation value which form the heart of the network. They contain habitats that are rare or important because of the wildlife they support or the ecosystem services they provide. They generally have the highest concentrations of species or support rare species. Core areas provide places within which species can thrive and from which they can disperse to other parts of the network. They include protected wildlife sites and other semi-natural areas of high ecological quality.

Within Fenland the Core Areas are the remaining areas of fen and the wetland habitats on the Great Washlands. They are all at least SSSI and most have international recognition. They comprise Holme Fen, Woodwalton Fen, Wicken Fen, Cam Washes, Chippenham Fen, Baston Fen, Ouse Washes and the Nene Washes.

8.2 Corridors

These are spaces that improve the functional connectivity between core areas, enabling species to move between them to feed, disperse, migrate or reproduce. Connectivity need not come from linear, continuous habitats; a number of small sites may act as ‘stepping stones’ across which certain species can move between core areas. Equally, a land mosaic between sites that allows species to move is effectively an ecological corridor.

In Fenland the main rivers and drains will form the corridors as it is largely a wetland system. Our proposed landscape corridors comprise the main rivers and drains but we also propose secondary corridors to provide useful additional connectivity and to connect to what would otherwise be blank areas on the map. Creating wildlife corridors on Fenland will be a new activity and there are issues because the land adjoining a main carrier or water course will usually have no connection with that water course. In addition if land in a corridor alongside the water course is to become a wildlife corridor with at least some wetland habitats, then its creation will not be straightforward and will require careful planning. Nevertheless water has a reasonable chance of being available due to the close proximity of the high level carrier. The creation of other habitats such as grassland and woodland in the corridor will be of significant benefit to many species, even without water being available.

8.3 Stepping stones

While the comments under 2 above still apply we have separated out these out largely because of the scale of Fenland which means that such stepping stones have an important role to play, but also to help provide clarity of understanding when compared to 'Restoration areas'. Stepping Stones tend to be much smaller, probably not connected to the network and perhaps not receiving management. Nevertheless as Lawton points out such stepping stones can do much to help create connectivity. More work is required to identify Stepping Stones so that they can be added to the network map.

There are many drains in Fenland and a separate or parallel approach could be to raise water levels in discrete areas of land, as stepping stones, and to border their drainage ditches with broad wildlife strips. Much would depend on how hydrological units 'fall out' on the ground. It is quite likely however that such an approach may not be practical due to the concerns of adjoining landowners and the difficulty of sourcing water for such areas.

8.4 Restoration areas³

These are areas where measures are planned to restore or create new high value areas (which will ultimately become 'core areas') so that ecological functions and species populations can be restored. They are often situated so as to complement, connect or enhance existing core areas. The Lawton Report uses text boxes to highlight examples of good practice and Box 1 on 'Habitat creation and restoration successes' has a paragraph on the Great Fen project.

In Fenland restoration areas are being planned around Holme Fen, Woodwalton Fen (The Great Fen), Wicken Fen (The Wicken Fen Vision), and the Ouse Washes (The Great Ouse Wetland) as well as close to Baston Fen (The South Lincolnshire Fens).

8.5 Buffer zones

These are areas that closely surround core areas, restoration areas, 'stepping stones' and ecological corridors, and protect them from adverse impacts from the wider environment. More work is required to identify Buffer zones so that they can be added to the network map.

Often the restoration areas have been planned around core sites and part of their function is to buffer them. However core areas and restoration areas will frequently require buffering from adjoining intensive land uses. This is in effect a new approach on Fenland and again requires considerable thought and planning. Certainly it will be essential to know the boundaries of hydrological units before progress can be made and the Internal Drainage Boards will be key players in such work. What is clear is that in general a buffer will need to be substantially more than a traditional six metre wildlife strip as widely deployed in agri-environment schemes. It may be necessary to identify ideal buffer land and then work to implement it over a number of years. A key issue is to ensure that water of good ecological quality reaches core areas and restoration areas.

³ It is perhaps unfortunate that this term is used, which has specific ecological meaning, rather than the more widely used term re-creation. This is mentioned here to recognise the potential for confusion arising.

8.6 Sustainable use areas

These are areas within the wider landscape focussed on the sustainable use of natural resources and appropriate economic activities, together with the maintenance of ecosystem services. Set up appropriately, they help to ‘soften the matrix’ outside the network and make it more permeable and less hostile to wildlife, including self-sustaining populations of species that are dependent upon, or at least tolerant of, certain forms of agriculture. There is overlap in the functions of buffer zones and sustainable use areas, but the latter are less clearly demarcated than buffers, with a greater variety of land uses. Although Sustainable Use Areas have been identified on the network map based on the number of target farmland bird species present, more work is required to refine their process of identification.

Lawton elaborates on this in Section 6.5. “The ways in which the wider countryside outside the ecological network – the matrix – is managed is important. If the matrix is hostile, protected sites need to be large, but even small sites can support thriving wildlife if the land around them is sufficiently benign. A richer, less hostile environment around the network will also, in itself, provide space for nature and support the provision of ecosystem services at landscape scales”. This is where environmentally-friendly farming techniques can make a major contribution.

The current situation regarding environmentally sensitive farming in the Plan area is set out in the section ‘*Sustainable agriculture*’.

Our proposal for an enhanced ecological network is set out in the accompanying large format map: *Fens for the Future: A Proposal for an Enhanced Ecological Network*. A smaller version of the map can also be found in Section 18 of this report. As is recognised above this proposal requires further development by the partnership as more work is required to identify Stepping Stones and Buffer Zones. In addition although Landscape Corridors are identified on the map, more work is also required to provide specifications for their establishment and the identification of Sustainable Use Areas requires further development.

SECTION 2 – OTHER CRITICAL FACTORS

9 Other critical factors

9.1 Sustainable agriculture

The drainage of the Fens revealed nutrient rich soil which could be used for farming. In all, 88% of land in the Fens is cultivated and 89% is either grade 1 or 2 agricultural land. These fertile soils account for about half of all Grade 1 land, the most productive farmland, in England. Farming contributes significantly to the success of the local economy, supporting a large number of businesses involved in the production of food and rural tourism. There are an estimated 4,000 farms in the Fens covering all sectors of agriculture and horticulture. This includes arable, livestock, poultry and dairy farming as well as a large number of farms growing vegetables and ornamental plants. Farms in the Fens permanently employ 14,000 people, or 6% of the working population. Horticultural production is particularly labour intensive and a further 13,000 people are employed temporarily throughout the year in the Fens to sow, harvest and process crops. In fact 37% of all the vegetables produced in England are grown in the rich fertile soils of the Fens. As well as their leading role in food production, the Fens are also one of the country's most important areas for ornamental crop production. An estimated 250 farms and nurseries grow hardy nursery stock and approximately 38% of the bulbs and flowers produced in England.

In 2009 the dominant land use on the Fens was for cereals with 137,033 ha or 44% of the farmed land while 46,845 ha or 15% of farmed land was used for growing cash roots (potatoes and sugar beet). Grassland (sole-rights rough grazing and uncropped arable land) and vegetables each accounted for 11% of the total farmed area.

Between 2000 and 2009 the area of farmed land used to grow cereals decreased by 18,600 ha or 12% of the farmed land area, cash roots decreased by 12,601 ha or 21% and grassland by 7,814 ha or 18%. Horticulture accounted for the smallest area of farmed land use and this area decreased by 945 ha or 32%. Over the same period the area of farmed land used to grow oil seeds increased by 13,959 ha or 128%, and the area of land used to grow stockfeed increased by 1315 ha or 442%. The area used for vegetables also increased by 5,510 ha or 18% (draft NCA description).

As far as livestock numbers are concerned pigs numbered 59,741 in 2009, a decrease by 35,761 from 2000 or 48%, sheep numbered 26,857 in 2009, a decrease by 12,657 from 2000 or 32% and cattle numbered 28,054 in 2009, an increase by 1,212 from 2000 or 4%.

Regarding farm labour in 2009 there were 4,300 landholdings managed by principal farmers and 698 managed by salaried managers. There were 2285 full time workers, and 1047 part time workers, and 4549 casual workers or gang workers.

Trends for farm labour from 2000 to 2009 show a decrease of 1,165 in the number of principal farmers, and an increase of 136 in salaried managers. The numbers of full time employees reduced considerably by 1,304 with a decrease of 149 in part time workers. During this period the number of casual workers increased by 373.

The food and drink manufacturing sector is the largest single manufacturing sector in the Fens and generates a turnover of approximately £1.7 billion which, together with businesses that pack and distribute produce, employs around 17,500 people in the Fens, accounting for 7% of employment. Combined, the farming and the food manufacturing sectors provide 13% of jobs in the Fens.

The high agricultural productivity is dependent on pumped drainage which is carried out by a number of Drainage Boards and on flood defence, both fluvial from flooding events such as happened in 1998 and have happened at a number of dates in the historic past, and from coastal inundation such as occurred in 1953. The Environment Agency is responsible for flood defence (see section on water management).

The silt (loam) fens are the most fertile and that these occur in a crescent shaped area facing to the Wash (see Map 3). These soils are stone free, easy to work and can grow more than one crop a year. They accord to the 'Settled inland Fens' in the landscape characterisation of the Fens National Character Area (NCA). Most of the peat soils (previously known as the Black Fens because of the colour of their soil) occur in a strip around the western and northern edge of the Fens with a larger area in the south and south western Fens. Although in the past these were very valuable soils for growing vegetables such as carrots and celery, they are less so now because much of the peat has oxidised away because of drainage and cultivation. The Holme Fen post demonstrates some of the changes that have occurred.

To clarify the above information relates to the entire Fens NCA area, not the Plan area.

9.1.1 Environmentally friendly farming

The main scheme currently available to encourage farmers and landowners to farm in environmentally friendly ways is Natural England's Environmental Stewardship Scheme (ESS). This scheme followed on from earlier schemes such as the Countryside Stewardship Scheme (this and other early schemes are referred to as classic agri-environment schemes, see Appendix 2c). In Environmental Stewardship there are in fact several related schemes:

- Entry Level Stewardship (ELS). As the name suggests this was designed as a relatively simple scheme for farmers to enter which was mainly to do with the boundary features around the edges of fields. There is also an organic ELS scheme.
- Higher Level Stewardship (HLS). A more complex scheme which is aimed at the management of semi-natural habitats and management for farmland birds. This scheme also covers habitat management on SSSIs. There is also an organic HLS scheme.

As funding for agri-environment schemes is limited and in order to help get the best value for money from individual schemes Natural England have introduced Target Areas where they would like to see land coming into ESS. The situation on Fenland is complicated. The Fens itself is not a Target Area for ESS but parts of it are Target Areas, see Appendix 2d. Natural England has also identified 'theme statements' in geographical areas for which they will encourage HLS applications. The situation regarding themes on the Fens is complex, with the NCA straddling two regions and including parts of eight Target Areas. Mountford and

Redhead (2012) summarised all the objectives contained within these statements and identified the most important for Fenland (see Table 6).

Table 6. Important HLS objectives for Fenland	
Theme Statement	No. of agreements
Maintaining and restoring significant areas of nationally important habitats	11
Reversing the decline of farmland birds (arable and wet grassland)	8+
Securing the recovery of national important species (notably arable plants and invertebrates)	0
Improving quality of water-bodies and habitats affected by diffuse pollution	3
Securing positive management of prioritised historic buildings	0
Heritage at risk and important landscapes and boundary patterns	2
Reducing damage to undesignated below-ground archaeology	2
Improving people's enjoyment & understanding of the farmed environment	1

Information regarding the early agri-environment schemes in the Plan area is shown in Appendix 2c, and Appendix 2e shows the information regarding Environmental Stewardship for 2011 (after Mountford and Redhead, 2012).

From this information it is apparent that 91.2% of the Plan area is not covered by a HLS target area (see Appendix 2d). In the Plan area there are the following numbers of agreements of different types (after Mountford and Redhead, 2012):

Table 7. ESS agreements in the Plan area			
Type of ESS Agreement	No. of Agreements	No. of Options	Area ha (%)
HLS alone on the agreement	21	466	2,443 ha (0.7%)
ELS and HLS on same agreement	69	2937	8,957.7ha (2.7%)
ELS alone on the agreement	756	11739	7,847.3ha (2.4%)
OELS and HLS on same agreement	3	244	848.5ha (0.3%)
OELS alone on the agreement	13	260	927.5ha (0.3%)
Overall take up of Environmental Stewardship	862	15646	21,024ha (6.3%)

This shows that 6.3% of the Plan area is under management options from ELS and / or HLS with 2.6% of the area having agreements with only ELS or OELS options.

Mountford and Redhead (2012) looked at the Fens NCA as a whole and found that significant proportions of the main BAP priority habitats in the Fens are under ESS (ELS and/or HLS) i.e. woodlands (25%), meadows (42%), grazing marsh (38%), purple moor-grass and rush pastures (36%), fens (70%) and reedbeds (67.5%). Most of the small area of calcareous grassland is also under ESS (68% under HLS). In 2003 agri-environment schemes for ditches in the Fens were more than 15% of the national total.

They also found that comparing take up of ESS with the broad habitats shown in the *Land Cover Map* (2007) there were high rates of take up in a) fen, marsh and swamp; and b) coastal sediments (salt-marsh and mud-flats). Smaller but important activity was found in woodland, neutral, rough and/or improved grasslands and freshwater. Relatively little activity was occurring within the arable land.

They noted that 37% of SSSI land is under ESS, with most of this area being in agreements with HLS or a combination of ELS/HLS.

9.1.2 Farmland birds

The arable farmland of the Fens has been identified as one of the most important areas in Britain for a range of scarce and declining farmland birds so it is important to consider how they are faring in the ESS on the Fens. Mountford and Redhead (2012) confirmed a focus on birds by comparing take-up data with the known occurrence of arable and (wet) grassland birds in the Fens. Much the highest take-up for areas with a diversity of grassland birds was for option **HK9**, though other **HN5** (for access) and **HP5** (saltmarsh) also focus on known good grassland bird areas. Arable birds appear to be less targeted by HLS take-up, though HE3 and some of the same grassland options (including **HQ11**) also favour these species.

Table 8 shows the total area of the Fens NCA to support, respectively, 5 or 6 target arable birds and 4 or 5 target grassland birds. This is a summary of a table by Mountford and Redhead which shows the proportion of these four areas under each HLS option, whereas here the proportion of each of the areas which is under HLS, irrespective of HLS option, is shown.

Table 8. Area of The Fens NCA supporting high numbers of target bird species			
5 arable birds	6 arable birds	4 grassland birds	5 grassland birds
81,747.5ha (7.91%*)	62,404.8ha (7.16%*)	42,145.2ha (9.74%*)	9,422.1ha (28.04%*)
* The percentage in brackets shows the proportion of the land that supports these species which is in HLS.			

The Mountford and Redhead (2012) report then went on to look at HLS agreements on 11 holdings in some detail to investigate the extent that the desired outcomes for these agreements were being met.

Not referred to above is the contribution that the Fens is seen as making to the '*Campaign for the Farmed Environment*' which is led by the farming and landowning organisations and aims to get more land voluntarily under management for wildlife.

Current activity to conserve farmland birds

The Bird Conservation Targeting Project (BTCP) has been developed to target management and resources towards important sites for scarce and declining farmland and woodland birds. Many datasets have been combined to produce targeting maps showing the most up-to-date and comprehensive distribution of scarce and declining farmland birds.

The Project is supported by a partnership between the British Trust for Ornithology (BTO), the Centre for Data and Recording (CEDaR), the Countryside Council for Wales (CCW), the Department of Agriculture and Rural Development (DARD), Forestry Commission England (FCE), Forestry Commission Wales (FCW), Forest Service (FS), Natural England, the Northern Ireland Environment Agency (NIEA), the Royal Society for the Protection of Birds (RSPB), and Scottish Natural Heritage (SNH).

The project has produced distribution maps which are already being used to guide the spending of hundreds of millions of pounds to benefit birds through agri-environment schemes. The targeting maps help to ensure that government grant schemes are allocated to put the right conservation measures in the right places. Some of the information from these maps is presented on the map showing 'Proposals for an Enhanced Ecological Network on Fenland' which accompanies part of this Plan.

The key arable farmland species, namely corn bunting, grey partridge, lapwing, turtle dove, tree sparrow and yellow wagtail all occur in comparatively good numbers within the Fens and safeguarding their populations is seen as a priority. The BTCP maps indicate the best places to target specific measures to improve habitats (Map 4).

On most farms in the Fens, management can be undertaken to benefit these key species and others and management advice is available from dedicated RSPB advisors. Environmental Stewardship funding through both ELS and HLS is available for arable land within the Fens.

9.1.3 Conclusion

It would appear that there is scope for further agreements to be put in place on the Fens given the small percentage of the area currently under agreement and perhaps more importantly the small number of agreements under most of the important 'theme statements'. It seems likely that the targeting needs to be improved so that all partners are clear what the priorities are and which areas are targeted geographically. This is important on the Fens as much of the land is so intensively farmed that it does not easily fit into HLS, except for those areas with concentrations of farmland birds. Hopefully this Plan can assist with this need.

9.2 Peatland soils

Deep peatlands cover nearly 10% of the UK land area, but an estimated 80% have been damaged. Peat soils can store more carbon than forests and woodland. Lowland peatlands may store more carbon per unit than their upland counter parts (NCA draft analysis). When peatlands are drained for agriculture their stored carbon is no longer protected from decomposition by waterlogging, thus the peats begin to degrade and gradually rot away, releasing carbon dioxide as they decompose.

'The Lowland Peat Survey of England and Wales' (Burton and Hodgson, 1987) systematically recorded the lowland peats across the country and recognised 103,122 ha of peat. Natural England (2010) has a figure of 95,800 ha for 'Lowland Fens / Reedbeds (deep peat)' and 192,200 ha for 'Lowland Fens / Reedbeds (wasted peat)'. At the time of 'The Lowland Peat Survey of England and Wales' lowland peat soils covered 24,000 ha of Fenland, "though they are decreasing in extent and becoming disjointed as they waste under arable use" (Holman, 2009). It is estimated that 16% of the peat stock recorded in 1850 remains and much of the remaining stock will be irreversibly degraded in the next two to three decades (Oates, 2002).

For a soil to be mapped as a peat by the soil classification used in England and Wales, the peat must be at least 40 cm thick and not be buried by more than 30 cm of mineral layers with low organic carbon. Peat horizons can occur within a number of other soils if they do not meet this definition. As peat soils waste due to arable cultivation they will move outside this definition.

The use of peatlands for improved pasture, or for arable or horticultural production requires drainage. Drainage leads to subsidence of the ground surface and the eventual destruction of the fragile peat. Wastage is greatest in thick peat deposits and where water tables are lowest.

The most complete record of peat wastage is that from Holme Fen, as described by Hutchinson (1980). The record shows four stages of peat wastage over the history of the record from the 1850s until the 1970s, each associated with an 'improvement' in the drainage regime i.e. a lowering of the pumped water level. Within each stage, the rate of peat wastage exponentially decreases with time in each stage. Within the final Stage 4 (1962-1978) described by Hutchinson (1980) the peat surface lowered by around 1 cm/year (Holman, 2009).

The original deep peatlands of the Fens are expected to have suffered more wastage than the 3.9 m measured at the Holme Post (Hutchinson, 1980), chiefly because they have been drained for longer and have been more continuously under intensive arable cultivation, particularly during the 20th Century. The alkalinity of fen peats will also have tended to produce higher wastage rates than in the acidic raised bog peats which form the upper part of the Holme Fen profile. The lowering of the surface levels in the "Black Fens" was estimated by Fowler (1933) as up to 4.6 or 4.9 m (compared with about 3.3m at Holme Post at that time). Holman gives a large number of other estimates of peat wastage.

In order to produce a current map of soils on the Fens Holman, from his review of peat wastage rates, assumes peat wastage rates since the last soil surveys by the Soil Survey of

England and Wales will be in the range of 0.7-2.1 cm/year for those sites under intensive cultivation. Natural England (2010) states that the land surface typically subsided at around 2cm a year. Seale (1975b) stated that the “best estimate” of wastage suggests that in 35 years’ time (e.g. 2010) peat that was 90 cm thick will be skirtland. It has therefore been assumed that all of the original areas of ‘Thin peat’ will have wasted to skirtland (peat remnant). Within the Deep Peat areas, it has been assumed that they will still currently be Deep Peat, with the exception of those areas surrounding Lowland Peat Survey observations with less than 1m of peat, which will now be predominantly ‘Thin Peat’.

In the East Anglian fens, where about 60% of remaining peats are less than 1 m thick with an average depth of 70 mm, this suggests a remaining life under the plough of between 25 to 50 years, and considerably less on thinner peats.

This demonstrates that peat wastage or loss is an ongoing process and that any Strategic Plan to design an ecological network for Fenland which is resilient [a resilient ecological network is one that is capable of absorbing, resisting or recovering from disturbances and damage caused by natural perturbations and human activities (including climate change) while continuing to meet its overall objectives of supporting biodiversity and providing ecosystem services] will need to address.

Based on his map of peatland extent Holman estimated that there are four Drainage Board Groups in Fenland which contain areas of extensive peat soils. Combined, the South Level, Middle Level, Witham and Nene Drainage Boards contain an estimated 16,500 ha of surviving peat soils. Within these, there are 33 Internal Drainage Districts (IDD) which contain areas of extensive peat soils. Of these, 5 are estimated to each contain more than 1000ha of surviving peat soils- the Southery and District IDD, Witham 3rd District IDD, Holmewood and District IDB, Middle Fen and Mere IDD and Witham 1st District IDD, which together contain over 50% of the estimated surviving peat soils.

Holman (2009) has a map showing the thickness of peat in the Fenland measured during the lowland peat survey (based on Burton and Hodgson, 1987). He draws three major conclusions from this map:

- The distribution of peat thickness in the arable sites is heavily skewed, with the highest frequency of sites having a peat thickness of less than 50 cm. **Of the estimated 24,000 ha of peat soil in Fenland, Burton and Hodgson (1987) estimated that only 10,500 ha of peat soils had peat thicker than 1m.**
- The nature reserve and washland sites tend to have greater typical peat depths. Burton and Hodgson (1987) estimated **that over 2300 ha of the 10,500 ha of peat soils with peat thicker than 1 m are located in nature reserves or under grass in flood relief washlands.**
- He provides an indicative map of current average peat thickness, taking into account that it is around 25 years since the fieldwork for the lowland peat survey was carried out.

Holman (2009) has a useful map showing the estimated annual volume loss or wastage of peat soils in Fenland by Internal Drainage Board District.

In 2011 Holman revised his 2009 paper based on a collation of available peat survey auger bore records to provide an improved assessment of the peat depth within the likely areas of remaining peat soils in Fenland (see Table 9 and Fig 2). In total, data for 1823 soil profiles were collated, having removed duplicate observations. This work allowed Holman to revise his 2009 estimate of the extent of peat since the 1987 Lowland peat Survey of England and Wales.

Table 9. Estimated current extent of peat soils in Fenland				
Drainage Board	Thick peat	Thin peat	Peat at depth	Total area (ha)
Middle Level	3,751	2,476	2,131	8,357
Nene	565	643	1,162	2,370
South Level	3,079	7,053	2,632	12,763
Tidal Witham	137	150	0	288
Welland	88	445	865	1,399
Witham	343	1,715	0	2,058
Total Area (ha)	7,964	12,481	6,790	27,234

It is worth noting that usage for permanent grassland can conserve peatlands, providing wetness is maintained. However, the removal of vegetation through grazing and hay/silage cutting, and the extraction of materials for thatching and fuel, limits the further formation of peat soil. Conditions conducive to peat formation are likely to limit land use to extensive summer grazing.

Carbon storage within the peat soils in Fenland

Based on given assumptions and simplifications, Holman (2009) estimates carbon storage within the peat soils of Fenland at approximately 41 Tg of carbon. It is recognised that there is considerable uncertainty in this estimate, due primarily to data paucity.

Holman 2011 estimates that with wastage, this has reduced to an estimated current total stock of around 37 Tg of carbon held within the peats of Fenland.

Estimated carbon emissions from drained Fenland peat

Based on given values of wastage, bulk density and organic carbon content, Holman estimates the carbon emissions from Fenland peat wastage at approximately 3.8×10^8 kg C/yr or 0.4 Tg C/yr. This is equivalent to 9 % of the annual loss of Organic Carbon from 0-15 cm depth of all soils across England and Wales (Bellamy et al., 2005) and about 0.3% of the UK's annual industrial emissions of CO₂.

In Holman 2011 the carbon emissions from Fenland peat wastage are revised to 0.5 Tg C/yr, of which about 80% comes from surface (thin and thick) peats. With the smaller current area of surviving peat, the current annual emissions are estimated at around 0.4 Tg C/yr within the IDD, of which about 70% comes from surface (thin and thick) peats. Table 10 and Figure 3 show the current annual Carbon emissions per unit area of peat within Fenland for areas of both surface and buried peat.

The annual per hectare GHG flux (t CO₂e) from different types of peatland under different types of land use were taken from data reviewed by Natural England (2010). These values are shown in Table 10.

Table 10. The GHG emission (t CO₂e) from different peatland types under different land uses (Source: Natural England)		
Land use	Fen peatlands (deep)	Fen peatlands (wasted)
Cultivated and temporary grassland	26.17	4.85
Improved grassland	20.58	
Afforested	2.49	
Restored	4.20	
Undamaged	4.20	

England's peatlands – carbon storage and greenhouse gases (Natural England, 2010) has, for the first time, estimated the carbon and greenhouse gas consequence of the degraded state of our peatlands. Their initial estimate is that over 3 million tonnes of CO₂-e is currently being lost to the atmosphere every year from England's peatlands. Their analysis suggests that most types of peatland restoration will deliver greenhouse gas benefits and that these benefits also represent good value for money. **The greatest benefits, and best value for money, appear to be from restoration of deep fen peatlands under agricultural use.** However, restoration of upland peatlands should also deliver widespread carbon savings at an acceptable cost to society.

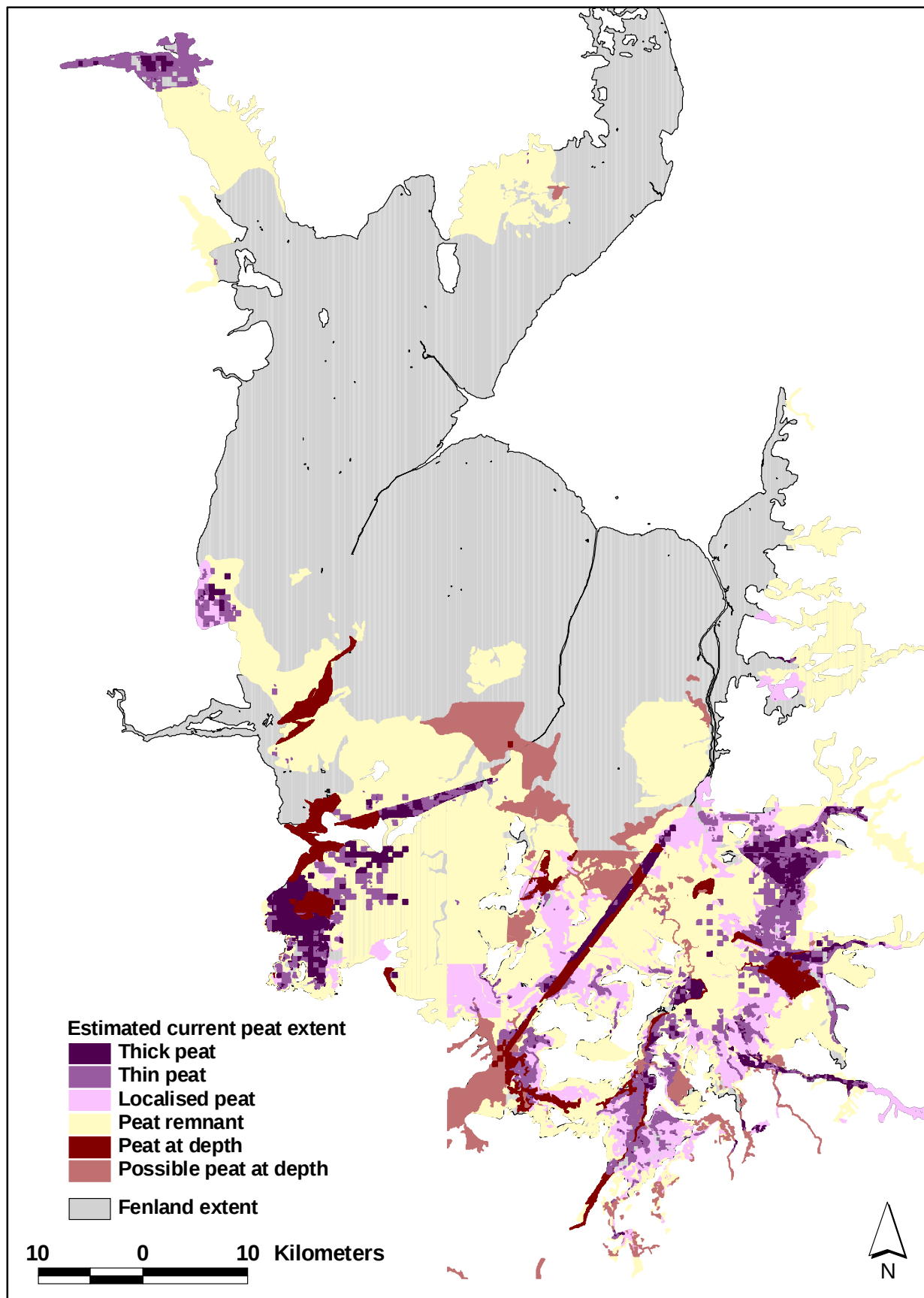


Fig 2. Revised map of the extent of peat on the Fens (Holman & Kechavarzi, 2011)

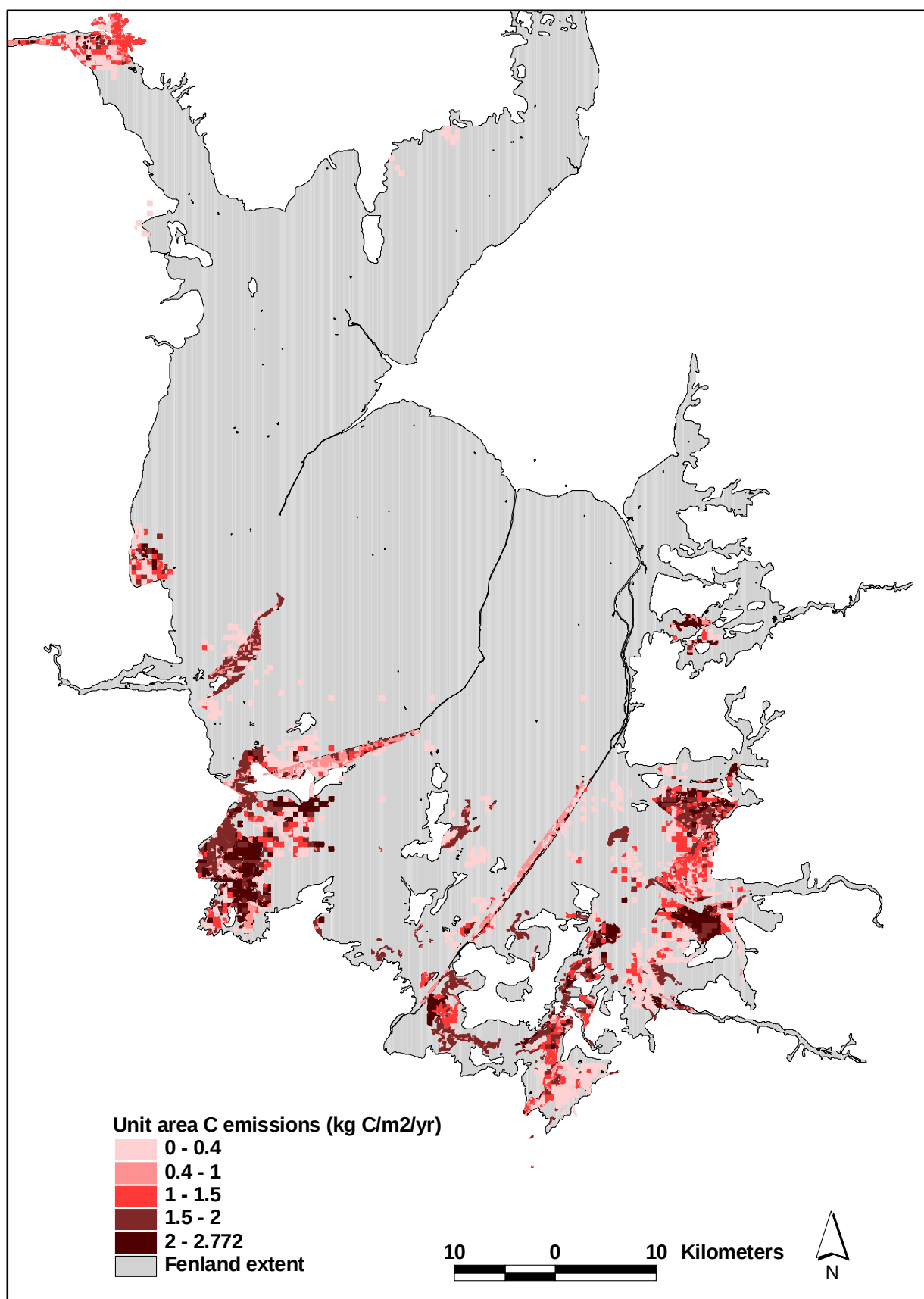


Fig 3. Current annual carbon emissions per unit area of peat within Fenland (Holman & Kechavarzi, 2011)

From the above description it will be evident that peatland soils provide a wide range of Ecosystem services which are included in the summary of these in Appendix 1.

Natural England (2010) presented evidence which justifies a more balanced approach to future peatland management where full recognition is given to carbon storage and the other benefits of healthy, resilient peatlands. **They propose that the best way to meet this challenge is to support and establish landscape-scale delivery projects, involving a wide range of stakeholders, to pull together a coherent approach to peatland management which fully understands the importance of peatlands to climate change and the other benefits of more active peatlands. Fens for the Future can be such a landscape-scale delivery project.**

9.3 Water management

Fenland is one of England's major river basins and the four main fenland rivers, Ouse, Nene, Welland and Witham drain 10% of England into the Wash. Drainage has taken place on Fenland since the Roman times onwards, if the Car Dyke had a drainage function as well as providing transport. Much drainage was undertaken by the Fenland monasteries, as demonstrated by Morton's Leam, created c 1490 and still functioning today. The Fenland we see now is entirely man-made. The main rivers are high level carriers that take water originating from high ground right across the Fens to major outfalls such as at Denver sluice. The great Washlands were provided so that at times of flood there was somewhere for the water to go rather than on valuable farmland. Further information about the number of washlands on the Fens is given in Section 5.5 (see also Appendix 8a).

In between these main rivers and drains at a high level is the extensive farmland at a low level, much below sea level. These areas are maintained by Internal Drainage Boards (IDBs) which use pumps to move excess water up into the high level carriers or at the coast, up and out to sea. Members of each Board include elected farmers and local councillors who represent the interests of people living and working in the Fens. Initially wind supplied the energy to pump the water out and at one time 700 or more wind pumps dominated the Fens' landscape. With the advent of steam power in the 19th century steam powered pumps began to take their place. The modern electric pumps can move the equivalent of 16,500 Olympic sized swimming pools in 24 hours.

At present approximately half a million people live on the Fens which cover an area of almost 1,500 square miles encompassing 13 districts, four counties and two government offices. Well-maintained flood defences remain essential and IDBs maintain 3,800 miles of watercourses and 286 pumping stations. Coupled with over 60 miles of coastal sea walls and 96 miles of fluvial embankments the Fens are well protected, despite their vulnerability to flooding. Predictions of sea level rises of up to 82cm by 2080, together with an increase in the frequency and intensity of storm surge events mean that there must be a continued programme of investment in flood defences.

Because of the artificiality of the drainage system referred to above and the fact that the ground is generally pretty level, the normal rules of riverine systems do not apply in Fenland and the IDBs can move water around the system with considerable ease. Nevertheless there are still sub-catchments and smaller hydrological units where the levels will be the same.

Within such units the IDBs generally operate a principle that water levels cannot be changed to benefit a particular landowner, if that change will disadvantage other landowners. This means that to make changes to water levels land owners need to be able to isolate their land from other land. There are ways to achieve this – for example by buying an entire hydrological unit or installing an impermeable membrane. This principle has important implications for wetland conservation on the Fens and for the establishment of an ecological network.

The conservation of biodiversity is now seen as important by the IDBs and indeed they have statutory drivers to encourage them in this direction. They, with the Environment Agency, are one of the Authority's responsible for producing Water Level Management Plans for statutory sites and they also have had a programme of producing their own Biodiversity Action Plans which form a useful way of prioritising their activities. Nevertheless the management of ditches, dykes, banks and embankments for flood protection in the area has, in many cases, led to a reduction in aquatic and marginal vegetation and biodiversity (Atkins, 2004).

9.3.1 Water availability

The hydrology of any particular part of Fenland is complex and it will be important to know from the Catchment Abstraction Management Strategy (CAMS) whether particular catchments have water available or not. This is not that easy to establish as some studies on Fenland, such as in the Welland CAMS, are still continuing and there are a number of individual CAMS studies for each of the river systems. It would help if a single Fenland River Basin CAMS could be produced. Maps 5 and 6 in the Mapping Appendix show the CAMS boundaries and a summary of current water availability respectively.

The draft National Character Area (NCA) analysis states that “those rivers that have been subject to assessment have a CAMS status of ‘no water available’ in the summer months, and a ‘water available’ CAMS status during winter months (typically the period of high flow).

In any event the design considerations are site specific and while 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. Various studies into water availability for wetland creation have been carried out (e.g. Souch et al, 2000). It is very likely that any major re-creation project will have to commission its own study into water availability and security of supply. For example the ‘South Lincolnshire Fenlands Partnership’ has recently commissioned a ‘Biodiversity & Integrated Catchment Management Scoping Study’ in support of developing a partnership approach to biodiversity and water management within the River Glen catchment and neighbouring hydrologically connected areas.

The initial work by Wet Fens for the Future and Wise Use of Floodplains proposed the creation of new multi-functional wetlands on Fenland. Progress since the mid 1990s has been limited and has been led by various conservation organisations, rather than by the water or drainage sectors. However dry winters in 2010/11 and 2011/12, with the declaration of drought in the spring of 2012, means that a further dry winter in 2012/13 would have serious consequences, both for agriculture and the environment. At present much of the winter rainfall and much of the rain that fell in April 2012 will have run straight to the sea and have been lost. As part of the proposals for an enhanced ecological network

on Fenland now may be the time for more ambitious proposals to be adopted that involve creating new wetlands that can hold some of the run-off from winter rainfall or storm events and make it available to other users at later periods, as well as making valuable contributions to biodiversity. This would have far more societal benefits than simply creating large numbers of relatively small on farm reservoirs with very limited ecological value, often nevertheless grant aided by the Rural Development Programme for England. Such new wetlands would contribute significantly to *Biodiversity 2020: A strategy for England's wildlife and ecosystem services* objectives and Water Framework Directive targets for Fenland.

9.3.2 Water quality

There are two Priority Catchments under the England Catchment Sensitive Farming Delivery Initiative (ECFSDI) that fall partly within the NCA; the Little Ouse (Thetford Area) (located in the south east of the NCA) and Lincolnshire Coast Rivers (located in the north east of the NCA), see Map 7 in the Mapping Appendix (NB, in fact there appear to be several catchments in the south east of the NCA as shown on Map 7). Soil erosion and soil wash is identified as an issue in the Little Ouse Priority Catchment particularly in areas of steep slopes and light sandy soils, under maize and root cropping while in the Lincolnshire Coastal Rivers Catchment, soil erosion may be associated with outdoor pig rearing and areas of intensive cereal and oil seed rape production.

Within both Priority Catchments excess nitrates and phosphates and pesticides from arable and horticultural food production are also identified as issues. Excess nitrates, phosphates and pesticides have led to pollution and eutrophication in water courses while sedimentation (a product of soil erosion) of rivers is a feature of these Priority Catchments.

The Water Framework Directive (WFD) is a major area of work for the Environment Agency. The WFD aims to get all water bodies - lakes and groundwater aquifers as well as rivers - into 'good ecological status' - or better - by 2027, with a series of 'landmarks' (2015 and 2021) to check progress. The Water Framework Directive became UK law in December 2003. It provides an opportunity for the Environment Agency to plan and deliver a better water environment with the focus on ecology.

The Water Framework Directive will help to protect and enhance the quality of: surface freshwater (including lakes, streams and rivers); groundwater; groundwater-dependent ecosystems; estuaries and coastal waters out to one mile from low water.

The Environment Agency is the lead authority in England and Wales responsible for carrying out improvements to inland and coastal waters through better land management. Their protection from diffuse pollution in urban and rural areas will:

- Drive wiser, sustainable use of water as a natural resource
- Create better habitats for wildlife in and around water
- Create a better quality of life for everyone

The current situation with regard to the ecological status of water bodies in the Fens under the Water Framework Directive is shown in Map 8.

The Anglian River Basin Management Plan indicates that generally the Ecological Status of rivers and waterways in the Fens NCA are either good (for example the River Haven, parts of the River Nene and the River Welland north of Spalding) or moderate (for example the River Witham north west of Boston), see Map 8. Chemical water quality is generally good apart from sections of the Nene and Great Ouse which fail to reach good status. For much of the NCA the groundwater chemical status has not been assessed due to unproductive strata, but for the area that has been assessed (in the west of the NCA) the groundwater chemical status is good.

It is worth noting that there are a number of papers that document the decline of aquatic macrophytes at Woodwalton Fen NNR due to the poor quality of water that was pumped onto the site, e.g. Palmer, 1975; Bridges, 1988; Pankhurst, 2002 and Newbold, 2010.

More broadly the Lawton Report made the following comments on the Water Framework Directive which “encourages management at catchment scales to protect inland and coastal waters, as well as groundwater. The Directive requires Member States to ‘aim to achieve good status’ in all water bodies by 2015 taking account of both ecological and chemical qualities. In response, in 2009 the Environment Agency published River Basin Management Plans (RBMPs) that classify and set objectives for water bodies which include around 40% of England’s rivers, our largest lakes, water-dependent Natura 2000 sites and 170 SSSIs. These plans indicate that despite considerable progress to tackle acute pollution over the past 20 years, major problems still remain: 22% of rivers and 25% of all water bodies met ‘good status’ requirements in 2009, a figure that is set to grow to around 30% by 2015. Because they take a whole-system approach, RBMPs potentially provide a basis for protecting and enhancing the inland and coastal freshwater components of an ecological network. Flood and Coastal Erosion Risk Management also has a key role to play in shaping the freshwater environment. Together these plans provide an opportunity to integrate the design of ecological networks with our needs to manage water now and into the future”.

It is quite clear that those responsible for addressing water quality and flood risk issues on Fenland need to be engaging at a senior level much more frequently with other key partners to develop innovative partnership based solutions which will help develop and construct an ecological network on Fenland. A possible model for this approach could be the partnership working developed by the Environment Agency to reach agreement on the Shoreline Management Plan for the Wash coast. The Fens for the Future partnership should facilitate these meetings.

This Links directly to Recommendation 4 of the Lawton report:

“Public bodies and statutory undertakers planning the management of water resources should:

- make space for water and wildlife along rivers and around wetlands;

- restore natural processes in river catchments, including in ways that support climate change adaptation and mitigation; and
- accelerate the programme to reduce nutrient overload, particularly from diffuse pollution”.

A recent report *Woodland for Water: Woodland measures for meeting Water Framework Directive objectives* (Nisbet et al, 2011) highlights the contribution that woodland can make to sustainable flood management, to water bodies remaining at risk of failing good water status despite improvements in agricultural land practices, and to the need to mitigate the effects of climate change. The benefits are potentially greatest for the planting of riparian and floodplain woodland, which can help to reduce diffuse pollution, protect river morphology, moderate stream temperature and aid flood risk management, as well as meet Biodiversity Action Plan targets for the restoration and expansion of wet woodland.

The contribution to tackling diffuse pollution includes both a barrier and interception function, whereby the presence of trees reduces the risk of direct contamination by agricultural activities on the adjacent land, and helps to trap and retain nutrients and sediment in polluted run-off. Riparian and floodplain woodland benefits for protecting river morphology and moderating stream temperatures are well proven, while a good case can also be made for mitigating downstream flooding. Planting Short Rotation Coppice or Short Rotation Woodland in these locations could help to maximise some benefits but also presents some risks.

Despite strong policy support for woodland expansion for water benefits, the scope for woodland planting at present remains limited by insufficient financial incentives and wider land use constraints. Nevertheless woodland planting is likely to have a role to play in establishing an enhanced ecological network on Fenland, especially with regard to landscape corridors.

It is worth noting that at ‘*The Fens – Delivering Environmental Benefits*’ Integrated Biodiversity Delivery Area event held in December 2011, *Workshop 3 - Sustainability in The Fens* noted that “There was discussion as to what was meant by ‘sustainability.’ IDB engineers present confirmed that status quo of intensive arable production is ‘sustainable’ by pumping and can be maintained for 20-30 years but that changes in how land is managed will be needed beyond this point. We need to future proof fenland in the medium to long term. We have to decide how different we want the Fens to be and when”.

9.3.3 Flood risk management – Catchment Flood Management Plans

The Catchment Flood Management Plans (CFMP) considers all types of inland flooding, from rivers, ground water, surface water and tidal flooding, but not flooding directly from the sea (coastal flooding) which is covered by Shoreline Management Plans (SMPs). The role of CFMPs is to establish flood risk management policies which will deliver sustainable flood risk management for the long term. The Environment Agency (EA) will use CFMPs to help target their limited resources where the risks are greatest.

The CFMP identifies flood risk management policies to assist all key decision makers in the catchment. They are produced through a wide consultation and appraisal process, however they should be seen as only the first step towards an integrated approach to flood risk management. The introduction states “As we all work together to achieve our objectives, we must monitor and listen to each other’s progress, discuss what has been achieved and consider where we may need to review parts of the CFMP”.

Overview of the current flood risk

Flood risk has two components: the chance (probability) of a particular flood and the impact (or consequence) that the flood would have if it happened. The probability of a flood relates to the likelihood of a flood of that size occurring within a one year period, it is expressed as a percentage. For example, a 1% annual probability flood has a 1% chance of occurring in any one year.

Currently the main sources of flood risk for people, property, infrastructure and the land are:

- river flooding from the main rivers and their tributaries;
- tidal flooding from the tidal sections of the main rivers where tidal water could rise over the top of the embankments;
- breaching/failure of embankments, which could be a problem along rivers that cross the fenland area of the catchment. This type of flooding is difficult to predict but could cause rapid flooding of areas immediately behind the embankments, which could result in a loss of life to people; and
- flooding within the areas managed by the Internal Drainage Boards, which is generally caused by high rainfall onto already saturated ground.

As an example of how the Environment Agency currently manages the risk in the catchment the following is taken from the Nene CFMP:

“The catchment has a history of flood risk, generally due to high rainfall that can lead to flooding of the river valleys and the breaching/overtopping of flood defences. Over the last 50 years numerous engineering schemes have been implemented to reduce flood risk in the catchment, including:

- the widening, straightening and embanking of rivers. Embanked rivers within The Fens area of the catchment provide protection up to a 1% annual probability river and tidal flood.
- building flood bypass channels. The bypass channel at Greatford provides protection up to a 1% annual probability river flood;
- constructing reservoirs. Flood storage reservoirs upstream of Market Harborough, Medbourne and Great Easton provide protection up to a 2% annual probability river flood; and
- flood alleviation schemes. The flood walls at Stamford and Market Harborough provide protection up to a 1% annual probability river flood.

In addition to these engineering schemes, other flood risk management activities are carried out in the catchment. These include activities which help to reduce the probability of flooding and those that address the consequences of flooding.

Activities that reduce the probability of flooding include:

- maintaining and improving existing flood defences and structures;
- maintaining river channels;
- maintenance of drainage networks by Internal Drainage Boards (IDBs) and landowners; and
- maintenance of road drainage and sewers”.

It is noticeable how rarely solutions that work with natural processes, as opposed to hard engineering solutions, are identified in these lists.

Future direction for flood risk management

In CFMPs the catchments are divided into distinct subareas which have similar physical characteristics, sources of flooding and level of risk. The most appropriate approach to managing flood risk for each of the sub-areas is identified and allocated one of six generic flood risk management policies.

Flood risk management policy options

In the Witham, Welland, Nene and Ouse CFMPs for the Fens sub-area the preferred policy option is:

Policy 4: Areas of low, moderate or high flood risk where we are already managing the flood risk effectively but where we may need to take further actions to keep pace with climate change.

This policy will tend to be applied where the risks are currently deemed to be appropriately-managed, but where the risk of flooding is expected to significantly rise in the future. In this case we would need to do more in the future to contain what would otherwise be increasing risk. Taking further action to reduce risk will require further appraisal to assess whether there are socially and environmentally sustainable, technically viable and economically justified options.

The CFMP then has sections on each of the subareas. Examples are given from the Welland and Nene CFMPs:

The issues in the Welland CFMP, Fens sub-area:

There is grade one and two agricultural land at risk in the Fens in the 1% annual probability river flood, but no critical infrastructure is at risk. These lowland areas are mainly rural, where historically much of the land has been drained for agriculture. Embanked watercourses carry water from upstream across these areas to outfall along the coast. The

probability of flooding has been significantly reduced in these areas through actions taken primarily for land drainage purposes. There is a perception of little or no risk. However flood defences can fail or be overwhelmed which means that some areas have significant residual risk and the consequences of flooding have the potential to be serious.

The issues in the Nene CFMP, Fens sub-area:

This lowland area is mainly rural, where historically much of the land has been drained for agriculture. Embanked watercourses carry water from upstream across these areas to outfall along the coast. The probability of flooding has been significantly reduced in this area through various engineering works including those for land drainage purposes. There is a perception of little or no risk. However, flood defences can fail or be overwhelmed which means that there can be significant residual risk with potentially serious consequences of flooding. Currently five properties within this sub-area are at risk from the 1% annual probability river flood. There is less than 1% of Grade 2 agricultural land at risk of flooding in this sub-area. There is no critical infrastructure at risk in the current at risk from the 1% annual probability river flood.

The Fens sub-areas for each of the Witham, Welland, Nene and Great Ouse CFMPs each have the same Vision and preferred policy:

Policy option 4: Areas of low, moderate or high flood risk where we are already managing the flood risk effectively but where we may need to take further actions to keep pace with climate change. A rationale follows the policy:

‘Historically, the Fens have been heavily managed by a number of organisations to reduce the probability of river and tidal flooding. Flood risk is expected to increase in the future to people, property and the environment. In the short term it will be feasible and effective to maintain the existing flood defences at the current level of flood risk management. However, in the future the protection given by these defences may decline as future flooding is expected to become more intense. It may be difficult to maintain the current level of flood risk management into the future for all low lying areas. Where it is technically, environmentally and economically viable, the policy is to undertake further activities to maintain the current level of flood risk management into the future.

Within the Fens sub-area, the preferred approach is to produce a flood risk management strategy to develop a sustainable, integrated and long term flood risk management approach. The strategy should investigate how flood risk varies across the Fens and the best approach to manage this risk, which may include making space for water. The strategy may highlight the need to carry out further work in some areas, while in others we may be able to continue with or reduce our flood risk management activities. As part of this strategy, flood risk from breaching of the existing defences should be considered. To develop a sustainable flood risk management approach the strategy must bring together organisations and other plans and projects across the Fens. This included considering flood risk from the rivers Witham, Welland, Nene, Great Ouse along with tidal risk and the policies set within The Wash SMP.

The key messages

- In the short term, it is still feasible and effective to maintain the existing flood defences at the current level of flood risk management.
- Produce a strategy to develop a sustainable, integrated and long term flood risk management approach for The Fens.
- **Proposed actions to implement the preferred policy**
- Produce a flood risk management strategy for The Fens to investigate how flood risk varies across the area and the best approach to manage this risk.

The key messages and proposed actions are somewhat more complex for the Great Ouse catchment but the above is the essence of the approach that is proposed for all the fenland sub-areas of the main river catchments.

Conclusion

In general the risk of flooding on the Fens at present is low and defences are good. In fact the level of protection provided is high. However the approach adopted has depended largely on hard engineering solutions rather than working with natural processes and it is notable for example how few washlands providing environmental enhancements are in use or have been constructed. It is encouraging that the preferred approach is to develop a more integrated approach involving all key partners and given the changed national policy position for biodiversity this is timely, necessary and welcome. The approach needs to take account of the requirement to develop an enhanced ecological network for Fenland and progress will certainly be easier if a fenland basin approach can be adopted. Good communication channels will need to be established and maintained to allow such an integrated approach to be developed.

9.4 Recreation and tourism

Rather than look in general at recreation and tourism across Fenland, this section concentrates on what is one of the largest regeneration strategies in England because of the potentially great synergies with the creation of an enhanced ecological network for Fenland.

In 1997 the **Fens Waterways Regeneration Strategy** was published and identified projects for developing the potential of the Fens for recreation, tourism and leisure over a 15 year period. The main proposal was for a new navigation ring, through the cathedral cities of Eastern England (Lincoln, Peterborough, Ely) which would avoid the need to pass through the difficult waters of the Wash (see Map 9 in Section 17).

A key part of the Strategy was the Feasibility Study for the Fens Waterways Link, which was produced as a Millennium Project in August 2000. In 2004 Atkins published an Implementation Plan which completed and built on the initial report. The following information is taken from these detailed plans.

The following supporting documents are also available from the Environment Agency as part of the Feasibility Study: Economic Analysis; Navigation; Engineering; Strategic Appraisal; Water Resources; Planning Issues and Land ownership issues.

Both the East of England and East Midlands's Regional Economic Strategies, and their respective Tourism Strategies recognise the importance of tourism in economic regeneration (tourism contributes £5 billion to the East Midlands Economy alone). An emphasis on the value of the waterways are seen as key in developing non-car based recreational opportunities such as cycling, walking, boating, and riding. The Tourism Strategies are also very clear on the benefits of tourism in improving the quality of life of residents. The Link will be recognised for recreational opportunities such as cycling, walking, riding and watersports and will be attractive to locals and visitors alike.

The Link will also be ideally placed to exploit the growth in wildlife tourism by connecting wildlife sites, enhancing existing areas and in creating new larger areas of wildlife habitat.

The Link will be complementary to the Norfolk Broads, helping to cement the image of the region as the place to be for water based and quiet recreation. The walking, cycling and boating experience will be far different from that found on the Broads though due to the linear nature of the Link and the peaceful, isolated countryside through which it flows.

The Vision for the Fens Waterways Link is impressive. The Link will represent the most significant strategic development of the inland navigation network of the UK in two centuries and will be the biggest navigation enhancement project in Europe. It will open up 240km of waterway; 80km of new waterway and increased access to 160km. This will create a new navigation route in the Fens to connect the existing navigations of the Trent, Fosdyke Canal and Witham with the Welland, Glen, Nene, Great Ouse, Middle Levels and the Grand Union Canal. The benefits envisaged are summarised in Table 11.

Central to the investment in this programme for regeneration is the economic benefit it offers the community. Through its stimulation of property development for residential, holiday properties, commercial and leisure opportunities, the area will attract businesses, long term investment, vacation spend and day trippers. The Link will provide a unique tourism asset that will provide real benefits to the local community through additional jobs and better transport facilities.

It is predicted that the Link will attract:

- 200,000 additional day visitors per year bringing in nearly £10m per year to the area.
- 800,000 additional visitors owing to bird watching, jogging, photography, picnicking and general relaxation bringing in nearly £4m per year in the area.
- An income through boating holidays of over £3m per year.
- At least 600 new privately owned boats leading to an income of around £1.5m per year.
- Income generated through boat trips and restaurant boats of £0.1m per year

- Income generated by the hire of day boats at some £0.05m per year
- Over 1700 full time jobs created to construct The Link; 80% taken from local communities
- Links with new technology.
- Skills and training opportunities to increase the economic activity of the Fens.

As well as all these benefits there are of course other issues that need to be addressed such as water availability. Using predicted boat numbers and movements this preliminary water balance assessment has calculated that the total additional demand of the Fens Waterways Link will be approximately 2500 Ml per annum assuming all water used for lock movements is lost to tide. This is a worst case estimate, as it assumes no back pumping or reuse of water transferred between catchments.

Along the route of the Link there is no additional summer surface water or groundwater available, as this is fully committed to existing abstractions and the environment. There is however, winter surface water available in all five catchments through which the Link would pass.

Preliminary consideration has been given to a range of options to meet the water demand of the link. These have been drawn out of options identified in Water Resources Strategies prepared for the Anglian Region and include:

- the use of three or four strategically sited winter storage reservoirs filled from winter surface water;
- utilising water from the existing Eye Brook Reservoir;
- effluent re-use;
- local water transfers and back pumping.

However, it is also recognised that the Link presents an opportunity for wider water resource management benefits (for example, to transfer and store water for public supply or agricultural use). A twin track approach is therefore recommended with investigations into sourcing water for the purposes of the Link progressed together with further discussions with potential partners over the wider water resource benefits that could be realised. It is hoped that these wider benefits could now lead to more ecologically sustainable solutions being adopted that would fully integrate with the proposed enhanced ecological network.

Construction of the Link is proposed over six phases of which Phase 1 is complete - construction of new lock connecting the Lower River Witham with the Black Sluice Navigation (South Forty Foot Drain) via the Boston Haven, providing access to 35km of navigation previously closed for nearly 50 years - and the implementation of Phase 2 is well advanced (Boston to Donington Link (Boston Barrier), combined tidal flood risk management/navigation structure). Phase 3 is the Donington to Surfleet Link which is a new waterway to connect the Black Sluice Navigation to the River Glen. This is an important linkage from an ecological

network perspective as it would be possible to significantly expand habitat creation around Baston Fen as part of this scheme.

It is likely that the above benefits are now optimistic given the financial difficulties that have affected the economy since 2008. Nevertheless this is still a major infrastructure project that has the potential to bring enormous environmental benefits with it. Indeed since the time that the Link was originally proposed the momentum behind taking action to enhance biodiversity has increased greatly. The combination of the Link providing many of the connections to assist with the establishment of the Fenland ecological network, as well as supporting the creation of some of the new restoration areas next to it, is certainly an integrated and innovative approach that could bring great benefits to biodiversity and WFD objectives on Fenland. This demonstrates the need for the two Partnerships to work closely together.

It is important to note that the Fens Waterways Link is only a Project, not an independent entity. The entity that is supporting the establishment of the Link is the Lincolnshire Waterways Partnership which initially comprised the Environment Agency, Lincolnshire County Council, British Waterways and now also includes Lincolnshire Spatial partnership and the Lincolnshire Wildlife Trust. The transformation of British Waterways to the Canals and Rivers Trust may have an impact on the timescales for moving forwards. **It seems vital to the development of the enhanced ecological network for Fenland that a Memorandum of Understanding should be agreed between the two Partnerships, with a degree of cross representation between them.** Lincolnshire County Council has staff whose time is in part allocated to the development of works related to the Link.

The Fens for the Future partnership also need to influence the various Waterspace Studies that Fens Waterways Link is producing such as the Peterborough, Bedford and Spalding Waterspace Studies.

Finally some further context for tourism in the area. In 2009 in Lincolnshire tourism was responsible for £971.64 million of local spending, supporting 17,175 FTE jobs (RSPB, 2011). In Cambridgeshire, including Peterborough, in 2010 total tourism value was almost £1.9 billion with 18,131 FTE jobs (Tourism South East, 2010). As is often the case we have not been able to find figures relating specifically to Fenland.

Table 11. Summary of potential benefits of developing the Fens Waterways Link
Sport and recreation
• Create an important sport and recreation resource • Contribute to the health and well-being of society • Form corridors linking urban areas to the countryside • Promote accessibility to recreation for all members of society • Create a new and improved fishery of regional importance • Promote social inclusion and a better quality of life
Tourism
• The Link will provide a tourism attraction with a strong brand • Provide a connection between existing and new attractions • Support the holiday industry through water-based activities • Protect and enhance the distinctive Fenland environment and attract a sustainable increase in visitor activity. • Fishing, walking, wildlife watching and cycling will help to address the seasonality of the current tourism offer
Heritage, culture and natural environment
• The Link will form a landmark feature in its own right • Provide access to a wide array of important historic buildings, structures and monuments • Contribute to the diversity of the natural environment by sustaining habitats and supporting rare species • Contribute to achieving biodiversity targets and incorporating sustainability principles at all stages of the project • Contribute to open space provision • Provide a resource for water supply, water transfer and land drainage
Economic opportunities
• The Link will provide a range of opportunities that will create a more diverse economy and increase the skills base of the local economy and will; • Be a tourism asset in its own right and will provide a connection between existing and new attractions • Act as a catalyst for economic renewal, including use of local labour force • Increase development value and the opportunity for investment • Focus and bring together regeneration opportunities • Generate long term economic activity and opportunities for employment • Be attractive to EU funding • Help diversify the rural economy • Promote innovation and technology, including access to broadband

9.5 Health and quality of life

Growing medical evidence shows that access to the natural environment improves health and wellbeing, prevents disease and helps people recover from illnesses. Experiencing nature in the outdoors can help tackle obesity, coronary heart disease and mental health problems.

Green spaces provide a wealth of opportunities for exercise and sport. Evidence shows a brisk walk every day, in a local green space, can reduce the risk of heart attacks, strokes and diabetes by 50%, fracture of the femur, colon cancer and breast cancer by 30%, and Alzheimer's by 25%. Add to this the impact of exposure to nature and green space on stress, mental health, aggression and violence within inner city communities and on ADHD amongst children and the full picture in relation to health and wellbeing and access to green space can start to be understood.

The natural environment offers many benefits for health and wellbeing:

- It reduces stress levels
- It encourages people to be more active, which is very good for health
- It helps people avoid getting ill
- It helps people with an illness remain stable
- People live longer if they live near areas of green space

The UK has one of the highest death rates from heart disease in Europe, with 115,000 dying prematurely each year. People using the natural environment keep active longer and adults who become more active halve their risk of dying early from heart disease.

Improving health saves money. Physical inactivity has serious effects on human health, which cost the UK economy more than £8 billion a year. Not only is sickness absence costly in terms of wages paid to staff who are not at work, but it also affects the output of a fully staffed team or business. Improving physical and mental health through connection with and exercise in open green space can help to reduce the amount of sick leave taken.

Aside from the use of green infrastructure to improve health, the resultant improved health can reduce the severity of ailments, the expense of treating ailments and it can shorten recovery time periods (Bird, 2007).

The Report "A Natural Health Service" (Natural England, 2009) estimates that for every £1 spend on establishing healthy walking schemes the NHS could save £7.18p in the cost of treating conditions such as heart disease, stroke and diabetes.

Research underlines the strong links between good physical health, good mental health and the natural environment. Outdoor activities, particularly walking, offer a cheap and accessible route to better health for all, and address many of today's pressing public health issues. The continued use of green space for physical activity is strongly linked to the quality of the landscape - in terms of beauty, diversity, and contact with nature.

Sociable walking is recommended around the world as a simple, cheap and popular form of exercise. In contrast to more structured exercise, such as visiting the gym or team sports, walking is highly accessible, even to high-risk health groups. The Chief Medical Officer in England reports that walking between 6 and 12 miles a week can reduce the risk of premature death by 20 to 30 per cent (Natural England, 2009).

Green space has a key role to play in the drive to increase levels of physical activity across the nation. Detailed studies of two recent schemes, using the natural environment to promote fitness ('Health Walks', co-ordinated by Natural England and 'The Green Gym', run by British Trust for Conservation Volunteers), show that being in contact with nature both encourages people to take exercise and sustains their participation in physical activity.

Nature reduces stress. Access to green space can also help alleviate a range of mental health problems. For example, contact with nature reduces stress within minutes; increases the elderly's satisfaction with where they live and improves children's concentration and self-discipline, including the symptoms of attention deficit disorder (Bird, op cit).

The UK Biodiversity Action Plan has established targets to restore and recreate natural habitats. The delivery of these targets would not only fulfil the Government's international obligation to halt biodiversity loss but would also deliver on a wide-range of other people-based Government objectives, including enhanced public health.

Nearly 40% of adults spend some of their leisure time carrying out water related recreation. The most popular activities are walking, swimming and visits to the beach. Boating, angling and other water recreation activities are increasing in popularity, with nearly 10% of adults regularly taking part in one of these activities (Environment Agency, 2009). The waterways of the green infrastructure network of the Fens support these activities, helping improve peoples' health and increasing their enjoyment of the natural environment. However, care needs to be taken to ensure the environment remains healthy in spite of these activities.

9.6 Living above the water line: the importance of fenland archaeology

This section was prepared by Kasia Gdaniec from Cambridgeshire County Council.

Beneath blanketing layers of marine clays, freshwater silts and peat, many metres below sea level, lie buried the prehistoric archaeological landscapes of the East Anglian fens. Today, Fenland appears to be a flat, featureless area of low-lying land, but peel away these agriculturally enriching deposits and an entirely different landscape of low hills, many rivers and their floodplains, ponds and mires would be seen. The coastline of The Wash did not exist. This diverse terrain provided varied resource-rich locales for human settlement since the end of the last glacial period and contained extensive areas of low-lying *dry* land that became submerged beneath contrasting successions of high energy deposits and slow-forming peats in expanding marsh lands over time. On account of their burial, we cannot know the density, longevity, type or significance of archaeological remains that are located at greater depths beneath the sequence of deposits infilling the fen basin. However, archaeological remains of all periods of sites located on land forms that were less deeply buried beneath the peats of the southern fens have emerged over the last 50 years through a

combination of peat loss and cultivation in areas where peaty ploughsoils are now less than 30cm thick.

9.6.1 The ancient environment

The earliest periods of post-glacial flooding in the fen basin are coincident with the drowning of 'Doggerland' - the low-lying land mass between East Anglia and The Netherlands which existed from the end of the last Ice Age until about 6300BC. Presently submerged beneath the North Sea, this palaeolandscape has been mapped using seismic data (Gaffney, Fitch & Smith, 2009). Rising sea levels following the melting of the ice caps flooded parts of it, separating higher ground of Britain from that on the European mainland creating new coastlines in the process. Doggerland was host to Mesolithic communities living in this hilly tundra zone, archaeological evidence of which was first found in the early 20th century when blocks of peat containing recognisable artefacts of Mesolithic date were dredged up by fishing trawlers. Considerable artifact assemblages and remains of tundra-species land animals have subsequently come from trawlers, from mineral extraction in the North Sea and also from scientific sampling of the sea bed over the Doggerland landmass. They indicate both the depth below present day sea level of former habitable land, and also the effects of climate change and sea level rise on the prehistoric landscape.

The Flandrian deposits that cover the fens were laid down at different periods within the last c.4,500 years following this major period of sea level change that had led to the deposition of silts and clays in the old rivers choking them in places. Peat development in the later Mesolithic period (c. 6,500-6000BC) occurred in the river channels that were unable to debouch their loads across the rising fen floor. Late Neolithic marine transgressions (c. 2,500BC) introduced thick layers of fine, bluish sticky clays (the 'Fen Clay') across the entire basin, in which only the high crests of the former hills remained exposed. Gradually the fen floor rose altering the natural drainage pattern considerably, leading to an increase in perched water and the further development of peat. Later prehistoric marine events deposited further silts and clays again within the basin, but the development of reed peat in the southern fen expanding outwards and upwards prevented much of this silt from reaching the southern margins. Deposits of silty clay alluvium were subsequently deposited all around the landward margins of Fenland, derived from soils eroded from the Midlands and deposited by seasonal or episodic flooding from the Roman period onwards⁴ (Fig 4).

⁴ Details of modern and historic palaeoenvironmental investigations undertaken to establish the presence and type of deposits in the fenland sequence, and, importantly, to provide an absolute chronology of stratified or singular deposits, can be found in: Waller, M. 1994. *The Fenland Project, Number 9: Flandrian Environmental Change in Fenland*. East Anglian Archaeology 70. Cambridge.

English Heritage commissioned *The Fenland Project* in the 1980s in response to the known deterioration of sites in Fenland that were being eroded by cultivation or subject to de-watering through land drainage. The aims were to identify exposed 'surface' sites through an extensive field walking programme supported by detailed aerial photographic survey of the area. A selection of sites would then be assessed in terms of their significance and to create a body of evidence that would aid local and national agencies in their effort to protect and manage sites, and landscapes, for the future - see Coles, J and D. Hall, 1998, *Changing Landscapes: The Ancient Fenland*. Cambs Co. Co. and WARP (Wetland Archaeological Research Project).

These alterations of the fen basin over time caused significant changes the habitable areas for human populations and wildlife alike.

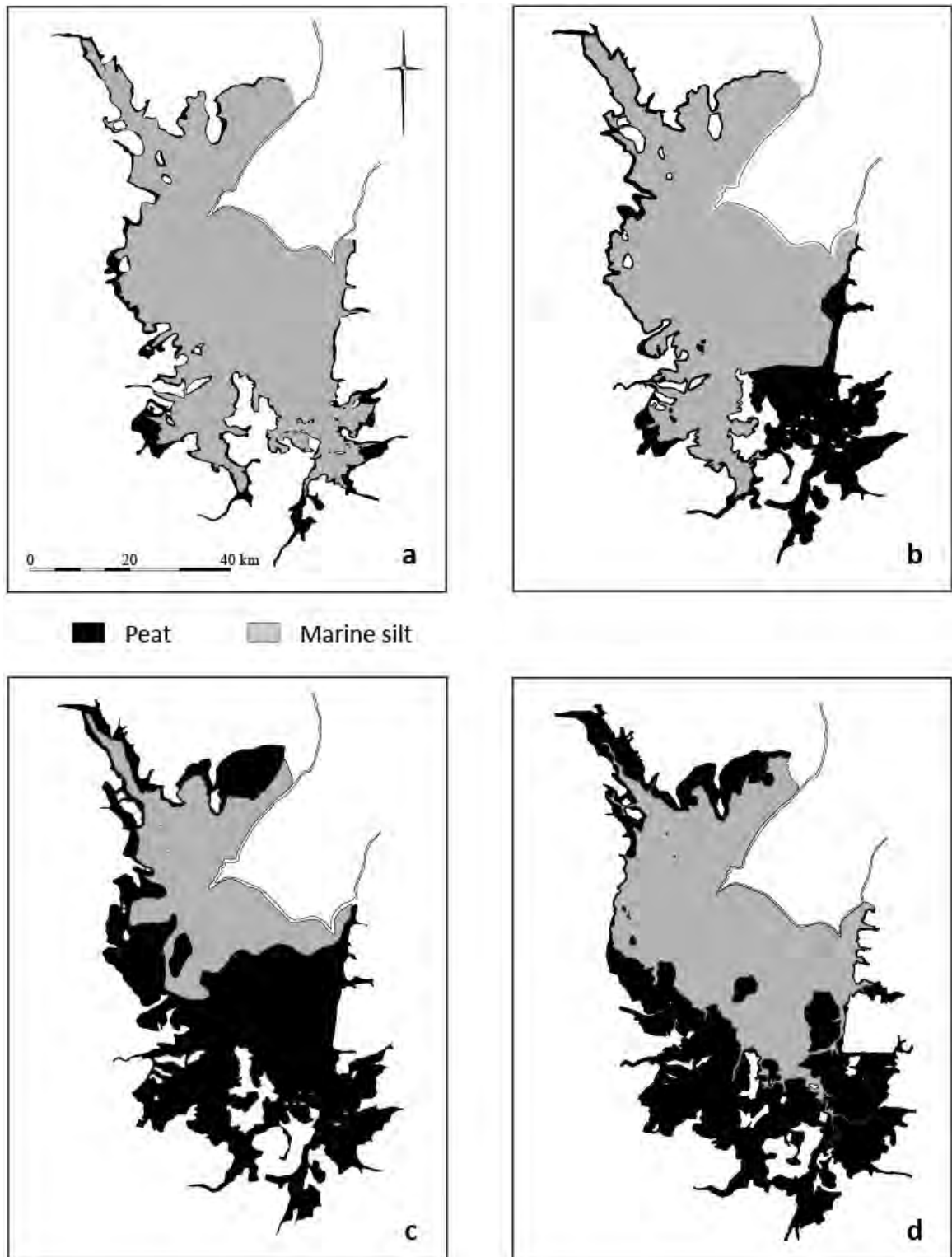


Fig 4. The succession of deposits infilling the basin of the East Anglian Fens: a) the late Neolithic marine zone, b) the development of the Early Bronze Age peat marsh, c) the later Bronze Age salt marsh, d) the extent of the late prehistoric upper peat.

9.6.2 Archaeological Survival

The full sequence of clays, silts and peats did not extend evenly and ubiquitously across Fenland owing to both the character and height of topographic features that became buried within it, and the force of transgressions or flood episodes (French, 2003). In some areas only freshwater peat development occurred, while in other areas where silts and clay sequences predominate it did not fully form (e.g. in large parts of Lincolnshire). The highest part of the land mass in Fenland, at heights around 3m OD, remained dry land throughout, eventually forming long-lived 'islands' in the growing marsh that were host to numerous settlements on their crests, while those at their lower margins became gradually submerged.

We know that the late marine transgressions in the late Iron Age period (c. 100BC) did not extend as far inland from the ancient coast in the southern fen as it had in the Neolithic period, but silts and clays were deposited in a large swathe around the former coastal fringe of The Wash and extensively across Lincolnshire resulting in large areas of tidal saltmarsh. Only the major rivers in Cambridgeshire were affected by these later inundations, much reducing their width and ability to flow across the increasingly infilling fenland basin. As rivers had played a major part in the location of settlement throughout prehistory, due to their use for transport and also for an abundance of resources within them and in their floodplains, their gradual choking led to shifts in settlement patterns, forcing communities at the fen edge to move to ever higher land. In some areas, and in certain periods, these silted-up rivers (or 'roddons') created areas of dry ground elevated above the level of the marsh as it shrank away in drier periods, affording new opportunities for passage as well as work. In the Roman period, for instance, where the roddons connected with tidal creeks, extensive water management systems were excavated to enable salt water to be diverted and pooled in areas where large evaporation tanks and kilns were located in order to extract the salt from the stored brine - such as at Coldham, near Elm, and the extensive salterns at Deeping Fen and Morton Fen in Lincolnshire (Honnor & Lane, 2002). Along with grain, salt production was a principal fenland product and trading commodity. Smaller scale salt production was already part of the Bronze Age and Iron Age repertoire of coastal and perimarine sites and, unlike most other aspects of the local Roman economy, it was one of the very few products that persisted into the Saxon period - particularly in the Lincolnshire fens (Cope-Faulkner, 2012).

Through the large scale archaeological examination of late Bronze Age settlement sites (c. 1000BC), for instance at Bradley Fen and Must Farm in the Whittlesey Brick Pits (Knight 2009) and Knight *et al* forthcoming), settlement shift upslope above the waterline is highly visible among the Bronze Age sites. The communities who had found favourable locations for settlement close to water and natural resources for food, fuel and craft production, and who had expended considerable efforts at managing the land around them, ditching it both for livestock management and drainage purposes, remained in their settlements until the need to continually re-cut clogged ditches and extend their land holdings up slope became too overwhelming - leading to their ultimate abandonment. This story is repeated at numerous archaeological sites that have been excavated in Fenland, notably at the Iron Age sites of Black Horse Farm, Sawtry (Newton, forthcoming) and Wardy Hill, Coveney (Evans, 2003) and multi-period prehistoric sites at the Upper Delphs, Haddenham (Evans & Hodder,

2006). One of the Bronze Age river channels of the ancient Nene at Must Farm that silted up in the Iron Age has recently revealed evidence of national importance: nine log-boats, a dozen fish weirs and eel traps that provide significant evidence of fishing and transportation in the river in their primary context. Photographs of the log boats, fish weirs and an eel trap in situ at Must Farm can be found in Appendix 9.

These remains were sealed in humic muds of the channel beneath 4m of anaerobic covering deposits. Boats have been found in the past, though never so many together, and usually during the hand excavation for the early drains and dykes.

Scrutiny of the Historic Environment Record (HER) data for any of the five Fenland authorities maintaining these large databases (Lincolnshire, Peterborough, Cambridgeshire, Suffolk and Norfolk) belies the real character of fenland's archaeological landscapes once an understanding of their location either under considerable or shallow depths of overburden is gained. While archaeological and historically important 'sites' are known, many of which are protected by statutory designations (Scheduled Monuments, Listed Buildings, Registered Parks and Gardens), the true density of archaeological sites can only be guessed at.

Through the development-led excavations and research projects of the last 30 years, an amazing range and number of well-preserved ancient settlements, task sites, funerary monuments and ritual sites have emerged. A coarse assessment of the distribution of Scheduled Monuments would show that pre-Medieval sites occur either at or above the limit of the Roman fen edge or on the island crests that remained dry land throughout the periods of massive inundation and alluviation, whereas post-Medieval sites are evidently more abundant through the heart of the fens. Earthworks are notably included in this historic category, especially dating from the Civil War period when defensive earthworks were constructed on the fen islands, along the rivers and the coastline. In addition, the major earthworks of the new river canalisations and their banks as a result of the 17th century royal commission altered the landscape. Against these designated sites are important 'spot finds' – many of which were discoveries made during dyking in the 19th and 20th centuries, although numerous artefacts have clogged many a potato harvester. At first dug by hand, dykers would occasionally unearth Bronze Age, Iron Age or Roman metalwork – sometimes hoards left by people who either deposited collections of valuable weaponry, dress fittings, helmets or founders' metalwork in the marsh to honour and appease their gods, or who lost items while crossing the fen. These dyke and river works represent the limited opportunities to understand what lay beneath the fen until the large excavations enabled by the large fenland quarries since the early 1990s allowed deeper excavation to be possible (e.g. at Needingworth; Colne Fen, Earith, the King's Dyke quarries at Whittlesey, Eye in Peterborough and Baston Fen in Lincolnshire).

These large scale works are spread relatively thinly across the fens, and contrast greatly with the small area and spot finds that are more abundant on the HER maps, but their contribution to archaeological and palaeoenvironmental research has been unparalleled due to the pristine quality of waterlogged preservation of wood, leather, textiles and environmental remains alongside the pottery, bone, stone and metalwork finds, typically found on dry land sites and the more comprehensive picture we gain from wetland

archaeology that has not been affected by the plough. In short, what the HER database mapping cannot show is the extent, density or location of archaeological evidence that lies preserved within and beneath the fen sequence: the later prehistoric and medieval peat marshes, Bronze Age to Roman alluvium and sometimes very early remains beneath the Neolithic marine Fen Clay.

9.6.3 Conditions for preservation

Understanding the character of the deposits in any given area of the fens, especially regarding their *water content* and the ability for it to be retained within the sediments (enabling the exclusion of oxygen and thus slowing down the process of decay) is crucial in order to determine the potential for the preservation of archaeological remains.

Prior to changes in planning guidance in 1990, archaeological excavations in Fenland were largely small scale research projects, or rescue schemes whose value went far beyond the extent of their excavation. These investigations showed the incredible level of preservation of organic remains (wood, leather, textiles, plant and animal remains) in the fills of ditches, pits, burnt mounds and also in the contemporary land surfaces that were sealed by later wetland deposits. Timber platform structures and marsh-crossing post-lined avenues such as those newly designated as a Scheduled Monument at Flag Fen, Peterborough (Pryor, 2001), and wooden trackways such as that at Guy's Fen, Thorney (French & Pryor, 1993), demonstrated the importance of the waterlogged peats for the preservation of these important remains.

However, such fragile, waterlogged organic remains are in danger of drying out and turning to dust through persistent drainage and certain cultivation methods. Increased land drainage on a massive scale since the major river and drainage works since the 17th century has caused a dramatic loss of the peat, between 6-8m in places, that covered the Cambridgeshire, Norfolk and Suffolk fens. This is best seen at Holme Fen, where an iron post was fully inserted through the peat into the Jurassic clay in 1851, 200 years after drainage began: its top being level with the ground. The post now stands roughly 4.3m proud of the peat, indicating the scale of desiccation and loss that has occurred since then. The wastage of the peat has brought to light numerous prehistoric sites that previously lay submerged and waterlogged beneath these marsh deposits in the southern fen, exposing them to air and mechanical action (ploughing) that has contributed significantly towards their erosion and desiccation. In the deeper parts of the fen basin, such as at Must Farm, Whittlesey, Neolithic and early Bronze Age landscapes, replete with up standing earthen burial monuments, were first submerged by initial peat growth followed by flood silts prior to the development of the later, more extensive permanent marsh. These sites remained fully preserved ahead of their excavation in advance of clay extraction for brick-making due to a combination of high water tables, water retentive sediments in the buried palaeorivers and, importantly, the anaerobic (lacking oxygen) conditions afforded by the fine grained silty clay (alluvium) that sealed them. Breaking these burial environments through land drainage, de-watering, peat shrinkage/loss and ploughing in areas where peat is now a remnant deposit (i.e. <300mm thick) causes the rapid deterioration of important archaeological resources that have the ability to inform us of the past land uses and environments in Fenland.

Once desiccation of waterlogged sites occurs, organic archaeological and palaeoenvironmental components quickly begin to degrade. The speed at which this happens is dependent upon sustained de-watering - either through drainage or prolonged periods of low rainfall and low groundwater conditions. Other agents of attrition include ploughing over sites that are currently closer to the land surface, (this is particularly the case for near surface prehistoric and Roman sites, or archaeological sites and structures that post-date the 17th century drainage campaigns), and the contamination of ground water due to prolonged use of nitrate-rich fertilisers and chemical pesticides. The introduction of chemicals into the ground water system causes the replacement of minerals into organic cellular structures leading to their eventual mineralisation or transformation to sludge. This is most prevalent in Mesolithic wooden sites in the Yorkshire wetlands at Star Carr, west of Scarborough (Boreham et al, 2011), where recent excavations have demonstrated that bone artefacts and antler picks have suffered in this way, contrasting with their near perfect conditions when the site was first found in the 1950s

9.6.4 New opportunities

Plans to restore areas of Fenland for ecosystems services, particularly to enable the re-wetting of areas to encourage the formation of peat, will be of benefit to underlying archaeological remains by aiding the long-term preservation of waterlogged archaeological sites where they are in hydrological connectivity with improvement soil zones. Relaxing the drainage regimes in these areas will encourage ground water tables to rise, in some areas fully saturating those remains that are currently prone to seasonal fluctuations in soil moisture levels – such fluctuations indicating that organic deterioration has already commenced.

In Fenland, archaeology has the ability to inform us about the patterns of human settlement and endeavour from the early Post-Glacial period (after 10,000BC) and also of the variety of material culture in the repertoire of the communities: nomadic at first, but who gradually settled down in managed landscapes. Linked with studies into the ancient environments of the sites found, we are better able to understand what caused people to abandon areas in preference for other areas, and when and why. The lessons that can be learnt from the archaeological study of the fenland area have great relevance today, when we are again witnessing the transformation of the fens through the effects of climate change, and attempting the management and sustainability of this dynamic landscape to preserve the best attributes of Fenland, its human and diverse wildlife and host plant communities, and its archaeological story.

9.7 Geodiversity

The solid geology of the Fens is dominated by Upper Jurassic clays including the Oxford Ampthill and Kimmeridge clays (formed around 157-152 million years ago). Of particular note is an isolated and well known mass of richly fossiliferous Upper Jurassic limestone, including coral reef deposits, which outcrops around Upware. Much of this geology is obscured by more recent Quaternary deposits over the last 2 million years.

The area was glaciated by the Anglian glaciations around 300,000 to 250,000 years BP, and glacial erosion beneath the ice sheet is probably responsible for the scouring out of the Fen Basin and the area now occupied by The Wash. The ice sheet deposited glacial sands, gravels and clays across the area, and left a shallow basin in which later peats and marine clays accumulated. It is these deposits which give a distinctive character to The Fens, and which hold the most recent record of fluctuations in sea level over the last 10,000 years. The deposits include a cyclic succession of peats, estuarine and marine clays deposited in both terrestrial and marine environments, and demonstrate a detailed record of climatic changes over the last 10,000 years. They are important for their contribution to discussions of future climate change and global warming. Large areas of gravels were left isolated in the southern Fenlands as 'islands' such as at Chatteris and Ely.

Between 8,000 and 2,000 years ago, the Wash embayment was even greater than it is now and incorporated much of the modern Fenland. The natural river courses of the four main rivers draining the Fens: the Witham, Welland, Nene and Great Ouse once meandered across the fen levels causing widespread seasonal flooding by river water and high tides. These rivers are now artificially canalised running straight and bounded by high banks to contain them from the lower adjacent fields. In some places 'roddons', inland silt banks, mark the former course of old river beds and lie up to 2-3 m above the dark peat soils which have subsequently shrunk due to cultivation, drainage and wind erosion.

There are ten geological SSSIs in the Plan area (see Appendix 1) and two mixed interest sites, i.e. geological and biological. A number of these are notified to demonstrate the cyclic succession of peats, estuarine and marine clays deposited in both terrestrial and marine environments.

9.8 The local economy

Conservation organisations generally take some time to become familiar with local economic organisations and structures following changes and this will be particularly so during a period of financial stringency when they have to concentrate on delivering their core responsibilities, perhaps with less staff. The organisations concerned with regional and local economies have changed dramatically over the last couple of years with the demise of the Regional Development Agencies and the formation of Local Enterprise Partnerships (LEPs). There are now four LEPs covering Fenland:

- The Greater Cambridge and Greater Peterborough LEP. Their strategic areas of focus are: skills and employment; strategic economic vision, infrastructure, housing and planning; economic development and support for high growth business; funding, including EU funding, regional growth funding and private sector funding.
- New Anglia LEP. Priority areas are tourism, energy and business support.
- Northamptonshire LEP. Priority areas appear to be food and drink, green spaces, heritage and motorsport.
- Greater Lincolnshire LEP. Priority areas appear to be infrastructure and physical regeneration and tourism.

Each LEP is different, therefore there is a significant challenge in front of the Fens for the Future partnership to make contact, talk to the right people and determine whether there are sources of funding available for conservation activities. It will help if the partnership can make a convincing case that conservation delivery makes good financial sense. The proposed Local Nature Partnerships are aimed at helping integration with the LEPs.

Various studies have highlighted the link between natural resources and services and GDP and job creation. One of the most authoritative is the review carried out by Natural England, *Microeconomic Evidence for the Benefits of Investment in the Environment* (MEBIE Review) in 2011. This is a very broad ranging and thorough survey that brings together an enormous amount of evidence in an easily accessible format.

A couple of examples from this report are:

- It is estimated that tourists spend £191 million in North and West Norfolk and that this provides 7,870 jobs FTE representing 17.5% of employment in the two districts. A survey of six sites on the coast associated with landscape and biodiversity estimated that the annual spend of visitors to these sites was £21 million which supports 442 jobs FTE (Rayment et al., 2000).
- It is estimated that tourist day visitors spent between £54,000 and £72,000 per year on the average forest site in England, with £7.43 average forest related expenditure per visit (Hill et al., 2003).

Also in 2011 the RSPB produced *Natural Foundations: conservation and local employment in the UK* which helpfully contains two local case studies. It is clear that in addition to delivering a range of valuable social, cultural and recreational benefits, preserving the natural environment also impacts significantly upon economic output and creates jobs.

Perhaps the most notable way that conservation impacts upon employment and incomes is through ecotourism. The tourism industry is characterised by significant levels of spending, high business start-up potential and diverse employment opportunities, often thriving most within remote, rural or coastal communities where alternative economic opportunities can be limited.

To provide context domestic UK trips taken to the natural environment increased by 10% between 2005 and 2009, despite general tourism trips declining by 9.2% in this period. Visits to RSPB reserves grew a staggering 38%, from around 1.5 million to almost 2 million, between 2005 and 2009.

To quote from the Natural Foundations report “In the UK, the availability of public funds for nature conservation is shrinking, just as the need to conserve biodiversity becomes more acute. There is a huge funding gap for our national conservation objectives and major national biodiversity targets were missed in 2010.

The UK Government is committed to a transition to a Green Economy, recognising that it is the only truly sustainable pathway and is central to any prospects of long-term prosperity. The surge to stimulate green growth combines with existing government agendas aimed at

promoting rural growth, and halting the loss of biodiversity in the UK, to make a powerful case for local investment in conservation. A responsible attitude towards our ecosystems and wildlife is intimately linked with our ability to achieve local, sustainable economic development.

It is now, therefore, more important than ever to understand how nature conservation and local economic growth can go hand in hand.

There are five main types of economic impacts that nature reserves have within local communities:

- Reserves provide direct employment for staff involved in site management and associated activities.
- Spending by employees and volunteers supports local economic activity.
- Direct expenditures by reserves on goods and services provide income and employment for local businesses.
- Grazing lets support income and employment for local farmers.
- Visitors to reserves spend money in the local economy.

The report contains a number of case studies of which two are located with the plan area. Tables 12 summarise the key figures and Table 13 presents a more detailed breakdown.

Table 12. Economic benefits of the RSPB reserves in the Plan area			
RSPB Reserve	FTE jobs	Tourism spend/FTE jobs supported	No. local FTE jobs
Frampton	9.6	£280,000 / 6.5	16.1
Lakenheath Fen	7.6	£370,000 / 8.5	16.1

Table 13. Breakdown of economic benefits of the RSPB reserves in the Plan area		
Economic impact	Frampton FTE jobs supported	Lakenheath FTE jobs supported
Direct employment	4.5	4.8
Spending by employees/volunteers	0.5	0.5
Direct reserve expenditures	2.3	2.0
Grazing lets/agricultural tenants	2.3	0.3
Visitor spending	6.5	8.5
Total	16.1	16.1

At Frampton the largest proportion of jobs was supported by spend of visitors to the reserve, a contribution that has increased significantly in recent years. It is expected that the increase in tourists to the reserve has been at least in part due to the development of the visitor facilities on site, illustrating how developments at reserves make both current, and ongoing, contributions to local economic activity.

Lakenheath Fen is a valuable source of income for the local economy, attracting tourism spend of £370,000 every year. The impacts of the reserve have been significantly bolstered by the £710,000 investment into a visitor centre, with visits increasing 72% between 2007 and 2009, and this direct injection of funds has provided business to locally sourced contractors. This is an important example of how investment on site at reserves can have both immediate and ongoing impacts within the local economy.

These case studies demonstrate how investment in conservation stimulates economic activity, frequently in areas where job opportunities are limited. These are each relatively new reserves that were started from scratch, as opposed to long established reserves such as the National Trust's Wicken Fen or the Wildfowl and Wetland Trust's Welney Reserve with their larger visitor numbers.

The RSPB have also published a report *RSPB Reserves and Local Economies* in 2011 which provides much more detail behind the summary data presented in *Natural Foundations: conservation and local employment in the UK*.

9.9 The Fenland landscape

Over the last 2 million years Quaternary deposits have accumulated in the shallow basin that is now occupied by The Wash. Glaciation processes scoured the Fen Basin and the area now occupied by the Wash. A cyclic succession of peats, estuarine and marine clays deposited in both terrestrial and marine environments give the area its distinctive character of large-scale, flat and open landscapes with extensive vistas to level horizons and huge skies. Soils over the coastal and central fens are rich, fertile calcareous and silty. Further inland soils are defined by dark, friable fen peat. Isolated outcrops of Jurassic and Cretaceous clay at the inner margins of the area create elevated islands such as the Isle of Ely.

I have given the Joint Character Area (JCA) description for the Fens below, although Natural England are working on National Character Area (NCA) descriptions, because it is simpler and is written in narrative format.

9.9.1 Key characteristics

- Large-scale, flat, open landscape with extensive vistas to level horizons and huge skies.
- A hierarchy of rivers, drains and ditches provide a strong influence throughout the area. Embanked rivers and roddons create local enclosure and elevation. Banks provide good grazing and grassland habitats.
- Modestly elevated 'islands' within fens provide isolated higher ground for most settlement. A higher proportion of grassland, tree cover and hedgerows are associated with these areas.

- Settled Fens or 'Townlands', in arc set back from the Wash, exhibit an ancient medieval and irregular field pattern. Typically smaller-scale with scattered farmsteads and dispersed ribbon settlements along the main arterial routes.
- Fens drained in 17th century comprise large rectilinear fields of black soil. A geometric road and drainage pattern with major high-level drains, washes and associated pumping stations. Roads and rail links often on elevated banks.
- Area south of Lincolnshire Wolds most recently drained with Wolds providing marked 'Upland' horizon to north.
- Woodland cover sparse. Occasional avenues to roads, elsewhere isolated field trees have marked significance. Shelter belts including poplar, willow and leylandii hedges around farmsteads. Numerous orchards in Wisbech area.
- Fragments of relic wet fen areas at Wicken, Woodwalton and Holme.
- Built forms exhibit strong influence ranging from historic cathedrals and churches, like Ely and Boston to large agricultural and industrial structures. Domestic architecture displays combination of elegant Georgian brick houses and bland 20th century bungalows.
- Marshes directly adjacent to the Wash exhibit an exceptionally open aspect, broken only by a series of sea walls. Associated river outfall structures, tidal saltmarshes and mudflats.
- Rich and varied intensive agricultural land use including wide range of arable, root crops, bulbs, vegetables and livestock. Field labourers prevalent at harvesting. Horticultural glasshouses and general agricultural clutter a significant feature.
- Bronze Age, Iron Age and Roman landscapes emerging from below the falling peat. Very rich archaeology especially on fen margins.

9.9.2 Landscape character

The Fens is a large area which slowly drains towards the Wash, England's largest tidal estuary. The area abuts a number of other character areas. To the east lies North West Norfolk and the Breckland. To the south-east rises the gently rolling East Anglian Chalk and to the south-west are the undulating Bedfordshire and Cambridgeshire Claylands. To the west, rise the gently shelving slopes of the Kesteven Uplands and the southern Lincolnshire Edge. To the north-west, the woods and gravel workings of the Central Lincolnshire Clay Vale gradually slope down to the Lincolnshire Fens, while due north the Lincolnshire Wolds rise to create a dominant 'Upland' horizon. The Steeping river marks the quieter northeast boundary to the Lincolnshire Coast and Marshes. The land boundary of the Fens is typically drawn along a series of catchwater drains, dykes, canalized rivers and lodes.

The single obvious factor uniting the Fens is the low-lying, level terrain. With the exception of the Isle of Ely, which reaches above 20 m, levels rarely pass the 10 m contour, and typically vary by little more than one or two metres over many miles. Much of the land is below sea level, relying on pumped drainage and the control of sluices at high and low tides to maintain its agricultural viability. The level horizons and the huge scale of the landscape create a strong sense of isolation. There are, typically, large open panoramas and enormous

skies, whose changing weather patterns have a strong influence on the observer. The large fields and strong seasonal changes of colour, created by varied and multiple cropping in the rich soils, forms a landscape which can, at one and the same time, be intimidating and yet uplifting. It is a landscape which represents man's dominance over the environment and often results in a strong rectilinear pattern of drainage to drain inland fens or reclaim coastal marshes.

Although at first acquaintance the Fens can seem monotonous, there are marked variations and graduations as one moves from fen to fen and, more noticeably, between areas with differing lengths of settlement history. There are four broad distinctions within the Fens. Firstly, the 'Settled fens' or 'Townlands', which run in a broad arc inland from the Wash, between Kings Lynn and Boston. This is a more ancient small-scale landscape of sinuous lanes and relative intimacy with a higher density of settlements, some fine churches and remnant grasslands.

Secondly, the extensive 'Peaty Fens' or 'Black Fens' which were finally comprehensively drained in the 17th to 19th centuries. This area comprises broad rectilinear fields and straight roads. The only consistent relief to the level landform are the 'negative' notches of the drainage ditches and the raised berms and banks of the artificial drainage channels. Within the broad area of peat fens are a few isolated islands of higher ground, most notably the Isle of Ely.

Thirdly, the fens of south-east Lincolnshire between the Townlands and the Wolds. This was the last area to be drained. Works were complete by 1820, having been accelerated in the agricultural and industrial revolution. The drainage here was so thorough that scarcely a vestige remains of what had been one of Britain's richest wildlife habitats. This is an open productive landscape with a strongly rectilinear form.

Finally, the band of Wash Marshes reclaimed from the Wash by the construction of a series of sea wall defences begun in the 17th century. Here, extensive fields of vegetable crops stand alone against the sky. Beyond the defensive walls, saltmarshes and tidal mudflats, often abundant with wildfowl, stretch out into the Wash.

9.9.3 Physical Influences

The Fens is a complex landscape which drains to the tidal basin of the Wash. As sea level has changed since the last Ice Age, the balance of saltmarsh, fen, bog and woodland has altered. The underlying geology is a combination of postglacial alluvium and freshwater clays and post-Roman marine clays. The exception being elevated islands of Jurassic clay at the inner margins of the area, for example at Ely.

The soils over the central and coastal fens comprise rich, fertile, stoneless, calcareous, silty soils while inland are swathes of dark, friable, fen peat. The original courses of the rivers meandered slowly across the level fens causing widespread seasonal waterlogging by river water and high tides. Four major rivers drain into the Wash: the Witham, Welland, Nene and Great Ouse. All rivers now have artificial canalized courses which run straight for miles and are bounded by high banks to contain the watercourse from the lower adjacent fields. In

some locations 'roddons', inland silt banks, mark the former course of old river beds and now lie like stranded sea serpents up to 2-3 m above the dark peat soils which have subsequently shrunk due to continuous cultivation, drainage and wind erosion of the peat. This irreversible shrinkage creates an ever greater demand for artificial drainage of the land.

Further information can be obtained from the full JCA No. 46 account or from the forthcoming NCA description.

SECTION 3 – THE NEED FOR CHANGE: ANALYSIS AND WAY FORWARD

10 The need for change

10.1 Rationale for intervention

Only 4792 ha of fenland habitats now remain in 8 separate sites. These sites are all small and are losing species (e.g. see Appendix 7). They are not buffered from adjoining intensive land uses and in some cases are used to take poor quality flood water which itself was causing further decline in the flora of ditches on the sites (see Section 9.3.2. and Newbold, 2010). It was this situation and the analyses carried out by 'Wet Fens for the Future' and the 'Wise Use of Floodplains' Projects that persuaded the main nature conservation organisations that action needed to be taken to substantially enlarge the few remaining fenland sites if they were to have any future. The rest as they say is already history with the 'Great Fen Project' making much faster progress than anyone had anticipated, the 'Wicken Vision' progressing and a number of other wetland re-creation schemes on the Fens making excellent progress.

The approach adopted has received further strong support from the Lawton Report, Making Space for Nature: A review of England's Wildlife Sites and Ecological Network, published in September 2010 and the subsequent White Paper 'The Natural Choice: securing the value of nature', published in June 2011. The Lawton Report summarises what needs to be done to enhance the resilience and coherence of England's ecological network in four words: more, bigger, better and joined (see Chapter 3 for further information).

The White Paper was followed in July 2011 by publication of a new England biodiversity strategy 'Biodiversity 2020: A strategy for England's wildlife and ecosystem services'. The ground breaking UK National Ecosystem Assessment (NEA) published in June 2011 was taken as a starting point for the strategy. This showed that nature is consistently undervalued in decision-making and that many of the services we get from nature are in decline. Over 40% of priority habitats and 30% of priority species were declining in the most recent analysis. The strategy states that "Our challenge is to halt this decline – for the benefit of this and future generations".

Biodiversity 2020: A Strategy for England's Wildlife and Ecosystem Services contains the following ambitious Vision:

By 2050 our land and seas will be rich in wildlife, our biodiversity will be valued, conserved, restored, managed sustainably and be more resilient and able to adapt to change, providing essential services and delivering benefits for everyone.

and 2020 Mission:

Our mission is to halt overall biodiversity loss, support healthy well-functioning ecosystems and establish coherent ecological networks, with more and better places for nature for the benefit of wildlife and people.

The key outcome for "land" is:

By 2020 we will have put in place measures so that biodiversity is maintained and enhanced, further degradation has been halted and where possible, restoration is

underway, helping deliver more resilient and coherent ecological networks, healthy and well-functioning ecosystems, which deliver multiple benefits for wildlife and people, including:

- 1A. Better wildlife habitats with 90% of priority habitats in favourable or recovering condition and at least 50% of SSSIs in favourable condition, while maintaining at least 95% in favourable or recovering condition;
- 1B. More, bigger and less fragmented areas for wildlife, with no net loss of priority habitat and an increase in the overall extent of priority habitats by at least 200,000 ha;
- 1C. By 2020, at least 17% of land and inland water, especially areas of particular importance for biodiversity and ecosystem services, conserved through effective, integrated and joined up approaches to safeguard biodiversity and ecosystem services including through management of our existing systems of protected areas and the establishment of nature improvement areas;
- 1D. Restoring at least 15% of degraded ecosystems as a contribution to climate change mitigation and adaptation.

The **Rationale** for this approach in Biodiversity 2020 states:

Although we have made some progress, biodiversity continues to decline. The independent review of England's wildlife sites and ecological network, *Making Space for Nature* chaired by Professor Sir John Lawton, concluded that England's collection of wildlife areas (both legally protected areas and others) does not currently represent a coherent and resilient ecological network that would be capable of responding to the challenges of climate change and other pressures.

The review concluded that establishing such a network would effectively conserve biodiversity and ecosystem services, delivering many benefits to people, while also making efficient use of scarce land and resources. It recommended that priorities in England should include better, more, bigger and joined sites for nature. Ecological networks are considered to be an effective means to conserve ecosystems and wildlife in environments, such as England, that have become fragmented by human activities. Some work on ecological restoration is already underway, but we need to extend this approach much more widely.

Hence the need to intervene in Fenland and to work to create an enhanced ecological network that supports biodiversity, rather than doing nothing and overseeing its further decline from an already very low base. Further details about the seriousness of the situation as seen at the turn of the millennium are given in Wicken Fen vision paper (Colston, Carter and Broadbent, 2001).

However even the above rationale is only part of the picture. Table 14 indicates the significance of different ecosystem services on the Fens and whether there are significant issues that need addressing.

Table 14. The significance of ecosystem services on the Fens		
Ecosystem Service	Significance on Fenland	Key issues
1. Food provision	High	Wastage of peat soils; Sustainability of pumped drainage
2. Timber provision	Low	
3. Biomass	Low	
4. Water availability	High	Competition for a limited resource
5. Genetic diversity	?	Presence of species with limited distributions
6. Regulating climate change	High	CO ₂ emissions as a result of peat wastage
7. Regulating soil erosion	High	Managing peat wastage
8. Regulating soil quality	High	Wastage of peat soils
9. Regulating water quality	High	High levels of phosphorus and other agro-chemicals in water courses
10. Regulating water flow	High	Much land below sea level; Climate change will increase storminess
11. Pollination	High	Limited food sources for insects
12. Pest regulation	Low	
13. Regulation coastal erosion	N/A	
14. Sense of place / Inspiration	High	More action needed to maintain specialness of area
15. Sense of history	High	Action needed to ensure heritage not lost by peat wastage and drying out
16. Tranquillity	Medium	Evidence shows this is reducing
17. Recreation	High	Encourage informed tourism
18. Biodiversity	High	Very limited habitat and lack of connectivity
19. Geodiversity	Medium	

It is apparent that there are major issues that need addressing for the area to have a more sustainable future.

10.2 SWOT analysis

A strengths, weaknesses, opportunities and threats (SWOT) exercise was carried out with the Fens for the Future group on 24 January 2012, not long after the present study had started. The full SWOT analysis is presented in Appendix 10. The results of the analysis are summarised below.

Strengths

Partnership working was the main issue raised. Emphasis was put on the combined knowledge, skills and expertise of the partners, their geographical spread and the involvement of the key core site landowners. Other issues were that the desire to take action is timely (Natural Environment White Paper, CAP reform), so the agriculture sector is starting to think about change and place and community. The Fens is a special place and people do want to see action taken to raise its profile and make progress in dealing with the key issues.

Weaknesses

Partnership working was the main issue raised, with many questions about its structure and functioning. The scale of the project was also raised as an issue. There were a set of issues around agriculture and the extent that farmers and landowners are bought into the project and issues around soils. The silt and peatland soils are probably the most valuable for farming in England but the present cropping use will lead to the loss of the peatland soils in c 50 years. Water and wetlands was another major issue with limited knowledge regarding hydrological movements and cycles and general management of the water resource. There were concerns about water availability and whether the support was there for wetland creation. As one would expect resources were an issue, especially obtaining these in the current financial situation and that some resources will be required for the core management of the project. Finally skills were raised, with the availability of biological surveyors being mentioned.

Opportunities

Partnership working was seen as a significant opportunity but also as a requirement for success. There was much strength to be gained from an effective partnership rather than organisations struggling alone in such a huge area. The timeliness of taking action now / new policies for the environment was also recognised as an opportunity (Lawton etc.). This is likely to bring in new funding streams. Under agriculture the need for more contact and engagement with farmers and landowners was raised which would help to break down barriers. It was noted under strengths that agriculture does change and farming will change on the Fens. It would be beneficial if farming leaders were to set out a long-term vision for change in farming on the Fens, involving new habitat creation and better peatland management. Farmers are going to need more water as will the biodiversity sector so there are opportunities to work together and produce integrated solutions. The agriculture issues links closely to *place and community* and the fact that there is a desire to enhance the Fens as

a distinctive and specialised place. There are many opportunities for community engagement with specific projects for the long term. Such projects can make important contributions to the *health and wellbeing* of local communities, although this was not noted. Wetland creation schemes can also make important contributions to tourism and the local *Fenland economy*; visitor payback schemes and local employment were noted.

There are issues around the Water Framework Directive requirement to improve *water quality* where wetlands may well be part of an integrated solution and where funding may be available. Similarly *water resources and management* also present opportunities because other sectors will also require more water and flood risk solutions may also be available. Washlands could be part of such solutions which would also help with *climate change* scenarios. Drainage Board Management Plans and BAPs also have contributions to make.

A whole set of opportunities were identified that could help with *wetland creation* opportunities from the EA Regional habitat creation programme and the Fens Waterway Link Project delivery to aggregate industries development and the restoration of gravel pits and clay pits for nature conservation.

Threats

A range of issues related to a poorly performing *partnership* were identified. With good leadership and governance such should not arise. Under *agriculture* the food security issue was seen as a threat. There is a debate to be had on this issue but again leadership from the environment sector will be needed. It should be quite possible for agriculture and the environment sectors to find win win scenarios so that good integrated solutions are found. As far as *water management* is concerned both poor water quality and lack of water are potential threats to wetland creation schemes on Fenland. Taking a medium to long term view it should be possible to find ways of dealing with these issues. In fact a range of issues in *opposition to wetland creation* were identified. There are however major challenges on Fenland from climate change, which is a major reason why a strong Partnership can make a real difference to dealing with the issues in a holistic way. Having one forum to discuss these matters can only be beneficial for Fenland communities. Such discussions at a Fenland level are simply not possible at present.

The *state of the economy* and short term thinking focused on economic growth undermining environmental issues were other issues identified.

10.2.1 Summary of key issues

- Partnership working
- Timeliness of taking action now
- Agricultural issues and the development of relationships with this critical sector
- The future of the peatland soils
- Maintaining fenland as a special place for all
- A set of key issues around water, its availability, quality and the development of new approaches to help address future scenarios

- The need to continue to take action to restore better functioning ecosystems on Fenland
- Resource availability for the Plan

10.3 Results of the data collection exercise

A data collection exercise from partners was carried out to collect basic information about habitat restoration on Fenland. The data collation was based round the elements of an ecological network identified in the White Paper *The Natural Choice: securing the value of nature*. The data is presented for core areas, for restoration areas and for new sites (new restoration areas), see Appendix 11.

This exercise included collecting data on the area of land already restored, the area currently being restored, the area with restoration planned and the area where no restoration is currently planned, see Table 15 below. This shows that Core Areas extend to 4792 ha or 1.4% of the Plan area, that restoration has already been carried out or is actually planned for 3341 ha (1.0% of the Plan area) while the total extent of identified restoration areas extends to a further 8451 ha (2.5% of the Plan area). This information was essential in helping to develop restoration targets for Fens for the Future. The establishment of corridors and buffer zones would require additional areas of land.

As the Strategic Map shows there are two types of Target Areas, existing ones where restoration is being carried out and proposed ones where no restoration has yet been carried out. The latter areas require considerable new resources to move them forwards.

Table 15. Current extent of habitat re-creation in Fenland					
	Total area (ha)	Area already recreated (ha)	Area currently being recreated (ha)	Area with re-creation planned (ha)	Area where re-creation is not currently planned (ha)
Core areas	4,792 (SSSI)	N/A	N/A	N/A	N/A
Restoration Areas	11,792	574	1,534	1,233	7,864
'New' restoration areas	2,460 minimum	N/A	N/A	N/A	2,342 minimum

It must be recognised that there is some variability in the basic data about core areas that it has not been possible to remove. This is believed to be because different areas of land can be designated as SAC, SPA, Ramsar and SSSI. For example the total core area notified as SSSI is 4792.42 ha but the total area of SSSI assessed as to its favourable condition amounts to 5137.22 ha.

Table 16 shows the results of the data collection exercise in relation to employment, volunteering and visits to Core Areas / nature reserves. In addition the Annual Revenue Expenditure on these sites is c £1,660,000.

Table 16. Nature Reserves /Core Areas: Employment, volunteering and visitors			
No. of Reserves (Core Areas)	FTE Posts employed	No. of Volunteers per annum	No. of visitors per annum
8	73.5	338+	146,500

10.4 Analysis of strategic options

The rationale for intervention is set out in Section 8.7 above. If biodiversity is to be retained on the Fens then major intervention is needed and the evidence is that creation of an ecological network would be the most effective way of proceeding. How this might be achieved is set out in Section 7 above. As this is the case the option of taking no action is not considered any further.

Lack of intervention to establish such a network will result in a continuing decline in biodiversity accompanied by declines in ecosystem service provision. The critical issues for ecosystem services are summarised in Table 14 in Section 10.1. The issues that the network can help mitigate such as climate change will only get worse if action is delayed. Its establishment should be a win win scenario for everyone by improving the provision of ecosystem services.

On the Fens the location of the proposed network is largely dictated by the geography of the rivers and main drainage channels and the location of the remaining areas of fen habitat and of peat. The approach and techniques needed to establish the network are not so clear cut, will pose considerable challenges and will need close partnership working between all stakeholders.

Target Areas have been identified by Partners within which 'restoration areas' are located. Some have on-going restoration taking place, others do not at this stage. The identification of such areas depends on a number of fundamental factors as identified in Section 5.5, which restricts where wetland creation can be carried out. These include the presence of peatland soils, low elevation, water availability, proximity of other conservation designations and preferably some residual biological interest remaining from earlier wetland habitats. It seems likely that given the experience of the Fens for the Future partners, the most appropriate areas for restoration will have been identified. The Environment Agency are a major player in restoring wetlands through their Regional Habitat Creation programme and they employ Atkins to help identify appropriate areas for wetland restoration using GIS techniques (see Section 5.5). This again suggests that the most appropriate areas will have been selected.

Looking strategically at where habitat restoration is taking place there has been and are great efforts being made in the Cambridgeshire Fens and in the Norfolk Fens but progress is

very limited indeed in Lincolnshire with the 114 ha Willow Tree Farm site in the South Lincolnshire Fens Target Area being the only active wetland creation being undertaken. There are also fewer organisations involved in Lincolnshire and it is too far from the eastern coasts of Norfolk and Suffolk to benefit from the Environment Agency's Regional Habitat Creation Programme. Clearly a strategic priority for Fens for the Future must be an engagement with potential partners in Lincolnshire.

Fortunately one of the main potential partnerships that Fens for the Future is developing is with the 'Fens Waterways Link Project'. Closer linkage needs to be made with the Lincolnshire Waterways Partnership that is closely involved in the development of the Fens Waterways Link. It is likely that Fens Waterways Link will need to develop similar partnerships in Cambridgeshire in the future to progress development of the Link in the south of the Fens and this will therefore also need to involve Fens for the Future.

A key aim for Fens for the Future is to continue working with and supporting all the main habitat restoration projects on Fenland which are identified on the strategic map that accompanies this Plan.

There are a number of technically challenging areas that Fens for the Future needs to consider how to address in conjunction with its partners, such as the establishment of connecting corridors, buffer zones and the identification and implementation of sustainable use areas. More work is needed to identify stepping stones leading to real change on the ground.

A critical area for Fens for the Future to progress is a constructive dialogue with the farming community over the partnership's Vision and over the proposals for an enhanced ecological network. It is difficult to see how this can be done without the Partnership having at least an experienced Project Officer on the ground who can lead this discussion. A key part of this argument will be to get Natural England to align its HLS targeting with this Vision and the proposals for an enhanced ecological network. Hopefully ideas such as the development of ecological networks will figure in the proposals for revising the programme that will follow on from the Rural Development Programme for England for the period 2014 to 2021.

It is possible that the environmental benefits from the Environmental Stewardship Scheme could be maximised by greater focus on outcomes, better coordination between schemes and agreement holders to address issues such as buffering/connectivity and fragmentation, and considering how schemes could work alongside private markets, for example payment for ecosystem services.

More generally Fens for the Future needs to have active and ongoing involvement with the Environment Agency over a number of critical matters such as water availability, water quality and flood risk management. These discussions can either be ad hoc or preferably through establishment of a Fens Water Forum that meets regularly. The Water Framework Directive is a major strategic driver for the Environment Agency and other bodies which will also provide opportunities that Fens for the Future can work with.

Fens for the Future needs to obtain feedback from the major restoration projects as to how local communities feel about and respond to proposed changes in their local environments.

Fens for the Future will need to maintain a list of contacts, a web-based database of Fenland research and up to date data on progress towards the establishment of the network.

10.5 Strategic alignment/fit

From the information presented in Section 3 above it is apparent that the strategic approach set out in this Plan is fully in accordance with and indeed based on the current national policies for biodiversity in documents such as ***Making Space for Nature: A review of England's Wildlife Sites and Ecological Network*** and the subsequent White Paper ***The Natural Choice: securing the value of nature***, as well as ***Biodiversity 2020: A strategy for England's wildlife and ecosystem services***. Progress as envisaged in this Plan would do much to help achieve a number of biodiversity targets. There is also good fit with the objectives of the Water Framework Directive.

In the past Regional Assemblies and Regional Development Agencies produces a raft of Strategic Plans so that it was relatively easy to assess fit with them. These have all largely gone and the key documents now are Core Strategy Development Plans. The Core Strategy sets out the strategic planning policy, including a 'spatial' vision and objectives. It also sets out a development strategy identifying the level of development expected to take place in over a period of perhaps fifteen years. In Fenland as there are four counties involved there will be four Core Strategy Development Plans to consider. It has not been within the scope of this study to examine these but it would be surprising if there were anything in this Plan that was contrary to these Plans. This is partly as these Plans will have been drawn up in cognisance of County Biodiversity Action Plans and partly as the approach set out in this Plan accords fully with the national policy for biodiversity.

There are of course many other strategic plans for consideration such as those produced by various statutory agencies, particularly the Environment Agency and Natural England. As is mentioned in Section 11.1 the current Rural Development Programme for England ends in 2013 and at present the Environmental Stewardship Scheme needs some adjustments to fit in with the new biodiversity policies aimed at enhancing ecological networks.

Again the broad thrust of what is proposed in this document should not be counter to such Plans, however 'the devil will be in the detail' and when it comes to considering individual areas of land or sites much detailed work may be required to demonstrate fit with such Plans before permission can be obtained to proceed.

11 Vision, mission, aims and objectives

The analyses outlined above have been used to develop the Partnership's vision, mission, aims and objectives as set out below.

11.1 Vision

The Fens was England's largest wetland. Now less than 1% of the original wetland habitat remains. The Fens for the Future vision is to see sustainable wetlands restored, re-created and reconnected across the Fens for the benefit of people, our natural and historic heritage and the rural economy. Sustainable wetlands will help reduce storm effects, make available clean water and retain peatland soils so helping mitigate the effects of climate change, while at the same time offering a haven for wildlife, protecting our historic heritage and providing exciting areas for people to visit. Recreational access and tourism increases with more people taking exercise in the countryside. The diversity of the local economy widens and opportunities for employment in local communities are created.

The Fens remain nationally important for modern productive farming but the provision for wildlife in the farmed landscape increases significantly, with much greater uptake of environmentally friendly farming practices and further improvements to drains and ditches, thus creating a web of wildlife habitats extending throughout Fenland. The variety and abundance of farmland wildlife increases and iconic Fenland species thrive.

Partnership working across Fenland is accepted best practice to achieve the Vision.

11.2 Mission

The Fens for the Future Partnership's Mission is to make the Fens one of the main UK BAP landscape scale wetland complexes by 2020, within a matrix of sustainable agriculture.

11.3 Aims and objectives

Aim 1: Key wetland sites, such as Wicken, Woodwalton and Holme Fens, remnants of the original Fen, together with the great Washlands, will form the Core Areas of our Vision for Fenland. This partnership will support the enhancement, enlargement and buffering of these Core Areas, increasing the connectivity between them and ensuring that their natural processes are able to function effectively.		
	Objective	Targeted action
1.1	Ensure all Core Areas reach and maintain 'Favourable Condition'.	Relevant Partnership members to ensure that the sites they are responsible for maintain 'Favourable Condition'.
1.2	Increase the size of the existing Core Areas to ensure that they are sustainable for the future.	Carry out an assessment of all Core Areas to ensure that they are large enough to be sustainable. Develop plans to achieve this aim.

1.3	Identify appropriate bufferland for the Core Areas to ensure that they are sustainable for the future.	
Aim 2: In addition to the existing Core Areas, extensions to these such as at South Lincolnshire Fens, Great Fen and the Wicken Vision, as well as entirely new areas such as Lakenheath Fen, Needingworth and the Wissey Wetland will be developed to provide sufficient areas of wetland habitats to enhance sustainability. Increasing capacity in Lincolnshire will be a focus for such action as it has such a small area of Fenland at present. These new wetlands will also need to be buffered and connected to support their natural processes.		
	Objective	Targeted action
2.1	New areas of wetland such as at Baston Fen, Great Fen, Wicken Vision, Lakenheath Fen, Needingworth and the Wissey Wetland are in the process of being created but the creation of further additional sites are needed if the biodiversity resource in the Fens is to be sustainable. Water resource studies will be needed to help identify potential locations.	Deliver habitat creation/enhancement projects to create 20,000 ha (5% of the area of Fenland) of new wetland by 2020 and X ha (to be determined) of other semi-natural habitats (such as orchards, etc.)
2.2	Identify potential locations for new wetland site creation, taking into account water availability, and create new wetland sites especially in Lincolnshire, where such wetland is now very rare (totalling 169 ha).	Deliver habitat creation/enhancement projects to create X ha (to be determined) of new wetland and X ha (to be determined) of other semi-natural habitats (such as orchards, etc.).
2.3	Identify appropriate bufferland for the new wetland sites to ensure that they are sustainable for the future.	
Aim 3: We will increase connectivity between the Core Areas by enhancing the main rivers, waterways and riverside habitats to create a web of habitats, helping species disperse. The Fens Waterways Link project and delivering the objectives of the Water Framework Directive offer exciting ways to help achieve this aim. This Aim will build on existing work by the Environment Agency and the Drainage Boards.		
	Objective	Targeted action
3.1	Increase our knowledge of the distribution and location of the important drains and ditches for	Establish a targeted programme for the survey of drains and ditches for flora and fauna. Work with the three Local Record centres covering

	flora and fauna, so that their management and connectivity potential can be improved further, while retaining their function as efficient drains.	Fenland and the Drainage Boards to help achieve this Objective.
3.2	Develop and deliver a strategy to achieve landscape scale conservation through creating coherent ⁵ and resilient ⁶ ecological network/s within the Fenland.	Identify the components of the ecological network, including Corridors & Stepping Stones (inc. habitat mosaics), Buffer Zones and 'Sustainable Use Areas' between Core Areas and Restoration Areas and agree an ecological connectivity strategy that maximises benefits for nature conservation and for people at a landscape scale.
3.3	Ensure that such a strategy is developed with and supported by key stakeholders.	We will work with farmers, Drainage Boards, local communities, developers, mineral companies, academics, Local Authorities and relevant organisations to understand and establish a coherent ecological network within Fenland.
3.4	Increase the biodiversity of the main rivers, waterways and riverside habitats in Fenland to create a web of habitats, helping species disperse.	Work with the main stakeholders, the Environment Agency, the Drainage Boards and Natural England to establish a web of wetland habitats and banks throughout Fenland to improve connectivity, helping species move between Core Areas and Stepping Stones so that biodiversity can thrive. This will require a step change in emphasis and the scale of provision. Objectives are: for a large percentage of drains to have wildlife berms along one side to act as refuges for biodiversity; for a large percentage of drains to have wildlife margins established alongside them and to reduce intensive grazing along main river to allow semi-natural vegetation to develop. Funding is available for habitat creation and restoration work that delivers Water Framework Directive objectives for waterbodies in the Fens. Drainage

⁵ A coherent ecological network is one that has all the elements necessary to achieve its overall objectives [of supporting biodiversity and providing ecosystem services]; the components are chosen to be complementary and mutually reinforcing so that the value of the whole network is greater than the sum of its parts.

⁶ A resilient ecological network is one that is capable of absorbing, resisting or recovering from disturbances and damage caused by natural perturbations and human activities (including climate change) while continuing to meet its overall objectives of supporting biodiversity and providing ecosystem services.

		Boards should include such targets in their Biodiversity Action Plans.
3.5	Support the development and implementation of the Fenland Waterways Link project.	Encourage the project to establish wetlands along its route adjacent to the waterway which will improve connectivity and contribute to a number of other Partnership Aims, e.g. 8 & 9.
Aim 4: We will further increase the web of habitats by enhancing water courses, ditches and the wider countryside helping species disperse. Farmers are already joining agri-environment schemes providing habitat for farmland wildlife and helping farmland birds, while enhancing the wider environment through resource protection, aided by targeted conservation advice from key partners. This Partnership will seek to extend this provision by working to deliver the Water Framework Directive objectives for Fenland waterbodies, encouraging more farmers to adopt environmentally friendly farming ⁷ and Drainage Boards to further develop their management practices. Water Framework Directive funding will be utilised to help achieve this work.		
	Objective	Targeted action
4.1	The strategy established by 3 above will include the smaller watercourses managed by Drainage Boards, farmers and landowners.	Promote an increase in the wildlife friendly management of ditches, banks and adjoining land especially within the Corridors & Stepping Stones, Re-creation Areas, Buffer Zones and 'Sustainable Use Areas'. Work with the main stakeholders, the Drainage Boards, Natural England, The Environment Agency, NFU and the CLBA to achieve a step change in emphasis and the scale of provision. <u>Achieve the following targets:</u> Encourage more farmers and landowners to enter into Environmental Stewardship A large percentage of bigger drains to have wildlife berms along one side to act as refuges for biodiversity while a large percentage of drains and ditches have wildlife margins established alongside them with Water Framework Directive measures to address diffuse pollution and improve waterbody morphology being in place. Improve the biodiversity value of farm reservoirs.
4.2	Enhance the ecological potential of	Manage land to achieve integrated natural and historic conservation management in line with

⁷ Environmentally friendly farming can be described as Environmental Stewardship Plus. In other words taking actions for the environment that go beyond the requirements of the Environmental Stewardship Scheme.

	the farmed environment.	Environmentally Friendly Farming practices. All Partners to support the 'Campaign for the Farmed Environment' to get more land under Environmentally Friendly Farming practices.
4.3	Protect and enhance the existing archaeological and historical resource	Provide better protection to archaeological sites assessed as being at risk from agricultural land use practises. Ensure all habitat creation/enhancement projects are sympathetic to the historical environment in both their design and methodology. Where opportunities exist support the investigation of new sites and finds as part of new projects.
4.4	Maintain and conserve the areas valuable soils	Maintain and restore the existing soil resource and reduce loss of peat and deliver Water Framework Directive objectives regarding reducing diffuse pollution, mainly by rewetting or keeping land under grass systems.
4.5	Maintain and enhance the areas rich geodiversity resource	Maintain the integrity of existing geological sites through proper management. In particular ensure that changes to water level management and farming practises do not lead to the deterioration of important Holocene Sea Level Change sites.
4.6	Increase abundance and resilience of Species populations	Identify species appropriate to the Fens area and aim to restore the diversity and abundance of species (including BAP and non BAP spp).
		Safeguard and reverse declines in farmland birds. Ensure, through targeted 1:1 advice, that the NE/RSPB Farmland Bird Packages (for both ELS & HLS) are implemented as a benchmark of Environmentally Friendly Farming. Look to achieve 3-4% of the arable area over Fenland as a whole within such schemes or establish as corridors/ buffers to existing sites. Work to integrate options between farms will be beneficial in giving rise to landscape scale effects.
		Identify non-native species in the Fens and ensure that strategic control of priority non-native invasive species is adequately undertaken to protect vulnerable species.

		Water Framework Directive funding to be sought by partnerships to control priority non-native species.
Aim 5: We will draw on the expertise of academic partners to continue research into the role of different types of connections and buffers in enabling species dispersal and increasing resilience as the climate changes. The results will inform our strategy for enhancing the network. Scientific monitoring is required to establish the effectiveness of the ecological network in Fenland.		
	Objective	Targeted action
5.1	Encourage research to provide an evidence base for the Fenland ecological network.	Encourage partners and others to collaborate in research to provide evidence to support the development of the Fenland ecological network. This research should focus particularly on the design and effectiveness of buffers and connectivity between sites. The aim should be to produce guidance for practitioners.
		Collaborate with other projects across England researching similar ecological networks.
5.2	Develop a monitoring programme to ensure that the projects objectives are delivered	Develop and implement a monitoring strategy for key ecosystem service outcomes of habitat creation & restoration including carbon flux, flood risk, species, and delivery of Water Framework Directive measures, recreation activities and diversification of food production. Ensure all new monitoring follows best practise.
		Develop and implement a monitoring strategy to ensure that the ecological network that the Partnership puts in place is effective. Ensure all new monitoring follows best practice.
Aim 6: We will work with farmers, Drainage Boards, local communities, developers, mineral companies, academics, Local Authorities and relevant organisations to understand and establish multifunctional wetlands that support biodiversity, maintain our historic heritage, reduce flood risk and improve water resource availability. New multifunctional wetlands have rarely been constructed in Fenland and we will work to reduce the barriers to their establishment. We will also explore new options for water storage, such as old mineral workings.		
	Objective	Targeted action
6.1	Ensure better integrated water management so that there is sufficient water for agriculture, wetland habitats and species.	Establish Catchment Management Boards to help achieve this. This will involve working with key partners and stakeholders in adjacent areas e.g. Northamptonshire as it is the source of the River Nene which flows through the Nene

		Washes and the area which the River Ouse flows through, before reaching the Ouse Washes.
6.2	Where possible ensure that new wetlands can provide both biodiversity enhancement and water resource provision for other land uses.	Establish new wetlands whose aim is to provide both these functions.
		Work to reduce the barriers to the establishment of new multifunctional wetlands as such sites have rarely been established on Fenland.
		Identify those washlands currently in arable production. Look to maximise the proportion of these that could be restored to an appropriate wetland/grazing habitat, particularly in, around and between Core Areas or alongside main water courses to deliver flood risk management and Water Framework Directive objectives.
		Promote this initiative to Local Planning Authorities and the Cambridgeshire/Peterborough Joint Strategic Planning Unit to embed these objectives into all new strategic development.
6.3	Improve water quality in Fenland in accordance with the aims of the Water Framework Directive (WFD).	Ensure that good ecological condition is achieved in the main rivers and water courses by 2015. Promote project ideas that meet WFD Catchment Sensitive Farming criteria for which funding may be available.
		Campaign to get the highland catchments of the large-scale wetland creation projects classified as priority areas for Catchment Sensitive Farming.
6.4	Influence the planning system to ensure that County and District Councils consider wetland habitat creation when preparing Strategic Plans and when setting after use conditions as part of the assessment of major development proposals, especially for mineral extraction.	The Cambridgeshire Minerals and Waste Plan is an example of good practise which could be more widely applied across Fenland.
Aim 7: We will work to promote climate change adaptation both through the implementation of our strategy to create a coherent and resilient ecological network in		

Fenland and by our encouragement of environmentally friendly farming and the delivery of Water Framework Directive measures for Fenland waterbodies.

	Objective	Targeted action
7.1	Ensure habitat and species adaptation	Expand the total habitat resource and increase connectivity so that species can adapt to climate change more easily. In particular increase connectivity between new and existing wetlands by the creation of linear habitats and river enhancement. Use an increase in HLS uptake and delivery of Water Framework Directive measures for waterbodies as a mechanism to help achieve these aims.
7.2	Promote and improve soil sustainability and carbon capture	Establish the potential for carbon sequestration using the existing evidence base where possible. Promote findings of recent reports and role of carbon sequestration to all relevant organisations working in Fenland.
7.3	Flood risk	Influence the development of flood risk management capital schemes to ensure they deliver multiple benefits to wildlife, local communities and landowners.
		Restore, create and manage wetlands (including reedbed, wet woodland, and grazing marsh and ponds) to manage flood risk, increase habitat connectivity * and deliver Water Framework Directive objectives for Fenland waterbodies. Ensuring all EA Regional Habitat Creation Programme targets for reedbed and grazing marsh creation are met.
		Undertake a feasibility study to provide figures on the effects of potential wetland creation on reducing flood risk and adapting to climate change within the Fens.
7.4	Water resource availability	Encourage EA to produce a single map for Fenland showing the water resource availability status of groundwater management units and river reaches in Fenland. This will assist in informing stakeholders about water resource availability across Fenland.
7.5	Reporting of results	Collect and collate information from a wider audience than presently used (i.e. farming).

		Look to link up different monitoring schemes and avoid duplication of effort. Ensure all information is reported in a user friendly manner.
7.6	Increase understanding of contribution of conservation in the Fens to flood storage, peat preservation and climate change mitigation	Promote the role of peat in flood prevention and CO ₂ storage and aim to mention it in 50% of all media programmes featuring Fenland sites.
Aim 8: We will encourage and enable a wider range of people to enjoy the natural and cultural heritage of the Fens by the further development of large, connected wetlands. The establishment of such networks will enable people to engage in a wide variety of outdoor activities, both formal and informal, contributing to their health and wellbeing. This will also promote the Fens as a unique landscape to both live in and visit.		
	Objective	Targeted action
8.1	Increase understanding of, and access to, the importance of the Fens.	Highlight and promote what makes the Fens important both historically and in the future. Identify relevant partners to assist in delivery.
		Promote community projects at targeted nature and heritage sites.
		Investigate the use of new technology e.g. Apps for mobile phones, to promote understanding and awareness. This could help to ensure that there is adequate interpretation information at sites to increase people's understanding.
8.2	Accessible information	Provide high quality and easily accessible information on the Fens and what makes them important both historically and in the future. Consider multimedia and new forms of engagement. Work in partnership with those already managing the historic environment resources for the area (e.g. Cambridge County Council Historic Environment Team and Cambridgeshire Archives).
8.3	Improve access to and within sites, taking into account site sensitivities (at present, according to the NCA draft document, only 0.69 % of the NCA (2654.26 ha) is classified as being publically accessible, mostly on NNRs, National Trust land, and CROW	Develop and promote an integrated network of green routes and public rights of way between key visitor attractions. Investigate possibilities of using river corridors as such access routes and explore opportunities around the Fens Waterway Link Project.
		Encourage the development of Strategic Green Infrastructure Strategies, as well as a

	access land).	Greenspace Strategy for each District Council.
8.4	Increase the number of visitors and provide a high quality visitor experience, taking into account site sensitivities.	Maintain and expand Walking 4 Health to connect people to the natural environment for health benefits.
		Promote Environmentally Friendly Farming farm visits.
		Develop and promote walking, cycling, and waterway routes in the Fens.
		Investigate whether certain facilities such as car parking, interpretation, visitor centres, picnic sites and better advertisement of the facilities are needed at key sites.
8.5	More people involved in volunteering work at sites and in the wider Fenland	Monitor numbers and increase knowledge base, training opportunities and confidence of volunteers. Particular emphasis on target groups such as young people, people recovering from illness etc.
8.6	Target people not represented in visitor or volunteering groups	Identify factors preventing community involvement and share information between sites and partners about successful ways of attracting and involving visitors from all sectors.
		Look to set up a 'Countryside companions' scheme to make visits possible for this difficult target audience.
8.7	Provide formal education and training opportunities for local people, schools and colleges	Identify relevant government-funded / lottery funded enabling schemes such as apprenticeships to help provide these opportunities. Devise a suitable programme of events and production of education resources amongst partners.
Aim 9: The Fens for the Future Partnership, together with the Fens Waterways Link Project, will work to increase and diversify the Fenland economy, although recognising the major contribution made by agriculture at present. This will be achieved by the further development of large connected wetlands, each of which is capable of attracting tens of thousands of visitors a year⁸		
	Objective	Targeted action
9.1	Explore the business potential of	Work with farmers to increase delivery of

⁸ Welney WWT on the Ouse Washes already receives 45,000 visitors a year and Wicken Fen 50,000. The Fenland Waterways Link Project estimates that the additional recreation and tourism encouraged by this Project alone could result in an additional £14 million a year revenue generation from one million visitors.

	delivering sustainable farming, biodiversity gain and appropriately designed and sited renewable energy	profitable Environmentally Friendly Farming. Help to connect products and services with local consumers and consider a possible Farming Accreditation scheme.
9.2	Promote and develop opportunities for green and heritage tourism	Undertake a feasibility study into fishing and boating (including kayaking and canoeing) opportunities in the project area to look for areas where such development would not be detrimental to the heritage resource. Develop a wildlife and heritage marketing plan to promote natural and cultural heritage to a wide range of visitors.
9.3	Develop a Joint Strategy with the Fenland Waterways Link Project for the provision of recreational and tourism facilities.	
9.4	Investigate and promote the (intrinsic and monetary) value of ecosystem services.	Use the partnership's contacts with academia to undertake such a study.
9.5	Provide formal education and training opportunities for local people, schools and colleges	Identify relevant government-funded / lottery funded enabling schemes such as apprenticeships to help provide these opportunities. Devise a suitable programme of events and production of education resources amongst partners.
Aim 10: We will raise the profile of the Fens for the Future Partnership to obtain wider recognition for its work. We will work to encourage greater inward investment to Fenland and will develop and promote the Strategy to keep all Partners and Stakeholders informed of progress and so that they have regular opportunities to influence its future development and direction.		
	Objective	Targeted action
10.1	Develop a Communications Plan for the Fens for the Future Partnership.	Set up a website or website page to promote the work of the project and ensure all information is accessible to a range of audiences.
10.2	Promote the Project	Produce a vision statement for the project ensuring it incorporates the recommendations of Natural Environment White Paper and the England Biodiversity Strategy and includes the project's aim of making the Fens one of the main UK BAP landscape scale wetland

		complexes by 2020.
		Promote the objectives of the project with particular reference to- a) habitat creation/enhancement, b) carbon, c) flood risk management, d) water resources, e) environmentally friendly farming and f) historic and archaeological importance to a wide audience.
		Engage with and obtain support of landowners, managers and their representative bodies, Local Authorities, Government agencies, Drainage Boards and local communities. Pursue opportunities for better collaboration between land managers.
		Address the issue of the fragmented nature and often overlapping advice and information that is produced around nature conservation in the Fens area.
		Encourage better linkages and promotion between projects and partners to maximise coverage, benefit, and efficiency and reduce mixed messages.
		Build a partners/members' log-in section into the website to enable better communication, storage of strategic documents, meeting dates, minutes, actions + timeline and so on.
10.3	Develop a strategic funding partnership with a range of organisations.	Provide a 5 year costed financial plan that is updated annually. Plan should cover expected costs, sources of income for the main priority projects and should involve public, private & voluntary sector partnerships. Look for suitable sources of match funding to develop partnership project opportunities.
10.4	Consider the use of innovative funding methods such as fund raising websites.	Investigate the potential for new approaches to fundraising.
Aim 11: We will monitor and evaluate the implementation of our Strategy to ensure that it is meeting its Aims and Objectives and is proceeding in an effective manner that meets the requirements of the Partners.		
	Objective	Targeted action
11.1	Develop a monitoring programme to ensure that the projects	Develop and implement a monitoring strategy for key ecosystem service outcomes of habitat

	objectives are delivered	creation & restoration including carbon flux, flood risk, species, recreation activities and diversification of food production. Ensure all new monitoring follows best practise.
11.2	Increase capacity to undertake monitoring	Develop & increase volunteer involvement and engagement of a wider community- in particular look to utilise farmers and IDB staff. Investigate opportunities to establish volunteer co- coordinators for the Project Area to co- ordinate volunteers in the wider Fens area and improve opportunities for training in monitoring training. Agree the methodologies necessary to make rapid assessment of different land uses. Investigate the use of modelling and innovative methods to improve efficiencies (opportunities to bring academia and practise closer together).
11.3	Reporting of results	Collect and collate information from a wider audience than presently used (i.e. farming). Look to link up different monitoring schemes and avoid duplication of effort. Ensure all information is reported in a user friendly manner.

11.4 Future Actions

The Partnership should:

1. Establish Fens for the Future as a sustainable Partnership with secure funding and agreed governance.
2. Encourage Fens for the Future to become the main Forum for debate about land use on Fenland.
3. Ensure that appropriate mechanisms are in place so that the Partnership can communicate effectively with its wider constituency.
4. Appoint a Project Officer.
5. Develop approaches and techniques for establishing corridors, buffer zones and sustainable use areas in practice.
6. Undertake further work to promote the improvements to water quality as a consequence of network creation.
7. Support action to establish further wetland creation projects.
8. Put greater emphasis on project delivery in Lincolnshire.
9. Develop closer working with the Fens Waterways Link.
10. Maintain up to date information on Fenland and commission further work if necessary.

12 Partners and governance

It is critical that the Partnership moves forward quickly to embed appropriate governance for Fens for the Future, develops effective means of communications and employs at least one Project Officer who is able to progress this strategy with stakeholders. Updated Terms of Reference for the Partnership are suggested below.

12.1 Fens for the Future Partnership – Terms of Reference

The Fens for the Future Partnership is a group of public and voluntary sector organisations whose broad aim is to further the development of a partnership approach to landscape-scale conservation on Fenland. This will achieve enhanced biodiversity outcomes and increased delivery of ecosystem services within the geographic area of the Inner Fens. This broad aim will be delivered by means of a long-term Strategic Plan which will encompass their vision, a major part of which is to develop and establish an enhanced and sustainable ecological network on Fenland.

The Fens for the Future Steering Group has the overall responsibility for the development and delivery of the Strategic Plan. In addition, Working Groups may be formed as necessary and a Stakeholder Forum of the wider partnership will meet at least annually to support the Steering Group in its aims.

12.1.1 Membership

All organisations and partnerships with an interest in or whose activities can have a potential impact upon the terrestrial and aquatic natural environment within the area of the Inner Fens are welcome to join the wider partnership.

This wider partnership will have an annual winter Forum meeting when members of the Steering Group are re-appointed.

The Steering Group will elect a Chair and Vice-Chair to serve for staggered two year periods.

The Steering Group will be responsible for devising an appropriate means of communicating with the wider partnership.

12.1.2 Membership of the Steering Group

Membership of Fens for the Future Steering Group is limited to a maximum of 20 (including a Chair and Vice-Chair). Members will be drawn from the wider organisations and partnerships that exist within the geographic area of the Inner Fens and will be elected at the annual winter Forum meeting of the wider partnership.

Steering Group members will be sought to reflect the following interests and expertise within the Inner Fens area:

- Land owning community
- Environmental NGOs

- Statutory environmental agencies
- Farmers
- Local government
- Green Infrastructure
- Academia Internal Drainage Board
- Historical Heritage
- Partnership Project Officer

The initial membership of the Steering Group is shown in Appendix 12.

Steering Group membership shall be by named representative (or a nominated deputy) and Steering Group members will serve for a period of 12 months with annual nominations at the winter Forum meeting of the wider partnership.

Major funding organisations such as Environment Agency and Natural England will be represented on the Steering Group.

Each member organisation on the Steering Group has equal status, regardless of levels of funding. Multiple members of one organisation will be considered as a single representative.

Steering Group members shall seek, as far as is possible, to reflect the wider interests of their organisation, sector or partnership (s) within the Fens for the Future Partnership.

The Steering Group may decide to co-opt or establish sub-groups of the steering group for time-limited periods at the discretion of members of the steering group.

12.1.3 The Role of the Steering Group

The role of the steering group is as follows:

- Establish a vision and strategic aims, in conjunction with the wider partnership, and oversee the implementation of the strategic vision and aims of the Partnership.
- Facilitate Delivery.
- Establish and oversee a SMART work programme for the achievement of the Partnership aims with clear accountabilities.
- Establish and oversee a reporting mechanism to update the Partnership on progress towards the Partnership objectives.
- Oversee the work of any Project officers that may be appointed.
- Liaise with national specialist groups and taxon groups, for example Wetland Biodiversity Integration Group (or its successor) and invertebrate groups.

12.1.4 Frequency of steering group meetings

The Steering Group will meet as necessary, likely to be quarterly. Meetings can be via teleconferences but two face to face meetings must be held a year. More frequent meetings may be held, in person or via teleconference depending upon circumstances.

12.1.5 Decision Making

Where possible the Steering Group will operate on a consensus basis but if this is not possible it will be by majority view.

Any decisions made by the Steering Group members do not necessarily reflect the views of their individual organisations.

Dissolution of the Partnership would be by decision of the annual winter Forum meeting of the wider Partnership, as advised by the Steering Group.

12.1.6 Competent Authority

A competent authority will need to be found to account for any funds obtained by the Partnership and to employ any staff that maybe recruited.

12.1.7 Role of any Project Officer that may be appointed

The role may involve:

- Convening the annual winter Forum of the wider Partnership
- Co-ordinating information to support the delivery of the Partnership's aims and objectives on the ground;
- Monitoring achievement of the Partnership's objectives
- Representing the Partnership externally as appropriate

13 Funding

In the current economic climate the availability of funds for biodiversity conservation is likely to be limited. This section considers present and some possible future sources and mechanisms for funding biodiversity delivery on Fenland. No single lever or mechanism will address the issue of the continued loss of biodiversity on Fenland. There will be a need to continue to draw upon a combination of mechanisms and levers. Enabling levers (advice, training and demonstration) are not explicitly referred to but can be used to complement the mechanisms discussed.

The funding for the delivery of this Plan can be divided into three parts:

13.1 Major capital expenditure

Funding is required to assist in the establishment of the enhanced network, essentially the construction of restoration areas, corridors and buffer zones which potentially requires millions of pounds. If proposals can be linked to Environment Agency or Drainage Board capital schemes then this would be a way of proceeding which would provide initial amounts of funding, although there is no guarantee that appropriate schemes will be required by the Agency or Boards in areas that will help establish the network. The priority landscape corridor identified on the map as the corridor where work should start is likely to be an example of this.

There are already examples of this approach such as the Environment Agency's Regional Habitat Creation Programme, which is aimed at helping replace conservation sites of European importance that are being affected by sea level rise on the East Anglian coast. Agency funding is helping create restoration areas on Fenland as the nearest replacement to the affected East Anglian sites. Significant national funding is also being provided to create restoration areas adjacent to the Ouse Washes to help overcome summer flooding which is responsible for 81% of the site being in 'unfavourable no change' condition.

The Environment Agency are also leading the largest waterways regeneration project in Europe, the Fens Waterways link, which has the potential to do a great deal to assist in the creation of the network. There is the opportunity to work with them to provide additional benefits that will both develop the network and the experience of visitors using the new navigations.

This approach could be extended to include the construction of new road links across the Fens such as the recently constructed Spalding to Peterborough road or the Thorney by-pass, where construction of such schemes in the future could include elements of network enhancement.

The actual costs of restoration are obviously variable depending on the location, quality and condition of the land that is being bought and the proposed end use. It is more expensive to create reedbed than wet grassland because there is more work required and greater control of water levels is needed. The cost of purchase and groundworks may be in the order of £17 – 20,000 per ha for wet grassland, rising to c £23,000 per ha for reedbed.

Ideally priority areas for wetland restoration, such as the Restoration Areas identified on the Strategic Plan that accompanies this Plan, would be identified as suitable areas for contributing to the national ecological network and any land that came up for sale within them could be bought and land banked. Once an appropriate area for restoration had been acquired then restoration work could proceed. Until that time the land could be let for commercial agricultural purposes. The only question is where the funding for such an approach would come from, although one possible suggestion is made below.

The most likely source of external funding secured for enhancing ecological networks on Fenland is the UK Life+ ring-fenced allocation of about £17m a year which has not been fully used since the programme started in 2007. In 2009 only £1m was spent on a project focussed on biodiversity outcomes whilst Life+ seeks to spend 50% of their allocation on these sorts of projects. Life+ Nature has to be focused on Natura 2000 sites of which the Ouse and Nene Washes, Woodwalton Fen, Wicken Fen, Chippenham Fen and Baston and Thurlby Fens are the only sites on Fenland while Life+ Biodiversity offers more opportunities.

A grant bid is in progress to the Heritage Lottery Fund for a Landscape Partnership Programme grant around the area of the Great Ouse Wetland. This is, we believe, focussed around archaeology and community engagement but there may be opportunities to factor in more practical works to foster biodiversity improvements.

The other major funding source is the Rural Development Programme for England (RDPE) and the Environmental Stewardship Scheme (ESS). While RDPE funding could be available for environmental enhancement work it is most likely that funding would come from the ESS. ESS is aimed mainly at private landowners and its Higher Level Scheme (HLS) is aimed mainly at the maintenance of areas of existing high quality semi-natural vegetation, rather than creating habitats from scratch. If HLS funding is to be accessed then the HLS targeting statements for the Fens will need to be revised to make its availability explicit. Of course this is likely to be an issue for the creation of networks elsewhere in the country. Unlike in other areas the present Woodland Grant Scheme is unlikely to play a major role in the Fens. It is difficult to be proactive with regard to ESS as at present the makeup of the successor to RDPE for the period 2014 to 2021 is unknown.

One possible way to facilitate access to major grant funds would be to consider setting up an independent not-for-profit Company or a Trust specifically for the purpose of developing the Network and accessing appropriate funding sources. In the medium to long term if the Government is seriously committed to ecological restoration then it is going to have to consider setting up appropriate funding mechanisms to support it.

Another option that has been suggested to the Fens for the Future Partnership is to create a 'land loan' bank, specifically to loan money for land purchases by Fens for the Future partners. This would be a way of possibly 'filling the gap' between money being needed to complete a land purchase and money being available from a grant giving body. The approach would involve supporters of the partner organisations putting money into the 'land loan' bank. The bank would then lend the purchase price of the land, to be repaid when funding was obtained. Investors in such a bank would be able to withdraw their funds, on the provision of appropriate notice.

There is already a model for such a bank. 'Shared Interest' loans money to fair trade producers in 33 countries. Currently they have 8,000 investors, investing an average of £3,375 each, meaning the bank has £27 million to invest. Investors are attracted by being able to make a vital contribution to assisting small fair trade businesses in developing countries at little personal cost to themselves. The cost is effectively the loss of interest that they would have got by investing elsewhere, plus a small element of risk.

The main funding sources for such major schemes can be seen from the information provided in Appendix 13.

13.2 Project development

The second part consists of many smaller projects that are needed to support the development of the enhanced network whether they are survey work, community involvement and development or information awareness projects. There is a much wider variety of potential grant giving organisations for such projects. The main funding providers for such projects are listed in Appendix 13.

Particularly noteworthy is the Catchment Restoration Fund which Defra has created recently to help improve water quality and meet the EU's Water Framework Directive targets. A £28m fund, providing up to £10m each year, has been allocated for projects to be delivered in 2012/13, 2013/14 and 2014/15. The fund will support work that aims to:

- restore more natural features in and around waters;
- reduce the impact of man-made structures on wildlife in waters; or
- reduce the impact of small, spread-out (diffuse) sources of pollution that arise from rural and urban land use".

13.3 Possible future funding mechanisms

13.3.1 Payments for Ecosystem Services (PES)

Payments for Ecosystem Services (PES) has the potential to unlock non-government sources of funding for the natural environment by requiring beneficiaries to pay (directly or indirectly) for the benefits they receive from the natural environment (e.g. flood storage, carbon storage). Theoretically, PES has the potential to unlock new sources of funding in a cost effective way by linking beneficiaries more closely to the source of the benefits. PES also has the potential to generate funding from sectors who have not traditionally invested in the natural environment.

Defra is currently developing, embedding and building the evidence base for an ecosystems approach through its 'Natural Value' programme and Fens for the Future could seek to become a pilot for this approach, facilitating the development and operation of a scheme.

13.3.2 Biodiversity offsets

In seeking new funding streams for biodiversity, there is a potential opportunity (estimated at £53-290m annually) through biodiversity offsets. In particular through delivery mechanisms where developers can purchase biodiversity credits from a landowner or habitat bank to deliver the offset requirement (in line with agreed requirements).

Again if a scheme is developed then Fens for the Future could seek to become a pilot for this approach.

13.3.3 Carbon sales

In theory, there is potential to raise a new source of funding for biodiversity through the sale of carbon, for example through the sale of credits but there is still a long way to go before a viable practical scheme is likely to be available (Tanneberger & Wichtmann, Eds, 2011).

13.4 Other recommendations

To increase the potential for securing funding for biodiversity there are a number of relatively simple things that Fens for the Future should consider in the way that a partnership works. These include:

- **Communication of priorities to other sectors:**

Identify the most effective way of gaining the interest of public and private sectors. This requires identifying appropriate media and style to flag the Fens priorities and what funding is being sought for. For example, recent information on external funding work by the RSPB states that in 2008/09 they were successful in raising approximately £25M from local, regional and international funders. Environment Agency have sought to secure external funding with the help of a glossy brochure identifying projects they would like support for. They highlight the need for funding (and why external funding is being sought); the importance of funders' contributions; and an insight into their priorities.

- **Use of Grant in Aid/Programme money**

Relatively small sums of public money can be used to bring in larger sums of money from other sources. Recent examples include the 'Beef and Butterflies' project in the South West region where £10k of Natural England money secured £100k from private and charitable sources and the Sefton Coast HLF project that used £40k over 3 years from Natural England to lever-in £1.9m from HLF and project partners. The Partnership would need to consider how such opportunities could be systematically maximised in the future.

- **Partnership working**

It is recommended that Fens for the Future continues to develop a partnership driven, strategic and programmed approach to the pursuit of external funding which offers the best hope of overcoming barriers such as the complexity of the application process, difficulty in finding match funding, problems prioritising projects etc. This will require external funding staff across the partnership working together to share information and

expertise and establish a programme of large scale external funding applications. This approach will require clear terms of reference to avoid potential disagreements over allocation of funding.

13.5 Monitoring and evaluation

Monitoring, review and evaluation are an important part of the delivery of the Plan and are necessary when considering whether a target landscape has been conserved, restored or enhanced. Having objectives that are 'smart' and deliverable with specified outputs will greatly help the review process, and the identification of whether any corrective action needs to be taken. The development of milestones on the way to the achievement of outputs and outcomes will also assist the monitoring of progress over time. Evaluation will test that the outcomes of the project work are being achieved in a way that delivers the aims and objectives, meets partners expectations and provide value for money.

It is important to remember that some evaluations of success may require baseline information to be collected before any programme actually starts. Certainly this could be important for any ecological monitoring.

A risk assessment should be prepared as part of the monitoring process so that those responsible can assess which areas of the business they need to focus on and when in order to keep the Plan on track and avoid pitfalls.

The implementation of any programme is likely to require project plans and proformas and monitoring and evaluation requirements need to be included on them. Non quantitative data such as people's perceptions and views can be gathered through the use of event evaluation forms and wider audits encompassing the general public if required.

A briefing should be held for staff and partners at the start of any programme to ensure that the monitoring process is clear and is followed. Assessment criteria can be explained, feedback forms noted and the process of recording clarified. This will ensure uniform recording is carried out and 'double counting' avoided.

Provision for staff to contribute to programme evaluation should be planned for right from the start of the work.

Regular reports will obviously need to be provided to funding organisations.

14 Recommendations for missing information

A great deal of time was spent chasing information in an appropriate format that could be used in this Plan. The required format was in GIS layers so that maps of the information for the Plan area could be produced. We were not able to get information on the distribution of aquatic macrophytes that Owen Mountford had produced in this format from the National Biological Records Centre at CEH or on the distribution of certain species of water beetle. We wanted this data to test how well our proposed ecological network picks up the distribution of key indicator species on Fenland. This is still work that it would be useful to take forward in the future.

We also sought information on the distribution of hydrological units on Fenland, especially in the vicinity of the core areas, but were not able to obtain any such information from Drainage Boards. This will be essential information for the development of the network, especially for corridors and buffer zones.

Work with Local Enterprise Partnerships will be beneficial, especially to ensure the collection of socio – economic data for the Fens as a whole, which is an important component of justifying the expenditure of large sums of money on ecological restoration.

The next stage will be for the Partnership to agree the priorities from this Plan and then prepare a costed action plan to take them forward. This will need to include:

- Re-establishing the Partnership on a secure basis and employing a Project Officer
- Holding technical workshops to look at the approaches and techniques for establishing corridors, buffer zones and sustainable use areas on the ground.
- Progress meetings with key sectors to develop the concept of the network in practice.
- Establish Fens for the Future as the key Fenland forum for discussing and implementing change on Fenland to provide it with a sustainable future.

15 References

- Archaeology, Arable Landscapes and Drainage in the Fenland of Eastern England. Archaeological Project Services Report No. 27/02.
- Atkins, 2004. Fens Waterways Link Implementation Plan. Environment Agency.
- Bird, W 2007. Investigating the links between the Natural Environment, Biodiversity and Mental Health. RSPB.
- Boreham, S., Conneller, C., Milner, N., Taylor, B., Needham, A., Boreham, J. and Rolfe, C. J. 2011 Geochemical Indicators of Preservation Status and Site Deterioration at Star Carr. *Journal of Archaeological Science*, 38, 2833-2857.
- Bridges, C. 1988 "A Survey of the Aquatic Vegetation of Woodwalton Fen NNR". (Unpublished - 170 pp).
- Colston, A., Carter, B. and Broadbent-Yale, P. 2001. The Wicken Fen Vision - a large new wetland reserve for people and wildlife in Cambridgeshire. The National Trust.
- Cope-Faulkner, P. 2012. Clamptgate Road, Fishtoft. Archaeology of a Middle Saxon Island Settlement. *Lincolnshire Archaeology and Heritage Report Series 10*.
- Cranfield University, for Wet Fens for the Future, December, 1995. Feasibility Study, Phase I. School of Agriculture, Food and Environment, Cranfield University.
- Cranfield University, for Wet Fens for the Future, November, 1996. Feasibility Study Phase II – A Study of the Economic and Social Implications of creating New Wetlands in Fenland. Cranfield University.
- Darby, H.C. 1956. The Draining of the Fens. Cambridge University Press.
- Environment Agency, 2009. Enjoying the Water in the East of England.
- Evans, C. 2003. Power and Island Communities: Excavations at the Wardy Hill Ringwork, Coveney, Ely. *East Anglian Archaeology 103*. Cambridge Archaeological Unit.
- Evans, C. and I. Hodder. 2006. 2 Vols The Haddenham Project: Woodland Archaeology:: Neolithic sites at Haddenham and The Haddenham Project: Marshland Communities and Cultural Landscape - From the Bronze Age to the Present Day. McDonald Institute, Cambridge.
- French, C. 2003. 'The development of the Cambridgeshire fenlands of eastern England', in *Geoarchaeology in Action, Studies in soil micromorphology and landscape evolution*, 133-142. Routledge. London.
- French, C.A.I. and F.M.M.Pryor. 1993. The South-West Fen Dyke Survey Project 1982-1986. *East Anglian Archaeology 59*. Fenland Archaeological Trust.
- Gaffney V., Fitch S. and Smith D. 2009. Europe's Lost World: the rediscovery of Doggerland. CBA Research Report. No. 160.

- Godwin, H. 1978. Fenland: its ancient past and uncertain future. Cambridge University Press.
- Hill, G, Courtney, P, Burton, R & J, Potts 2003. Forests' role in Tourism: Phase 2. Summary report - Final for the Forestry Group (Economics & Statistics) of the Forestry Commission.
- Holman, IP and Kechavarzi, C. 2011. Draft. An estimate of peat reserves and loss in the East Anglian Fens, Commissioned by the RSPB. Cranfield University.
- Holman, IP. 2009. An estimate of peat reserves and loss in the East Anglian Fens, Commissioned by the RSPB. Cranfield University.
- Hume, C. 2008. Wetland vision Technical Document: overview and reporting of project philosophy and technical approach. The Wetland Vision Partnership.
- Knight, M. 2009. 'Excavating a Bronze Age timber platform at Must Farm, Whittlesey, Peterborough', in PAST no 63. Prehistoric Society, London.
- Knight, M., M. Brudenell and D. Gibson. Pattern and Process: Landscape Prehistories from Whittlesey Brick Pits. The Bradley Fen and King's Dyke Excavations. CAU Flag Fen Basin Depth & Time Series - Volume 1.
- Mountford, J.O. and Redhead, J.W. (2012). The Fens NCAs: Data-pack for participants in workshop (Natural England, Peterborough 5th December 2011). Included as Annex in Mountford, J.O., Amy, S.R., Baker, A., Carey, P.D., Cooke, A.I., Dean, H.J., Peyton, J.M., Pywell, R.F. and Redhead, J.W. (2012). Monitoring of Higher Level Stewardship: Interim Report on 2011/12 Programme. CEH Project NEC03703.
- Natural England, 2010. England's peatlands: carbon storage and greenhouse gases (NE257).
- Natural England, 2011. Microeconomic Evidence for the Benefits of Investment in the Environment – review.
- Newbold, C. 2010. Possible Reasons for the Decline of the Aquatic Flora at Woodwalton Fen NNR -with particular emphasis on the *Potamogeton* flora. Unpublished?
- Newton, A. Forthcoming. An Iron Age fen edge settlement and early Romano-British activity at Black Horse Farm, Sawtry, Cambridgeshire. East Anglian Archaeology Monograph Series.
- Nisbet, T., Silgram, M., Shah, N., Morrow, K., and Broadmeadow, S. (2011) Woodland for Water: Woodland measures for meeting Water Framework Directive objectives. *Forest Research Monograph*, 4, Forest Research, Surrey, 156pp.
- Oates, R. 2002. Restoring the Fens – the report of The Fens Floodplain Project, 1999 - 2002. RSPB.
- Palmer, M. 1975 "Study of the flora and fauna of dykes at Woodwalton Fen NNR". (Unpublished - 100pp).
- Pankhurst T. 2002 "The Ditches of Woodwalton Fen NNR – Botanical Survey and Analysis". (EN commissioned report – unpublished).

- Pryor, F.M.M., 2001, The Flag Fen Basin: Archaeology and Environment of a Fenland Landscape. English Heritage Archaeological Reports. London.
- R. Oates, 2002. Restoring the Fens – the report of The Fens Floodplain Project, 1999 - 2002. RSPB.
- Rayment, M, Lewis, P, Henderson, R & Broom, G 2000. Valuing Norfolk's Coast. The Economic Benefits of Environmental and Wildlife Tourism Sandy: RSPB.
- RSPB, 1998. 'Wet Fens For The Future, Final Report.
- RSPB, 2011. Natural Foundations: conservation and local employment in the UK. Sandy.
- RSPB, 2011. RSPB Reserves and Local Economies. Sandy.
- Souch, C., Gilbert, J., Gowing, D., Hess, T. & Fiorini, E. 2000. Anglian Region joint study on water resources availability for wetland creation: final report. Cranfield Ecohydrology Centre.
- Tanneberger, F. & Wichtmann, W., Eds. 2011. Carbon credits from peatland rewetting: climate – biodiversity – land use. Schweizbart Science Publishers, Stuttgart.
- The England Biodiversity Group, 2011. ThinkBIG: Why landscape-scale conservation benefits wildlife, people and the wider economy.
- Thomas, G.J., Allen, D.A. & Grose, M.P.B. 1981 The demography and flora of the Ouse Washes, England. Biol. Conserv. 21:197 – 229.
- Tourism South East, 2010. Economic Impact of tourism: Cambridgeshire 2010 results.
- UK 2012. The Climate Change Risk Assessment, the UK Government report. Defra.
- Wet Fens for the Future Project, 1996. Wet Fens for the Future booklet.
- Wise Use of Floodplains website at www.floodplains.org

16 Appendices

Appendix 1. Ecosystem Services:

Service	Assets/attributes: main contributors to service	State	Analysis	Opportunities	Principle Services Offered by Opportunities
Analysis of Provisioning Services					
Food provision	Soil Water resources	44% of the soil in The Fens is classified as Grade I agricultural land, 43% as Grade II. In 1987 it was estimated that there were 24,000 ha of lowland peat soils in the Fens. (Holman 2009) Arable cultivation requires drainage which leads to wasting of the peat.	The Fens produces 37% of all outdoor vegetables; 24% of potatoes and 17% of sugar beet in the UK. 4,000 farms employ 27,000 people in intensive food production. Soil management is primarily aimed at supporting food production, which may be at the expense of other ecosystem services. Peat wastage leads to concern about the long term viability of the soil for food production.	To ensure the long term sustainability of soil and hence support the production of food, while ensuring that there are mechanisms to conserve and restore peat. This is likely to mean increasing the area of land under grass and therefore reducing agricultural productivity.	• Soil quality • Provisioning services • Soil erosion • Biodiversity

Service	Assets/attributes: main contributors to service	State	Analysis	Opportunities	Principle Services Offered by Opportunities
			Continued commercial farming at the current level will result in the loss of the peat resource.		
Water availability	Rivers Drains Washlands Groundwater	Those rivers that have been subject to assessment have a CAMS status of 'no water available' in the summer months, and a 'water available' CAMS status during winter months (typically the period of high flow). However many areas of Fenland have yet to be assessed. Ground water is over abstracted.	Abstractions in the south central NCA area are used mainly for irrigation and industry. Water is imported from outside the catchment for public water supply. The Ely Ouse to Essex Transfer Scheme diverts water from the Ely Ouse River to Essex water courses to support river flows and abstractions for public water supply.	There is potential to increase the storage of water by increasing the number of reservoirs, washlands and wetlands and by increasing the storage capacity of existing washlands. This will increase water availability for irrigation as well as providing opportunities to benefit biodiversity.	• Cultural services • Water quality • Historic environment

Service	Assets/attributes: main contributors to service	State	Analysis	Opportunities	Principle Services Offered by Opportunities
Analysis of Regulating Services					
Climate Regulation	Peat soils	Loss of peat and the carbon it stores has been very significant as a result of peat wastage in agriculturally drained and cultivated soils. In some areas ground levels have fallen by 5-6 feet as a result of peat wastage. In future, wind erosion of remaining dried peat soils will be significant. Methane emissions are thought to be negligible.	The 24,000 ha of peat soils (estimated in 1987) are highly valuable for agriculture but loss of peat and the carbon that it stores as a consequence of peat wastage caused by the oxidation and shrinkage of peat soils that have been agriculturally drained and cultivated has been very significant. When the peat soils and their hydrological status are well managed the 24,000 ha will make a valuable contribution to carbon sequestration	Wetted peat deposits represent a key part of the carbon storage resource of the UK. Recreation of wet fen, wet grassland and washland together with changes to arable management (specifically minimum tillage, greater use of organic manures, biosolids and digestate plus soil conditioners such as biochar) will help to ameliorate these significant losses if pursued on sufficient scale. If peat is kept wet it reduces or avoids oxidation.	• Soil quality • Food provision • Regulation of soil erosion • Regulation of soil quality • Regulation of water quality • Historic environment

Service	Assets/attributes: main contributors to service	State	Analysis	Opportunities	Principle Services Offered by Opportunities
			and storage.		
Regulation of Soil Erosion	Semi-natural habitats Extensively grazed permanent	About 2 cm a year of peat soils are lost through peat wastage and wind erosion.	There are two Priority Catchments under the ECFSDI that fall partly within the Fens NCA in the south east (the Little Ouse (Thetford Area)) and in the north east (the Lincolnshire Coast Rivers). Soil erosion and soil wash is identified as an issue in the former while in the latter soil erosion is an issue. The loss of peat soils through peat wastage and wind erosion has already been identified as an issue. This is particularly	Encourage landowners and managers to use farming methods that protect the soil such as maintaining cover at sensitive times e.g. use of grass buffer strips in areas of arable. Similarly encourage landowners and managers to take opportunities to manage and protect the remaining peat soils.	• Food provision • Climate regulation • Regulation of soil erosion • Regulation of water quality

Service	Assets/attributes: main contributors to service	State	Analysis	Opportunities	Principle Services Offered by Opportunities
			problematic with spring-sown root cropping such as sugar beet, carrots and parsnips, where land is exposed throughout the winter.		
Regulation of Soil Quality	Permanent grassland and other semi-natural habitats	89% of the soils in the Fens are Grade 1 and Grade 2 Loss of peat is a particular problem in this NCA, estimates in Holman (2009 & 2011) and NE (2010) suggest a reduction in peat soils of c 2 cm a year.	The dark humus rich peaty fens and the finer lighter silty fens are the key natural resource. Compacted soils lead to reduced infiltration and storage of water and, potentially, increased soil erosion. Maintenance of the integrity of the hydrological system in this NCA will contribute to	Encourage Good agricultural practice to avoid soil compaction. Maintain wetted peat soils to reduce loss through compaction, oxidation and wastage.	• Geodiversity • Historic environment • Climate regulation • Regulation of soil erosion • Regulation of water quality • There are strong interactions between different regulating services (e.g. water, soil, air quality) and between the regulating services and other ecosystem services. Collectively regulating services underpin many of

Service	Assets/attributes: main contributors to service	State	Analysis	Opportunities	Principle Services Offered by Opportunities
			maintaining and improving soil quality. UK NEA: soil quality is linked to almost all other regulating services (e.g. nutrient cycling, biomass production, water quality, climate regulation, pollination etc.) through the soils capacity to buffer, filter and transform. Soil quality over the last 50 years has been degraded primarily by atmospheric pollution and inappropriate management practices.		the goods and services provided by all habitats.

Service	Assets/attributes: main contributors to service	State	Analysis	Opportunities	Principle Services Offered by Opportunities
Regulation of Water Quality	Permanent grassland. Semi-natural habitats Washlands Reedbeds and other wetland habitats	Excess nitrates, phosphates and pesticides have led to pollution and eutrophication in water courses while sedimentation in rivers is a feature of the priority catchments in the NCA (the Little Ouse and Lincolnshire Coast Rivers). In both catchments excess chemicals from arable and horticultural food production are identified as issues.	There are two Priority Catchments under the ECFSDI that fall partly within the NCA; the Little Ouse (Thetford Area) and Lincolnshire Coast Rivers. Excess nitrates and phosphates and pesticides from arable and horticultural food production are identified as issues within both Priority Catchments, in addition, soil erosion is identified as an issue. Excess nitrates, phosphates and pesticides have led to pollution and eutrophication in water courses while	Manage farmland under the principles established under the England Catchment Sensitive Farming Delivery Initiative (ECFSDI). Encourage landowners and managers to manage land to prevent the drying out of peat. Encourage the establishment of areas of semi-natural habitat such as reed bed and washland which slow the passage of water through the hydrological system. Establish new and increase existing areas of permanent grassland, other semi-natural habitats including reedbeds, fens and wet grassland.	• Food provision • Biodiversity • Geodiversity • Historic environment • Climate regulation • Regulation of soil erosion • Regulation of soil quality

Service	Assets/attributes: main contributors to service	State	Analysis	Opportunities	Principle Services Offered by Opportunities
			sedimentation (a product of soil erosion) of rivers is a feature of these Priority Catchments.		
Regulation of Water Flow (flooding)	Semi-natural habitats Extensively grazed permanent grasslands and washlands Washlands Remaining Fens Artificial flood defence structures	The four main catchments within the NCA are the Witham, Welland, Nene and Great Ouse. The EA flood risk map indicates the majority of the NCA is at high risk of river and/or coastal flooding. Flood control is a key issue for most of the NCA. Remaining Fens allow a longer period of water storage. UKNEA – a rigorous estimate of the	The four main catchments within the NCA are the River Witham, River Welland, River Nene and the Great Ouse. Flood control is a key issue for most of the NCA particularly since major flooding events in 1953; the Environment Agency Flood Risk map indicates that the majority of the NCA is at high risk of river and / or coastal flooding. However, most settlements are offered protection	Extensive areas of semi-natural habitat (washlands with wet grassland, reedbeds, etc.) enable effective flood management. Increase the current flood storage capacity by creating sizeable areas of lowland fen, reedbeds, coastal floodplain grazing marsh concentrating on areas at risk near settlements. Washlands on the major river systems include three large wetlands comprise the largest proportion of SSSIs in the NCA. Better management of water courses for example a more	• Food provision • Water availability • Climate regulation • Regulation of soil erosion • Regulation of soil quality • Regulation of water quality

Service	Assets/attributes: main contributors to service	State	Analysis	Opportunities	Principle Services Offered by Opportunities
		possible increase in flood hazard is a crucial task for planning future climate change adaptation strategies but our understanding of this change in risk is currently limited.	from flooding by man-made defences on the coast and main rivers. In addition, washlands (areas of permanent grassland deliberately flooded to prevent rivers overtopping) occur on the major river systems and include three large SSSI: the Nene, Ouse and Cam Washes. The Welland Washes have not been used since 1953 and are now arable farmland. In the Fens sub-areas of all four main rivers in the NCA the current Policy in CFMPs is "In the short term it is	relaxed management of the systems. Produce a strategy to develop a sustainable, integrated and long term flood risk management approach. Adopt Great Fen strategy elsewhere of combining objectives for rewetting floodplains for biodiversity and for flood risk management. It aims to store winter floodwater while also providing water to restore and maintain fenland habitat on previously arable land. Other objectives include improving water quality, increasing recreation and tourism opportunities, and improving quality of life for local people.	

Service	Assets/attributes: main contributors to service	State	Analysis	Opportunities	Principle Services Offered by Opportunities
			considered feasible and effective to maintain the existing flood defences at the current level of flood risk management. However, in the future the protection given by these defences may decline as future flooding is expected to become more intense⁹. It is proposed to produce a Flood Risk Management Strategy for The Fens to investigate how flood risk varies across the area and the best approach to managing this risk in the future.		

⁹ River Welland Catchment Flood Management Plan Summary Report, December 2009. Environment Agency.

Service	Assets/attributes: main contributors to service	State	Analysis	Opportunities	Principle Services Offered by Opportunities
Pollination	Orchards	Unknown	Bumble bee declines in the UK have been related to climatic shifts. There has been a severe decline in wild and managed pollinator numbers over the last 30 years, this trend is likely to continue. This is caused by loss of semi-natural habitat, the introduction of pathogens, inappropriate use of agro-chemicals and climate change. It is difficult to model the future and therefore difficult to predict the likely	Use pollen and nectar mixes for field margins in Environmental Stewardship to increase landscape connectivity.	• Food provision • Biodiversity

Service	Assets/attributes: main contributors to service	State	Analysis	Opportunities	Principle Services Offered by Opportunities
			impacts for crop and wildflower pollination. Lowland meadow habitats found in the NCA provide important nectar sources for pollinating insects in an area otherwise devoid of significant remaining semi-natural habitats.		
A sense of place/ Inspiring Places	The draining of the fens and the creation of the landscape was a monumental achievement.	Large-scale, flat landscape with long views and expansive skies. Provides a strong sense of place and strong integrity & consistency.	A hierarchy of embanked rivers, drains and ditches form a distinct geometric pattern and provide a strong influence throughout the area. Marshes, swamps and fens add a further distinct character. Despite	Rivers and waterways are key distinctive features. 17th century drainage system is internationally important in cultural, land management and engineering terms.	• Spiritual and religious value • Inspiration for art, folklore, architecture etc. • Aesthetic values • Cultural heritage values • Recreation and tourism

Service	Assets/attributes: main contributors to service	State	Analysis	Opportunities	Principle Services Offered by Opportunities
			apparent uniformity, marked variations occur throughout the area, from the ancient character of the 'settled Fens' between King's Lynn and Boston to the straight lines and strong colours of the drained 'peaty Fens', plus extensive orchards in Wisbech. Many writers have been inspired including Charles Kingsley, Graham Swift, Edward Storey and Carry Akroyd.		
A sense of history	Mesolitihc and Neolithic dryland settlement and ceremonial site remains, dating from periods before the first	Well preserved remains of prehistoric to Roman landscapes are being exposed due to shrinking peat levels	The area's distinct history and character are inextricably associated with the fine balance between man's ability to	Early archaeological evidence is being exposed from the shrinking peat. Well preserved remains from the Bronze Age are found such as at Flag Fen.	• Spiritual and religious value • Inspiration for art, folklore, architecture etc. • Aesthetic values

Service	Assets/attributes: main contributors to service	State	Analysis	Opportunities	Principle Services Offered by Opportunities
	marine transgressions. Waterlogged prehistoric settlements, structures and boats from the Bronze Age and Iron Age. Roman engineering: Car Dyke (from Lincoln to the River Cam) and the Fen Causeway (Peterborough to Denver). The 'Romanisation' of the fens evident in extensive new settlement patterns. Salterns: prehistoric to medieval, dominant in the silt fen.	in shallow fen areas in which under drainage has occurred since 17th century. Those sealed beneath ancient marine and freshwater deposits in the deeper parts of the fen basin, or in the ancient fenland rivers, remain waterlogged, well preserved and of national and international importance. English Heritages <i>The Fenland Project</i> (Coles and Hall 1998) set up to recover evidence of the past before it desiccated	extract agricultural wealth from a productive landscape and the forces of the natural landscape which are constantly poised to return to a 'waterland' state. The subtle changes in soils and drainage have determined the historic settlement pattern, with the monastic establishments at Ely, Crowland and Thorney reflecting the clay islands' ability to support large structures. Likewise the 'Silty Fen', arcing around the Wash, gave rise to the 'Townlands' with their fine	Interpretation of the many historic features associated with the drainage of the Fens over the millennia. Eel fishing Raise awareness of the value of the features found in this area and the need to encourage farmers to adopt alternative cultivation methods to prevent the loss of archaeological remains <i>and the peat</i>. Many of the ancient waterways are not recognised as such and would benefit from interpretation/information boards	• Cultural heritage values • Recreation and tourism • Environmental Stewardship.

Service	Assets/attributes: main contributors to service	State	Analysis	Opportunities	Principle Services Offered by Opportunities
	Historic fen-wide drainage system. Ely Cathedral, Boston Stump are featured cathedrals, but numerous, powerful, medieval abbeys were located on all Fenland islands and around the fen edge. Canal systems linking the islands and the mainland, and river diversion works were commissioned by these establishments. Saxon and Medieval sea defences are visible around The Wash A diversity of field	and perished, 1000s of new sites were mapped. The assessment of a handful of sites in each of the Fenland counties indicated that many were in a poor state of preservation due to intensive under drainage of the land since the 17th century, while others in parts of Fenland with shallow cover soils were plough damaged or ploughed out. Excavations in Fenland have demonstrated the use of 'marling' or 'claying' of fields in	medieval churches (e.g. Boston) and Georgian merchant houses. The settlements on the 'Peaty Fen' followed the systematic drainage of the Levels and is less rich in visible historic features, however they conceal considerable evidence of prior settlement dating back to prehistoric times (e.g. at the timber late Bronze Age causeway at Flag Fen and the boats and fishing structures at Must Farm). The peaty fens also conceal an intricate pattern of former		

Service	Assets/attributes: main contributors to service	State	Analysis	Opportunities	Principle Services Offered by Opportunities
	patterns ranging from the ancient semi-regular enclosure of the Townlands to the engineered 18th/19th century fields of the open inland fens.	the peat fens from the 18th to the early 20th century, where silts and clays are dug from lines of pits across a field and thrown up onto the peat surface in an attempt to add bulk to the thin deflated cultivation soils and prevent their loss through 'Fen Blows'.	watercourses and creeks that are evident in aerial, infra-red and LiDAR images. Archaeology in the Fens is well protected underground while the peat is relatively intact. Increasingly, remains are discovered as the peat dries out. Historic towns – Georgian architecture.		
A sense of tranquillity	Large-scale, flat landscape with long views and expansive skies without intrusive industrial activities.	64% of the NCA is classified as undisturbed (CPRE intrusion map of 2007), a decrease from 90% on the 1960s.	The open and empty landscape means different things to different people; some can find it featureless and intimidating whereas	Appealing landscape, history and wildlife create great opportunities for tourism.	• Spiritual and religious value • Inspiration for art, folklore, architecture etc. • Aesthetic values • Cultural heritage values

Service	Assets/attributes: main contributors to service	State	Analysis	Opportunities	Principle Services Offered by Opportunities
			others find it exhilarating and value its tranquillity, which still persists away from the settlements and major transport corridors. Sense of tranquillity is likely to be particularly associated with the area's remaining wetland habitats.		• Recreation and tourism
Recreation	Rights of Way Open access land Coastal access	2, 314 km of rights of way within this NCA.	Recreation is supported by 2,314km of rights of way (at a density of 0.6km per km ²) and 627ha of open access land. Recreational opportunities are relatively restricted due in part to the dominance of agriculture and also	Major habitat restoration projects at Great Fen and Wicken Fen offer opportunities for improving and creating new access. New national coastal access routes. Long distance routes such as Ouse Valley Way, Hereward Way and Nene Valley Way could all be promoted.	• Spiritual and religious value • Inspiration for art, folklore, architecture etc. • Aesthetic values • Cultural heritage values • Recreation and tourism • Social relations

Service	Assets/attributes: main contributors to service	State	Analysis	Opportunities	Principle Services Offered by Opportunities
			the lack of public access or rights of way over most of the drained fens. Existing green infrastructure sites are currently also limited; however major initiatives with coastal access, and at Great Fen and Wicken Fen, provide a clear vision of what can be achieved in the future by restoring and expanding the unique and rich fenland ecosystems. There are opportunities for promoting long distance walking (e.g. Ouse Valley Way, Hereward Way and Nene Valley Way)	Major green infrastructure studies have been completed which should indicate ways to progress.	

Service	Assets/attributes: main contributors to service	State	Analysis	Opportunities	Principle Services Offered by Opportunities
			and good routes for cycling and horse-riding along old drove roads. Agriculture dominates the landscape, recreational opportunities are restricted.		
Biodiversity	Internationally protected sites:	A number of sites notified for their international importance because the habitats they contain support internationally important numbers of breeding and/or overwintering birds, spined loach, and great crested newt.	Seasonally flooded wet grassland, reedbeds, calcareous fen and ditches provide important habitats for a number of species. Key to the success of these habitats is the presence of water at the right time of year in the appropriate quantities. An ecological	Management of water courses more appropriate to the requirements of biodiversity. Create an enhanced ecological network on Fenland.	• Water regulation • Water purification/detoxification and waste treatment • Pollination • Soil formation and retention • Provision of habitat • Spiritual and religious value • Inspiration for art, folklore, architecture etc. • Recreation and tourism

Service	Assets/attributes: main contributors to service	State	Analysis	Opportunities	Principle Services Offered by Opportunities
			network is required to connect core sites, increase their area and create more sites. At present the extent of fenland habitats is not sufficient for them to have a viable future. The extent of habitats in Lincolnshire in particular is very small.		
Geodiversity	Fens geological SSSI: Roswell Pits Eye Gravel Pit Upware South Pit Wretton Cowbit Wash Adventurers' Land Shippea Hill Wiggenhall St.	Geological deposits include a cyclic succession of peats, estuarine and marine clays and demonstrate a detailed record of climatic changes over the last 10, 000 years.	The layers of deposits are important for their contribution to discussions of future climate change and global warming.	Holme Fen demonstrates the ways in which such sites can be used to illuminate past events.	• Inspiration for art, folklore, architecture etc. • Aesthetic values • Cultural heritage values

Service	Assets/attributes: main contributors to service	State	Analysis	Opportunities	Principle Services Offered by Opportunities
	German's Horbling Fen Upware Bridge Pit North Mixed interest SSSI: Holme Fen Ouse Washes				

Appendix 2. Key Fenland Biodiversity Statistics

Appendix 2a. Area of land with particular conservation designations by sub-zone of the Fens NCA and for the entire Plan area. Percentages refer to the proportion of that subzone in each designation category with the exception of those for the total land area (shaded in grey) which simply record the relative size of the two sub-zones within the NCA). After Mountford and Redhead, 2012. **NB** a) No land within this NCA is designated as a National Park; and b) some designations (e.g. SSSI and SAC) can apply to the same area.

Subzone	Total land area		No designation		SAC		NNR		SSSI		AONB	
	Area (ha)	% of NCA	Area (ha)	%	Area (ha)	%	Area (ha)	%	Area (ha)	%	Area (ha)	%
Settled Inland Fens	58,254.5	15.1%	58,194.9	99.9%	0	0	0	0	6.5	0.01%	51.1	0.1%
Open Inland Fens	273,793.6	71.1%	26,7615.7	97.7%	866.5	0.3%	724.1	0.3%	5,652.4	2.1%	0	0
Total	332,048.1	86.2%	325,810.6	98.1%	866.5	0.3%	724.1	0	5,658.9	1.7%	51.1	0

Appendix 2b. Condition of SSSIs as measured by areas (in hectares) in each of 4 categories. Results presented by sub-zone of the Fens NCA and for entire Plan area. Percentages refer to the proportion of SSSI resource in that subzone in each condition category with the exception of data for whole SSSI which repeat the information from the table above. **NB** no SSSIs in this NCA have been destroyed. After Mountford and Redhead, 2012.

Subzone	Total SSSI area		Favourable		Unfavourable					
	Area (ha)	% of sub-zone			Recovering		No Change		Declining	
			Area (ha)	%	Area (ha)	%	Area (ha)	%	Area (ha)	%
Settled Inland Fens	6.5	0.01%	6.5	100%	0	0	0	0	0	0
Open Inland Fens	5,652.4	2.1 %	2,612.6	46.2%	455.5	8.1%	2,519.7	44.6%	64.5	1.1%
Total	5658.9	1.7%	2619.1	46.3%	455.5	8.0%	2519.7	44.5%	64.5	1.1%

Appendix 2c: Classic agri-environment schemes – area, number and range of options. After Mountford and Redhead, 2012.

Subzone	Countryside Stewardship Scheme			Environmentally Sensitive Areas			Wildlife Enhancement Schemes	
	Area (ha)	Agreements	Options	Area (ha)	Agreements	Options	Area (ha)	Agreements
Settled Inland Fens	2279.9	15	234	0	0	0	0	0
Open Inland Fens	24019.2	174	2652	132.1	3	21	0	0
Totals	26299.1	189	2886	132.1	3	21	0	0

Appendix 2d. Overlap between character area and HLS Target Areas

[Percentage values refer to the proportion of the sub-zone within each Target Area or for “Not Target Area” the proportion of the NCA subzone that is not part of any HLS Target Area and thus uses the relevant HLS Regional Theme Statement in order to prioritise activity]. After Mountford and Redhead, 2012.

Plan area	HLS Target Area								Not Target Area
	Breckland	Chilterns & East Anglian Chalk	Deeping Fen	Limewoods	Lincolnshire Coast	North Norfolk Coast & Wash	Peterborough	Witham	
Settled Inland Fens	0	0	0	0	0	304.5 (0.5%)	0	0	57948.0 (99.5%)
Open Inland Fens	2243.6 (0.8%)	832.0 (0.3%)	5124.5 (1.9%)	217.3 (0.08%)	0	0	11789.4 (4.3%)	8841.0 (3.2%)	244226.4 (89.4%)

Appendix 2e. Overall take-up of ELS and HLS (together with OELS and OHLS):

Showing the number of agreements (NA), number of options/parcels applied (NO) and total agri-environment area (by NCA sub-zone and the whole Plan area). Results are presented separately for agreements including ELS & HLS, ELS only, OELS & HLS and OELS only. After Mountford and Redhead, 2012.

Fens NCA Subzone	HLS alone on the agreement			ELS and HLS on same agreement			ELS alone on the agreement			OELS and HLS on same agreement			OELS alone on the agreement			Overall take up of Environmental Stewardship		
	NA	NO	Area*	NA	NO	Area*	NA	NO	Area	NA	NO	Area	NA	NO	Area	NA	NO	Area
Settled Inland Fens	1	5	6.9	2	82	96.3	112	1,656	930.1	2	145	633.0	3	52	110.1	120	1940	1,776.3
Open Inland Fens	20	461	2,436.1	67	2855	,8861.4	644	10,083	6,917.2	1	99	215.5	10	208	817.4	742	13706	19,247.7
Total for Plan area	21	466	2,443	69	2937	8,957.7	756	11,739	7,847.3	3	244	848.5	13	260	927.5	862	15646	21,024

Appendix 3. UK BAP species associated with fens and fen vegetation in Cambridgeshire

Vascular plants

Cambridge milk-parsley <i>Selinum carvifolium</i>	
Fen violet <i>Viola persicifolia</i>	BAP
Fen woodrush <i>Luzula pallidula</i>	BAP
Greater water parsnip <i>Sium latifolium</i>	BAP
Lesser water-plantain <i>Baldellia ranunculoides</i>	
Marsh pea <i>Lathyrus palustris</i>	
Marsh stitchwort <i>Stellaria palustris</i>	BAP
Milk-parsley <i>Peucedanum palustre</i>	
Tubular water-dropwort <i>Oenanthe fistulosa</i>	BAP
Water germander <i>Teucrium scordium</i>	BAP
Yellow early marsh orchid <i>Dactylorhiza incarnata</i> ssp <i>ochroleuca</i>	BAP

Stoneworts

Hedgehog stonewort <i>Chara aculeolata</i>	group BAP
Dwarf stonewort <i>Nitella tenuissima</i>	group BAP

Invertebrates

Beetle <i>Pterostichus aterrimus</i>	
Centre-barred sallow <i>Atethmia centrargo</i>	
Desmoulin's whorl snail <i>Vertigo moulinsiana</i>	BAP, LBAP
Fenn's wainscot <i>Chortodes brevilinea</i>	
Small emerald <i>Hemistola chrysoprasaria</i>	

Birds

Reed bunting <i>Emberiza schoeniclus</i>	BAP
--	-----

Fen habitats also occur on sites in Cambridgeshire that provide resources for **other species** such as...

Adder <i>Vipera berus</i>	BAP
Common toad <i>Bufo bufo</i>	BAP
Grass snake <i>Natrix natrix</i>	BAP
Grasshopper warbler <i>Locustella naevia</i>	BAP
Great crested newt <i>Triturus cristatus</i>	BAP
Marsh Harrier <i>Circus aeruginosus</i>	
Otter <i>Lutra lutra</i>	BAP, LBAP
Water vole <i>Arvicola terrestris</i>	BAP, LBAP
Yellow wagtail <i>Motacilla flava</i> ssp <i>flavissima</i>	

... although these species cannot be said to be reliant on fens.

Appendix 4. UK Biodiversity Action Plan Species associated with fens and fen vegetation that are known from Wicken Fen

HD = Habitats Directive, RL = UK Red List

Species	Status
Otter	BAP, HD
Water Vole	BAP
Brown Hare	BAP
Harvest Mouse	BAP
Great Crested Newt	BAP, HD
Common Toad	BAP
Grass Snake	BAP
Slow Worm	BAP
Common Lizard	BAP
Bittern	BAP, BD, RL
Bullfinch	BAP, RL
Hen Harrier	BD, RL
House Sparrow	BAP, RL
Kingfisher	BD
Lapwing	BAP
Linnet	BAP, RL
Marsh Harrier	BD
Reed Bunting	BAP, RL
Shelduck	BD
Short-eared Owl	BD
Song Thrush	BAP, RL
Starling	BAP, RL
Skylark	BAP, RL
Tree Sparrow	BAP, RL
Turtle Dove	BAP, RL
Yellowhammer	BAP, RL
Fen Violet <i>Viola persicifolia</i>	BAP
Insects: Moths	
Beaded Chestnut	BAP
Blood-vein	BAP
Brindled Beauty	BAP
Broom Moth	BAP

Species	Status
Buff Ermine	BAP
Centre-barred Sallow	BAP
Dark Brocade	BAP
Dark Spinach	BAP
Dark-Barred Twin-Spot Carpet	BAP
Dot Moth	BAP
Double Dart	BAP
Dusky Brocade	BAP
Dusky-lemon Sallow	BAP
Ear Moth	BAP
Feathered Gothic	BAP
Fenn's Wainscot	BAP
Figure of Eight	BAP
Galium Carpet	BAP
Garden Dart	BAP
Garden Tiger	BAP
Ghost Moth	BAP
Goat Moth	BAP
Grass Rivulet	BAP
Grey Dagger	BAP
Knot Grass	BAP
Lackey	BAP
Large Nutmeg	BAP
Latticed Heath	BAP
Lunar Yellow Underwing	BAP
Minor Shoulder-knot	BAP
Mottled Rustic	BAP
Mouse Moth	BAP
Mullein Moth	BAP
Oak Hook-tip	BAP
Oblique Carpet	BAP
Powdered Quaker	BAP
Rosy Minor	BAP
Rosy Rustic	BAP
Rustic	BAP
Sallow	BAP

Species	Status
September Thorn	BAP
Shaded Broad-Bar	BAP
Shoulder-Striped Wainscot	BAP
Small Emerald	BAP
Small Phoenix	BAP
Spinach	BAP
White Ermine	BAP
Other Invertebrates	
<i>Lipara similis</i> Cigarillo gall fly	BAP
<i>Vertigo moulinsiana</i> Desmoulin's Whorl Snail	BAP, HD

Appendix 5. Examples of species believed to be extinct at Wicken Fen

Source: Colston, A., Carter, B. and Broadbent-Yale, P. 2001. The Wicken Fen Vision - a large new wetland reserve for people and wildlife in Cambridgeshire. The National Trust.

Mammals

Water vole

Birds - examples only

Montagu's Harrier

Marsh Warbler

Butterflies

Swallowtail

Large Copper

Large Tortoiseshell

Dark Green Fritillary

Moths - examples only

Reed Tussock

Marsh Dagger

The Many-lined

Gypsy Moth

Coleoptera - examples only

Dromius sigma

Pterostichus aterimus

Panagaeus crux-major

Lixus paraplecticus

Dragonflies

Small red damselfly

Common Hawker

Keeled Skimmer

Black Darter

Norfolk Hawker

Crustacea

White-clawed Crayfish

Vascular plants

Black Bog-rush

Bladder sedge

Blue Water Speedwell

Bog Pimpernel

Bottle sedge

Bulbous Rush

Butterbur

Common Cotton-grass

Fen Orchid

Field Pepperwort

Frog-bit

Greater Duckweed

Greater Water-parsnip

Green-winged Orchid

Hairy Rock-cress

Heath Grass

Heath Wood-rush

Lesser Bladderwort

Lesser Marshwort

Marsh Cinquefoil

Marsh Helleborine

Marsh Lousewort

Nodding Bur-marigold

Opposite-leaved Pondweed

Pale sedge

Round-leaved Sundew

Trifid Bur-marigold

Various-leaved Pondweed

Appendix 6. BAP priority species associated with ponds, lakes and reservoirs in Cambridgeshire and Peterborough according to the Million Ponds Project

Annual Knawel – *Scleranthus annuus*
Beetles – *Bidessus unistriatus*, *Donacia aquatica*
Common Toad – *Bufo bufo*
European Eel - *Anguilla anguilla*
Shining ram's-horn snail - *Segmentina nitida*
European Water vole - *Arvicola terrestris*
European Otter – *Lutra lutra*
{Fen Orchid – *Liparis loeselii*}
Fen Violet – *Viola persicifolia*
{Flat Sedge – *Blysmus compressus*}
Glutinous Snail – *Myxas glutinosa*
{Grass-poly – *Lythrum hyssopifolia*}
Grass Snake – *Natrix natrix*
Grass-wreck pondweed – *Potamogeton compressus*
Greater Water Parsnip – *Sium latifolium*
Great Bittern – *Botaurus stellaris*
Great Crested Newt – *Triturus cristatus*
Lesser Horseshoe Bat – *Rhinolophus hipposiderus*
Marsh Stichwort – *Stellaria palustris*
Mud Pond Snail – *Omphiscola glabra*
Noctule Bat – *Nyctalus noctula*
Norfolk Hawker – *Aeshna isosceles*
Northern Lapwing – *Vanellus vanellus*
Reed bunting – *Emberiza schoeniclus*
{Pennyroyal – *Mentha pulegium*}
{Pillwort – *Pilularia globulifera*}
Reed Bunting – *Emberiza schoeniclus*
Ribbon Leaved Water Plantain – *Alisma gramineum*
Shining ram's-horn Snail – *Segmentina nitida*
{Sharp-leaved pondweed – *Potamogeton acutifolius*}
{Small Fleabane – *Pulicaria vulgaris*}*
Song Thrush – *Turdus philomelos*
Soprano Pipistrelle – *Pipistrellus pygmaeus*
Stoneworts - *Nitella tenuissima*, *Tolypella prolifera*, *Tolypella intricata*
Tree Sparrow – *Passer montanus*

Tubular Water-dropwort – *Oenanthe fistulosa*

Water Germander – *Teucrium scordium*

White Clawed Crayfish - *Austropotamobius pallipes*

Yellow Wagtail – *Motacilla flava*

Species in brackets have not been recorded on the Fens recently, i.e. any 10km square records are prior to 1970 (Mountford, pers.com). An asterisk indicates that there is one record of an introduction.

Appendix 7. Rare species associated with drainage ditches in Cambridgeshire

Marsh sow-thistle *Sonchus palustris* (reintroduced in Cambridgeshire),

Fen pondweed *Potamogeton coloratus*,

Fen ragwort *Senecio paludosus* (Red list: Critically Endangered),

Hair-like pondweed *Potamogeton trichoides*,

Whorled water-milfoil *Myriophyllum verticillatum*,

Fringed water-lily *Nymphoides peltata*,

Greater water- parsnip *Sium latifolium*,

The Stonewort *Nitella tenuissima* (Red List: Endangered)

The Stonewort *Tolypella prolifera* (Red List: Vulnerable),

The snail *Pseudanodonata complanata*,

The snail *Pisidium pseudosphaerium* (Red List: Rare),

The snail *Valvata macrostoma* (Red List: Vulnerable),

Hairy dragonfly *Brachytron pratense*,

An aquatic beetle *Donacia dentata*,

The weevil *Bagous subcarinatus*,

The relict fen diving beetle *Agabus undulates*; and

Spined loach *Cobitis taenia*.

Appendix 8a. Area of Washlands in use in the early nineteenth century

(After Thomas, et al., 1981).

NB there is also a map showing their location in Cranfield University, December 1995.

River	Washland	Approximate field area
Wissey	Stoke Ferry	20 ha
Wissey	Hilgay Fen	60 ha
Little Ouse	Stallode Wash	100 ha
Little Ouse	Joist Fen	20 ha
Lark	Isleham Fen	30 ha
Cam	Upware	70 ha
Cam	Dimmock's Cote	110 ha
Old West	Chear/Stretham/Ewell	10 ha
Great Ouse	Cawdle Fen	10 ha
Great Ouse	Ely Washes	40 ha
Great Ouse	Swavesey	130 ha
Great Ouse	Holywell	100 ha
Great Ouse	Ouse Fen Washes	50 ha
Great Ouse	Berry fen	50 ha
Great Ouse	Ouse Washes	1914 ha
Great Ouse	Salters Lode	140 ha
Great Ouse	Nordelph	120 ha
Nene	Nene Washes	1235 ha
Welland	Peakirk	200 ha
Welland	Crowland	250 ha
Welland	Crowland Fodder Lots	220 ha
Welland	Cowbit Wash	550 ha
Glen	Baston Fen	165 ha
Glen	Pinchbeck South Fen	500 ha
Total	24	6094 ha

Appendix 8b. Examples of drained meres on Fenland

(After Godwin, 1978).

Nene river system:

- Whittlesey
- Trundle
- Ugg
- Brick
- Ramsey
- Benwick

Ouse and its tributaries:

- Streatham
- Soham
- Willingham
- Harrimere

Little Ouse:

- Red Mere

In addition there were at least 53 'deepes' on the East Fen west of Wainfleet in Lincolnshire (Darby, 1956).

Appendix 9: Photographs from Must Farm



Fig A10.1 Two of the Bronze Age boats being excavated in the sediments of a Bronze Age branch of the River Nene at Must Farm near Peterborough. © Dave Webb, Cambridge Archaeology Unit.



Fig A10.2 A fish weir and eel trap in the base of the Bronze Age channel where it has traversed the roddon of the much larger Neolithic branch of the River Nene. © Dave Webb, Cambridge Archaeology Unit.



Fig A10.3 Remains of an eel trap newly excavated from a Bronze Age river's deposits. © Kasia Gdaniec, Cambridgeshire County Council

Appendix 10. SWOT Analysis: Raw Data

Strengths

Partnership working
Broad partnership with common / agreed goals.
Everyone agreeing on Vision / Objectives.
Broad partnership and history of joint working.
Strong partnership.
Wide group of partners / interest groups steering the plan and promoting its aims.
The partnership has a collective desire to work together.
Partnership buy-in.
The partnership binds diverse interests together.
Positive active partnership of key organisations (including good geographical spread.
Key 'core site' landowners in partnership.
All leading NGOs and key Government Agencies involved.
Partnership working between commercial business, agencies and Local Authorities.
Wide geographical spread.
Geographical reach of the partnership.
Good geographical coverage by partners.
Demonstrates a wide audience working together (strength in numbers).
Alignment with other sectors agendas (in part e.g. tourism, water resources).
Combined knowledge, skills and experience of the partners.
Some breadth of interest / expertise involved in the partnership.
(Can) Deliver different partner objectives in joined up way e.g. NEWP, WFD, etc.
Helping individual partners realise their own goals.
The desire to take action is timely
Lawton and NEWP recently published.
The desire by Defra to look at Ecosystem Services.
EA habitat restoration plans (for flood and managed coastal realignment), i.e. habitat creation is already happening.
Strong case for large-scale habitat creation in the Fens: ecosystem services, economic benefits, health and wellbeing.
Action already happening to demonstrate benefits (case studies).
Given the state of the economy now is a good to invest in diversifying the Fenland economy and enhancing its green infrastructure.
Need for an overall plan for the Fens. EA and NE cannot work in isolation.
Development of a clear co-ordinated strategy.
The plan will provide a strategic assessment and future focus.
The partnership does not need to start at the beginning.
Commitment to achieving positive outcomes for the Fens.

Wetland habitat creation aspirations only cover 5% of the fens.
The plan will demonstrate how individual projects link together and why we need lots of projects.
Will provide a framework – for funding links.
Evidence is available: Fens Biodiversity Audit, water shortages.
Agriculture
The Fens do change, farming will change on the Fens.
General positive swing in landowner attitudes towards conservation.
Long-term vision for change in farming, through new habitat creation and peatland management.
Place and community
Enhancement of the Fens as a place, distinctive and specialised.
Opportunities for community engagement with specific projects for the long term.
Many people love Fenland, its wildlife and cultural heritage.
Restoring wildlife for all in the Fens.

Weaknesses

Partnership working
Some key stakeholders have not bought into the Partnership
Some key stakeholders missing from the partnership: Peat experts, Tourism etc.
Too narrow a Partnership (dominated by conservation organisations?)
Full support of all Stakeholders required?
Partner differences / competition
Lack of leadership – will EA/NE have the vision to lead the Partnership.
Once the Plan is produced (it will) not (be) adopted at higher level of organisation in EA.
Current members of Partnership not thinking in a whole Fens way – thinking of own projects.
Need to keep all partners happy and make compromises.
Need equal ambition / pledge from Fenland inhabitants / businesses / farmers and landowners / developers.
Extra effort required to target or cut information for different audiences – will the strategy meet all needs?
Still lots of work on economic links / integration needed.
Lack of clear governance.
The scale of the project
Challenge of working cohesively across a huge area.
Lack of clear strategy for the whole Fens.
Trying to cover too large an area.
Don't know what the future holds – can 'we' be visionary.
Agriculture <i>(these comments could have been included under Partnership Working)</i>
Landowners / land managers may not buy in.

Lack of buy - in by NFU / CLA farming community in the Fens.
Land ownership Fens agri-business desire to make profits.
Food security lobby – CAP reforms.
Access – still an issue with landowners. Do we need to ensure that all new habitat areas of certain size are publicly accessible?
Soils
Value of peat soils to the farming community.
What is the likelihood of soil improvement in some areas (worst areas) without radical land use change – unlikely in short term.
Water and wetlands
Lack of knowledge about hydrological movements and cycles and water resource generally.
Political recognition of the need to re-create wetlands.
Water resources for creating wetlands.
Limitation of water resources.
Lack of evidence e.g. to describe a ‘functional Fenland ecological network’.
Resources
Resources – if there is dedicated funding organisations may have other priorities.
£££ are needed – how easy will this be to get for immediate investment in top priority projects?
Too dependent on public sector funding
Need to gain momentum to be able to employ a Project Officer / staff to drive the Strategy forwards.
The economic downturn is limiting opportunities – gravel extraction, business developments and related mitigation works, funding sources.
Skills
Limited numbers of expert surveyors in specialist taxa.

Opportunities

Water quality
Water Framework Directive (WFD) implementation (3)
Funds available from WFD pots.
Need to explore links with Nene Valley NIA (Nature Improvement Area) development as improvements in water quality may have impacts in the Fens.
Water resources and management
Need to join up Flood Risk Management Plans for the whole Fens.
Increasing requirements for water storage for agricultural development.
IDB Management Plans
Opportunity to safeguard the water resource by co-ordinating development and planning issues / concerns / needs with those promoting a sustainable natural environment.
Climate change
Climate change: need to meet flood defence and water resource needs.
New policies for the natural environment

Lawton and NEWP are key policy drivers – it is a time for change.
Implementing Lawton is ‘flavour of the month’ – need to capitalise on this.
Demonstrating how to deliver the England Biodiversity Strategy – the Fens leads the way on species delivery.
Opportunity to become a Defra Ecosystem Services pilot?
Funding for peat soil and carbon storage.
Partnership working
To work more closely and effectively as a partnership.
More integrated working could result in an ‘end product’ greater than the sum of individual projects.
Provides a basis with consensus for future lobbying.
Enables a positive considered response to funding or political initiatives. Can be proactive.
Lots of potential projects to be funded.
Develop baseline levels for area, species, people, resources.
Wetland creation
EA Regional habitat creation programme and Fens Waterway Link Project delivery.
Fens Waterways Link – creation of wetlands to store water for operation and users contributing to conservation in the Fens ‘payback’ schemes.
Compensation for loss of coastal habitats to coastal squeeze – plenty of space in the Fens.
Restoration of gravel pits and clay pits for nature conservation.
Aggregate Industries development.
Key people / organisations providing data and information on possible sites.
Increasing interest in wildlife, social network communications and public involvement and participation in conservation and local history.
Opportunities to monitor the colonisation of new sites by different species.
Agriculture
Greater engagement with key communities will be facilitated (farmers and landowners).
Better understanding of natural environment issues will be gained and become embedded in farming practices.
Break down of barriers between farming and environmental groups.
Future refinement of Environmental Stewardship appropriate for the Fens.
Community
Increasing interest in wildlife, social network communications and public involvement and participation in conservation and local history.
Need to develop an effective Forum to communicate regularly with different sectors across Fenland.
The Fenland economy
Tourism – provides destinations to support the local economy. ‘Payback’ schemes for tourists to fund conservation work.
Employment provided by large scale habitat creation schemes.
Develop a ‘value of’ for the Fens – to the wider public and business community e.g. LEPS.

Threats

Partnership working
Partnership fails to agree.
Diverse interests and aims in the partnership could be divisive.
No support for plan from NE/EA – lack of decision making – <i>plan</i> side-lined by cuts and re-structuring.
Shortage of funding could discourage stakeholders and partnership breaks up.
Lack of a clear Action Plan after Strategic business Plan produced could destroy the partnership.
Partnership involvement – e.g. all partners need a continuing ‘vested intent’ within the plan.
Exposes intent to potential objectors.
Opposition to wetland creation
Lack of public support for wetlands in the Fens.
Strong vested interests opposed to wetland creation.
Poor take up of initiatives at local / regional scale as local politics / politicians remain as refusniks.
Economic distortion, e.g. the value of competitive land use etc.
Lack of knowledge and will to plan effective operation of new washlands.
Chemical content of agricultural soils found in hazardous levels in water courses.
Ecological factors – predation, invasive species, etc.
Climate change
Climate change happens faster than we can cope.
Climate change and other future risks.
Climate change – drought.
Droughts, floods or natural disasters.
Agriculture
The farming lobby and food security.
Losing the food security debate.
Land required for food production – “food security” arguments taking precedence.
CAP reform.
The state of the economy
Current economic climate, funding <i>availability</i> , change in policies, staff etc.
Political – short term thinking focused on economic growth undermining environmental issues.
Water resources
Lack of water resources – or water being available at the wrong times.
Water resources <i>and</i> water quality.

Appendix 11. Results of the data collection exercise

Appendix 11a. Extent of Core Areas

Core Areas	Area (ha)	SSSI Area (ha)	Area already re-created (ha)	Area currently being re-created (ha)	Area with re-creation planned (ha)	Area where no re-creation is currently planned (ha)	No. posts employed	No. volunteers	No. visitors	Total capital cost of project	Annual revenue Expenditure
Holme Fen	269.4	261.7	N/A	N/A	N/A	N/A	3	See Appendix 11b	See Appendix 11b	N/A	£35,000
Woodwalton Fen	208.65	229.7	N/A	N/A	N/A	N/A					
Wicken Fen	255.4	247.2	N/A	N/A	N/A	N/A	See Appendix 11b	See Appendix 11b	See Appendix 11b	N/A	See Appendix 11b
Nene Washes	1438	1310	N/A	N/A	N/A	N/A	2.5			N/A	£120,000
Ouse Washes (WWT)	2403	2403	N/A	N/A	N/A	N/A	15	30	45,000	N/A	£259,000
Ouse Washes (RSPB)			N/A	N/A	N/A	N/A	8.5	15	8000	N/A	£400,000
Baston and Thurlby Fens	55	56.74	N/A	N/A	N/A	N/A	See Appendix 11b	See Appendix 11b	See Appendix 11b	N/A	See Appendix 11b
Chippenham Fen	111	114.78	N/A	N/A	N/A	N/A	2	15	2,500	N/A	£4,500
Cam Washes	169.3	169.3	N/A	N/A	N/A	N/A	Not known	Not known	Not known	N/A	Not known
Total	4740.45	4792.42									

Appendix 11b. Extent of re-creation areas and stepping stones

Target Re-creation Area / Stepping Stone	Area (ha)	SSSI Area (ha)	Area already re-created (ha)	Area currently being re-created (ha)	Area with re-creation planned (ha)	Area where no re-creation is currently planned (ha)	No. posts employed	No. volunteers	No. visitors	Total capital cost of project	Annual revenue Expenditure
Great Fen (inc Holme and Woodwalton)	3741	N/A	0?	862	179	2222	8.3	183	10,000	£17,000,000	£80,000
Wicken (Vision Area)	5000	N/A	50	418.3	10	4536	25	75	50,000	£100,000,000	£500,000
Ouse Washes re-creation project I	500	N/A	0	0	450	0	Not known	Not known	Not known	Not known	Not known
Ouse Washes re-creation project II	112	N/A	74	0	0	0	Not known	Not known	Not known	Not known	Not known
Needingworth	975	N/A	150	50	500	275	2	15	500	Not known	£90,000
Lakenheath	600	N/A	300	25	40	200	5	20	30,000	Not known	£150,000
Wissey - Hilgay	65	N/A	0	65	0	0	2	0	0	£2,000,000	N/A
Wissey - Methwold reedbed	22	N/A	0	0	22	0	0.1	0	0	£1,200,000	N/A

Target Re-creation Area / Stepping Stone	Area (ha)	SSSI Area (ha)	Area already re-created (ha)	Area currently being re-created (ha)	Area with re-creation planned (ha)	Area where no re-creation is currently planned (ha)	No. posts employed	No. volunteers	No. visitors	Total capital cost of project	Annual revenue Expenditure
Wissey - Methwold Fen	32	N/A	0	0	32	0	0.1	0	0	£480,000	N/A
South Lincs Fen (Willow Tree Farm)	745	N/A	0	114	0	631	2	(600+hrs)	2,000	£2,000,000	£100,000
Total	11,792		574	1534.3	1233	7864	73.5	338+	146,500		

Appendix 11c. Extent of potential new sites

Target Re-creation Area / Stepping Stone	Area (ha)	SSSI Area (ha)	Area already re-created (ha)	Area currently being re-created (ha)	Area with re-creation planned (ha)	Area where no re-creation is currently planned (ha)	No. posts employed	No. volunteers	No. visitors	Total capital cost of project	Annual revenue Expenditure
Witham Peatlands	500	N/A	N/A	N/A	N/A	500	N/A	N/A	N/A	Not known	N/A
Stickney and the Deepes	200	N/A	N/A	N/A	N/A	200	N/A	N/A	N/A	Not known	N/A
Welland Washes	1160	N/A	N/A	N/A	N/A	1160	N/A	N/A	N/A	Not known	N/A
Kings Dyke, Peterborough	Not known	N/A	N/A	N/A	N/A	Not known	N/A	N/A	N/A	Not known	N/A
Block Fen (part of the Great Ouse Wetland)	500	N/A	8	0	50	442	N/A	N/A	N/A	Not known	N/A
Roswell Pits, Ely	Not known	N/A	N/A	N/A	N/A	Not known	N/A	N/A	N/A	Not known	N/A
Colne Fen, Earith	Not known	N/A	N/A	N/A	N/A	Not known	N/A	N/A	N/A	Not known	N/A
Kingfisher Bridge, nr Wicken	60.7	N/A	60.7	0	0	0	Not known	Not known	Not known	Not known	Not known
Wissey - Methwold Severals	40	N/A	0	0	0	40	0	0	0	Not known	N/A
Total	2460.7+										

Appendix 12. Original membership of the Fens IBDA Steering Group

Expertise/interests area	Organisation	Name
Academia	Anglia Ruskin/CEH	Francine Hughes/Owen Mountford
Water Environment	Environment Agency	Will Akast/Erin Vos
Farmer	Turfpits Farm	Rex Sly
Farm advice	FWAG	Barney Parker
Flood Risk Management	Environment Agency	David Gillet
Green Infrastructure	CCC	David Bethall
Historical Heritage	CCC	Kasia Gdaniec
Internal Drainage	Witham 4 th District	Martin Redding
Localism agenda/community	Norfolk LBAP	Scott Perkin
Land agent	Smiths Gore	Andrew Morris
Land owning	CLA	Rob Wise
Land owning	NFU	Alex Dinsdale/Paul Tame
Local authority	Peterborough City Council	James Fisher
National Trust		Chris Soans
Natural England		Catherine Weightman
RSPB	RSPB	Amy Crossley/Simon Tonkin/ Graham Elliot
Wildlife Trust	Norfolk	Nick Carter
Wildlife Trust	Cambridgeshire	Martin Baker
Wildlife Trust	Lincolnshire	Mark Tarttelin

Appendix 13. Potential project funding sources

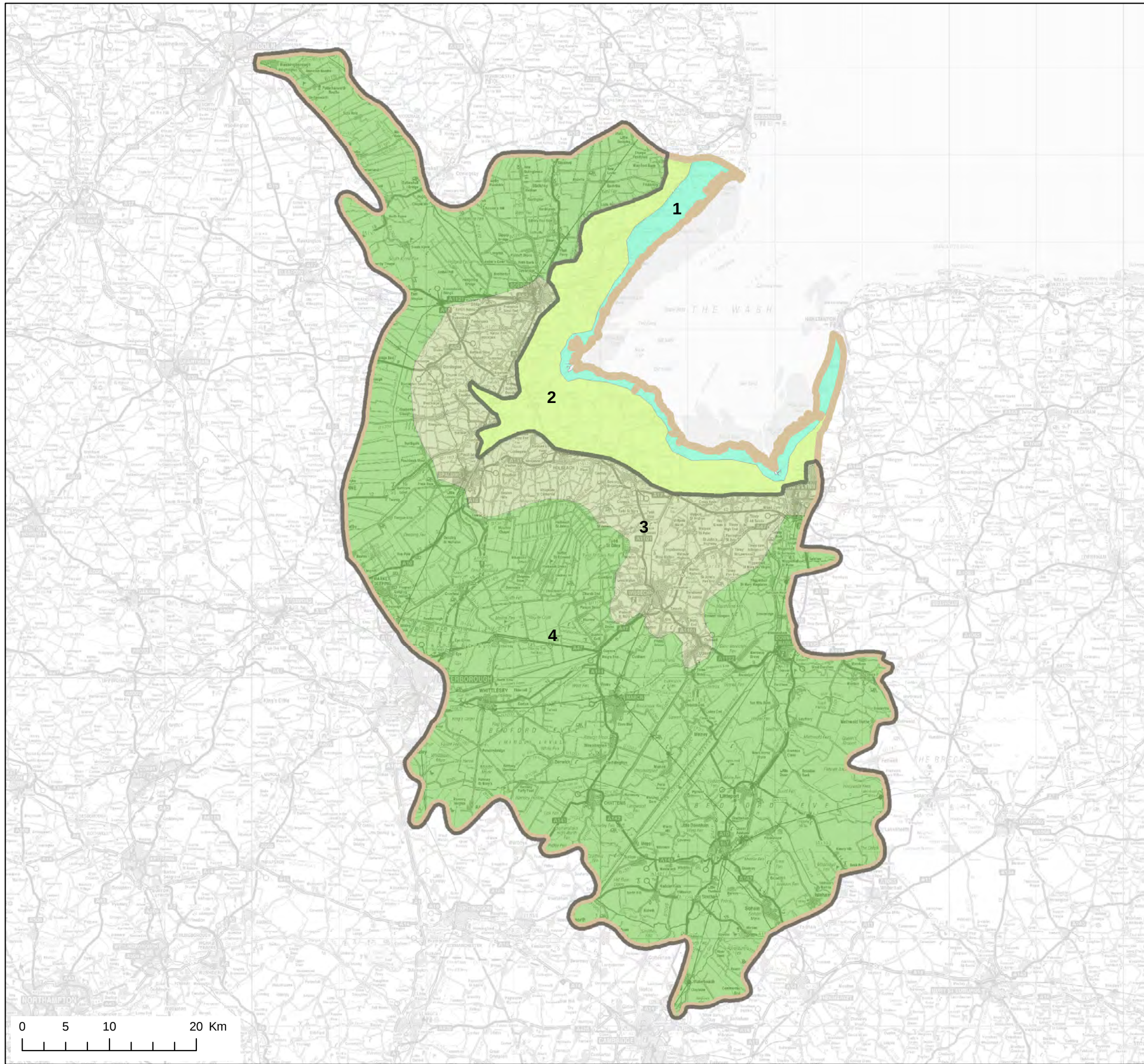
Body	Grants	Grant Amount	Total Project cost	Descriptions	Key Conditions	Deadlines	Match funding required	Notes
EUROPEAN / UK GOVERNMENT FUNDS								
INTERREG IVB North Sea Region	EU340mn	usually 50%		Spreading transnational cooperation in environmental conservation activities	Needs at least 3 eligible Member States in partnership projects.	call closes 13-June-12	50%	
EU Life+	Life+ Nature	up to 10 mill euros		Long term sustainable investments in Natura 2000 sites	Best practice and/or demonstration projects	6th call was 13-Mar-12, closes 26-Sep-12	25% minimum, usually 50%	
				Focus on conservation of species and habitats targeted by the Birds and Habitats Directives	Promote synergies between different priorities under the 6th Environmental Action Programme and integration	Requires member state (Defra) approval		
	LIFE+ Biodiversity	up to c. Euro 1.5 million		Halt loss of biodiversity in EU priority habitats	Transnational co-operation projects preferred	6 th call was 13-Mar-12, closes 26-Sep-12	25% minimum, usually 50%	
				Demonstration of measures and practices that contribute to halting the loss of biodiversity in the EU, other than those related to the implementation of the objectives of the Birds and Habitats Directives	promote synergies between different priorities under the 6th Environmental Action Programme and integration			
EU/UK Government via Defra	Rural Development Programme, England, via Fens Adventurers Local Action Group (LEADER)	£10,000-£100,000		Safeguard and enhance the rural environment, improve the competitiveness of the agricultural sector and foster sustainable and thriving rural businesses and rural economies across England.	Time limited, last applications likely May 2012, all payments have to be submitted by Sept 2013		Varies	NE and Forestry Commission are delivery partners
				Conservation of the natural built and historic environment: maintains and enhances existing environmental assets and creates new habitats where appropriate. This will support adaptation to and mitigation against climate change.	Time limited, last applications likely May 2012, all payments have to be submitted by Sept 2013		Varies	
				Access and recreation: opens up new areas of the rural landscape to provide public access. This will help communities access their rural landscape, promote accessibility for minority groups, build on opportunities provided by commercial access and increase public awareness and enjoyment of the rural environment.	Tourism: aims to improve the quality of rural tourism and make it more sustainable by forging better links with local environmental and cultural assets (including local food		Varies	

Body	Grants	Grant Amount	Total Project cost	Descriptions	Key Conditions	Deadlines	Match funding required	Notes
					and drink), encouraging collaboration and more effective use of ICT. Up to 60% of costs available.			
UK Government via EA	Catchment Restoration Fund	£10m available nationally pa for 3 years. Minimum of £50,000 per grant		Aimed at restoring more natural features in and around waters; reduce the impact of man-made structures and reducing the impact of small, diffuse sources of pollution.	The lead applicant for funding must be a charity or similar organisation, other organisations could be partners. An integrated approach to catchment management is preferred.	Mid-September to mid October 2012 for funding from the 2013/14 allocation: Mid-September 2013 to mid-October 2013 for funding from the 2014/15 allocation.	Funding can be up to 100% of costs.	
LOTTERY								
Heritage Lottery Fund	Landscape Partnership Projects	£250,000 to £2million		Must meet all 4 priorities: conserving/restoring built/natural features of historic landscape; increase community participation in local heritage; increase access to, and learning about landscape; increase training in local heritage skills	Requires partnership working, development grant of £100k available. Requires lead-in time to build partnership and funding commitment	Rolling programme quarterly cmt meetings. Deadline 28 th Feb annually	Under £1million, 5%; over £1 million 10%	
					Coverage is area based - 20-200km2			
	Your Heritage	up to £100k		Help people to learn about, look after and celebrate heritage in a fun and enjoyable way	Help people to learn about their heritage - includes environmental heritage	Submitted anytime and decided at next regional meeting	Usually 10%	
					Conserve heritage			
					Actively engage people in heritage			
	Heritage	>£100,000		Help people to learn about, look after and celebrate heritage in a fun and enjoyable way	Help people to learn about their heritage	Rolling programme for grants under £5 million	Usually 10% +	
					Conserve heritage			
					Actively engage people in heritage			
Big Lottery Fund	Communities Living Sustainably	grant fund was £10mn;		Improved rural and urban environments – which communities are better able to access and enjoy; Healthier and more active people and communities		Closed at present.		

Body	Grants	Grant Amount	Total Project cost	Descriptions	Key Conditions	Deadlines	Match funding required	Notes
LANDFILL TAX								
Biffaward	Small Grant	£250-£5000	<£10,000	Projects that enable local communities to improve local amenities and conserve wildlife		Rolling	5%	
	Main Grant - Biodiversity	£5-50,000		Biffaward looks to support site-based projects that protect and enhance biodiversity across the UK, particularly those concentrating on species and habitats that have been identified as a priority in Biodiversity Action Plans.	Within 25 miles of a Biffa operation, also within 10 miles of any landfill site, Have Biodiversity Action plan targets, Management plan in place, Have partners	Rolling	10%	
	Flagship	£150,000-500,000		For regionally significant projects which improve/rebuild biodiversity or cultural facilities.	Within 25 miles of a Biffa operation, also within 10 miles of any landfill site	Application forms out in spring 2011	10%	
				projects that have something unique and exciting that no other project in the region, or possibly country, has	Site-based Partnership working			
Wren	Small Grant	£2,000-£15,000		Object D Where it is for the protection of the environment, the provision, maintenance or improvement of a public park or other public amenity in the vicinity of a landfill site.	Max total cost of project £50,000	None, apply when ready	10%	Very varied and broad what is funded, barn owls, water voles, etc.
	Main Grant	£15,000-£75,000		Object D Where it is for the protection of the environment, the provision, maintenance or improvement of a public park or other public amenity in the vicinity of a landfill site.	Completed within 18 months. Grant no less than 20% of project cost, £50,000 or no more than 85% total cost	None	10%	
	Biodiversity Action Fund	£75,000-£250,000		Object DA: Recreation, restoration or conservation of BAP listed habitat, surveying, monitoring, on site research into a BAP listed habitat. Can be more than one site where clear ecological links and same habitat being supported.	At a site, <10 miles from landfill site (Wicken, Great Fen, Lakenheath, Hilgay, all fit)	31-Jan-12	10%	
Sita Trust	Enhancing Communities fast track fund	up to £10,000	£20,000	Projects that make physical improvements to community leisure facilities and historic buildings / structures	Within 3 miles of Sita site	2 monthly	11.50%	
	Enhancing communities core fund	£50,000	£250,000			Three funding rounds a year	11.50%	
	Enriching nature programme	<£120,000		Carrying out physical improvements to benefit BAP priority species or habitats at identified sites; Projects involving research, survey and monitoring work can also be funded, but only where there is a clear intention, and a reasonable	Within 10 miles of landfill site, £300,000 allocated in 2012 to each region.	Three funding rounds a year. Next Closing date 29/6/12.	11.50%	

Body	Grants	Grant Amount	Total Project cost	Descriptions	Key Conditions	Deadlines	Match funding required	Notes
				likelihood, that this work will lead to physical improvements. Targeted at a single BAP species or habitat.		Applications scored regionally, decided nationally.		
Cemex Community Fund		c.£10-20,000			Projects which are very close (i.e. within 3 miles) to a CEMEX quarry, landfill or high impacting site (this is the majority of our grant distribution)*see www.cemexlocations.co.uk , Consider the environment in all aspects, for example use of sustainable resources, ecological design, Act as Beacons for other projects and applications, such as those which demonstrate innovation and/or inspiration socially or environmentally	Rolling		
Amey Cespa Community Fund	Window TBC	£150k project max grant £20k, over £150k, max grant £40k		The conservation of a specific species or a specific habitat where it naturally occurs.	Cambridgeshire. Project within 10 miles of active landfill site Will not fund projects (or their governing groups) that have received a grant from the (the previous name was) Donarbon Community Fund less than 2 years ago.	Expression of interest end of previous months for panels early July/Oct/Jan/April	10%	
				The provision, maintenance or improvement of a public park or other general public amenity				
Woodford environmental fund (Grantscape comes under this for Cambs)	want applications	£5-35,000 (except. £50,000)		Support nature conservation objectives	Project within 10 miles of Warboys landfill site, 70% within five miles	2 funding rounds	11.42% donation	
TRUSTS								
Wildlife Habitat Trust (BASC offshoot)	National habitat conservation grants	Unknown. Discretionary.		Primarily to purchase land; also projects which target the conservation of known breeding habitat of the UK's hunted migratory species	Mallard, wigeon, teal, tufted duck, pink footed goose, greylag, pintail, pochard	Annual approval at April / May Trustees mtg		

Body	Grants	Grant Amount	Total Project cost	Descriptions	Key Conditions	Deadlines	Match funding required	Notes
Naturesave trust		up to £5,000		Projects which specifically address the promotion and implementation of sustainable development, environmental and / or conservationist improvement and or general 'green' issues	Mostly materials and equipment, not those heavy on staff time.	Rolling		Prefers to provide start-up capital to small projects to get them going, rather than to contribute to the general administration costs of a larger charity or company.
JP Getty JNR Charitable Trust	Preserving our natural heritage	£10,000-£250,000 (small grants up to £5,000)		Enhance beautiful landscapes or areas of special conservation value. Where the aim is 'conservation' our main focus is on broad biodiversity projects, rather than the preservation of individual species. Consider projects that encourage greater public appreciation and enjoyment of the natural environment whilst still promoting sustainable use of these wonderful areas.		Rolling		Wants to wind down so spending more. For RSPB managed by WHQ - Michelle Thomas contact. Spoke to ~Owen Thomas . OK to go for as partnership. Let know plans.
Esmee Fairburn Foundation		av. £87,000		The arts, education and learning, the environment and enabling disadvantaged people to participate fully in society	Prioritises work that addresses significant gap in provision; develops or strengthens good practice; challenges convention/takes a risk; tests out new ideas/practices; takes enterprising approach; sets out to influence policy or change behaviour more widely. Fund core/project costs. Not usually to orgs with >£6million a year. Not capital costs.	Two stage application, can be made at any time.		
Miller Philanthropy	to natural environment	£5-50,000		Natural environment e.g. Pond Conservation for Give and Let Live scheme, and to map priority ponds	Not too well supported charity	Quarterly	None	40% to environmental issues causes, www.scmphilanthropy.com
Big Give				Website to advertise needs to philanthropists, Great Fen and Wicken Fen are on				
Cambridgeshire Horizons, Housing Growth Fund				Supported Wicken Vision	Based on developed contributions, so related to development sites			



Fens for the Future

A Strategic Plan for Fenland :
A Proposal for an Enhanced Ecological Network

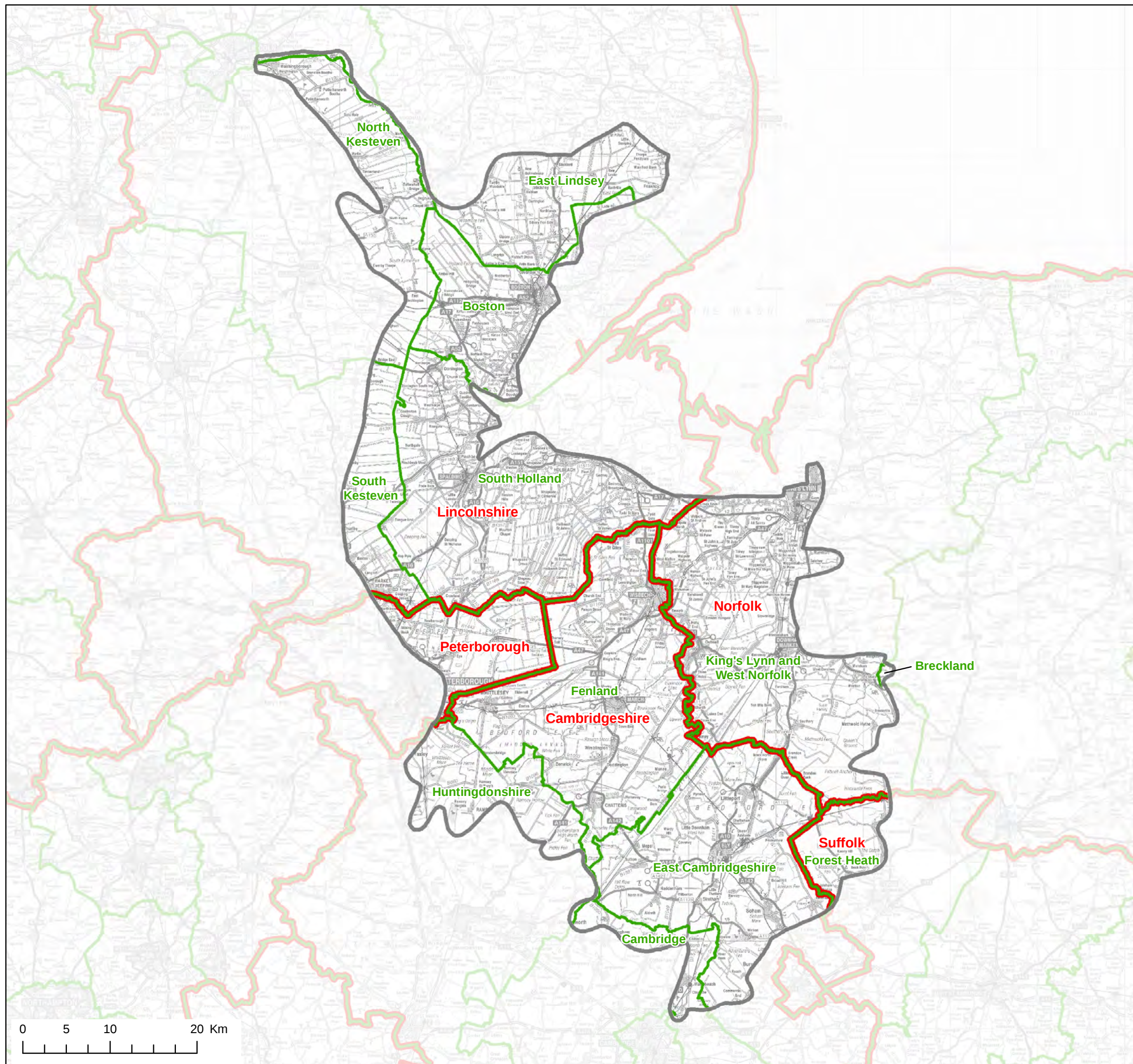


Map 1. Plan area: comprising the "Settled Inland Fens" and the "Open Inland Fens" within the Fens National Character Area

- Plan boundary
- The Fens National Character Area (simplified)
- 1. Open coastal marshes
- 2. Drained coastal marshes
- 3. Settled inland fens
- 4. Open inland fens

Mapped by - Carrie Mackay-Payne (2012)
GI and Analysis Team, Natural England
© Crown copyright and database right [2012]
Ordnance Survey Licence number 100022021.

Map Reference -110407



Fens for the Future

A Strategic Plan for Fenland :
A Proposal for an Enhanced Ecological Network

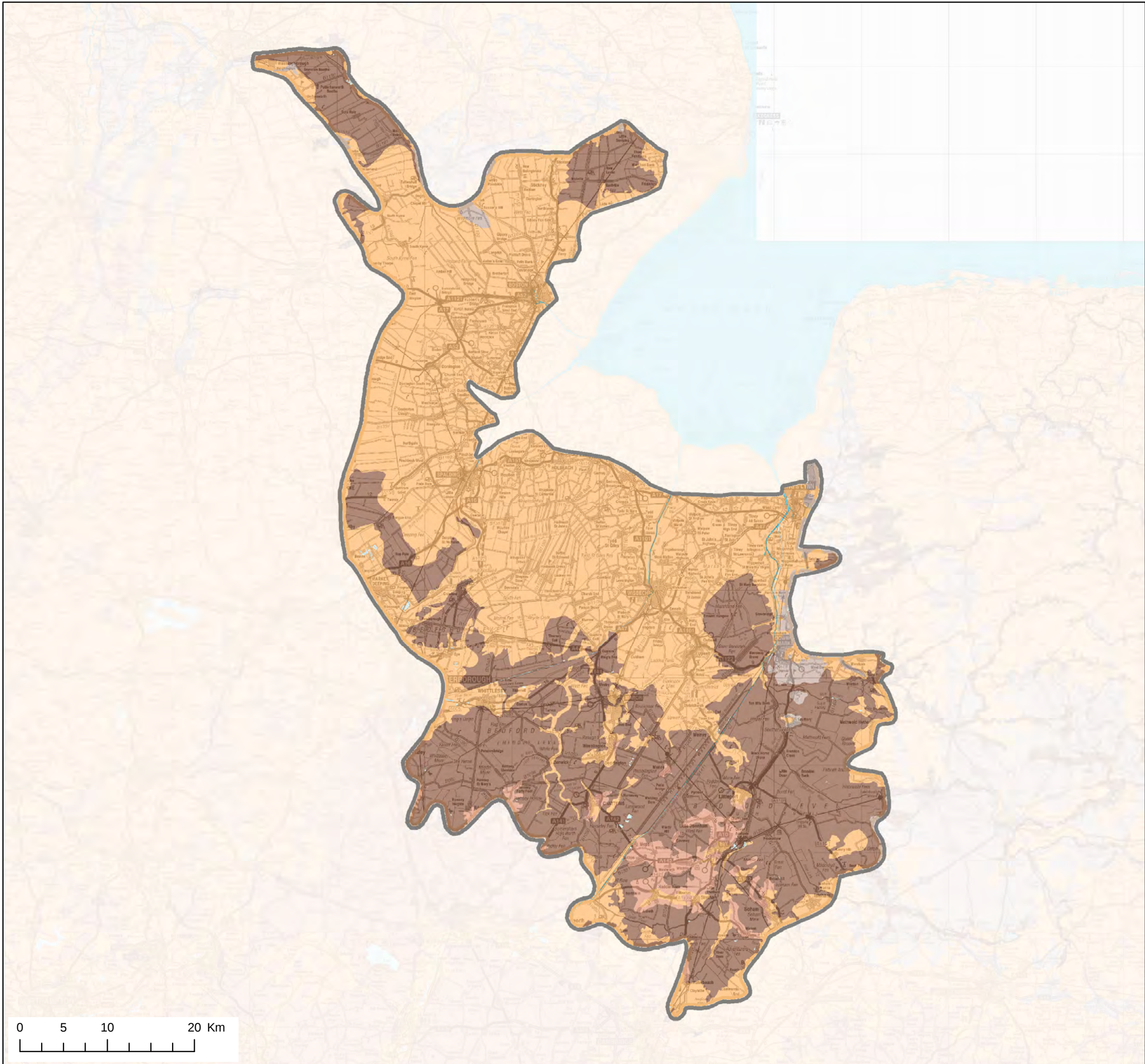


Map 2. Administrative boundaries

- Plan boundary
- County / unitary authority
- District / borough

Mapped by - Carrie Mackay-Payne (2012)
GI and Analysis Team, Natural England
© Crown copyright and database right [2012]
Ordnance Survey Licence number 100022021.

Map Reference -110407



Fens for the Future

A Strategic Plan for Fenland :
A Proposal for an Enhanced Ecological Network



Map 3. Fenland soils: showing the distribution of
peat and loam (silt) soils

- Plan boundary
- Unclassified
- Peats
- Sands
- Loams
- Clays
- Sea
- Water

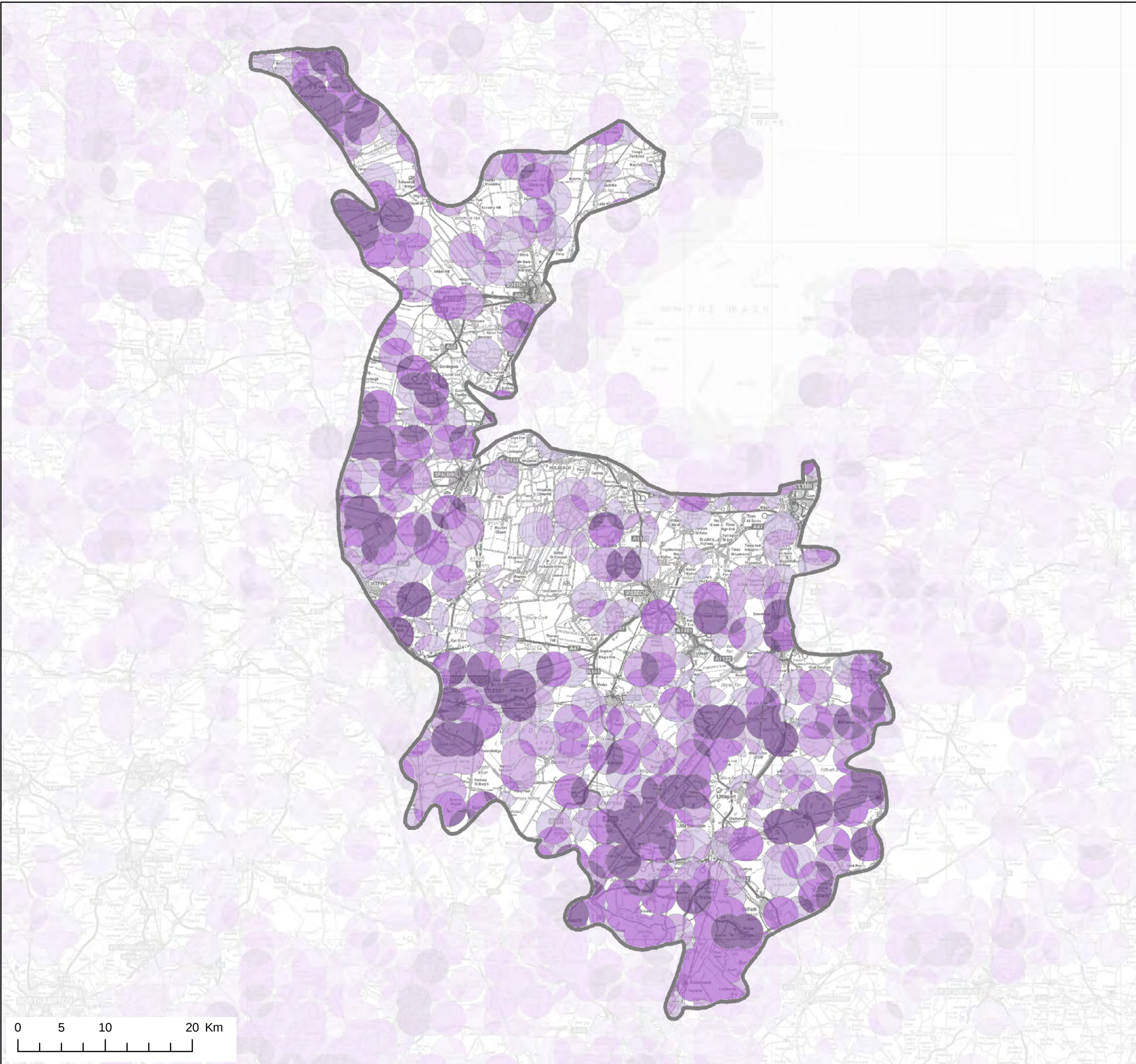
Fens for the Future

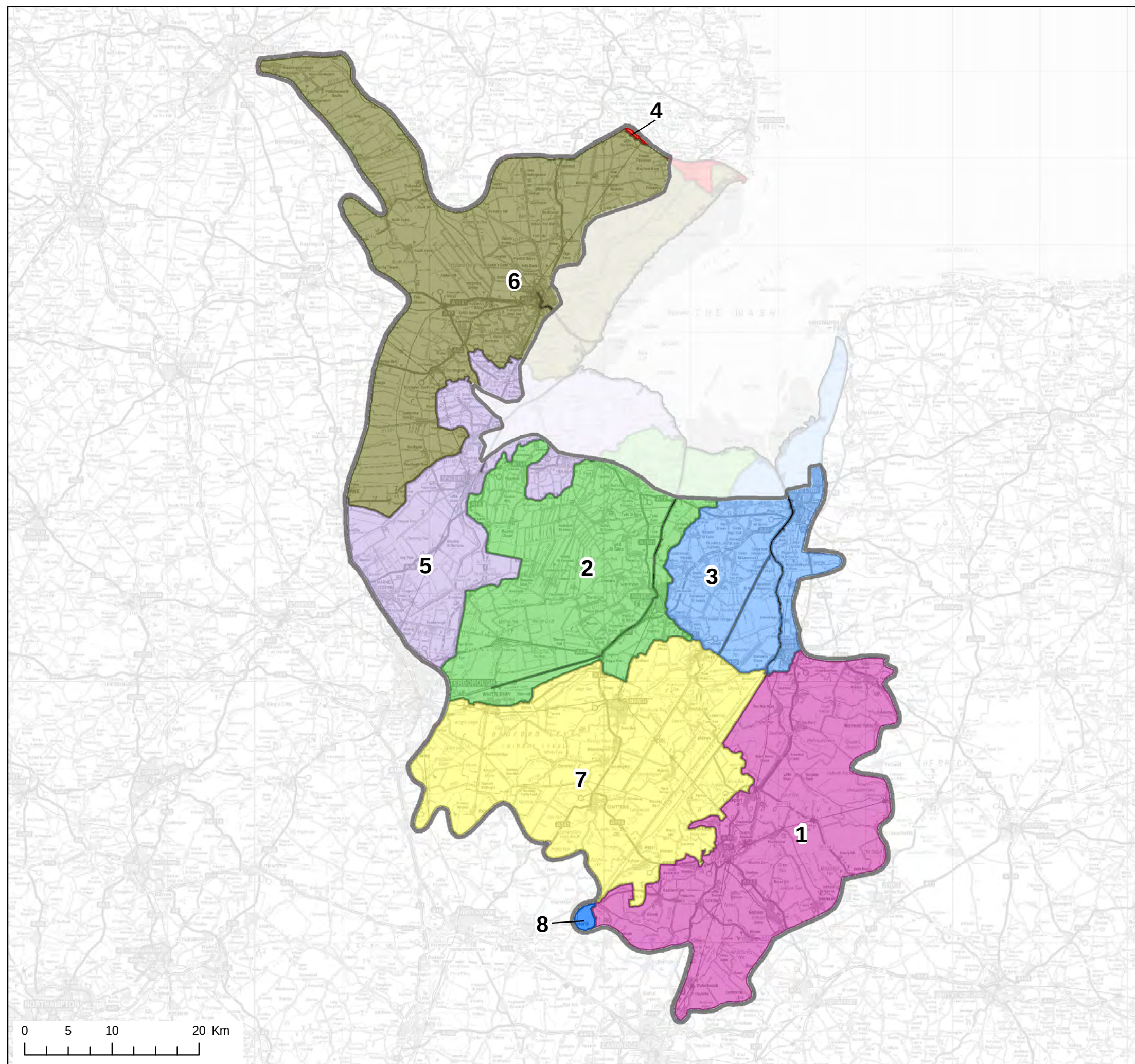
A Strategic Plan for Fenland :
A Proposal for an Enhanced Ecological Network

Map 4. Key farmland bird assemblages

-  Plan boundary
-  Arable 3 species
-  Arable 4 species
-  Arable 5 species
-  Arable 6 species

Key farmland bird assemblages: based on the distribution of corn bunting, grey partridge, lapwing, turtle dove, tree sparrow and yellow wagtail





Fens for the Future



A Strategic Plan for Fenland :
A Proposal for an Enhanced Ecological Network

Map 5. Environment Agency Catchment Abstraction Management Strategy (CAMS) areas

-  Plan boundary
-  1 Cam and Ely Ouse (including South Level)
-  2 Nene
-  3 North West Norfolk
-  4 Steeping Great Eau and Long Eau
-  5 Welland
-  6 Witham
-  7 Old Bedford including the Middle Level
-  8 Upper and Bedford Ouse

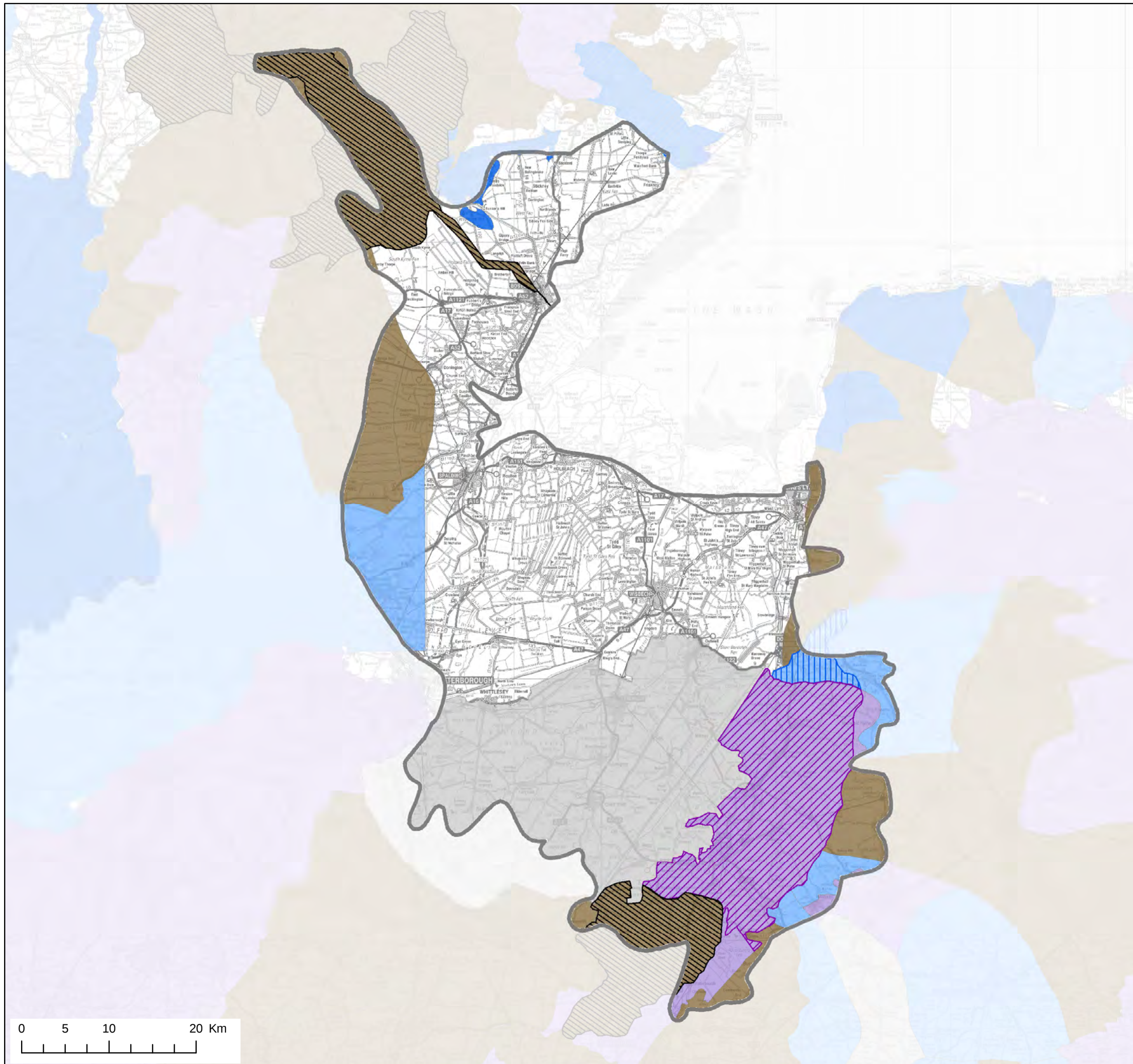
Mapped by - Carrie Mackay-Payne (2012)
GI and Analysis Team, Natural England
© Crown copyright and database right [2012]
Ordnance Survey Licence number 100022021.

Map Reference -110407

Fens for the Future

A Strategic Plan for Fenland : A Proposal for an Enhanced Ecological Network

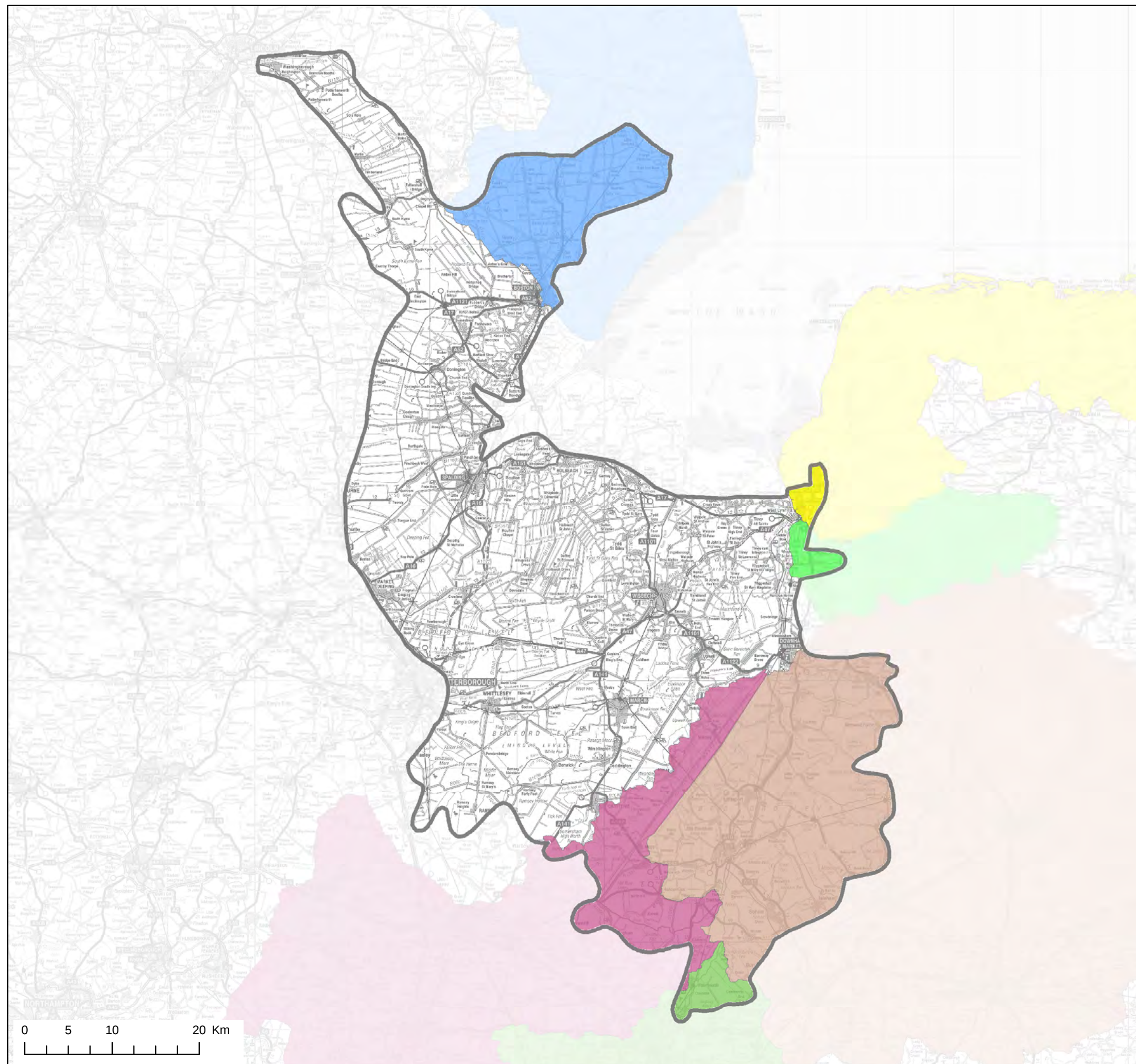
Map 6. Water resource availability status



-  Plan boundary
- Major groundwater units**
-  Water Available
 -  Over abstracted
 -  Over licenced
 -  No water available
 -  Not assessed

- Surface and groundwater units**
-  Water available
 -  Over abstracted
 -  Over licenced
 -  No water available

0 5 10 20 Km



Fens for the Future

A Strategic Plan for Fenland :
A Proposal for an Enhanced Ecological Network



Map 7. England Catchment Sensitive Farming
Delivery Initiative (ECFSDI) priority catchments

-  Plan boundary
-  Cam & Granta
-  Lincolnshire Coast Rivers - Anglian
-  Little Ouse (Thetford Ouse)
-  Lower Great Ouse
-  North Norfolk Rivers
-  River Nar

Mapped by - Carrie Mackay-Payne (2012)
GI and Analysis Team, Natural England
© Crown copyright and database right [2012]
Ordnance Survey Licence number 100022021.

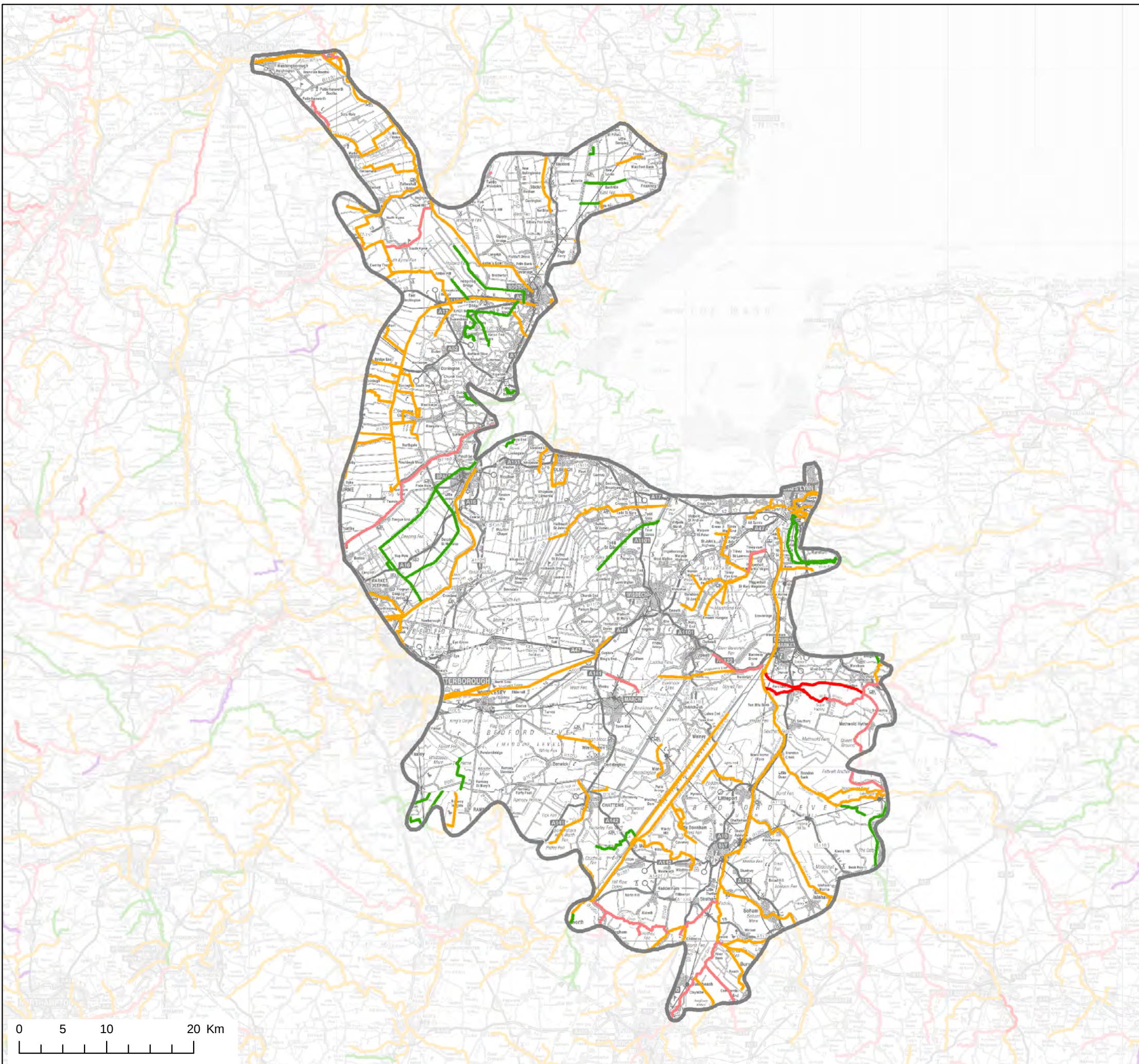
Map Reference -110407

Fens for the Future

A Strategic Plan for Fenland :
A Proposal for an Enhanced Ecological Network

Map 8.The Water Framework Directive
Ecological Status of Fenland waterbodies (2011)

-  Plan boundary
-  Good
-  Moderate
-  Poor
-  Bad
-  Not yet assessed



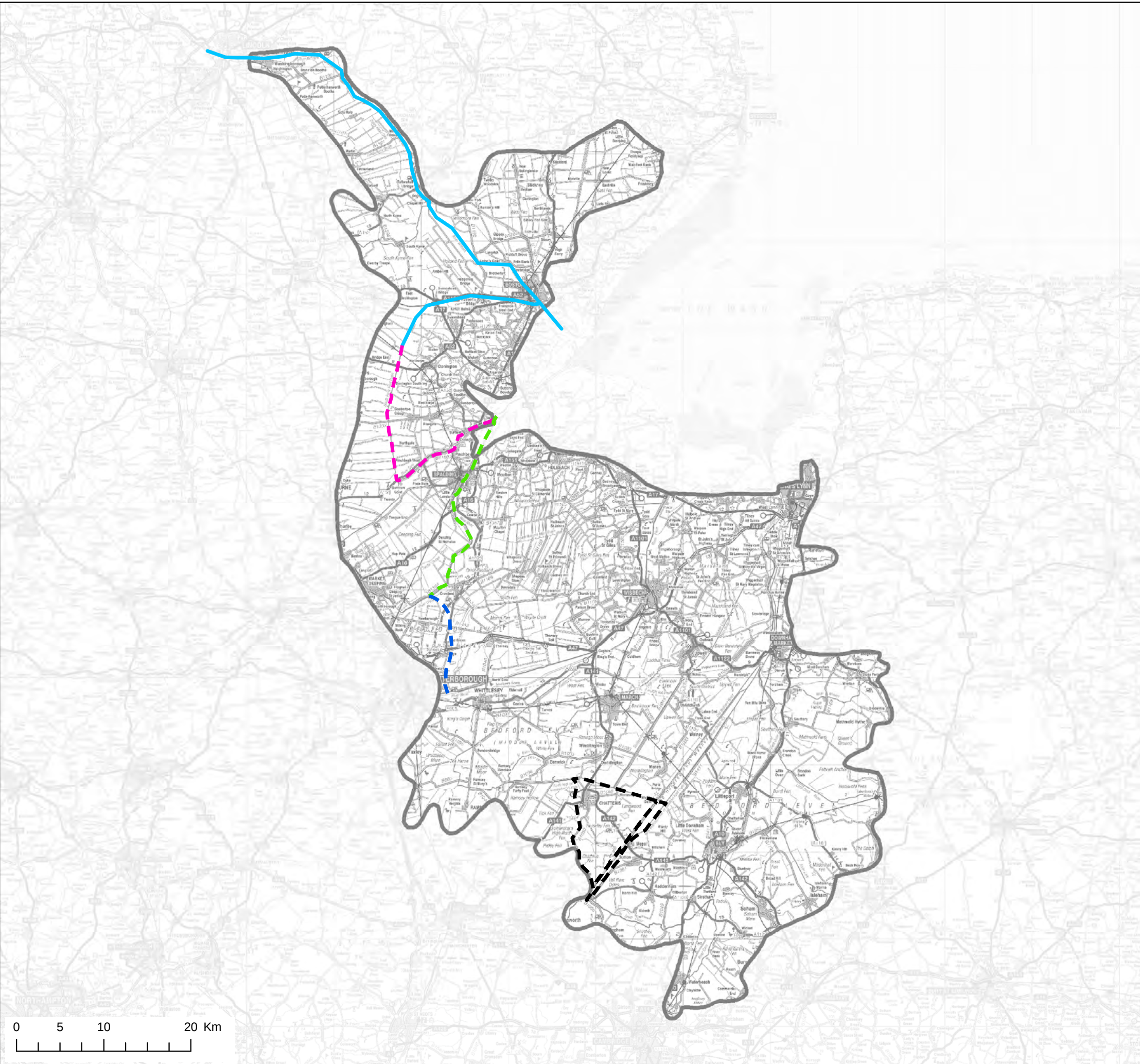


Fens for the Future

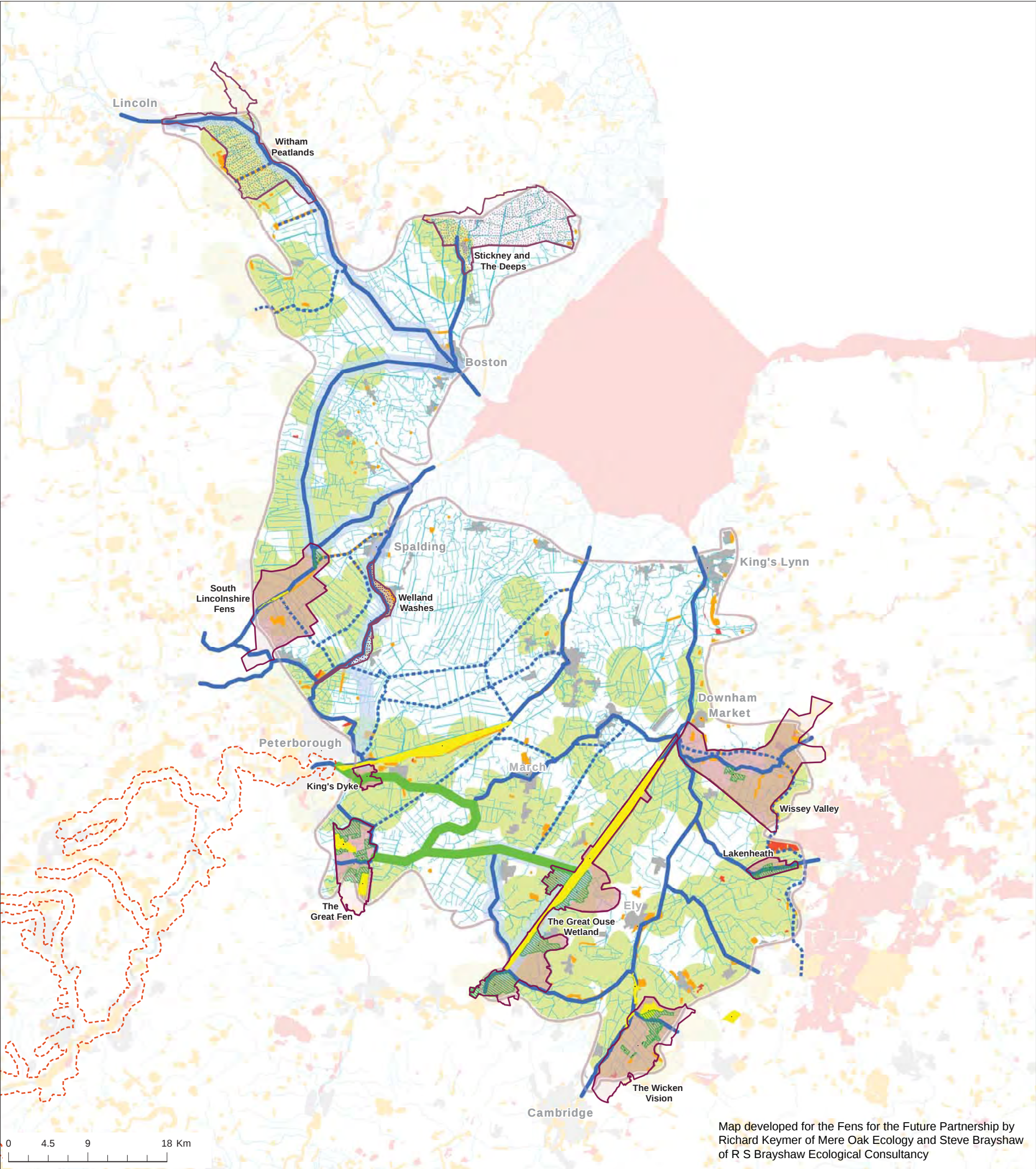
A Strategic Plan for Fenland :
A Proposal for an Enhanced Ecological Network

Map 9.The Fens Waterway Link Initiative phasing

- Plan boundary
- Phase 1 & 2 : Boston to Donington Link
(fully operational March 2009)
- Phase 3 : Donington to Surfleet Link
- Phase 4 : Surfleet to Crowland Link
- Phase 5 : Crowland to Peterborough Link
- Phase 6 : Alternative potential new navigation
(indicative)



18 Map of Proposed Enhanced Ecological Network



FENS FOR THE FUTURE

A Proposal for an Enhanced Ecological Network for Fenland

This map presents a proposal for the creation and enhancement of an ecological network for Fenland. The plan boundary is based on the Fens National Character Area and comprises the 'Settled Inland Fens' and the 'Open Inland Fens' where associated habitats are dependent on freshwater systems. The 'Open Coastal Marshes' and 'Drained Coastal Marshes', which are coastal in nature and whose conservation has been led by two long-standing partnerships: the *Wash Estuary Strategy Group* and the *Wash and North Norfolk Coast European Marine Site Partnership*, are omitted.

The proposed ecological network is based on the structure recommended in the Natural Environment White Paper:**The Natural Choice: securing the value of nature**, published in June 2011, which in turn is based on the Lawton Report: **Making Space for Nature: A review of England's Wildlife Sites and Ecological Network**. The proposed network comprises the following elements: core areas, corridors, stepping stones, restoration areas, buffer zones and sustainable use areas. Full descriptions of each of these are provided in the accompanying report: **A Strategic Plan for Fenland : A Proposal for an Enhanced Ecological Network**.

Core Areas

Areas of high nature conservation value which form the heart of the network. They contain habitats that are rare or important because of the wildlife they support or the ecosystem services they provide. They comprise the remaining areas of fen and the wetland habitats of the Great Washlands. They are all Sites of Special Scientific Interest (SSSI) and most have international recognition as Special Area of Conservation (SAC) and/or Special Protection Areas (SPA).

Proposed Priority Landscape Corridor

Proposed Landscape Corridors

Proposed Secondary Corridors

Landscape Corridors and Secondary Corridors improve the functional connectivity between core areas, enabling species to move between them to feed, disperse, migrate or reproduce. As it is largely a wetland system the proposed Landscape Corridors comprise the main rivers and main drains, but Secondary Corridors are also identified to provide useful additional connectivity. It is recommended that priority should be given to the development of the proposed **Priority Landscape Corridor** which connects the southern Fens and Ouse Washes to the Great Fen and to the Nene Washes.

Stepping Stones (to be identified)

Connectivity need not come from linear, continuous habitats; a number of small sit may act as Stepping Stones across which certain species are able to move between Core Areas. It is envisaged that smaller, currently isolated, SSSI and Local Wildlife Sites will be the foundation for the development of Stepping Stones.

Restoration Areas

Areas where measures are already underway to restore or create new high value habitats and species populations, and where ecological functions are enhanced.They are often located as extensions to existing Core Areas.

Buffer Zones (to be identified)

Areas surrounding Core Areas, Restoration Areas, Stepping Stones and Corridors, that protect them from adverse impacts from the wider environment. Often Restoration Areas have been planned adjacent to Core Areas and part of their function is to buffer them. However, Restoration Areas will also require buffering from adjoining intensive land uses.

Sustainable Use Areas

Areas within the wider landscape where the focus is on the sustainable use of natural resources and appropriate economic activities, together with the maintenance of ecosystem services. Set up appropriately, they will help to 'soften the matrix' outside the Proposed Ecological Network and make it more permeable and less hostile to wildlife, including self- sustaining populations of species that are dependent upon, or at least tolerant of, certain forms of agriculture. The indicative Sustainable Use Areas identified here are based on areas with the highest assemblages of key farmland birds: corn bunting, grey partridge, lapwing, turtle dove, tree sparrow and yellow wagtail.

Target Areas (some habitat restoration underway)

Target Areas (no current habitat restoration activity)

Areas identified by partners, for habitat creation and restoration. Habitat restoration projects are already taking place in some of the Target Areas, but in others restoration work is yet to get underway.

Plan Boundary

SSSI

Local Wildlife Sites

Fen Waterways Link

Nene Valley Nature Improvement Area

Note.The proposed Enhanced Ecological Network is based on existing ecological important sites and features, in particular SSSI and the main rivers and drains. Local Wildlife Sites will alsobe important components of an enhanced network by providing the focus for the development of Stepping Stones. Although many of these sites and features are visible on the map, many more, including some of the most extensive, are obscured are by the components of the ecological network e.g. although Ouse Washes is an SSSI, but appears as a Core Area on the map. Similarly, many of the main rivers and drains are hidden under the Corridors.