Lincolnshire Biodiversity Action Plan

2011 – 2020 (3rd edition)

LINCOLNSHIRE BIODIVERSITY PARTNERSHIP

Contents

****A list of acronyms and a glossary can be found at the back of the BAP on pages 238 and 240****

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Cover image: The Gullet, Deeping Lakes (Barrie Wilkinson)

Foreword

This 3rd edition of the Lincolnshire Biodiversity Action Plan (BAP) represents many things. It represents conservation success stories in the organisations that have been brought together and work that has been delivered on the ground. It also represents lessons that must be learned - actions that have not been achieved, fully, or in part, but that are still considered important. More simply, there is a need to adequately disaggregate monitoring to understand the full effect of conservation delivery. But perhaps most importantly, through the public consultation and the Partner input to this edition, this BAP represents the accumulated efforts of hundreds of individuals and their desire to see the state of biodiversity in the historic county of Lincolnshire improved.

The progress sections in each of the action plans highlight some of the conservation work to date. The list is long - after 11 years of action this is not surprising - but the lists of threats are also still longer than might be hoped, even if the precise nature of these threats may have changed over the last few years. The coastal and marine section is far larger in this edition and the evolving Marine Conservation Zones under the Marine Act will be a great help to BAP delivery. Since the 2nd edition much has changed in policy and legislation and this has been incorporated into the action plans. It is a time of change, with the publication of the Natural Choice white paper, and more changes are to be expected. This edition is adaptable to change but the actions and targets are still relevant. The root causes of biodiversity loss and the actions needed to address them will not alter because of different funding streams or the changing names of participating organisations.

Challenges lie ahead, but the strength of the Lincolnshire BAP has always been in its Partnership. This large and diverse Partnership has enabled much more conservation delivery than individual organisations and landowners working alone. The work of the six habitat groups in galvanising and prioritising this action has been crucial and must continue. The wider workstreams of the Lincolnshire Biodiversity Partnership have also contributed to this innovative model of working. Information flow between the Lincolnshire BAP, Lincolnshire Environmental Records Centre and Local Sites partnership has aided delivery in all areas.

The scale of the BAP Partnership and the overwhelming response from the public consultation show that the BAP is needed and wanted. The track record of the Lincolnshire BAP Partnership's delivery demonstrates that it is entirely necessary for a better future for Lincolnshire's biodiversity. We all must look forward to 2020, with a sense of achievement relating to past gains and a sense of determination to achieve future ones.

Richard Chadd
Chair of the Lincolnshire Biodiversity Partnership

Acknowledgements

Lincolnshire Biodiversity Partnership is grateful to the representatives and volunteers from many organisations that contributed to writing the Lincolnshire BAP 3rd edition.

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Thanks also go to all contributors to past editions of the Lincolnshire BAP. Highlights can be found in Lincolnshire Biodiversity Partnership annual reviews and BAP annual reports.

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A full list of organisations signed up to the Lincolnshire BAP 3rd edition can be found in Appendix 1.

1. Vision and aims

1.1 Vision statement

Lincolnshire and its neighbouring seas are much richer in biodiversity.

1.2 Aims

By working in partnership towards this vision, identifying priorities for action, and engaging with local stakeholders BAP Partners aim to…

- *Conserve and enhance Lincolnshire's biodiversity; recreating habitats on a landscape scale and developing networks of interlinked natural areas – a 'living landscape' of which wildlife is an integral part, not confined to specially protected sites.*

- *Ensure that biodiversity is recognised as an essential element of life in the historic county of Lincolnshire: including its contributions to health and wellbeing; the economy, recreation and tourism; and provision of ecosystem services (such as flood protection, retention of water resources, carbon storage and crop pollination).*

- *Ensure biodiversity conservation is sustainable; the benefits are felt by society, the economy and the environment.*

- *Provide and gather biodiversity information to monitor progress and enable individuals and organisations to make decisions based on sound evidence.*

2. The role of the Lincolnshire BAP

2.1 The Lincolnshire BAP in context

Local BAPs raise awareness of biodiversity issues by focusing on species and habitats with local relevance, and are a mechanism to enable national targets to be delivered at a local level. They identify local priorities for biodiversity conservation, and work to deliver agreed actions and targets for priority habitats and species and locally important wildlife and sites[1]. Local BAPs contribute to the delivery of the UK BAP, the England and EU Biodiversity Strategies and the global commitments made by the UK at Nagoya in 2010.

The Lincolnshire BAP has been delivered through a broad partnership since the first plan was published in 2000. This has proven to be a successful way of focusing resources and sharing best practice between local authorities, statutory agencies, NGOs and other interested parties. Over time the Lincolnshire BAP partnership has become part of something bigger – the Lincolnshire Biodiversity Partnership was formally constituted in 2007 (see Box 1). This has added strength to the Lincolnshire BAP and enabled other Partners to better fulfil their responsibilities, including implementation of the NERC Act by local authorities.

Box 1: The LBP
The Lincolnshire BAP is an integral part of the Lincolnshire Biodiversity Partnership (LBP). The LBP covers four workstreams; the BAP, the Lincolnshire Environmental Records Centre (LERC), Local Sites and Geodiversity. LBP is the first partnership in the UK to be structured in this way. It has been seen as an innovative model for the future. For more information see www.lincsbiodiversity.org.uk

LINCOLNSHIRE BIODIVERSITY PARTNERSHIP

Through this collaborative partnership approach much has been delivered and priorities for the future have become clear. For example native woodland planting in the Lincolnshire Limewoods initiative area equalled nearly five times the target that was set in 2006; and there are 7000ha of arable field margins in Environmental Stewardship against a target of 300ha. However the importance of monitoring through the BAP is also clear as analysis shows that only 182ha of this 7000ha are the most environmentally beneficial kind. Continued partnership working is crucial to ensure that this knowledge can be shared and learned from to ensure mutually beneficial outcomes for business and biodiversity. Some targets from the 1st and 2nd editions of the Lincolnshire BAP have not been delivered; the need to monitor these and the reasons for failure is essential for designing successful initiatives in the future. For more on BAP delivery see section 6.

The Lincolnshire BAP adds value to individual initiatives through collaborative working; simultaneous delivery of multiple objectives; best practice sharing; data gathering; and monitoring and demonstrating individual contributions to wider national commitments.

2.2 Why is biodiversity important?

Biodiversity affects all aspects of our lives, culture and economy in ways that we do not always consider. From the food we eat and air we breathe to the commodities we trade; all are affected by biodiversity as it underpins the ecosystem services that support us.

Box 2: What is biodiversity?
The term 'biodiversity' is shorthand for biological diversity – the variety of life on earth and the systems that support that variety. The Convention on Biological Diversity (which resulted from the 1992 Rio Earth Summit) provides a more precise definition:

'The variability among living organisms from all sources including inter alia, terrestrial, marine and other aquatic ecosystems and the ecological complexes of which they are a part; this includes diversity within species, between species and of ecosystems.'[2]

2.2.1 Ecosystem services

Some of the services that biodiversity provides us are obvious – they are on our plate – but some are less apparent. In order for the food to have got to our plate much of it requires soil to grow in and insects to pollinate it. The processes that produce soil are aided by the soil biodiversity and a diversity of pollinating insects is required for producing a range of different crops. These are ecosystem services, and other examples include flood attenuation, water and nutrient cycling, carbon storage, and most crucially the production of oxygen through photosynthesis, which enables us to breathe.

Recognition of these services and their value to human societies is increasing but not necessarily fast enough, which is one of the reasons why BAPs are needed to help identify the issues affecting our biodiversity and to coordinate action.

The National Ecosystems Assessment[3] describes ecosystem services in four categories and considers the market and non-market benefits. By valuing all of these benefits and comparing them to the costs of biodiversity protection it may be possible to bring a wider range of audiences on board with what has been seen as a narrow 'green' agenda in the past.

Provisioning services e.g. food from agriculture
In the last decade the UK has produced more food from crops than at any other time in history, this generates £6,600 million per year. In addition, around two thirds of the UK's current woodland area is productive plantation. However the expansion in agricultural and woodland area has come at the expense of other ecosystem services and biodiversity. These issues are discussed further in sections 3 and 4.

Regulating services e.g. flood control and crop pollination
These include some of the most important services that directly underpin the provisioning services and our daily lives. The Alkborough Flats managed realignment scheme on the Humber Estuary is providing £400,000 worth of flood protection benefits every year, in addition to habitat for 150 bird species[4]. The scheme has a benefit to cost ratio of 3.22[5]. Insect pollination for UK crops alone is estimated at £340 million per year[6].

The flip side is that degraded ecosystems can cost us money – our ecosystems may have less capacity to perform regulating functions or may have lost them altogether. It costs over £200million every year to clean the agricultural nutrients, pesticides and other contaminants from UK water[7]. A great deal of this could have been 'buffered' (essentially cleaned out by soil), but much of the UK's soil is degraded or eroded and therefore has a lowered capacity to provide this ecosystem service. Similarly,

agricultural soil degradation costs between £29million and £128million per year through its contribution to flooding events[8].

Cultural services e.g. recreational benefits
Lincolnshire's biodiversity is a key element of its landscape, which adds to the quality of life for its residents and visitors. This is evident in the continued membership of conservation bodies and interest in nature conservation TV programmes and books: the combined membership of the main conservation charities is over nine million and over half the adult population visit the natural environment every week[9].

These elements provide wellbeing; a sense of place and often pride in where people live, and the services are multiple – doubling as outdoor gyms, meeting areas and commutes to work. The health benefits of green infrastructure can be significant; people who live within 500m of accessible greenspace are 24% more likely to meet recommended levels of physical activity[10]. Mental health is also shown to be improved through access to greenspace, or physical activity in greenspace, in urban areas or the countryside[11]. Yet since these services are undervalued, or not financially valued, they are under threat. In the UK around 10,000 playing fields were sold between 1979 and 1997 and the number of allotments is at around 10% of the area of that in the 1940s[12].

Supporting services e.g. nutrient cycling
The supporting ecosystem services are the most crucial of all because all the other services and our lives depend on them. They include nutrient cycling, the production of oxygen by plants and the formation of soil from rocks. Knowledge of how these services interact and how they are affected by other services and human activities is limited; however they are used as environmental indicators. Measurements have shown that the pH of surface soils has increased over the past 30 years in line with the decrease in sulphate deposition[13]. Less positive are the low rates of soil formation – less than 1cm a year[14] – which is cause for concern when compared to the much higher agricultural soil erosion rates in some areas.

2.2.2 Intrinsic value

The reasons for conserving biodiversity outlined in 2.2.1 are often the most cited as they strike a chord with everyday lives of individuals, but philosophically there is another reason for conservation. The intrinsic value arguments are more complex but the central tenet is that every living thing has a value which we cannot fully comprehend. By extension, a key question is "who has the right to destroy that value"? The dominant theory within the discourse is that humans are simply part of nature, not dominating it, thus we should seek to conserve the value in the rest of nature. One of the central writers within this discourse is Aldo Leopold with the quote: "a land ethic changes the role of *Homo sapiens* from conqueror of the land-community to plain member and citizen of it. It implies respect for his fellow-members, and also respect for the community as such"[15].

3. Threats to biodiversity

Threats to biodiversity are numerous and human activity is responsible for most of them[16]. This section highlights some principle areas of concern and section 4 describes the main ways of attempting to halt and reverse these impacts.

3.1 Habitat loss and fragmentation

Habitat loss and fragmentation is one of the main reasons for biodiversity decline. Loss of habitat means a reduction in the number of places to live, eat or establish breeding territory, with the inevitable result that biodiversity will decline. Fragmentation is the other half of the problem; as habitat patches become smaller and more isolated, the opportunities for species dispersal or meeting a suitable mate decline. While much of this loss may have occurred many years ago (from decades to hundreds of years) the impacts on our wildlife and plants are still being felt. The loss of habitat is compounded by changes in landscape use through agricultural intensification which accelerated from the 1940s[17]. Driven by EU policy, subsidies and the justified desire to improve self-sufficiency, agricultural intensification brought use of chemical fertilisers and pesticides and eutrophication. These made large parts of our countryside unsuitable for wildlife and plants, thus restricting them to islands of remaining habitat. Expansion of urban areas and the networks of road and rail that connect them have also contributed to the loss and fragmentation of habitat.

Due to the fertility of its soils Lincolnshire is a principally agricultural county, dominated by intensive arable cultivation in large fields, frequently without connecting hedgerows. The historic loss of biodiversity in Lincolnshire has been more significant than in much of the UK.

While the threats of habitat loss and fragmentation continue, the rate at which they continue to change our landscape and the biodiversity within it may be slowing, and in some areas even reversing, thanks to the policies and legislation described in section 4. But there are 'new' threats (see below). The impacts of climate change, disease and non-native species are significant individually, but it is how they could interact with and multiply the existing threats that is of most concern.

3.2 Climate change

Box 3: Projected climate changes for the East Midlands

Medium emissions scenario for the 2050s;

- Increase in winter mean temperature is likely to be between 1.1°C and 3.4°C.
- Increase in summer mean temperature is likely to be between 1.2°C and 4.2°C.
- Change in winter precipitation is likely to be between 2% and 29%.
- Change in summer precipitation is likely to be between -36% and 6%. [18]

The threat posed by climate change is thought to be the most significant threat to our biodiversity in the long term. Even with stringent carbon emission control measures there is an acceptance that our climate will continue to change as a result of historic and current emissions[19]. Projections of future climate change sometimes seem minor, with only a small change in temperature and large error margins. However it is important to remember that gradual changes are only part of the picture; climate change brings far more unpredictable and extreme weather, to which biodiversity cannot adapt in the same way as it can to gradual changes. Therefore as well as

working to reduce emissions, we must accept that there will be climate impacts on biodiversity, and do what we can to minimise them.

For many species moving will be the most likely response to the effects of climate change, but in a landscape of fragmented habitat surrounded by generally hostile land uses this will be difficult or impossible. Some mobile species are showing changes in distribution that are being attributed to climate change[20], which demonstrates that not all species are necessarily losers. But it is the less mobile and less adaptable species that are of most conservation concern; these will be the species to suffer most severely from climate impacts. They may benefit from continuity of habitat to enable them to move through 'climate corridors'.

3.3 Other threats

Invasive non-native species and disease are two other high profile threats to biodiversity, which are often linked. For example, non-native crayfish species outcompete the native white-clawed crayfish *Austropotamobius pallipes* for habitat. They also transmit crayfish plague, which devastates native populations whilst leaving non-native species unaffected.

Of more concern is the seemingly increasing number of plant diseases and pests taking hold in the UK. Through destruction of the infected vegetation, an untold number of species that depend on the ecosystem will be affected – from the insects dependent on the nectar, to the animals feeding on the insects, up to top predators. Fungi such as *Phytophthra ramorum* are now known in the UK on a number of native and non-native tree and shrub hosts, causing significant financial concern to the timber industry and conservation management concerns on Planted Ancient Woodland Sites (PAWS) in particular. See the invasive non-native species action plan for more information.

A less high profile threat to biodiversity is complacency and lack of prioritisation in policies and funding streams. As section 2.2.1 illustrates, all of human society is reliant upon ecosystem services, which are underpinned by biodiversity. Yet biodiversity and these ecosystem services are consistently undervalued or even invisible to society and decision makers. The National Ecosystem Assessment found that 30% of ecosystem services are currently declining and many more are in a degraded state. The same Assessment suggested that the differences in future land use changes would have a greater effect on ecosystem services than would the difference between low or high climate impact scenarios[21].

Action to help species and habitats survive require the same broad approach to conservation as that described in 3.1 – we need to reverse habitat loss and fragmentation. All these other threats simply make the need for action more urgent. Strategies to ensure species and habitats are resilient in the face of change (i.e. at the landscape scale) are crucial, see sections 4 and 6.

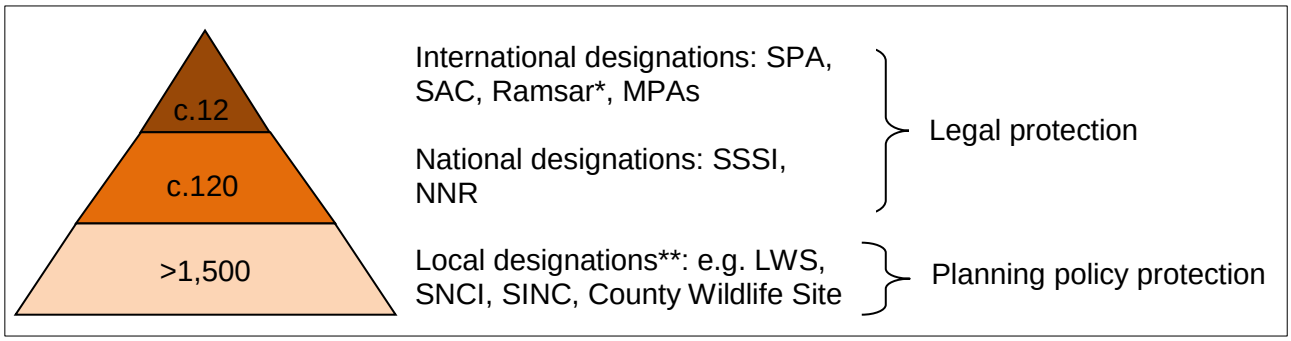
4. Biodiversity protection

Protection of biodiversity and the wider environment cannot succeed without a multi-layered system of legislation and policy from the international to the local level. While there are still many gaps and loopholes in this system, biodiversity is significantly better protected now than in the past.

4.1 The protected sites system

Historically, biodiversity conservation focused on protecting specific areas and a number of different designations and networks have grown up around this system. The pyramid below exemplifies the main pieces of legislation and policy in the English system.

Chart 1: Hierarchy of protected sites



Numbers refer to approximate number of sites in the historic county of Lincolnshire and its adjacent sea.[22]
* Not legal protection but always underpinned with SSSI designation.
**The administration of the Local Sites system in Lincolnshire – Local Wildlife Sites (LWSs) and Local Geological Sites (LGSs) – is managed by the LBP on behalf of local authorities. The guidelines for site selection were developed and approved by the LBP in accordance with the 2006 Defra guidance[23].

4.2 Legislation and policy outside protected areas

Specially protected areas cannot ensure the survival of all our biodiversity – a supportive legislative and policy framework is vital – the only way to conserve all biodiversity is to integrate conservation into other areas and sectors. This has developed through time and will continue to grow and shift with successive governments and changes in policy direction.

As such this section can only highlight the most relevant areas in Lincolnshire and developments within them for biodiversity.

4.2.1 Policies for specific sectors

- Agriculture: The Common Agricultural Policy and agri-environment schemes[24] have the largest impact on how our countryside is managed and therefore what opportunities it can offer for wildlife.

- Planning: A complex and historic system on land. Some of the most relevant areas for biodiversity are PPS9[25], the Planning and Compulsory Purchase Act (2004) and the Strategic Environmental Assessment Regulations (2004). Planning policy at sea is a newer area, only now being developed.
- Public bodies: The NERC Act[26] requires all public bodies to have regard for biodiversity[27]. This 'biodiversity duty' has been a huge step forward in encouraging all sectors to integrate the environment into their sector and daily work.
- Water management:
  - The Water Framework Directive (2003)[28] is the most significant piece of EU water legislation to date. It focuses on water quality and the ecological quality of aquatic habitats. This legislation considers everything from abstraction to surrounding land uses and specific in-channel measures.
  - With much of the county lying below or close to sea level, flood and coastal erosion risk management is critical to Lincolnshire's population and economy.
- Marine: Policies are being developed to take forward implementation of the Marine Strategy Framework Directive (2008) and the Marine and Coastal Access Act (2009).

4.2.2 Biodiversity policies

Polices for wider protection of biodiversity and the environment have a long history that is entwined with the protection of specific sites. Over the last decade or so the concepts of ecosystem services and landscape-scale working have solidified across the environmental sector and brought a new way of working. These paradigms and the policies below set the tone for the future of conservation thinking and action.

- Making Space for Nature/the Lawton review[29]: The review was launched to look at England's collection of wildlife areas and whether they represent a robust natural environment that is capable of responding and adapting to the challenges of climate change and other pressures. It reported in 2010 that England's wildlife areas are not robust, and made a series of recommendations. These recommendations were summarised in the words: *more, bigger, better, joined*. While conceptually this may seem simple, the high profile authors and high level endorsement of this report made it a very significant achievement for the environmental sector.
- Think Big[30]: published on the same day as The Natural Choice (see below) this document underlines the case for landscape-scale working – expanding on the references and evidence base on which the policy decisions are made in The Natural Choice. It is also a best practice document describing the key elements of successful landscape-scale working.
- The Natural Choice/The Natural Environment White Paper[31]: The first environment White Paper for 20 years, The Natural Choice is a hugely significant step forward. Incorporating significant elements of the National Ecosystems Assessment and Making Space for Nature, the White Paper places a strong emphasis on "restoring nature's systems and capacities" through better valuation of the benefits – economic, social and wellbeing – that we all receive from nature. "When nature is under-valued, bad choices can be made".

Table 1: Key commitments within The Natural Choice

Protecting and improving our natural environment	Establishment of Local Nature Partnerships.
	Creation of Nature Improvement Areas.
	Planning reforms will ensure co-operation across local authority boundaries. As a part of these reforms the Government will introduce a biodiversity offsetting scheme.
Growing a green economy	New guidance on valuing the benefits of nature will be issued including a directive on how corporate bodies should measure their own impacts.
	Establishment of a business-led ecosystems markets taskforce.
	Expansion of the market for natural services.
	Natural Capital Committee: an independent body to report to the Government's economic affairs committee. This body will put the value of nature at the heart of the Government's economic thinking.
Reconnecting people and nature	Recognition of the vital role that access to nature can have in improving health outcomes. Public Health England will be issuing guidance on this.
	Establishment of Green Infrastructure Partnerships.
	Create new Local Green Areas.
	Remove the barriers to outdoor learning.
International and EU leadership	Greening the Common Agricultural Policy.
	Implementing an ambitious EU biodiversity strategy.
Monitoring and Reporting	A full set of indicators will be established by spring 2012.

4.3 Protecting species

Alongside protecting sites and habitats, a large amount of legislation and policy is directed at protecting species. The backbone of this protection is the Wildlife and Countryside Act[32] which provides various levels of protection to a range of species. This has been added to both in scope and number of designated species by the Countryside and Rights of Way Act[33], European directives such as the Habitats Directive[34] and Birds Directive[35], and international commitments such as CITES[36] and the Bern Convention[37].

4.4 Power to the people

The effect individuals can have on biodiversity conservation is huge. It could be argued that individuals are the driving force of conservation in England, given their subscriptions to environmental charities, many of which lobby for positive policies and legislation for biodiversity protection. Some charities also own and manage land for biodiversity benefit. But the impact of individuals is wider; from comments on planning applications, to volunteering at a local nature reserve or even attending a rally to let decision makers know the strength of public feeling.

Central to these actions by individuals is a personal connection with the natural environment. This connection is often first made in childhood and cemented by an understanding of biodiversity, which is why the Common Themes section contains an action plan for awareness and involvement by the community (page 32).

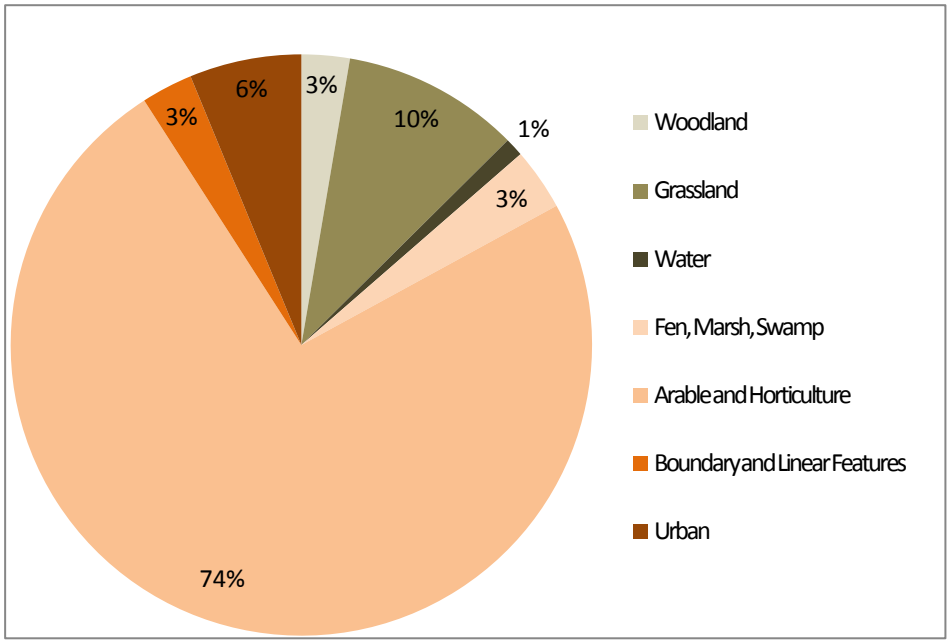
5. Lincolnshire landscapes

Lincolnshire has a huge diversity of habitats: from the saltmarsh and sand dunes of the coast to the calcareous grassland in the south of the county, and from the rolling hills of the Wolds to the open expanse of fen. Out to sea, the underwater landscape is also varied, with undulating hills, channels and reefs. It is this diversity that makes Lincolnshire a special place for wildlife.

5.1 Lincolnshire's landscapes and habitats

All of the habitats in the county have been shaped by humans in some way. These habitats are spread across a landscape in which arable farmland is the dominant land use. Whilst farmed land can be a haven for wildlife, only a limited number of species thrive on annually cultivated areas. In addition, only a very small minority of the county is dedicated to wildlife.

Chart 2: Lincolnshire land use



Countryside Survey data © NERC (2009) - Centre for Ecology and Hydrology

5.1.1 National Character Areas (NCAs)

NCAs [38] subdivide England into 159 areas of similar landscape character. Each NCA has a unique identity resulting from the interaction of wildlife, landforms, geology, land use and human impact. Together they form a widely recognised national spatial framework, used for a range of applications including the targeting of agri-environment scheme funding.

The historic county of Lincolnshire is covered by 10 NCAs (see map on page 18) and two Marine Natural Areas. For each NCA there is a description of the area, and desirable actions have been highlighted that would help to maintain the character of the area in to the future. At the time of publication some of the NCA descriptions were being revised, as such a full description of each area cannot be included here. Please see Natural England's website for more information: www.naturalengland.org.uk/ourwork/landscape/englands/character/areas

Box 4: Previous landscape designations
NCAs have built on much previous work on landscape designation – including Natural Areas and Landscape Character Assessment.

Natural Areas are similar to the NCAs but are based primarily on wildlife and natural features. They are seen as biogeographic zones as opposed to the NCAs, which incorporate more human and social elements with the natural.

Natural Areas have been retained for describing marine areas, and Lincolnshire has two Marine Natural Areas.
www.naturalengland.org.uk/ourwork/conservation/biodiversity/englands/naturalareas.aspx

Landscape Character Assessment is a tool that aims to help people understand and articulate the characteristics of landscape; basically to identify the essence of 'place'.

Landscape Character Assessment is used for various purposes including planning policies, environmental management and to measure change in landscapes.
www.naturalengland.org.uk/ourwork/landscape/englands/character/assessment

5.1.2 BAP habitats

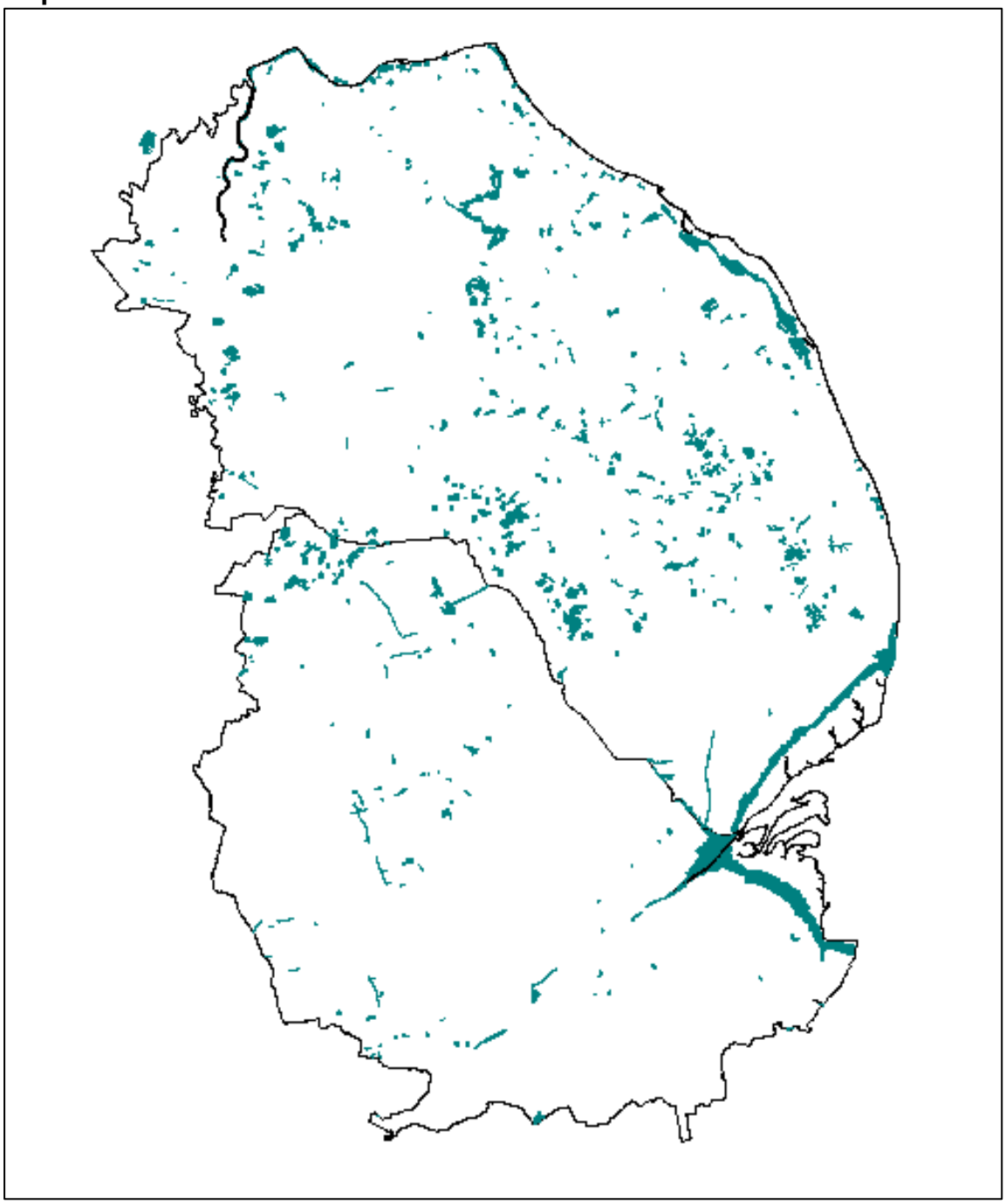
As the remainder, and largest portion, of this BAP illustrates, Lincolnshire has a wide range of UK BAP habitats[39] – section 6 explains how certain habitats were chosen for inclusion within this BAP.

Most illustrative though is the area that these BAP habitats cover (see Map 1). At present using a bottom-up methodology[40] of mapping it has only been possible to attribute BAP habitat to 1.2% of the land area of the historic county. Whilst it is clear there is more habitat to be mapped is it also apparent that this is not a robust situation for the biodiversity of Lincolnshire. However as small as most of these fragments of habitats are, it can "be as much the sum of the parts that matters as the whole. Even the smallest area of land or building can contribute towards a landscape-scale approach provided they are connected or are acting as a stepping stone that enables wildlife to move across a wider landscape"[41].

5.2 Lincolnshire's species

As with most of the UK, the precise status of many of Lincolnshire's species is still unclear due to a lack of long-term data sets and/or a coordinated mechanism for monitoring. However since its inception, LERC has been seeking to address this – working with species experts to make trend data available and accessible for some of the most recorded taxa; and to develop distribution maps for the less well-recorded species. Chart 3 demonstrates the value of this – in this case data highlighting the dramatic decline in the figure of eight moth *Diloba caeruleocephala* since 1970. This decline has been mirrored nationally and led to the species being added to the UK BAP list in the 2007 review.

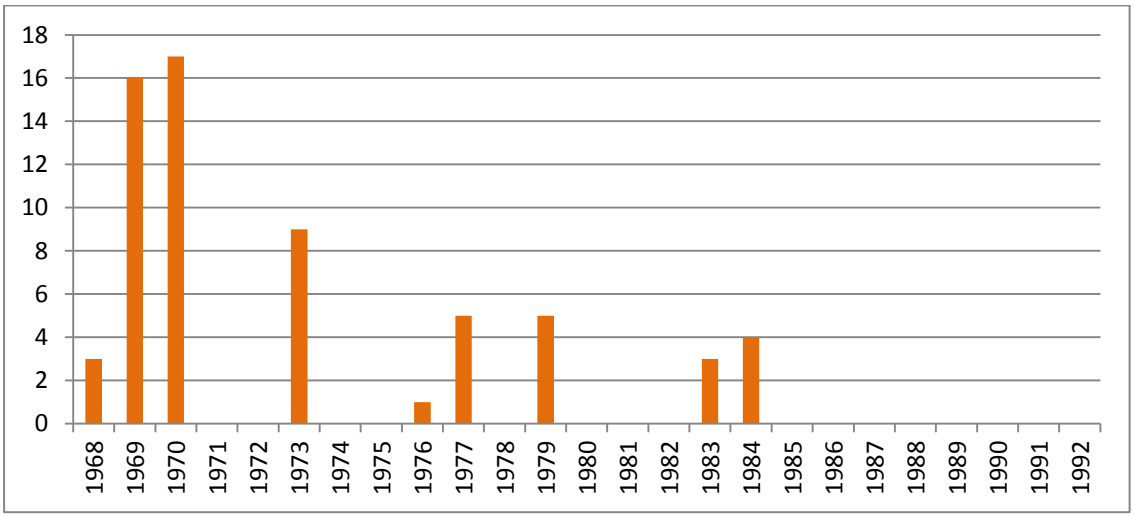
Map 1: BAP habitats



Also see Appendix 4.

Areas of BAP habitat mapped to December 2010 by the LBP. These areas include Lincolnshire Wildlife Trust reserves and some LWSs. This map represents work in progress and we are aware of further BAP habitat which has yet to be digitised and included.

Chart 3: Number of records for figure of eight moth *D. caeruleocephala* in Lincolnshire (1968-1992)

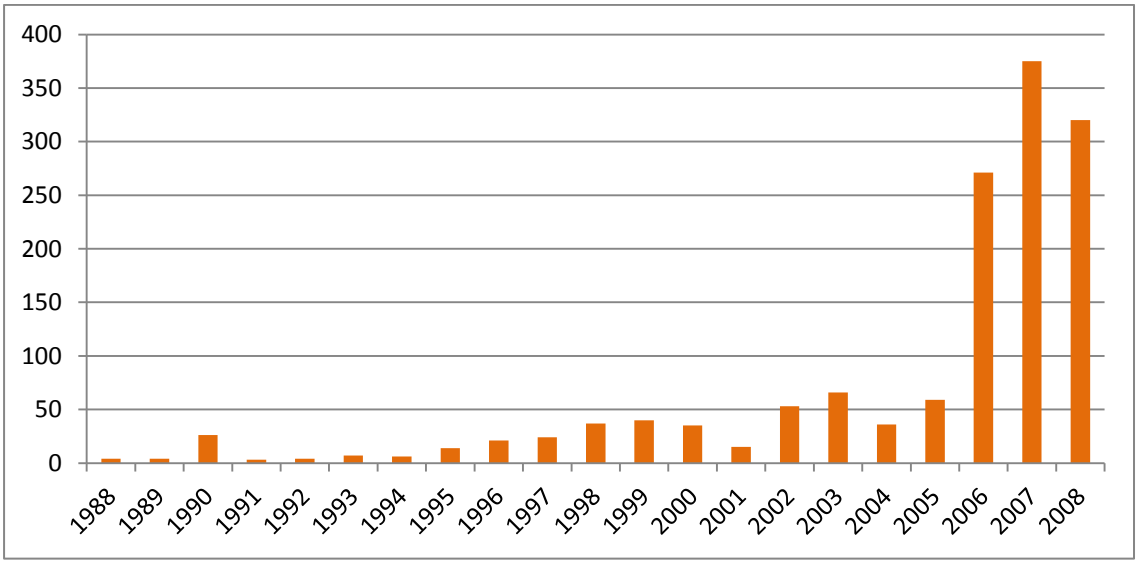


Rothamsted insect survey light trap network data courtesy of Lincolnshire Environmental Records Centre. Accessed 09/06/11.

Monitoring can also highlight conservation success stories. For example, records of water vole *Arvicola amphibius* have increased dramatically since systematic recording and management by many organisations, especially IDBs, and have shown Lincolnshire to be a stronghold for the species (see Chart 4).

The data held by LERC represent only a fraction of the knowledge and expertise of conservation professionals and species experts, upon whom it relies for the majority of its data. Their contributions should not be underestimated. See section 14 for more information on the priority species in Lincolnshire.

Chart 4: Number of records for water vole *Arvicola amphibius* in Lincolnshire (1988-2008)



Data courtesy of Lincolnshire Environmental Records Centre.
Accessed 29/09/11.

6. Planning and taking action for biodiversity

This section covers more of the 'nuts and bolts' of biodiversity action; from how Local BAPs are produced and structured to the achievements of the previous two Lincolnshire BAPs, before finally looking forward to the future of biodiversity conservation in the historic county.

6.1 The UK BAP context for Local BAPs

The UK BAP sets the overarching structure for Local BAPs and has also provided guidance and tools for writing Local BAPs and reporting on actions. This section describes this structure and its rationale as a way of explaining the format of the following Habitat Action Plans (HAPs) and Species Actions Plans (SAPs).

Consistency in format within this hierarchy of action plans is necessary in order for reporting and recording of delivery of successes or failures. It is important to be able to aggregate local actions against national targets to determine if we have been successful in reversing national biodiversity declines.

6.1.1 Local priorities vs. UK priorities

The Lincolnshire BAP seeks to meet the needs of those UK BAP priority species and habitats found in Lincolnshire as well as addressing more local needs. For example, the action plan for bats relates to all bat species present in Lincolnshire even though they are not all UK BAP priority species. There is also an action plan for parks and open spaces; these are not national priorities, but Lincolnshire organisations consider them to offer opportunities for the conservation of urban biodiversity and appreciation of the natural world so they are of local importance.

6.1.2 Criteria for selecting HAPs and SAPs

In order for habitats and species to be included in the Lincolnshire BAP in their own action plan, at least one of the following criteria must apply:

- Habitats on the UK BAP priority list present in Lincolnshire in significant amounts – e.g. lowland mixed deciduous woodland.
- Habitats for which a local action plan can have an influence in addition to the national HAP – e.g. coastal and floodplain grazing marsh.
- Habitats that are considered of local importance/relevance – e.g. churchyards and cemeteries.
- Species on the UK BAP priority list and present in Lincolnshire for which action cannot be delivered through a relevant HAP – e.g. greater water-parsnip.
- Species on the UK BAP priority list and present in Lincolnshire for which action at a local level could have an influence and add value to work being done through the national action plan – e.g. bats.

In addition to the 26 HAPs, 11 SAPs and three common themes action plans included in this edition of the BAP, the need was identified for a generic action plan to tackle invasive non-native species.

6.1.3 Plan structure

Each action plan follows the same format according to national guidelines: introduction, information on current status, threats, recent action, objectives, targets and actions. For each action plan a Lead Partner organisation has been identified, who is likely to be the main driver in delivering the action plan targets. The action plans are grouped into eight sections:

1 common themes section	Including over-arching actions relevant to all or some action plans.
6 habitat groups (based on broad habitat types)	Coastal and marine HAPs; farmland and grassland HAPs; heathland and peatland HAPs; rivers and wetlands HAPs; trees and woodland HAPs; urban HAPs.
1 species section	All the SAPs plus the invasive non-native SAP.

Action plans for species and habitats covered in the second edition have been updated or removed, and new plans have been written for additional species and habitats according to the criteria listed in section 6.1.2. In some cases the scope of an action plan has changed slightly from the second edition in order to align more closely with UK BAP habitat definitions. See Appendix 3 for the relationship between Lincolnshire and UK BAP habitats, and Appendix 5 for a full list of UK BAP species relevant to Lincolnshire.

6.1.4 Types of targets

There are four main types of target:

Target type	**Content of target**
Establish baseline/ keep information up to date	Extent and condition of habitat. Population or distribution of species.
Maintain extent	No net loss of habitats or species (or no loss for irreplaceable habitats).
Achieve positive conservation management	Measured using SSSI, LWS or other appropriate criteria.
Increase extent	Habitat restoration and creation. Facilitate increases in species' population/ distribution.

In addition, targets are as "SMART" as possible in order to ensure that progress can be quantified and meaningfully reported.

SMART: Specific, Measurable, Achievable, Realistic, Time-limited

The majority of the targets are for 2015, with some looking forward to 2020 and beyond. The aim is that these will be reviewed approximately every five years.

6.1.5 The role of habitat groups

Local BAPs are written by local experts with knowledge of the local area. A BAP officer coordinates the process and monitors delivery. The Lincolnshire BAP is particularly strong as the partnership of organisations and individuals involved in its development, delivery and monitoring is part of a larger partnership: the LBP (see Box 1 – page 2).

In Lincolnshire the BAP partnership is structured into six habitat groups in line with the six habitat sections of the BAP. The habitat groups also encompass the work of the SAPs relevant to their group of habitats. It is the responsibility of the groups to develop the HAPs and SAPs, to work on priorities for delivery within the group, report on progress, and update plans as necessary. This work is facilitated and aided by the BAP coordinator. This collaborative working has proven to be very successful in delivering action in the 1st and 2nd editions of the Lincolnshire BAP as best practice and information could easily be shared between group members.

6.1.6 Monitoring and reporting

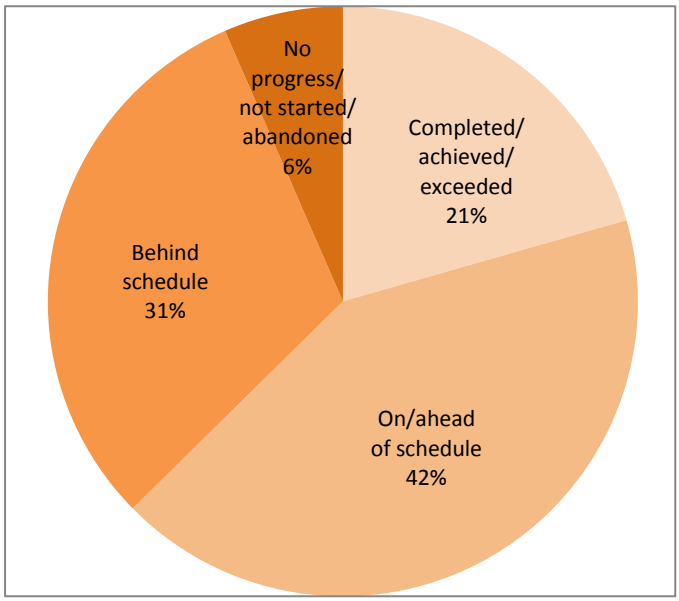
All Partners will be responsible for reporting contributions towards targets and actions at least annually (April each year). The BAP coordinator will collate information from Partners and produce summary reports, as well as use the national Biodiversity Action Reporting System (BARS) to show how the Lincolnshire BAP is contributing to national targets.

BARS is used as standard throughout the UK. It is a web-based information system that supports the planning, monitoring and reporting requirements of BAPs. The system enables Local BAP partnerships and Lead Partner organisations to enter details of planned action and record achievements and progress towards targets. Other individuals can add reports via the Local BAP coordinator.

It is important that progress is recorded annually at the local level to help identify gaps in delivery and priorities for action. This system makes it possible for Defra to collate information on progress towards the UK's national and international biodiversity commitments – recognising the contribution that local action makes to the bigger picture of biodiversity delivery.

6.3 BAP progress 2000-2010

Chart 5: Status of BAP 2nd edition targets



Date assessed 31/03/11.

A great deal has been achieved during the periods covered by the first two editions of the Lincolnshire BAP, but overall decline in habitats and species and degradation of landscapes has not yet been arrested. Chart 5 shows the status of targets from the 2nd edition. It shows that while many targets have been achieved or significant progress has been made, there are also targets for which progress has been slower, or where no progress has been made at all.

The progress sections in each of the HAPs and SAPs will look at this in more detail, but looking at the BAP as a whole, some patterns emerge:

- The types of action that have been achieved or completed include hedgerow and tree planting targets and some survey targets e.g. churchyards and otters.
- Baseline data are not easy to obtain – e.g. due to incompatible/incomparable surveys/ lack of complete coverage/ lack of resources.
- Difficulties in reporting action – in some cases we are falling short of targets not because of a lack of action, but due to an inability to disaggregate reporting. For example, 760ha of grassland in Lincolnshire is in Higher Level Stewardship Agreements (HLS) agreements to maintain, restore or recreate habitat, yet it is only possible to allocate 354ha to a particular BAP habitat[42].

Looking forward to the delivery of the 3rd edition of the Lincolnshire BAP, these issues will need to be addressed by prioritising action and making efficient use of the resources available. Better communication between Partners will improve reporting abilities and prevent duplication of effort, enabling all Partners to fully realise all that is being delivered for biodiversity in the historic county, and more importantly to understand how successful this delivery is.

6.4 The approach 2011-2020: delivering The Natural Choice

Conserving biodiversity in relatively small, protected areas is not sustainable and is not enough, particularly in the face of climate change. Wildlife needs room to move, but in many areas intensive farmland, towns and cities, busy roads and railways all make this difficult or impossible. In Lincolnshire, many organisations are already working in partnership at the landscape scale to address this by creating habitat networks and corridors that connect the areas of best quality habitat.

This kind of large-scale habitat restoration and creation will continue and could be strengthened by the new Nature Improvement Areas outlined in The Natural Choice[43]. This should ensure that the largest benefits for biodiversity, people and the economy are achieved for the resources available. It will also be important to work with neighbouring counties to ensure a coordinated, cross-boundary approach.

Think Big[44] describes ten key features of a successful landscape-scale project:

1. Information – knowing the current state of the environment and having information about its potential.
2. Partnership – collaboration between and across different organisational, political and administrative areas.
3. Co-ordination – namely the need for a project coordinator.
4. Carrots and sticks – regulation and financial incentives are needed.
5. Strategic and local – the local drive that gets things done is coordinated and achieved in a sustainable way.
6. Managing conflict – through careful planning and land-use decisions.
7. Protect – existing designated sites.
8. Buffer – sympathetic management of land surrounding existing sites.
9. Enhance – to maximise biodiversity and ecosystem services.
10. Connect – to enable species to move in response to climate change/ pollution events etc.

Map 2: The National Character Areas of historic Lincolnshire

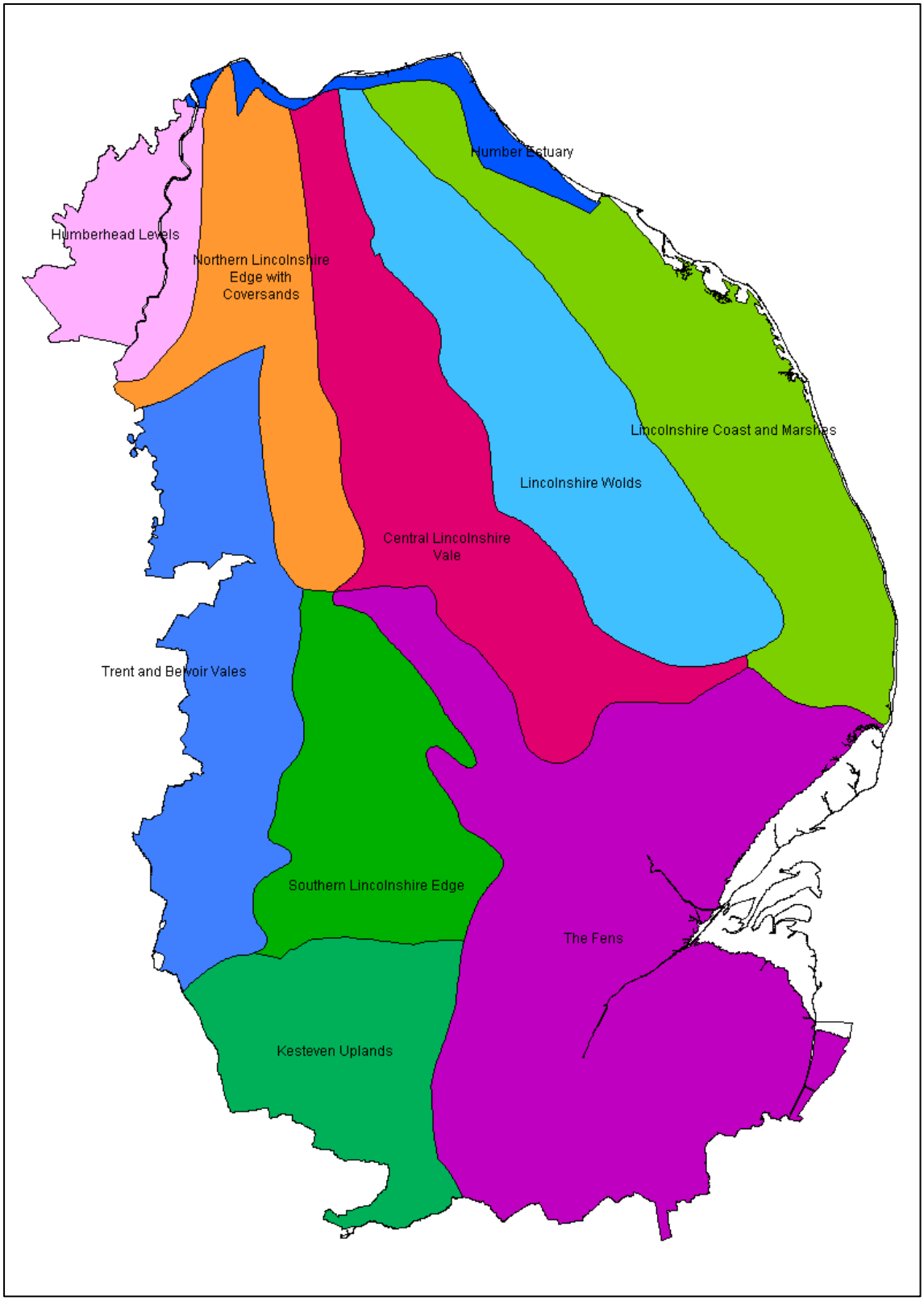


Table 2: Landscape-scale activities in and across each NCA

	Humberhead Levels Project The shared vision for the Humberhead Levels is to create an internationally renowned, unique wetland landscape, supporting thriving communities and wildlife. Of particular importance are the Humberhead Peatlands, now a National Nature Reserve (NNR), part of which (around Crowle) lies within North Lincolnshire. Water management is the key issue.
	Humber Management Scheme The Humber Estuary is the largest coastal plain estuary on the east coast of Britain and England's largest port complex. A vision for the NCA is being developed, linked to the Humber Management Scheme, the aim of which is, subject to natural change, to maintain the favourable condition of the Estuary through the sustainable management of activities. (www.humberems.co.uk).
	Lincolnshire Wolds AONB The majority of the Lincolnshire Wolds NCA is intensively farmed and BAP priority habitats are fragmented. In addition to work carried out through the Lincolnshire Wolds AONB Management Plan (www.lincswolds.org.uk), two partnership initiatives aim to enhance linear habitats to re-establish effective networks throughout the landscape (see below).
	Lincolnshire Chalk Streams Partnership The Partnership is taking action to ensure that the nature conservation, landscape, community and economic opportunities offered by these nationally important chalk streams are fully realised. (www.lincswolds.org.uk/chalkstreams).
	Life on the Verge initiative This initiative is identifying roadside verges currently supporting BAP priority grassland, and verges where it is most likely that restoration of stretches of continuous habitat would be successful. Information is informing management and restoration work. The initiative was extended to the Wolds following success in the Southern Lincolnshire Edge and Kesteven Uplands (www.lifeontheverge.org.uk).
	Lincolnshire Coast and Marshes Partnership The vision of the Partnership is to have, once again, a mosaic of grasslands, rich in wildlife, intersected by a distinctive pattern of watercourses. This will be a landscape where both arable and livestock farming thrive and communities have a high quality of life. The partnership is focusing on areas around Saltfleetby, Huttoft, Burgh Le Marsh and Gibraltar Point. (www.lincsmarshes.org.uk).
	Lincolnshire Coastal Country Park Between Chapel St Leonards and Sandilands a Coastal Country Park has been established. Over the last two years, a continuous 2.2km stretch of land behind the dunes south of Anderby Creek has come into conservation management and BAP priority habitat is developing. The Coastal Country Park aims to provide high quality facilities for visitors and better protection for wildlife, by creating enhanced and interconnected wildlife areas. (http://microsites.lincolnshire.gov.uk/lincolnshirecoastalcountrypark).
	Trent Vale Landscape Partnership The Partnership is taking action within parishes adjacent to the River Trent to conserve and enhance the area for BAP priority habitats and species whilst also enhancing and celebrating the cultural identity of the Trent Vale between Newark and Gainsborough. (www.trentvale.co.uk).

	Lincolnshire Limewoods The Lincolnshire Limewoods Partnership aims to protect, enhance and promote the natural and historic landscapes and features of the Lincolnshire Limewoods. Appropriate woodland management is being encouraged; new habitats are being created and managed to link woodlands together; and access and interpretation are being improved and promoted. (www.lincolnshire.gov.uk/limewoods).
	Kirkby Moor/Bain Valley Centred on the Lincolnshire Wildlife Trust nature reserves at Kirkby Moor and Moor Farm, a vision is being developed for re-establishment of extensive tracts of heathland, wet woodland and other BAP priority habitats, linking to the Lincolnshire Limewoods and the Witham Fens.
	South Lincolnshire Fenlands Partnership The Partnership aims to restore and re-create up to 800ha of Lincolnshire's lost fenlands between Bourne and Market Deeping**.** This will provide new habitats for wildlife, a more diverse landscape, improved flood protection through flood storage areas, and sustainable local employment. (www.lincsfenlands.org.uk).
	Adjacent to the Wash bank managed realignment could provide the opportunity to reinstate coastal BAP habitats, such as the grazing marsh habitats created at Frampton Marsh.
	Coversands Heathland The Tomorrow's Heathland Heritage Coversands Project, which ran until 2008, re-created and restored heathland and acid grassland at various sites across Lincolnshire, covering 953ha. The project concentrated on improving the resilience of remaining sites by expanding and buffering them and then re-establishing heathland. All partners have an on-going commitment to management of the sites.
	Wolds Edge Woodlands On the eastern fringe of the Wolds NCA and the western fringe of the Lincolnshire Coast and Marshes NCA lie ancient woodlands on boulder clay soils. A vision for the area is being developed, to reverse the fragmentation of these woodlands.
	Witham Valley Country Park The Witham Valley Country Park aims to create a connected network of managed outdoor space from the centre of Lincoln into the surrounding countryside. Sand and gravel working south of the city provide opportunities for creating BAP habitat, and development can contribute to re-establishment of effective green infrastructure and flood risk management.

Management of The Wash is overseen by the Wash and North Norfolk Coast European Marine Site Management Scheme[45], whose role is to work with relevant stakeholders *to ensure management measures are sufficient to meet the conservation goals and to highlight any gaps where additional management might be required*.

Also of relevance but not included in the table, is the pilot Fens Integrated Biodiversity Delivery Area. It is not a landscape scale project in itself, more of an approach bringing existing projects and strategies together to help them achieve more. There are other pilot Integrated Biodiversity Delivery Areas in other parts of England and more proposed.

[1] JNCC: http://jncc.defra.gov.uk/page-5761#LBAPs. Accessed 03/06/11.
[2] United Nations (1992) Convention on Biological Diversity.
[3] UK National Ecosystems Assessment, (2011) The UK National Ecosystems Assessment: Synthesis of the Key Findings. UNEP-WCMC, Cambridge.
[4] Defra, (2010) An invitation to shape the Nature of England.
[5] Environment Agency, (2009) Ecosystem services case studies: Better regulation science programme.
[6] UK National Ecosystems Assessment, (2011) The UK National Ecosystems Assessment: Synthesis of the Key Findings. UNEP-WCMC, Cambridge.
[7] Environment Agency, (2007) The Total External Environmental Costs and Benefits of Agriculture in the UK.
[8] Ibid.
[9] HM Government, (2011) The Natural Choice: securing the value of nature.
[10] Natural England, (2009) An estimate of the value and cost effectiveness of the expanded WHI scheme.
[11] Mass, J. et al, (2006) Green space, urbanity, and health: how strong is the relation? *J Epidemiol Community Health,* **60**: 587-592.
[12] UK National Ecosystems Assessment, (2011) The UK National Ecosystems Assessment: Synthesis of the Key Findings. UNEP-WCMC, Cambridge.
[13] Ibid.
[14] Ibid.
[15] Leopold, A. (1949) A Sand County Almanac. Oxford: Oxford University Press.
[16] IUCN: www.iucn.org/what/tpas/biodiversity/about/biodiversity_crisis/?gclid=CNX4n9b3makCFcRtfAod3yYJxA. Accessed 03/06/11.
[17] Useful further reading includes: Lawton, et al. (2010) Making Space for Nature; Maclean, (2010) Silent Summer: the state of wildlife in Britain and Ireland; NEA (2011)
[18] UK Climate Impacts Programme: http://ukclimateprojections.defra.gov.uk/content/view/2166/499/.
[19] IPCC, (2007) Fourth Assessment Report: Climate Change 2007. Cambridge University Press, Cambridge.
[20] For example changes to the banded demoiselle distribution.
[21] UK National Ecosystems Assessment, (2011) The UK National Ecosystems Assessment: Synthesis of the Key Findings. UNEP-WCMC, Cambridge.
[22] Lincolnshire Environmental Records Centre.
[23] Defra, (2006) Local Sites: Guidance on their Identification, Selection and Management.
[24] www.naturalengland.org.uk/es.
[25] OPDM, (2005) Planning Policy Statement 9: Biodiversity and Geological Conservation.
[26] For more information see: www.naturalengland.org.uk/ourwork/conservation/biodiversity/protectandmanage/duty.aspx.
[27] For guidance see: Defra, (2007) Guidance for Local Authorities on Implementing the Biodiversity Duty; or Defra, (2007) Guidance for Public Authorities on Implementing the Biodiversity Duty.
[28] For more information see: www.environment-agency.gov.uk/research/planning/33362.aspx.
[29] Lawton, J. et al. (2010) *Making Space for Nature: a review of England's wildlife sites and ecological network*. Report to Defra.
[30] England Biodiversity Group, (2011) Think Big: How and why landscape-scale conservation benefits wildlife, people and the wider economy.
[31] HM Government, (2011) The Natural Choice: securing the value of nature.
[32] For more information see: http://jncc.defra.gov.uk/page-1377.
[33] For more information see: http://jncc.defra.gov.uk/page-1378.
[34] For more information see: http://jncc.defra.gov.uk/page-1374.
[35] For more information see: http://jncc.defra.gov.uk/page-1373.
[36] For more information see: http://jncc.defra.gov.uk/page-1367.
[37] For more information see: http://jncc.defra.gov.uk/page-1364.
[38] Formerly called Joint Character Areas.
[39] For a full list of UKBAP habitats see: http://ukbars.defra.gov.uk/plans/national.asp?S=&L=1&O=&SAP=&HAP=&submitted=1&flipLang=&txtLogout=. Accessed 09/06/11.

[40] i.e. using recent survey data from known sites rather than taking data from the national inventories, which are often out of date.
[41] England Biodiversity Group, (2011) Think Big: How and why landscape-scale conservation benefits wildlife, people and the wider economy.
[42] HLS data received 13/01/11.
[43] HM Government, (2011) The Natural Choice: securing the value of nature.
[44] England Biodiversity Group, (2011) Think Big: How and why landscape-scale conservation benefits wildlife, people and the wider economy.
[45] For more information see: www.washandnorthnorfolkcoastems.co.uk.

7. Partner acronyms

Throughout the action plan tables each of the Partners are referred to by a unique acronym to save space.

For ease of reference, these are listed here rather than in the generic acronyms section on page 238.

AW	Anglian Water
BC	Butterfly Conservation
BTCV	British Trust for Conservation Volunteers
BW	British Waterways
CLA	Country Land and Business Association
CoLC	City of Lincoln Council
CSFI	Catchment Sensitive Farming Initiative
EA	Environment Agency
EIFCA	Eastern Inshore Fisheries and Conservation Authority
ELDC	East Lindsey District Council
FC	Forestry Commission
FWAG	Farming and Wildlife Advisory Group
GAAFFS	Grantham Angling Association Fly Fishing Section
HINCA	Humber Industry Nature Conservation Association
HMS	Humber Management Scheme
IDBs	Internal Drainage Boards
IWA	Inland Waterways Association
LAs	Local Authorities
LARG	Lincolnshire Amphibian and Reptile Group
LBC	Lincolnshire Bird Club
LBG	Lincolnshire Bat Group
LCC	Lincolnshire County Council
LCGMP	Lincolnshire Coastal Grazing Marsh Partnership
LCSP	Lincolnshire Chalk Streams Project
LDG	Lincolnshire Deer Group
LEA	Local Education Authority
LMDB	Lindsey Marsh Drainage Board
LNU	Lincolnshire Naturalists' Union
LWT	Lincolnshire Wildlife Trust
NE	Natural England
NELC	North East Lincolnshire Council
NFU	National Farmers' Union
NKDC	North Kesteven District Council
NLC	North Lincolnshire Council
NT	National Trust

PTES	People's Trust for Endangered Species
RSPB	Royal Society for the Protection of Birds
SHDC	South Holland District Council
T&HMCF	Thorne and Hatfield Moors Conservation Forum
WESG	Wash Estuary Strategy Group
WLDC	West Lindsey District Council
WT	Woodland Trust
YNU	Yorkshire Naturalists' Union

8. Action plans for common themes

In the process of developing the SAPs and HAPs three distinct categories of actions repeatedly occurred. To avoid repetition and to stress the importance and cross cutting nature of some actions, they were removed from the individual HAPs and SAPs and grouped together into three plans which follow. In this way, the HAPs and SAPs could be specific and highly focused, and the actions relevant to a range of species and habitats can be found together in one place.

These three plans are rightly 'common themes' for action for biodiversity in Lincolnshire and should not be seen as an adjunct to the HAPs and SAPs. Delivering on these actions is not restricted to a single habitat, species or area; the benefits can be felt across all of the county's biodiversity into the future.

Common themes action plans:

Biodiversity information and monitoring

1. Introduction

A sound knowledge of the biodiversity resource of Lincolnshire is essential for the meaningful and effective implementation of conservation measures, especially when working at the landscape scale[46].This same information is necessary for monitoring whether or not conservation measures are successful, and for informing planning decisions. Finally, making this information available to a wider audience is important in increasing understanding and inspiring people about biodiversity.

All of these functions rely upon an efficient and effective system of data collection, collation, verification, storage, retrieval and exchange. The data must be available for use by statutory, voluntary, local authority and other sectors that need the information. To this end, most counties in England have an Environmental Records Centre.

Monitoring of progress towards targets also has benefits for local authorities, which require up to date information for reporting. Currently this includes the NERC Act, the Planning and Compulsory Purchase Act, the Habitats Directive and indicator 160 on the condition of Local Sites but this system will evolve over time.

2. Current status in Lincolnshire

Following a period of development, the Lincolnshire Environmental Records Centre (LERC) was formally constituted in 2007, and has a dedicated full time member of staff. It is the main reference point for biodiversity data in Lincolnshire; holding over 1.2 million species records, as well as habitats and designated sites information. In March 2011 LERC celebrated being accredited by the Association of Local Record Centres – a stamp of approval that means data users can be confident that the service provided is of the highest standard, and data providers can be sure that their data are stored and used appropriately. These are significant steps forward for environmental monitoring and data management in Lincolnshire since the publication of the second edition of the BAP.

Candidate LWSs are assessed by the independent LWS Panel against Lincolnshire criteria (published by the LBP in 2006, revised in 2008 and under revision again in 2011-12). These criteria were and are produced in accordance with Defra guidance. Local Sites are a material consideration in planning matters and should be included in relevant planning documents.

Survey of sites previously identified as SNCIs and recognised by local authorities is almost complete for priority sites, except in South Kesteven. Around 40% of the SNCI area has been surveyed in the five years since the publication of the BAP 2nd edition, which represents a very significant investment from local authorities.

In addition to gathering information on the remaining SNCIs and other, previously unrecorded, sites there is a need to revisit designated LWSs on a five-to-ten-year rolling programme to assess condition; this is partly ensure the continued good condition of the LWS and partly to meet the monitoring requirements of indicator 160.

3. Actions required

Action	Details	Partners	Action date	Relevant plans
LIN3_BIM_A01	Promote species and habitat recording among organisations and the general public.	All Partners	Ongoing	All plans
LIN3_BIM_A02	Identify gaps in knowledge and target resources towards survey of priority habitats and species.	**LBP,** county recorders, all other Partners	Ongoing	All plans
LIN3_BIM_A03	Review all available information and produce an updated biodiversity audit.	**LBP**, all other Partners	2015	All plans
LIN3_BIM_A04	Collate information and report on progress towards Lincolnshire BAP targets and contributions to national BAP.	**LBP**	Annually	All plans
LIN3_BIM_A05	Resurvey remaining SNCIs for assessment against LWS criteria.	**LAs**	2015	Brownfield Chalk streams and blow wells Coastal sand dunes Fens Grazing marsh Heathland and peatland Lowland calcareous grassland Lowland dry acid grassland Lowland meadows Lowland mixed deciduous woodland Peat and clay exposures Parks and open spaces Ponds, lakes and reservoirs Reedbeds and bittern Rivers, canals and drains Saline lagoons Saltmarsh Springs and flushes Traditional orchards Wet woodland Wood-pasture and parkland
LIN3_BIM_A06	Identify and survey potential new Local Sites.	LBP, LAs, NE, EA, LWT	Ongoing	
LIN3_BIM_A07	Designate all sites meeting criteria in LWS guidelines and maintain a sound evidence base by monitoring all LWSs every 5-10 years.	**LAs**, LBP, LWS Panel	Ongoing	

Revised 2011
Catherine Collop (Lincolnshire Biodiversity Partnership), Fran Hitchinson (Lincolnshire Biodiversity Partnership).

[46] England Biodiversity Group, (2011) Think Big: How and why landscape-scale conservation benefits wildlife, people and the wider economy.

Policy, planning and resource management

1. Introduction

Biodiversity is not just confined to designated sites and nature reserves, and it includes widespread and common species; therefore policies that affect land management also affect biodiversity. The Natural Choice is clear that embedding biodiversity and its value in decision making in all sectors is the only way to ensure sustained economic growth, prospering communities and personal wellbeing[47].

The Lincolnshire BAP 2nd edition focused mainly on policies and legislation that affected terrestrial habitats; this 3rd edition, however, also takes account of marine legislation and emerging policy, and will continue to be updated in line with future developments.

The Common Agricultural Policy has had a serious adverse effect on biodiversity in the past, but more recent policy changes and the introduction of agri-environment schemes, and other initiatives, are helping to switch the emphasis towards more sustainable land management (see section 4 – Biodiversity protection).

Significant habitats and species can be found throughout urban areas, parks and gardens. Planning and development control processes can have major adverse or beneficial impacts on this biodiversity. Recognition of the importance of biodiversity in strategic plans is a first step towards sustainable development across whole landscapes – effectively conserving biodiversity in this way does not need to conflict with other objectives or be onerous to achieve, and it contributes to a healthy environment that supports society and the economy.

Ongoing changes in national legislation, policy and guidance continue to require a significant commitment to biodiversity conservation from local authorities and other public bodies. This should ensure that full consideration is given to conservation and enhancement of biodiversity on statutory and non-statutory sites as well as in the wider countryside. Local Development Frameworks (LDFs) provide the opportunity for local authorities to develop strong policies to bring about gains for biodiversity.

2. Current status in Lincolnshire

Given the dominance of agricultural land in Lincolnshire, a widespread uptake of agri-environment schemes is key to delivering benefits for biodiversity in the wider countryside.

Most existing Local Plans in Lincolnshire include references to biodiversity, and it is important that the LDFs that replace them will do the same. Individual policies give some protection to LWSs and other site designations.

Natural England has produced standing advice for Local Planning Authorities on deciding if there is a ‘reasonable likelihood’ of protected species being present, which is to be used as a material consideration in the determination of applications[48]. It also provides advice on survey and mitigation requirements.

First steps are being made into marine planning policy around the country; the Net Gain project is working to develop a network of MCZs for the North Sea, including a number of potential sites identified off the Lincolnshire coast.

3. Actions required

Action	Details	Partners	Action date	Relevant plans
LIN3_POL_A01	Ensure biodiversity targets are integrated into the policy documents of Partner organisations.	All Partners	Ongoing	All plans
LIN3_POL_A02	Include and invoke policies in LDFs and other strategies to secure the protection and enhancement of BAP habitats.	**LAs**	Ongoing	All HAPs
LIN3_POL_A03	Work in partnership with local planning authorities in the preparation of biodiversity policies within their LDFs and in their subsequent implementation and monitoring.	All Partners	Ongoing	All plans
LIN3_POL_A04	Seek funding to support existing and new projects that benefit Lincolnshire's biodiversity.	All Partners	Ongoing	All plans
LIN3_POL_A05	Increase the number of LNRs in Lincolnshire; each Local and Unitary Authority to designate at least one new LNR by 2020 (if not already done between 2006 and 2010).	**LAs,** NE	2020	All plans (excluding marine)
LIN3_POL_A06	Ensure that all existing LNRs have biodiversity management plans.	**LAs,** NE	2015	All plans (excluding marine)
LIN3_POL_A07	Continue to target conservation management and habitat creation using agri-environment schemes (Environmental Stewardship, English Woodland Grant Scheme etc.).	**NE**, FC, FWAG, Landscape Scale Projects, LWCS, LWT	Ongoing	Arable field margins Chalk streams Coastal sand dunes Farmland birds Fens Grazing marsh Heathland and peatland Hedgerows and hedgerow trees Lowland calcareous grassland Lowland dry acid grassland Lowland meadows Lowland mixed deciduous woodland Natterjack toad Ponds, lakes and reservoirs Reedbeds and bittern Saline lagoons Saltmarsh Traditional orchards Wet woodland Wood-pasture and parkland

LIN3_POL_A08	Continue to seek improvements in agri-environment schemes in order to provide strong incentives to benefit biodiversity.	**NFU, FWAG,** LWCS, LWT, NE	Ongoing	Arable field margins Chalk streams Coastal sand dunes Farmland birds Fens Grazing marsh Heathland and peatland Hedgerows and hedgerow trees Lowland calcareous grassland Lowland dry acid grassland Lowland meadows Lowland mixed deciduous woodland Ponds, lakes and reservoirs Reedbeds and bittern Saline lagoons Saltmarsh Traditional orchards Wet woodland Wood-pasture and parkland
LIN3_POL_A09	Specify the use of seeds/plants of local provenance in habitat restoration schemes on or adjacent to existing sites (but for creation schemes consider a mix of species/ provenance to allow for climate change adaptation).	All Partners	2015	Heathland and peatland Hedgerows and hedgerow trees Lowland calcareous grassland Lowland dry acid grassland Lowland meadows Lowland mixed deciduous woodland Traditional orchards Wet woodland Wood-pasture and parkland
LIN3_POL_A10	Ensure availability and use of locally sourced seed and plug plants for grassland re-creation by promoting approved contractors/ suppliers.	**LWT, NE**	2012	Lowland calcareous grassland Lowland dry acid grassland Lowland meadows
LIN3_POL_A11	Seek to ensure that all planning applications take into account known and potential sites for protected species and that the protection and enhancement of the habitat is considered in accordance with planning policy guidance e.g. PPS9.	**LAs**	Ongoing	Bats Farmland birds Natterjack toad Newts Urban birds Water vole White-clawed crayfish
LIN3_POL_A12	Ensure that SuDS in association with new developments include biodiversity benefits and are in line with best practice guidelines.	**LCC, NLC, NELC,** EA, AW, IDBs, NE, other LAs	2020	Brownfield Ponds, lakes and reservoirs Reedbeds and bittern Rivers, canals and drains

LIN3_POL_A13	Promote Integrated Coastal Zone Management and sustainable use of the marine environment.	**HMS, WESG,** LAs, LWT, IFCAs	Ongoing	Coastal sand dunes Commercial fish (marine) Grazing marsh Peat and clay exposures *Sabellaria spinulosa* reefs Saline lagoons Saltmarsh
LIN3_POL_A14	Ensure relevant flood and coastal erosion risk management strategies and plans take BAP habitats into account.	**EA, LAs**, HMS, NE, WESG	2015	Coastal sand dunes Grazing marsh Peat and clay exposures *Sabellaria spinulosa* reefs Saline lagoons Saltmarsh
LIN3_POL_A15	Ensure any loss of coastal BAP habitat due to coastal works is compensated for in accordance with current legislation.	**EA, LAs, NE**, HMS	2015	Coastal sand dunes Grazing marsh Saline lagoons Saltmarsh
LIN3_POL_A16	When carrying out coastal defence or other construction works take steps to minimise disruption of coastal and other natural processes which might lead to the loss of BAP habitat.	**EA**, HMS, LAs, LWT, NE	2015	Coastal sand dunes Peat and clay exposures *Sabellaria spinulosa* reefs Saline lagoons Saltmarsh
LIN3_POL_A17	Agree a county wetland BAP habitat recovery plan and strategy in association with LCC Minerals and Waste Planning and key industry stakeholders.	**LCC,** EA, LWT, NE, NELC, NLC	2013	Fens Ponds, lakes and reservoirs Reedbeds and bittern Springs and flushes
LIN3_POL_A18	Ensure that restoration of minerals extraction sites maximises BAP habitat gains.	**LAs**, LWT, NE	Ongoing	Brownfield Fens Heathland and peatland Lowland calcareous grassland Lowland dry acid grassland Ponds, lakes and reservoirs Reedbeds and bittern Wet woodland
LIN3_POL_A19	Support the Net Gain Project in the development of a coherent network of Marine Conservation Zones.	LAs, HMS, IFCAs, LWT, NE, WESG	Ongoing	Commercial fish (marine) Peat and clay exposures *Sabellaria spinulosa* reefs Seals

Revised 2011
Catherine Collop (Lincolnshire Biodiversity Partnership), Fran Hitchinson (Lincolnshire Biodiversity Partnership).

[47] HM Government, (2011) The Natural Choice: securing the value of nature.
[48] www.naturalengland.org.uk/ourwork/planningtransportlocalgov/spatialplanning/standingadvice/advice.aspx

Awareness and involvement

1. Introduction

Increasing awareness and appreciation of the role of wildlife and wild places in all our lives is vital if we are to maintain and restore the natural environment for future generations. Although conservation organisations, local authorities and other bodies already play their part in promoting these benefits, more can and should be done to involve other institutions and individuals.

This Lincolnshire BAP should enable all of us, whether as organisations, or as individuals to make better decisions for biodiversity and to direct resources appropriately.

There are three main areas to consider:

- Wider public awareness, often achieved through education and interpretation.
- Landowner engagement.
- Awareness of the marine environment and its conservation.

Public or community involvement has always been a key feature of the conservation movement. The creation of Local Strategic Partnerships and associated Community Strategies offer both local communities and the environmental sector a way to formally engage with local authorities and agree actions. Other formal routes include the green infrastructure policies within LDFs, which should ensure more people are able to experience nature. These existing mechanisms need nurturing and supporting.

More informally, education and interpretation have an important role to play in promoting public interest and understanding of biodiversity conservation in the context of wider environmental education.

Landowner awareness of and involvement in biodiversity conservation is an area of increasing importance for the conservation sector. The majority of the wider countryside is in private ownership and influencing through changing policies alone is not enough. Winning hearts and minds and demonstrating that in some cases altering management practices for conservation can have little or no impact on profitability provides a stronger argument for change.

In the last few years there has been greater awareness of the issues surrounding the marine environment. Since most of the life in our seas is out of sight and consequently out of mind, its conservation has been neglected in the past. The new processes and policies brought in by the Marine and Coastal Access Act should bring improved awareness and protection of our seas.

2. Current status in Lincolnshire

All of the authorities in Lincolnshire have a Community Strategy at some stage of development or revision, according to their statutory duty. However the biodiversity content in these strategies varies greatly.

Many community groups undertake small conservation projects on a local level and there is a need for a coordinated system of providing help, advice and support to these groups, which does not exist at present.

Engagement with landowners is generally at the level of individual Partner organisations or linked to specific initiatives (for example a dedicated officer for the Lincolnshire Coastal Grazing Marshes Partnership has assisted landowners to maintain, restore or create grazing marsh habitat).

There is also a variety of environmental education opportunities available throughout Lincolnshire through local authorities, statutory conservation bodies, charities and other organisations. Examples include the Wash Study Centre at Gibraltar Point, Freiston Centre for Environmental Education, and the South Humber Bank Wildlife and People Project.

3. Actions required

Action	Details	Partners	Action date	Relevant plans
LIN3_AWA_A01	Use events, publications and the media to explain ways in which varied sectors of the wider community can be involved in biodiversity conservation.	All Partners	Ongoing	All plans
LIN3_AWA_A02	Promote the economic value of environment-based tourism in Lincolnshire.	All Partners	Ongoing	All plans
LIN3_AWA_A03	Encourage sensitive and appropriate management of different habitat types by provision of advice to land owners and managers.	Buglife, EA, FC, FWAG, God's Acre Project, LCSP, LWT, NE, LCGMP, RSPB	Ongoing	All HAPs
LIN3_AWA_A04	Use financial incentives to promote the creation and use of long-term management plans to guide suitable management of woodland habitats.	**FC, NE,** LWT, FWAG, WT, LWCS	2015	Lowland mixed deciduous woodland Traditional orchards Wet woodland Wood-pasture and parkland
LIN3_AWA_A05	Use visitor guidelines and promote relevant codes of conduct for reducing human impact on local marine wildlife.	LWT, HMS, NE, WESG	2015	Seals Commercial fish (marine) *Sabellaria spinulosa* reefs
LIN3_AWA_A06	Reduce littering at sea and on beaches with further promotion of Adopt-a-Beach volunteer scheme (run by MCS).	LWT, WESG	Ongoing	Coastal sand dunes Saltmarsh Peat and clay exposures *Sabellaria spinulosa* reefs Commercial fish (marine) Seals

LIN3_AWA_A07	Encourage schools to use their grounds to contribute to nature conservation in Lincolnshire and create biodiversity-rich habitats on school grounds.	**LEAs (LCC, NELC, NLC),** LWT, NE, RSPB	Ongoing	Gardens and allotments Newts Urban birds
LIN3_AWA_A08	Provide and promote opportunities for environmental education and training for all age groups.	BTCV, LBG, LNU, LWT, RSPB, University of Lincoln	Ongoing	All plans
LIN3_AWA_A09	Ensure landowners are aware of and observe statutory requirements relating to spraying near watercourses and waterbodies and entry of sediment into them.	**NE**, EA, FWAG	Ongoing	Rivers, canals and drains Ponds, lakes and reservoirs

Revised 2011
Catherine Collop (Lincolnshire Biodiversity Partnership), Fran Hitchinson (Lincolnshire Biodiversity Partnership).

9. Coastal and marine

Vision for Lincolnshire's coast and marine environment

- Existing habitats are protected from the pressure of harmful development.
- Coastal habitats have been enhanced and extended, creating a sustainable network for wildlife.
- Sustainable development on all parts of the coastline has created a coastal environment that benefits people and wildlife.
- The importance of coastal and marine biodiversity for tourism and the local economy has been recognised.
- The North Sea is managed sustainably with respect to global marine factors and in a manner complementary to the environment, economy and society of Lincolnshire; including reducing and compensating for the impacts of climate change and sea level rise.
- Implementation of the Marine and Coastal Access Act has resulted in an ecologically coherent, well-managed and effective network of Marine Protected Areas including the creation of Marine Conservation Zones and the development of a robust marine planning system.

Introduction to coastal and marine action plans

Some of the most important wildlife sites in Europe, including two of the most significant estuaries (The Wash and Humber), occur along Lincolnshire's coast. Both estuaries are designated SACs, as well as 'Saltfleetby-Theddlethorpe Dunes and Gibraltar Point'. Candidate SACs off the Lincolnshire coast have also been submitted to the EU for 'Inner Dowsing, Race Bank and North Ridge', and 'Dogger Bank'. The Lincolnshire coastline supports intertidal habitats, and dune formations among the best of their type anywhere in the UK. The coast also provides feeding and wintering habitats for internationally important numbers of birds. However, these birds and the ecological functions of the designated sites are also dependent on the continued availability of suitable inland areas – a mosaic of terrestrial habitats for roosting, feeding and breeding.

The habitats covered in the plans in this section are dynamic; they rely on coastal processes for their existence and as a result, are subject to natural changes in quality and extent. The aim of each plan is to allow these processes to continue to operate by managing the impacts of human influences on them. Human influence is both direct (development on sand dunes, pollution and disturbance, for example) and indirect (the alteration of natural processes through climate change or the installation of coastal defences).

Effective management of human impacts will include the retention of existing habitats, the creation of new ones and the rehabilitation of degraded sites, bringing benefits not only to wildlife, but also to the communities and industries along the Lincolnshire coast.

The Marine and Coastal Access Act allows for the implementation of a coherent network of MPAs, including the designation of MCZs. At the time of writing, six sites have been proposed off the Lincolnshire coast, and the Government still has to decide which will be formally designated. It is intended that the action plans in the Lincolnshire BAP will act to support the aims and objectives of MCZs and other MPAs in conserving and enhancing marine biodiversity.

Selection of Habitat Action Plans[49]

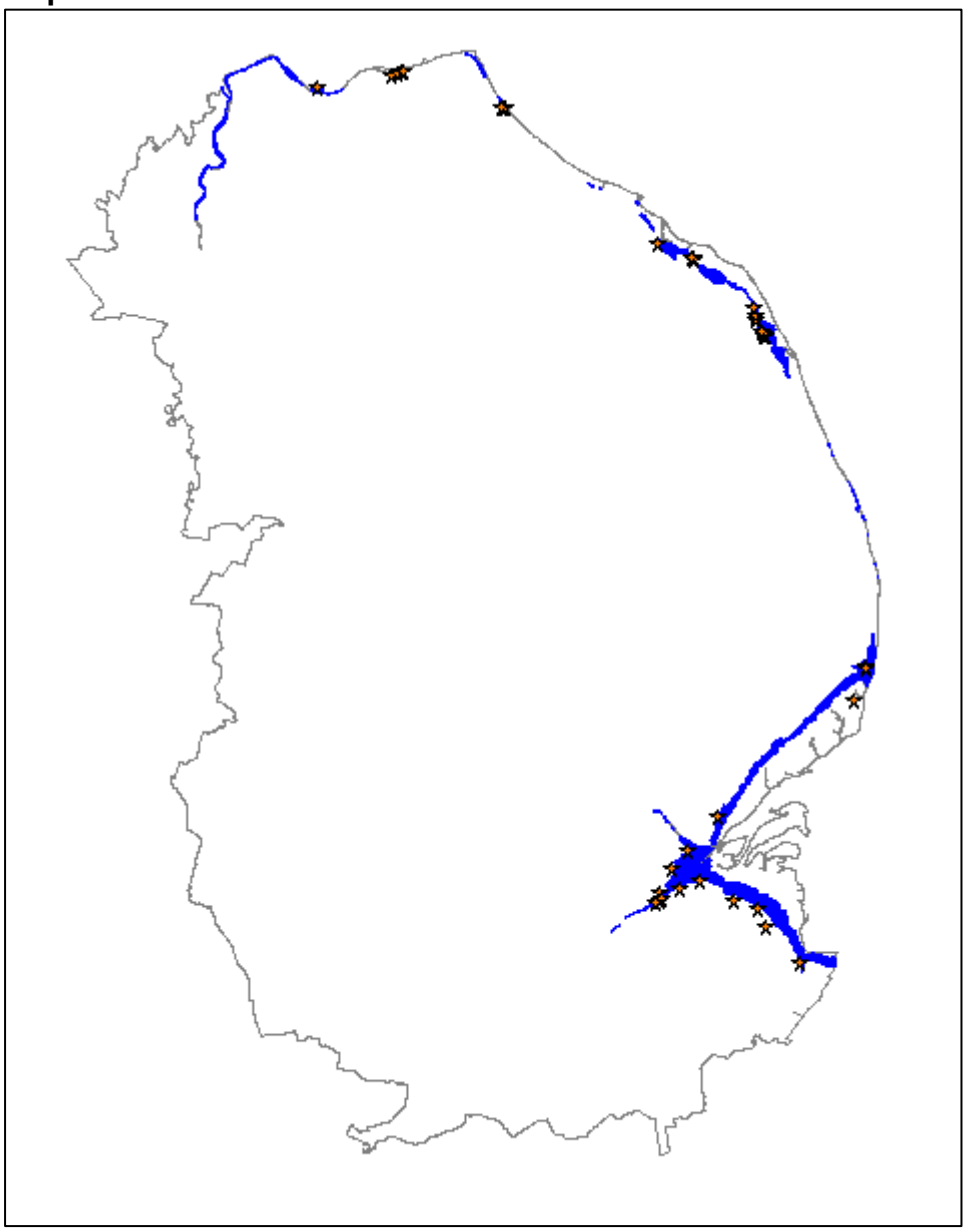
Lincolnshire has a sediment-dominated coast and this is reflected in the selection of HAPs. Only habitats listed under the UK BAP categories of supralittoral sediment (coastal sand dunes), and littoral sediment (saltmarsh, and peat and clay exposures) have been included in the coastal HAPs. This theme is continued with the marine HAPs, where one habitat listed under sublittoral sediment (saline lagoons) is included. A single habitat (*Sabellaria spinulosa* reefs) has also been selected from the sublittoral rock category.

The decision was taken not to include HAPs for the following habitats because the habitat is either not present in a significant amount or it is too broadly distributed to be effectively addressed at the local level: seagrass beds; coastal vegetated shingle; subtidal sands and gravels; sheltered muddy gravels; and tide swept channels. Intertidal mudflats are a significant feature of the Lincolnshire coast and of high conservation value. However, a mudflats HAP has not been included here because their needs are already well addressed through the management of the Humber and Wash European Marine Sites.

Other habitats that may have a strong coastal bias in their distribution – coastal grazing marsh, for example – are located in other sections of this document. It should also be noted that a number of additional habitats (such as the grassland found on sea defences) form important components of the coastal habitat mosaic.

Habitat action plans:

Map 3: Distribution of coastal BAP habitats



Also see Appendix 4.

UK BAP species associated with Lincolnshire's coastal and marine habitats

Also see the Species section on page 171.

		Coastal sand dunes HAP	Peat and clay exposures HAP	*Sabellaria spinulosa* reefs HAP	Saline lagoons HAP	Saltmarsh HAP	Species Action Plan
Astragalus danicus	Purple milk-vetch	✓					
Bryum warneum	Sea bryum	✓					
Bupleurum tenuissimum	Slender hare's-ear					✓	
Carex divisa	Divided sedge	✓					
Galeopsis angustifolia	Red hemp-nettle						
Hordeum marinum	Sea barley					✓	
Minuartia hybrida	Fine-leaved sandwort						
Monotropa hypopitys hypophegea	Bird's-nest	✓					
Panagaeus cruxmajor	Crucifix ground beetle	✓					
Pogonus luridipennis	Yellow pogonus					✓	
Athetis pallustris	Marsh moth	✓				✓	
Cupido minimus	Small blue	✓					
Eupithecia extensaria occidua	Scarce pug					✓	
Colletes halophilus	A mining bee	✓				✓	
*Podalonia affinis***	A sand wasp	✓					
Gammarus insensibilis	Lagoon sand-shrimp				✓		
Clupea harengus	Herring						
Dicentrachus labrax	Bass						
Dipturus batis	Common skate						
Gadus morhua	Cod						
Galeorhinus galeus	Tope shark						
Hippoglossus hippoglossus	Halibut						
Merlangius merlangus	Whiting						
Microstomus kitt	Lemon sole						
Pleuronectes platessa	Plaice						✓*
Raja clavata	Thornback ray						
Scomber scombrus	Mackerel						
Solea solea	Sole						✓*
Epidalea calamita	Natterjack toad	✓				✓	✓
Alauda arvensis	Skylark					✓	
Branta bernicla	Dark-bellied brent goose					✓	
Carduelis cannabina	Linnet					✓	
Carduelis flavirostris	Twite					✓	
Larus argentatus	Herring gull						
Limosa limosa	Black-tailed godwit					✓	
Numenius arquata	Curlew					✓	✓*
Delphinus delphis	Common dolphin						
Halichoerus grypus	Grey seal						✓*
Lagenorhynchus acutus	Atlantic White-sided dolphin						

Lagenorhynchus albirostris	White-beaked dolphin						
Phoca vitulina	Common seal						✓*
Phocoena phocoena	Harbour porpoise						

* Species is included in a grouped Species Action Plan.

** Not a UK BAP species, but is RDB listed and very restricted in Lincolnshire so of local importance

[49] Also see section 6.1.2 Criteria for selecting HAPs and SAPs

Coastal sand dunes

Summary

UK BAP
Coastal sand dunes – priority habitat.

Current national trend
UK – 70,000ha (2007), England – 11,897ha (2003). No clear trend for UK, declining in England (*BARS, 2008 reporting*).

Estimated Lincolnshire resource
580ha

Lead Partner
Lincolnshire Wildlife Trust

1. Introduction

Dunes form when there is an adequate supply of sand in the intertidal zone and where onshore winds are prevalent. A sufficiently wide beach, the surface of which dries out between high tides, is also important. Dry sand is blown inland and deposited above the high water mark, where it is trapped by strandline plants and dune-building grasses such as sand couch, marram and lyme grass.

Several types of habitats make up dune systems. These are related to the time elapsed since the sand was deposited, the degree of stability and the local hydrological conditions. Along the storm tide wrack line, a distinctive, patchy strandline vegetation occurs, along with a specialist group of invertebrates. The first obvious sand ridges are the mobile dunes, immediately inland of the strandline, where sand deposition is greatest. They support rather few plant species, the most characteristic being marram grass. Like other coastal habitats, sand dunes play a role in coastal flood defence and reduce coastal erosion risk.

In the UK, major dune systems are widely distributed with a total of around 12,000ha of sand dunes in England; 8,000ha in Wales and around 50,000ha in Scotland. Fixed dunes and dune heath are particularly threatened habitats and are regarded as a priority under the Habitats Directive.

2. Current status in Lincolnshire

Sand dunes are a common feature on the Lincolnshire coastline, 70% of Lincolnshire's sand dunes are in the Cleethorpes to Mablethorpe stretch of coastline, where they form part of a complex of coastal habitats including mudflats, saltmarsh, dune slacks and grassland. Good examples occur at Saltfleetby-Theddlethorpe NNR and Donna Nook NNR. The dune system and its integral freshwater area are managed by grazing, mowing and scrub control to maintain a wide range of habitat types, and old ponds and dykes have been restored. Special attention has been given to maintaining the natterjack toad *Bufo calamita* population. Within the NNR dunes there is an extensive freshwater marsh, sometimes referred to as a 'maritime fen' because of the plant communities found there.
South from Skegness much of the sand dune area is within the Gibraltar Point NNR and is also covered by Ramsar Site, SPA and SAC designations. Dune slacks here are not as extensive as at Saltfleetby-Theddlethorpe, but the freshwater marsh with natural and man-made ponds has a rich and varied plant and animal life. 'Strip

saltings' (alternating strips of saltmarsh and low sand dunes) are well developed. Much of the management at Gibraltar Point has been devoted to reconciling intensive use for education and public enjoyment with the conservation of wildlife and natural features.

Lincolnshire's dune vegetation is not typical of Britain as a whole. While some national vegetation communities, such as red fescue semi-fixed dune, are relatively scarce in the county, sand couch grass mobile dunes are unusually common. Lincolnshire has over 26% of the national total of this habitat. Lincolnshire also has 55% of England's sea-buckthorn (perhaps most extensively found at Gibraltar Point and Saltfleetby NNRs). This shrubby plant, which invades dunes, is nationally scarce and of European importance and only occurs naturally along the east coast from the Humber to the Thames. It poses a conservation dilemma; although it provides habitat for breeding birds and wintering birds, it also is an aggressive coloniser of important dune grassland. A balance between the two conservation objectives has to be maintained by active management.

The Saltfleetby freshwater marsh is particularly important for species of conservation interest including two plants, the marsh pea *Lathyrus hirsutus* and marsh helleborine *Epipactis palustris*, which are found nowhere else in the county. Also some plants are at, or near, their northern limit on the Lincolnshire coast. The sea bindweed *Calystegia soldanella*, found on sand dunes, and the sea holly *Eryngium maritimum*, a plant of shingle and the early stages of dune formation, sea heath *Frankenia laevis*, found in the sand dune-saltmarsh transition zone, the shrubby seablite *Suaeda vera* and marsh-mallow *Althea officinalis*.

Sand dunes also support good numbers of invertebrates – Gibraltar Point and Saltfleetby-Theddlethorpe are the richest coastal areas in Lincolnshire for invertebrates, and many of them are rare or scarce nationally. For example the crucifix beetle *Panagaeus cruxmajor* (a UK BAP species), found in dune slacks at Saltfleetby-Theddlethorpe, one of only three known sites in the UK, and the short-winged conehead *Conocephalus dorsalis*, a cricket found at the northern limit of its range at Donna Nook.

Sand dunes are a key designation feature of the Humber European Marine Site.

3. Threats in Lincolnshire

- **Coastal squeeze** due to rising sea levels.
- **Beach nourishment** to restore sand beaches between Mablethorpe and Skegness. This has an impact on dune formation (both accretion and erosion); the precise effects are not clear, so monitoring is being undertaken at Gibraltar Point.
- **Inappropriate grazing levels**. Continued grazing is necessary to maintain fixed dune communities, but over-grazing can have damaging effects. A more widespread problem is undergrazing, leading to an increase in coarse grasses and scrub.
- **Recreation.** Many dune systems are used extensively by holiday-makers, particularly at honey-pot sites with adjacent holiday accommodation. Used not only for walking but also parking and in some cases for driving four-wheel drive vehicles or motorcycles; excessive use can cause local erosion. Dog walking can also be a problem where dogs may disturb breeding birds and other wildlife. Major problems arise where there is widespread erosion of the turf year-on-year. Some dune systems are also used as golf courses. Although much original vegetation can be retained in the rough, the fairways, greens and tees are often highly modified by mowing, fertilising and re-seeding.

- **Spread of sea-buckthorn**. Sea-buckthorn is natural, but can reduce open species-rich sand dune communities. However, it is important to maintain a healthy population of this species, which is nationally scarce.
- **Falling water tables.** Dune slack communities depend on a high winter water table. There may be considerable variation in the water table from year to year and specialised dune slack species are adapted to cope with this. However, a long-term fall in water table can lead to a loss of the typical dune slack plants and invasion by scrub and coarse vegetation. Causes of falling water tables include agriculture and housing developments.
- **Sea defence and stabilisation**. Many dune systems in Lincolnshire are affected by sea-defence works, or artificial stabilisation measures such as sand fencing or marram planting. While careful dune management measures can help counteract severe erosion, engineered defence systems usually reduce biodiversity in dunes.
- **Dredging and marine aggregate extraction** may also affect sand dunes through the disruption of coastal processes and removal of the sediment source.

4. Progress towards Lincolnshire BAP targets 2006-2011

Target details*	Progress 2006-2011	Status 31/03/2011	3rd edition targets
Establish a baseline for existing extent and condition of coastal sand dunes in Lincolnshire (including an assessment of habitat quality) by 2012.	Part completed through 2010 habitat audit. Info on condition and from other sources still to be incorporated.	On schedule.	No equivalent target in 3rd edition.
Maintain the current extent of sand dunes in Lincolnshire (based on 2012 figures) by 2015.	No full assessment yet. Some losses reported in Humber Estuary – chestnut paling fencing in place. 105ha in HLS (maintenance).	On schedule.	Amended and included in 3rd edition.
Achieve favourable condition for all sand dunes by 2015.	Info on condition needs to be collated. Some dunes likely to be in need of restoration. 105ha in HLS (maintenance).	Behind schedule.	Amended and included in 3rd edition.
Expand the amount of sand dune and landward buffering habitat by adding a further 100ha by 2015.	Dunes continuing to form at Gibraltar Point and Anderby Creek. 64ha under restoration through HLS. No other potential sites for restoration.	Behind schedule.	Target too ambitious. Amended and included in 3rd edition.

* targets were reviewed in 2009 therefore some may differ from those published in 2006

5. Objectives

- To maintain existing dune systems by limiting human intervention to allow natural processes to continue.
- To protect sites from development.

6. Targets and actions 2011-2020

Target	Details
LIN3_CSD_T01	No net loss of sand dunes in Lincolnshire (based on 2010 data) between 2010 and 2020.
LIN3_CSD_T02	Achieve positive conservation management for 95% of sand dunes by 2015.
LIN3_CSD_T03	Restore 50ha of degraded sand dunes by 2020.

Action	Details	Target links	Partners	Action date
LIN3_CSD_A01	Keep the 2010 baseline up to date with details of extent and condition of known sand dune sites.	1	**NE**, LAs, LBP, LWT	2015
LIN3_CSD_A02	Prepare management plans for all designated sand dune sites – taking into account grazing, scrub control, vegetation restoration and visitor pressure.	1,2	**NE**, LAs, LWT	2012
LIN3_CSD_A03	Work with coastal golf courses to ensure their management policies and practices are sympathetic to the flora and fauna of sand dune systems.	1,2	**NE**, LWT	2012
LIN3_CSD_A04	Continue to implement beach management strategies that encourage protection of the seaward fronts of dune systems from unsustainable pressure by pedestrian or vehicular traffic, and discourage the use of mechanical beach cleaning equipment close to dune fronts.	1,2	**LAs**, EA, LWT, NE	Ongoing
LIN3_CSD_A05	Monitor effects of beach nourishment between Mablethorpe and Gibraltar Point.	1,2	**EA**, LWT, NE	Ongoing
LIN3_CSD_A06	Identify, assess and prioritise sand dunes where restoration of degraded or over-stabilised dunes is possible to reverse past losses, or inland migration of dunes might be possible (e.g. Toby's Hill).	2,3	**LWT,** LAs, NE	2012
LIN3_CSD_A07	Identify areas where sympathetic management can create buffering habitat for vulnerable sand dune sites – and implement.	2,3	**NE**, FWAG, LWT	Ongoing

7. Further information

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Revised 2011

Claire Ludgate (Natural England), Catherine Collop (Lincolnshire Biodiversity Partnership), Nick Tribe (Natural England).

Peat and clay exposures

Summary

UK BAP
Peat and clay exposures – priority habitat.

Current national trend
Intertidal exposures have been identified around the country but little is known about the UK distribution of subtidal peat and clay (though they are likely to occur in the vicinity of intertidal occurrences).

Estimated Lincolnshire resource
Present along the coastline from Mablethorpe to Ingoldmells and at Cleethorpes but the full extent is unknown.

Lead Partner:
Natural England

1. Introduction

Peat and clay exposures include littoral and sublittoral peat and clay. These habitats were formed from the sediment of former lake beds and ancient forest peatland ('submerged forests'). Wood from these forests can sometimes be found preserved amongst the peat. This makes the peat and clay exposures a unique and irreplaceable habitat.

Peat and clay can occur in this habitat together or independently. Dependent upon their locations they are both subject to periodic inundation and emergence from sediments.

Peat exposures can be 15cm higher than the surrounding sand level. Extensive platforms up to 100m in length can also occur across the shoreline and tends to be backed by beach and sand dune systems. Therefore, the degree of peat exposed depends upon the movement of the sand. Where peat is present on the shore or in shallow waters, the surface may be covered by algal mats consisting of red seaweed, *Ceramium spp.*, and green seaweeds, *Ulva lactuca* and *Ulva intestinalis*. However, their cover can be limited by the actions of the sand. The crabs *Carcinus maenas* and *Cancer pagurus* are often found in crevices in the peat, and hydroids in small pools. These small pools can also occur on the surface of the peat and clay when water remains in depressions on the surface.

On clay exposures the seaweed cover is generally sparse with species such as *Mastocarpus stellatus* and *Ceramium spp.* attached to loose-lying pebbles or shells. On the clay surface there may be small clumps of the mussel *Mytilus edulis*, together with barnacles and the winkle *Littorina littorea*. Polychaete worms may also be present in the clay. The covering of seaweed on peat and clay exposures may provide cover for cryptic species to inhabit. Mussel beds can also provide additional habitat components and increase the space available for other organisms to settle.

Both peat and clay are soft and are bored into by a variety of piddock species (bivalve mollusc), particularly *Pholas dactylus*, *Barnea candida* and *Barnea parva*. Habitats with existing or historical evidence of piddock activity are unusual and of

limited extent. Piddock holes which are no longer inhabited can provide additional micro-habitats for species, including small crabs and anemones. Their empty shells can also provide more space for species to settle. Therefore, they add to the biodiversity interest of this habitat.

The extent and maximum depth of peat and clay beds that exist sublittorally is not known. There is little information on the communities associated with subtidal examples of peat and clay exposures, but the flora and fauna is likely to be different to those found associated with intertidal examples. It is possible that subtidal occurrences of the habitat support communities, which may or may not include piddocks.

Little is known about the UK distribution of subtidal peat and clay, but they are likely to occur in the vicinity of intertidal occurrences. This intertidal habitat is known to be present along the north and south coasts of Wales, and the south and east coasts of England.

2. Current status in Lincolnshire

Lincolnshire's 'submerged forest' can be found along the coastline from Mablethorpe to Ingoldmells and at Cleethorpes; revealed by erosion of the deposits covering it. Despite this erosion, there are still sufficient amounts which may be seen at low spring tides (when sand movements allow) at Cleethorpes and more regularly on the coast at Huttoft Banks and Wolla Bank[50].

From around 7500BC a mixed oak/elm forest with some lime and beech and a hazel understory developed on the clay soils, while on sands pine became dominant. Due to periods of sea level rise the forest started to become waterlogged and reeds and sedges produced peat to cover the woodland floor from about 2500BC. The peat at Chapel Point has been radiocarbon dated to about 1940BC. By this time the area was becoming increasingly marine: in a quiet, low-energy environment and on a mobile coastline up to ten feet thickness of marine/brackish sediments developed. This was the first stage of the burial of the forest.

Four sites along the Lincolnshire coast have been identified as RIGS for the peat exposures and submerged forest:

- Sutton on Sea Foreshore.
- Huttoft Bank Foreshore.
- Wolla Bank Foreshore.
- Vickers Point Foreshore.

These should be resurveyed and assessed against new LGS criteria in due course.

3. Threats in Lincolnshire

- **Coastal and offshore development** can physically damage the peat and clay beds with the increase in infrastructure, trenching and cable/pipe laying (including where cables from offshore wind farms are brought onshore).
- **Coastal flood protection** can directly and indirectly impact upon peat and clay exposures by habitat loss and the alteration of sediment regimes along the coast.
- **Dredging activity** can lead to direct habitat removal or affect the habitat indirectly by altering sediment and hydrology regimes.
- **Mussel fisheries** disturb both peat and clay exposures and can affect the sediment.
- **Non-native species** have the potential to impact on the native species associated with these habitats. In Belgium and The Netherlands, the non-native

American piddock *Petricola pholadiformis* has almost completely displaced the native piddock *Barnea candida*.

- **Bait collection** where piddocks are harvested can physically damage the habitat.
- **Climate change** has the potential to alter tidal heights and increase storm events which would disturb the sensitive clay and peat habitats. Increases in wave exposure can increase the rate of erosion and the loss of the habitats.

4. Current conservation

Environment Agency beach nourishment works in the area are carried out in such a way to avoid known areas of the submerged forest and prevent damage to stumps that are lying submerged but close to the surface. Four areas of submerged forest are designated as RIGS; it is hoped that when these are resurveyed, they will become LGSs. It is anticipated that these areas will also receive protection as a result of being a specified 'feature' of the Lincolnshire Belt recommended MCZ.

5. Objective

- Prevent further loss of habitat extent and quality (as far as natural processes allow).

6. Targets and actions 2011-2020

Target	Details
LIN3_PCE_T01	Establish a baseline for existing extent and condition of peat and clay exposures in Lincolnshire (including an assessment of habitat quality) by 2012.
LIN3_PCE_T02	No reduction in the current extent of peat and clay exposures in Lincolnshire (based on data from T01) between 2011 and 2020.

Action	Details	Target links	Partners	Action date
LIN3_PCE_A01	Identify existing areas of peat and clay and assess their condition.	1	**LBP**	2012
LIN3_PCE_A02	Publish and promote a map indicating key areas of the shore (so that beach nourishment machinery/ boat activity/ power cables coming onshore etc. do not damage the habitat).	1,2	**LBP**, EA, LWT, NE	2012
LIN3_PCE_A03	Designate all sites meeting LGS criteria.	1,2	**LGS Panel,** ELDC, LBP, NELC	2015
LIN3_PCE_A04	Seek inclusion of peat and clay exposures within the MCZ network.	2	**LWT,** NE	2015
LIN3_PCE_A05	Promote and raise awareness of the value of this habitat.	2	**NE,** EA, ELDC, LBP, LWT, NELC	Ongoing
LIN3_PCE_A06	Discourage visitors from taking souvenirs from the submerged forest.	2	ELDC, LWT, NE, NELC	Ongoing

7. Further information

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Sabellaria spinulosa reefs

Summary

UK BAP
Sabellaria spinulosa reefs – priority habitat.

Current national trend
Sabellaria spinulosa is naturally common around the British Isles but stable, well-developed reefs are uncommon (Holt et al. 1998).

Estimated Lincolnshire resource
Baseline is 1846.5ha as per a survey undertaken in 2005 (Jessop and Stoutt, 2006). One of the most stable *Sabellaria spinulosa* reefs in the UK found in the mouth of The Wash.

Lead Partner
Eastern Inshore Fisheries and Conservation Authority

1. Introduction

Sabellaria spinulosa is a small, sedentary, suspension feeding, tube dwelling polychaete worm: it can form dense sub-tidal aggregations with tubes fused together forming reefs[51]. Initially the worms settle upon solid material such as rocky substrates or shell. Once the tubes are established, further worms can settle, less stable sediments can be colonised, and reefs form. Planktonic *S. spinulosa* larvae show a preference to settle on living or old *S. spinulosa* rather than in new areas[52].

The tubes of the *S. spinulosa* are built using sand particles from the water column; this means they require a turbid environment to live in[53]. The tubes are brittle structures that can be several centimetres thick. These tubes can stabilise pebble and gravel habitats and make it possible for other species to colonise the reef: larger species, like flatfish and shrimp, are then attracted to the reefs to feed. There is often a rich and diverse community associated with well-developed *S. spinulosa* reefs[54] – for this reason, these types of reefs of high conservation value.

S. spinulosa is naturally common around Britain because of the worms' tolerance of pollutants and turbid waters and their minimal requirements. However stable, well-developed reefs are uncommon[55]. Less stable, often annual, 'crusts' are more widespread[56] though these are not included in the BAP habitat definition. Reef features are not static, and their distribution can vary from year to year, making it difficult to monitor changes in extent.

2. Current status in Lincolnshire

Well-developed *S. spinulosa* reefs occur along the Lincolnshire coastline. The most stable reefs of the UK occur in the waters of The Wash SAC, and they are a feature of the European Marine Site[57].

The 2008 condition assessment for the Wash determined the *S. spinulosa* feature to be in a favourable condition overall. However, the report noted that the central core reef areas are at risk from trawling for pink shrimp and potentially from sea mussel dredging. Management measures for towed gears may need to be considered in order to ensure continued protection.

3. Threats in Lincolnshire

Fisheries activities. In The Wash the central core reef areas are at risk from trawling for pink shrimp and potentially from seed mussel dredging. Mobile fishing equipment can break off pieces of reef, and worms cannot rebuild the broken tubes. Species associated with the reef would also be at risk.

Coastal development including the laying of cables and pipes can cause direct damage to reefs. Maritime structures may alter sediment or flow regimes, which can impact the ability of the worms to build their tubes.

Aggregate extraction can also disturb *S. spinulosa* reefs and often takes place in mixed sediments, where *S. spinulosa* occurs. The effects of the activity on the reefs and the increased amount of sediments in the water column around the reef are as yet unknown.

Pollution can damage reefs. Large amounts of sediment suddenly added to the environment can alter the substrate or smother features.

4. Current conservation

A variety of organisations have roles in managing the Wash European Marine Site. The Eastern Inshore Fisheries and Conservation Authority has responsibilities for the conservation of the marine environment in conjunction with fisheries management and enforcement duties. The Authority's research team has conducted numerous surveys since 2006 to map the distribution and coverage of the core reef features, providing information to assist the management process.

5. Objectives

- Gain a better understanding of the extent of *Sabellaria spinulosa* reefs in Lincolnshire.
- Maintain the extent and quality of Sabellaria spinulosa reefs in Lincolnshire.

6. Targets and actions 2011-2020

Target	Details
LIN3_SAB_T01	Develop an understanding of the distribution of core *S. spinulosa* reef features in Lincolnshire waters by 2012.
LIN3_SAB_T02	Implement management measures by 2015 to prevent damage to reefs by commercial/ leisure activities.

Action	Details	Target links	Partners	Action date
LIN3_SAB_A01	Identify existing areas of *Sabellaria spinulosa* reef and assess the wildlife value of the habitat through survey and desk study.	1	**EIFCA,** LBP, NE	2012
LIN3_SAB_A02	Assess, and prioritise *Sabellaria spinulosa* reefs where protection of degraded habitat may be possible to allow recovery and reverse past losses.	1,2	**EIFCA**, NE	2012
LIN3_SAB_A03	Identify issues impacting on the extent and condition of *Sabellaria spinulosa* reefs.	2	**EIFCA,** NE	2013
LIN3_SAB_A04	Develop and implement management plans to address the issues identified in A03.	2	**EIFCA,** NE	2015

LIN3_SAB_A05	Provide information and advice to improve awareness of the presence and value of this habitat and the threats that it faces.	2	**EIFCA,** WESG, LWT	Ongoing

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Saline lagoons

Summary

UK BAP
Saline lagoons – priority habitat.

Current national trend
Fluctuating – probably stable (*BARS Reporting, 2008*).

Estimated Lincolnshire resource
60-110ha

Lead Partner
Natural England

1. Introduction

This action plan covers coastal lagoons and saline ditches, which are virtually tideless, natural or man-made bodies of saline (salty), hyper-saline (very salty) or brackish (slightly salty) water wholly or partially separated from the sea, but with some influx of sea water. They are usually shallow and warm and can contain a variety of substrata, often soft sediments which in turn may support tasselweeds and stoneworts as well as filamentous green and brown algae. In addition lagoons contain invertebrates rarely found elsewhere: they also provide important habitat for a range of water birds.

The flora and invertebrate fauna present can be divided into three main components: those that are essentially freshwater in origin, those that are marine/brackish species and those that are more specialist lagoonal species. The presence of certain specialist plants and animals make this habitat important to the UK's overall biodiversity. 10 species of invertebrates and plants associated with lagoons are protected under the Wildlife and Countryside Act.

Saline lagoons should not be viewed in isolation: they often merge into reedbeds, fens or wet grassland and are sensitive to changes in adjacent saltmarshes and mudflats.

The loss of lagoons in the UK has been considerable – recent evaluations estimated that in the latter half of the 1980s 38 lagoons were lost in England. Most lagoons are lost through human activity and it is likely that the natural formation of new lagoons will not keep pace with this loss. The national approach sees managed realignment as providing the best opportunity for habitat creation.

As well as being a nationally rare habitat, saline lagoons are a priority habitat under the Habitats Directive.

2. Current status in Lincolnshire

Saline lagoons are a key designation feature of both The Wash and Humber European Marine Sites. Past survey work has identified 37 saline lagoons/ lagoon-like habitats in Lincolnshire along the Humber, the north-east coast and around The Wash (see map on page 37). Most of them are small (less than three hectares in extent) and some may not currently meet the UK BAP habitat definition, so up-to-date survey data would be desirable. The information available suggests that around

60ha of identified lagoons are within the recommended salinity range for the habitat, with a further 50ha below the recommended lower limit. Sea defence works may have been a significant cause of loss of saline lagoon habitat in the past; fortunately many of the remaining saline lagoons and brackish water habitats are now covered by statutory designations.

Many agricultural ditches adjacent to the sea defences along the whole coastline contain brackish water. Although a proportion of these are poor in nature conservation interest as a result of nutrient enrichment and over-management, some contain plants and invertebrates characteristic of slightly and moderately saline conditions: these could be candidates for BAP habitat restoration/re-creation.

Key sites in Lincolnshire identified for their species assemblages include Moulton Marsh LWT reserve, which supports the eight lagoonal specialists; Killingholme Haven Pits SSSI, with the rare tentacled lagoon worm *Alkmaria romijni* and spire snail *Hydrobia neglecta*; Humberston Fitties, the most northerly recorded site for the lagoon sand shrimp *Gammarus insensibilis*; and the newly created Freiston Shore RSPB reserve, which was soon colonised by breeding avocets and other typical species. There may be opportunities to create more lagoons in future if suitable coastal works are undertaken.

3. Threats in Lincolnshire

- **Natural succession into other habitats.** Saline lagoons are transient habitats. Salinity changes as succession leads to freshwater and terrestrial habitats such as fen and carr. Similarly saline ditches can silt up. Active management is required to halt or reverse these successional developments if the natural processes of lagoon creation are not also taking place.
- **Sea level rise and coastal squeeze.** It has been estimated that 120ha of coastal lagoons in England (10% of the UK resource) will be lost in the next 20 years, mainly as a consequence of sea level rise. However, sea level rise also presents an opportunity for the re-creation of lagoons and other brackish water habitats during coastal engineering projects. Sea level rise, combined with channel movements, is clearly linked to loss of saline lagoons at Reads Island in the Humber Estuary.
- **Artificial control of water** (sea and fresh) to lagoons can have a profound influence on the habitat. Many lagoons are often seen as candidates for in-filling or land claim as part of coastal development.
- **Industrial development in the South Humber Gateway.** This area is undergoing a period of development that could lead to a direct loss of lagoons as well as possible threats from pollution and disruption of natural processes.
- **Pollution and nutrient enrichment** from industrial and agricultural run-off can lead to eutrophication which can have major detrimental effects on lagoons and saline ditches.

4. Progress towards Lincolnshire BAP targets 2006-2011

Target details*	Progress 2006-2011	Status 31/03/2011	3rd edition targets
Maintain the current extent (75ha) of saline lagoon and saline/brackish ditch habitat by 2015.	Assessment needs to be carried out to determine whether identified saline lagoons still meet BAP definition. 4.2ha in HLS.	On schedule.	Amended and included in 3rd edition.

Achieve favourable condition for all saline lagoons by 2010.	Assessment needed. 4.2ha managed in HLS.	Progress unknown.	Amended and included in 3rd edition.
Expand the extent of saline lagoons in Lincolnshire – create 15ha of saline lagoons by 2010.		No progress.	Amended and included in 3rd edition.

* targets were reviewed in 2009 therefore some may differ from those published in 2006

5. Objectives

- To maintain the current area and number of saline lagoons in the county.
- To improve/restore condition of existing lagoons where necessary.
- To create new saline lagoons if opportunities arise through coastal works, in line with agreed coastal management policies.

6. Targets and actions 2011-2020

Target	Details
LIN3_SAL_T01	Maintain the current number and extent (23 sites, 97ha) of saline lagoon and saline/brackish ditch habitat: no losses between 2011 and 2015.
LIN3_SAL_T02	Achieve positive conservation management for 95% of saline lagoons by 2015.
LIN3_SAL_T03	Expand the extent of saline lagoons in Lincolnshire – create 15ha by 2020.

Action	Details	Target links	Partners	Action date
LIN3_SAL_A01	Ensure that all qualifying saline/brackish lagoons in Lincolnshire are protected by appropriate designation – SSSI or LWS.	1,2	**LWS Panel**, LBP, LAs, LWT, NE, WESG	2015
LIN3_SAL_A02	Make information available to all relevant parties (including landowners and managers) about the importance of saline/brackish lagoons and ditches; about appropriate management; as well as grants/schemes.	1,2	**NE**, FWAG, IDBs, LWT, RSPB, WESG	Ongoing
LIN3_SAL_A03	Work with landowners and managers to get management plans in place for all saline/brackish lagoons larger than 1ha (and surrounding habitat) to ensure appropriate management.	1,2	**NE**, LWT, RSPB	2014
LIN3_SAL_A04	Develop a database/GIS layer for saline lagoons – including details of location, size, habitat quality and management.	2	**NE**, IDBs, LBP, LNU, LWT, RSPB	2014
LIN3_SAL_A05	Carry out survey and periodic monitoring of saline/brackish ditches.	2	**NE**, EA, IDBs, LWT, RSPB	Ongoing
LIN3_SAL_A06	Identify suitable sites for saline/brackish lagoon creation/restoration as opportunities arise.	3	LWT, NE, RSPB, WESG	2014
LIN3_SAL_A07	Implement creation schemes for new saline lagoons or increase extent at existing sites. Aim for creation of 15ha.	3	**EA**, LWT, NE, RSPB	2020

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Revised 2011

Catherine Collop (Lincolnshire Biodiversity Partnership), Claire Ludgate (Natural England), Nick Tribe (Natural England).

Saltmarsh

Summary

UK BAP
Coastal saltmarsh – priority habitat.

Current national trend
Declining (*BARS, 2008 reporting*). There is no evidence to suggest that this trend is repeated in Lincolnshire.

Estimated Lincolnshire resource
5928ha *(WFD saltmarsh extent polygons, 2010)*

Lead Partner
Wash Estuary Strategy Group

1. Introduction

Coastal saltmarsh occurs in the transitional zone between intertidal flats and terrestrial habitats. It develops in situations where sufficient shelter from strong wave action allows a net deposition of silt to occur. A limited number of salt tolerant plants colonise the deposited silts, between the mean high water of neap tides and the mean high water of spring tides, producing saltmarsh.

Saltmarsh is an important resource for wading birds and wildfowl. It provides a high-tide refuge for birds feeding on adjacent mudflats in winter and on passage in autumn/spring. Saltmarsh also provides sheltered nursery sites for several species of fish, and can export nutrients to nourish neighbouring mudflats. Saltmarshes are important habitats for many rare invertebrates. It is also an excellent carbon sink; saltmarsh soils store 210g C $m^{-2}yr^{-1}$, which is a substantial rate. Carbon stored in saltmarsh is probably more valuable than that stored in any other natural ecosystem due to the lack of production of other greenhouse gasses. In contrast to freshwater wetland soils, marine wetlands produce little methane gas, which is a more potent greenhouse gas than CO_2[58] Like other coastal habitats, saltmarsh plays a role in reducing coastal flooding and erosion.

There are about 45,337ha of saltmarsh in the UK, concentrated mostly in the estuaries of low-lying land in eastern and north-western England and in Wales. Saltmarsh is continuing to decline at a national level. In Medieval times large areas of saltmarsh were converted to agriculture and more recently there have been more piecemeal losses to industry and other land uses. Coastal saltmarshes are listed in Annex 1 of the Habitats Directive.

2. Current status in Lincolnshire

Large areas of saltmarsh occur in Lincolnshire within the Humber and Wash estuaries; along the more open north-eastern coastline between Cleethorpes and Mablethorpe; and just north of The Wash at Gibraltar Point. The sheltering effects of estuaries, barrier islands and spits, and shallow inshore seas all play a role in saltmarsh formation in Lincolnshire. Around 6000ha occur in the county; 18% of the resource in England.

In spite of continuing sea level rise along the Lincolnshire coast, saltmarsh continues to grow; this natural extension of saltmarsh is, however, at the expense of mud flats. The beach nourishment scheme between Mablethorpe and Skegness is also likely to lead to further accretion at Gibraltar Point in due course (this is being monitored). Beach profiles are steepening however, so it is difficult to know for how much longer this saltmarsh growth will continue. As loss of saltmarsh due to sea level rise continues in more southerly counties, it is important to seek to maintain the extent of saltmarsh in Lincolnshire to compensate for national losses.

It is worth noting that saltmarsh is also developing on managed realignment sites such as Chowder Ness and Alkborough Flats, which were created to compensate for losses within the Humber Estuary SSSI/SAC/SPA/Ramsar designated sites.

The vegetation communities of Lincolnshire saltmarshes are typical of the east coast. They are rich in sea lavender *Limonium vulgare* and sea aster *Aster tripolium*. Approximately 46% of the marshes within The Wash are grazed by livestock, but this could change in the future if agri-environment agreements are not renewed.

Almost all of the saltmarsh areas in Lincolnshire have been notified as SSSIs. In addition, all Lincolnshire saltmarshes are also within SPAs and those within The Wash and Humber estuaries also carry the Ramsar designation. Those at Saltfleetby and Gibraltar Point, and some of those bordering The Wash are within NNRs. The Humber Estuary, Saltfleetby-Theddlethorpe Dunes and Gibraltar Point and The Wash are also SACs under the Habitats Directive. Saltmarsh is a key designation feature of both the Humber and the Wash and North Norfolk Coast European Marine Sites.

3. Threats in Lincolnshire

- **Inappropriate grazing levels**. Grazing has a marked effect on the structure and composition of saltmarsh vegetation. Intensive grazing produces a sward attractive to wintering and passage wildfowl and waders, whilst less intense grazing produces a tussocky structure which attracts breeding waders. If formerly grazed saltmarshes are abandoned, coarse grasses may dominate the mid and upper marsh.
- **'Coastal squeeze' and erosion**. Soft sediment coastlines, of which saltmarshes are a part, are dynamic systems where the sediments are reworked from time to time through natural processes. Where the landward margin of these systems has been artificially fixed, this can lead to net saltmarsh loss through erosion: on coasts where relative sea level is rising this effect can be greatly amplified.
- **Development and recreation.** Saltmarshes near to estuaries can be particularly vulnerable to land claim for industry, port facilities and transport infrastructure. Recreational pressures can also result in damage to, or loss of, saltmarsh
- **Changes in sediment supply**. This may be affected by coastal protection works, beach nourishment or by changes in estuary morphology caused by land claim, dredging of shipping channels and the impacts of flood defence works. Reduced sediment supply can exacerbate 'coastal squeeze' as there is less mud available for saltmarsh to build on.
- **Eutrophication** due to sewage effluent and agricultural fertiliser run-off can cause problems of algal growth on saltmarshes.
- **Oil pollution** can potentially destroy saltmarsh vegetation and associated invertebrate species, and whilst the marsh usually recovers, sediment may be lost during the period of die-back.

4. Progress towards Lincolnshire BAP targets 2006-2011

Target details*	Progress 2006-2011	Status 31/03/2011	3rd edition targets
Maintain the current extent (5000ha) of saltmarsh in Lincolnshire by 2015.	Growing in some places, eroding elsewhere – needs assessing. Currently no net loss. New estimate of current resource ~6000ha. 536ha in HLS (maintenance).	On schedule.	Amended and included in 3rd edition.
Expand the extent of saltmarsh in Lincolnshire by 650ha by 2010.	Data collected by EA in 2010 shows total 5928ha.	Achieved through natural processes.	Amended and included in 3rd edition.
Restore grazing to all areas of saltmarsh that were traditionally grazed by 2015.	All saltmarsh that was been grazed in recent decades is covered by HLS.	On schedule.	Amended to refer to all types of management.

* targets were reviewed in 2009 therefore some may differ from those published in 2006

5. Objectives

- To maintain the quality and extent of the existing resource through natural coastal processes.
- To identify opportunities for the creation of saltmarsh in order to offset losses in other parts of the UK.

6. Targets and actions 2011-2020

Target	Details
LIN3_STM_T01	No net loss of saltmarsh in Lincolnshire between 2011 and 2020 – monitor losses vs. gains in the Humber, Wash and open coast.
LIN3_STM_T02	Increased extent of saltmarsh in Lincolnshire by 2020: increases occurring in The Wash; on the South Humber Bank; and on the open coast.
LIN3_STM_T03	Achieve positive conservation management for 95% of saltmarsh by 2015; maintain to 2020.

Action	Details	Target links	Partners	Action date
LIN3_STM_A01	Ensure that all saltmarsh is covered by appropriate designation (SSSI or LWS).	1	**NE**, LAs, LWS Panel, LWT, RSPB, WESG	Ongoing
LIN3_STM_A02	Collect information on changes in the extent and quality of saltmarsh resource in Lincolnshire and keep baseline information up to date.	1	**EA**, **LBP**, NE	Ongoing
LIN3_STM_A03	Identify suitable sites for creation of saltmarsh habitat if opportunities arise.	2	**EA**, LAs, LWT, NE, RSPB, WESG	2012

LIN3_STM_A04	Use the results of A03 to undertake creation works if opportunities arise.	2	**EA**, LAs, LWT, NE, RSPB, WESG	Ongoing
LIN3_STM_A05	Ensure appropriate management of all saltmarshes by agreeing management plans, and offering advice to key organisations, landowners and managers.	1,3	**NE**, EA, FWAG, HMS, LAs, LWT, RSPB, WESG	Ongoing

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Revised 2011

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10. Farmland and grassland

Vision for Lincolnshire's farmland and grassland

- An actively and sustainably farmed countryside that benefits biodiversity and the farming community. Habitat diversity has increased.

- Land use is a mosaic of productive land, within healthy ecological networks of semi-natural and managed habitats, which can meet food supply demands without the loss of associated species.

- The decline in important habitats has been halted and reversed and habitats are restored and created on a landscape scale, with appropriate traditional management techniques in place – especially the use of livestock.

- Hedges, hedgerow trees, watercourses and farm ponds are managed for biodiversity, with suitable protection from farm operations. Linear habitats are encouraged and sympathetically managed as biodiversity corridors and stepping stones.

- Buffer zones and other measures are adopted to reduce erosion and pollution of the wider environment.

- Use of pesticides and other chemical/nutrient inputs have been reduced, resulting in less diffuse pollution.

Introduction to farmland and grassland action plans

Lincolnshire is one of Britain's most important agricultural counties and farming has been the dominant land use here for many centuries. Defra's 2009 June Survey estimated that 81% of the county is farmed, and that 71% of the county is ploughed annually (arable, horticulture and temporary grassland) – compared to 39% for England. Consequently availability of semi-natural habitat within the county is below the national average, and there is a need for better delivery for biodiversity and habitat connectivity within the farmed environment – particularly boundary/linear habitats (usually hedges and ditches) which surround most farming systems (see section 2.12 in The Natural Choice).

Considered by many who do not know the area as flat and uniform, the county is remarkably varied due to a wide range of soil types and, in places, a rolling topography.

In the south-east of the county there is a high concentration of Grade 1 and 2 soils (peat and silt based), which support the diversification of farming from purely arable and mixed farm production to horticulture. The field systems here are generally large and tend to be edged by dykes, drains and other watercourses – the essential means of maintaining the drainage for production reasons in the open fen landscapes.

Elsewhere in the county the soil is poorer in agricultural terms. Chalk and limestone dominate the geology of the uplands of the Wolds, the Kesteven Uplands and the Lincoln Edge. These areas contain increasingly scarce and fragmented sites of species-rich calcareous grassland. Other valuable grasslands lie along the coastal plain where there are pockets of grazing marsh with traditional summer grazing and seasonal waterlogging on fertile and productive silty clays.

Other soil types include extensive areas of heavy and medium clay loams that were once dominated by grasslands. Sandy loams occur in areas where the soils are derived from ancient wind-blown sand, alluvium deposits and outcrops of sandstones, and they are often associated with sites of high biodiversity. The sands and clays hold important, but often fragmented, concentrations of scarce habitats; including heathland, springs and flushes and species-rich lowland meadow.

Wildlife-rich and pastoral grassland is an important element of the county's biodiversity. However, this declining resource, including grazing marsh and lowland meadows is being lost to alternative farming systems, urban creep and tourism development.

Changes to the Common Agricultural Policy (CAP) in the past have helped to improve the environmental focus within the farmed environment. Farmers must meet a range of environmental standards known as 'cross compliance' in order to receive Single Farm Payments. This method of support is decoupled from production and linked almost entirely to the area of productive land, irrespective of what is grown. Additional financial incentives are available to benefit the environment, principally Environmental Stewardship; this is divided into ELS and HLS. ELS, along with parallel options for organic farms, is a basic scheme, currently open to all, and aimed at general habitat and species benefits; whereas HLS is a targeted scheme to deliver enhancement, restoration and creation of priority habitats and for species that require more specific management. The CAP will be reviewed again during the period covered by this BAP, the implications of which are as yet unknown.

Following the loss of set-aside, there were concerns about how the management of land to efficiently produce food would impact on the environment. In response, the CLA and NFU, with the support of industry leaders and environmental organisations came together to create the Campaign for the Farmed Environment – a voluntary initiative that promotes existing Environmental Stewardship schemes and encourages voluntary management to exceed the environmental benefits that used to be provided by set-aside. If by 2012 it is not successful, regulation may be put in place to deliver this.

Many farmers have shown that with the appropriate incentives and well-designed measures, they will accept the challenge of reversing the decline of farm biodiversity. Environmental Stewardship provides most of the incentives for the farming sector to implement BAP objectives in partnership with others. It is essential that farmers have long-term confidence in HLS and that funding is maintained as this is the primary means of achieving the targets set out in this document for farmland habitats and species.

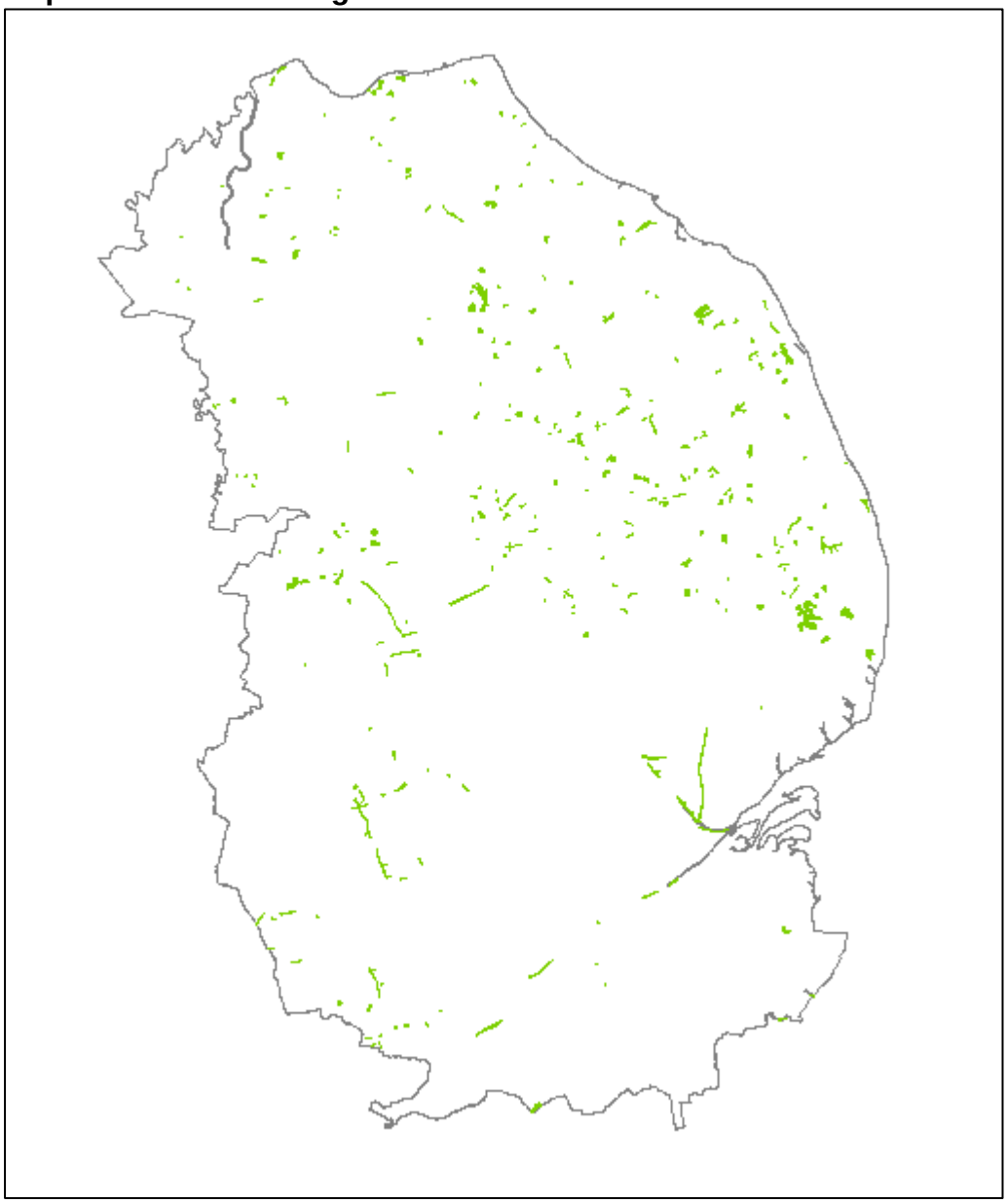
Selection of Habitat Action Plans[59]

The selection of HAPs reflects those UK BAP priority habitats in Lincolnshire that offer the greatest potential for increasing farmland biodiversity.

While three grassland habitats are included in this section, a fourth – lowland dry acid grassland – is covered in the heathland and peatland section of the BAP because of its association with heathland habitats.

Habitat Action Plans:

Map 4: Distribution of grassland BAP habitats



N.B. Distribution of lowland dry acid grassland is included in map 5.
Also see Appendix 4.

UK BAP species associated with Lincolnshire's farmland and grassland

Also see the Species section on page 171

		Arable field margins HAP	Coastal and floodplain grazing marsh HAP	Hedgerows and hedgerow trees HAP	Lowland calcareous grassland HAP	Lowland meadows HAP	Species Action Plan
Tolypella intricate	Tassel stonewort		✓				
Tolypella prolifera	Great tassel stonewort		✓				
Aceras anthropophorum	Man orchid				✓		
Armeria maritima elongata	Tall thrift					✓	
Astragalus danicus	Purple milk-vetch				✓		
Blysmus compressus	Flat-sedge		✓				
Bupleurum tenuissimum	Slender hare's-ear		✓				
Carex divisa	Divided sedge		✓				
Carex ericetorum	Rare spring-sedge				✓		
Clinopodium acinos	Basil thyme	✓			✓		
Coeloglossum viride	Frog orchid				✓		
Dianthus armeria	Deptford pink				✓		
Euphrasia pseudokerneri	Chalk eyebright				✓		
Galeopsis angustifolia	Red hemp-nettle	✓					
Gentianella anglica	Early gentian				✓		
*Herniaria glabra***	Smooth rupturewort	✓					
Hordeum marinum	Sea barley		✓				
Minuartia hybrid	Fine-leaved sandwort				✓		
Orchis ustulata	Burnt orchid				✓		
Potamogeton acutifolius	Sharp-leaved pondweed		✓				
Potamogeton compressus	Grass-wrack pondweed		✓				
Pulsatilla vulgaris	Pasqueflower				✓		
Ranunculus arvensis	Corn buttercup	✓					
Scandix pecten-veneris	Shepherd's needle	✓					
Scleranthus annuus	Annual knawel	✓					
Sium latifolium	Greater water parsnip	✓					
Torilis arvensis	Spreading hedge parsley	✓					
Carabus monilis	Necklace ground beetle	✓			✓	✓	
Harpalus froelichii	Brush-thighed seed-eater	✓					
Ophonus laticollis	Set-aside downy-back	✓		✓	✓		
Ophonus melletii	Mellet's downy-back				✓		
Ophonus stictus	Oolite downy-back				✓		
Adscita statices	The forester				✓	✓	
Cupido minimus	Small blue				✓		
Hamearis lucina	Duke of Burgundy				✓		
Hemistola chrysoprasaria	Small emerald				✓		
Lasiommata megera	Wall	✓		✓	✓		
Orgyia recens	Scarce vapourer			✓			
Pareulype berberata	Barberry carpet			✓			
Plebejus argus	Silver-studded blue				✓		

Satyrium w-album	White letter hairstreak			✓			
Scotopteryx bipunctaria	Chalk carpet				✓		
Thecla betulae	Brown hairstreak			✓			
Tholera cespitis	Hedge rustic		✓		✓		
Tyta luctuosa	Four-spotted moth	✓					
Bombus ruderatus	Large garden bumblebee	✓					
*Priocnemis coriacea****	a spider-hunting wasp				✓		
Triturus cristatus	Great crested newt		✓	✓			✓*
Natrix natrix	Grass snake		✓				
Alauda arvensis	Skylark	✓					✓*
Carduelis cannabina	Linnet	✓		✓			✓*
Cygnus columbianus Bewickii	Bewick's swan		✓				
Emberiza citronella	Yellowhammer	✓		✓			✓*
Emberiza scheoniclus	Reed bunting	✓		✓			✓*
Limosa limosa	Black-tailed godwit		✓				
Miliaria calandra	Corn bunting	✓		✓			✓*
Motacilla flava	Yellow wagtail		✓		✓	✓	✓*
Numenius arquata	Curlew		✓				✓*
Passer montanus	Tree sparrow	✓		✓			✓*
Perdix perdix	Grey partridge	✓			✓		✓*
Pyrrhula pyrrhula	Bullfinch			✓			✓*
Streptopelia turtur	Turtle dove			✓			✓*
Sturnus vulgaris	Starling	✓	✓	✓	✓	✓	✓*
Vanellus vanellus	Lapwing	✓	✓			✓	✓*
Barbastella barbastellus	Barbastelle bat			✓			✓*
Erinaceus europaeus	Hedgehog	✓		✓		✓	
Lepus europaeus	Brown hare	✓					
Micromys minutus	Harvest mouse	✓		✓	✓		
Muscardinus avellanarius	Dormouse			✓			
Plecotus auritus	Brown long-eared bat			✓			✓*

* Species is included in a grouped Species Action Plan.
** Not a UK BAP species, but is RDB listed and very restricted in Lincolnshire so of local importance
*** Not a UK BAP species, but is nationally notable and very restricted in Lincolnshire so of local importance

[59] Also see section 6. 1.2 Criteria for selecting HAPs and SAPs

Arable field margins

Summary

UK BAP
Arable field margins – priority habitat.

Current national trend
Increasing – this trend is repeated in Lincolnshire.

Estimated Lincolnshire resource
Environmental Stewardship agreements are currently in place for over 7000ha of uncropped field margins and in-field plots and headlands.

Lead Partner
Natural England

1. Introduction

The aim of this action plan is to benefit a wide range of characteristic farmland habitats and species in arable areas, without significant loss of crop production, and with the added benefit of providing buffer zones for neighbouring habitats. The resulting improved network of wildlife corridors will provide greater connectivity between fragmented or isolated habitats, with long-term benefits for less mobile species.

The term 'arable field margin' is used here to mean a planned strip of uncropped land lying between a crop and the field boundary (in addition to cross compliance requirements), that is deliberately managed to benefit biodiversity, with the added benefit of protecting boundary habitats from nutrient run-off. It also refers to uncropped plots and headlands within fields. Four types of margin are included in this definition: cultivated, low-input margins; margins sown to provide food for wild birds; margins sown to provide pollen and nectar for invertebrates; permanent grassy margins. See the UK BAP definition for a fuller description of the types of margin that are included and excluded.

The latest estimate (2008) is that there are over 105,200ha of arable field margins in the UK. Arable field margins provide nesting and feeding sites for game birds and some passerines. Many species of invertebrates are also associated with field margins, and beneficial predators that feed on crop pests are dependent on this habitat for part of the year. The creation of pesticide-free field margins increases the density of beneficial invertebrates and therefore reduces the need for chemical spraying on the crop itself. Managed sympathetically, permanent field margins can be excellent habitats for tussocky plants, grasses and more vigorous wild flowers.

Scarce arable plants (arable weeds) – such as night-flowering catchfly *Silene noctiflora*, round and sharp-leaved fluellen *Kickxia spuria* and *K. elatine*, Venus' looking-glass *Legouisa hybrida*, dwarf spurge *Euphorbia exigua* and small toadflax *Chaenorhinum minus* – were once common and found throughout cultivated fields. They have suffered under modern agricultural practices; changes in cropping, fertiliser application and in particular from pesticides and improvements in seed cleaning methods. Some of these species are now threatened with extinction, though

many are not actually a hindrance to producing a profitable crop. It is important to distinguish these threatened species from and herbicide-resistant arable weeds.

Many of these scarce species may still be present in the seed-bank and simply need the right conditions to give them the opportunity grow, flower and set seed. The key to conserving these rare arable plant species is the increased uptake of Environmental Stewardship options for cultivated margins and in-field options; however, payments do not currently reflect the additional costs to farmers incurred by management in this way.

2. Current status in Lincolnshire

Environmental Stewardship agreements are currently in place for:

- 182ha cultivated, low-input margins (2.6%) of which only 63ha are unsown
- 802ha margins sown for wild birds (11.3%)
- 417ha margins sown for invertebrates (5.8%)
- 5724ha permanent mixed grass strips (80.3%)

While these total over 7000ha, the majority are permanent mixed grass strips, which have the least value for biodiversity. The focus of this action plan will be to increase the proportions of the other three types of margin, most importantly cultivated, unsown margins for the benefit of rare arable plants and invertebrates.

Priority also needs to be given to determining the distribution of rare arable weeds in Lincolnshire; although a few scarce arable species are still widespread and even frequent, a whole group of once-frequent species has catastrophically declined in the last 30 years. Opportunities where more sympathetic management for these species can take place need to be identified on a range of sites across the county and on a range of soil types.

Scarce arable plants are featured in the HLS targeting statement for the East Midlands (Theme 3): *Natural England will consider applications offering appropriate management for Important Arable Plant Assemblages including nationally scarce plants such as night-flowering catchfly, small-flowered catchfly, shepherds needle, corn buttercup and red hemp nettle, particularly in Lincolnshire, Nottinghamshire and Rutland.*

3. Threats in Lincolnshire

- **Spray drift of pesticides** into the field-edge environment. This eliminates or reduces plant and invertebrate biomass and diversity.
- **Lack of cultivation** – a mix of cultivated and uncultivated margins are needed to provide maximum benefit for biodiversity.
- **Over-spreading of fertilisers** into the field edge. This benefits a limited number of vigorous or adaptable species at the expense of a wide spectrum of other plants.
- **Silt deposition** – fine particles of silt washed from crop land can carry high levels of phosphates and some pesticides, reducing the diversity of the field-edge environment, impacting on the associated biodiversity.

4. Progress towards Lincolnshire BAP targets 2006-2011

Target details*	Progress 2006-2011	Status 31/03/2011	3rd edition targets
300ha of arable field margins created for wildlife and in favourable management by 2015 (not including single-payment	7125ha field margins in ELS or HLS. Though only 182ha are cultivated, low-input. (802ha sown for wild	On schedule.	Amended and included in 3rd edition.

cross compliance margins).	birds; 417ha sown with wildflowers/agricultural legumes; 5724ha permanent grass).		
Produce a report on scarce arable weeds, with distribution data, for Lincolnshire past and present by 2015.	LNU botany project ongoing.	On schedule.	Target carried forward.

* targets were reviewed in 2009 therefore some may differ from those published in 2006

5. Objectives

- To ensure survival of the full number and range of arable plant species currently present in Lincolnshire.
- Increase the proportion of cultivated, low input margins and those sown for birds and invertebrates through Environmental Stewardship.
- To maximise the value of permanent grass strips by locating them where they buffer and link habitats of particular value for wildlife, provide effective green infrastructure and provide feeding habitats for vertebrates such as barn owls.

6. Targets and actions 2011-2020

Target	Details
LIN3_AFM_T01	7000ha of arable field margins of a range of types managed for biodiversity in agri-environment schemes by 2015 (not including single-payment cross compliance margins).
LIN3_AFM_T02	Produce a report on scarce arable weeds with past and present distribution data for Lincolnshire by 2015.

Action	Details	Target links	Partners	Action date
LIN3_AFM_A01	Monitor the uptake of field margin options and highlight failures to establish unpopular or difficult habitat types, which are essential for restoring biodiversity in the county, with a view to promoting uptake and increasing incentive payments.	1	**NE**, FWAG, NFU	Annually
LIN3_AFM_A02	Create additional areas of field margins through Environmental Stewardship and Campaign for the Farmed Environment. Aim for a range of: cultivated low-input margins (10%); margins sown for wild birds (20%); margins sown with wildflowers or agricultural legumes (10%); and permanent mixed grass strips (60%).	1	FWAG, NE, NFU	2015
LIN3_AFM_A03	Analyse LNU/BSBI records to find out more about the distribution of arable weed species in Lincolnshire.	2	**LBP**, LNU, LWT	2012

LIN3_AFM_A04	Identify farmland areas (one per NCA) to target for wildlife surveys and encourage farm advisors, agronomists and other local specialists to carry out (aim for three per year).	1,2	**LNU**, FWAG, LWCS, LWT	2015
LIN3_AFM_A05	Use the information from A03 and A04 to produce a report on scarce arable weeds, with distribution data, for Lincolnshire past and present.	2	**LNU, LBP**	2015
LIN3_AFM_A06	Organise annual training/ demonstration events on how to determine which margin types have the best benefits for rare arable plants and other biodiversity, depending on farm location.	1	**NE, FWAG**, LNU, NFU	Annually

7. Further information

- Natural England (2010) Entry Level Stewardship – Environmental Stewardship Handbook. Third edition. Defra, London.
- Natural England (2010) Higher Level Stewardship – Environmental Stewardship Handbook. Third edition. Defra, London.
- BRIG (ed. Ant Maddock) (2008) UK Biodiversity Action Plan; Priority Habitat Descriptions. (Updated July 2010).

Revised 2011

Catherine Collop (Lincolnshire Biodiversity Partnership), Clare Harrison (Lincolnshire Wildlife Trust).

Grazing marsh

Summary

UK BAP
Coastal and floodplain grazing marsh – priority habitat.

Current national trend
Extent probably increasing, though condition not known.

Estimated Lincolnshire resource
Over 700ha in agri-environment schemes and identified through LWS surveys (additional areas of habitat have been identified, but not yet digitised).

Lead Partner
Lincolnshire Coastal Grazing Marshes Partnership

1. Introduction

This action plan deals with both coastal and inland floodplain grazing marsh.

Grazing marsh is periodically inundated, or wet, grassland with a high water table; usually bounded by brackish or freshwater ditches that frequently support diverse plant and invertebrate communities. Traditional grazing marsh can also include areas used for hay production with aftermath grazing. The habitat is most usefully considered as a complex with many elements including grassland, drainage ditches, fen and reedbed: water-filled hollows and permanent ponds with emergent swamp communities are often a feature of the habitat. Grazing marsh also includes washlands (areas of deliberately flooded pasture or meadow) and can be found in natural river floodplains, both large and small, as well as along the coast.

Grazing marshes are particularly important for the numbers of breeding waders that they support; including snipe, lapwing, redshank and curlew. Internationally important populations of wintering Bewick and whooper swans also occur, along with other wildfowl.

It is estimated that there are about 230,000ha of grazing marsh in the UK, with the majority in England. However, only a small proportion of this is agriculturally unimproved and still supporting a high biodiversity; much of the reported extent is likely to be too dry to meet BAP criteria. Losses of grazing marsh have been significant in the last 60 years and this has continued to the present day, though this decline in extent may now have been halted as a result of increased uptake of wet grassland creation options through agri-environment schemes. It is important that this momentum is not lost, and that, as appropriate, land coming out of CSS over the coming years is prioritised to go into HLS in order to ensure continuity of management as grazing marsh.

The main opportunities for grazing marsh restoration or re-creation in Lincolnshire are along the coast (including the edge of The Wash) and in river valleys such as the Trent, Witham and Welland.

2. Current status in Lincolnshire

Lincolnshire's coastal and floodplain grazing marsh was formerly abundant. However, agricultural intensification that accelerated in the 1950s with Government grants for field drainage, combined with the building of new pumping stations, has resulted in the loss of the vast majority of functioning grazing marsh. The loss of this wet grassland has led to widespread loss of biodiversity especially breeding and wintering waders and wildfowl, and diverse lowland meadow and aquatic plant communities.

Further post-war declines continued with, for example, a loss of 25% of the remaining resource in the Lincolnshire Coast and Marshes NCA between 1990 and 2000. Only small pockets of grazing marsh survived. Following these exceptional past declines the trend in loss in the Lincolnshire Coast and Marshes NCA has now been reversed and the majority of high value sites are now managed specifically for biodiversity; including SSSIs and many sites supported through agri-environment schemes. The Lincolnshire Coastal Grazing Marshes Partnership has been instrumental in reversing this trend (see below), and surveys are demonstrating that restoration (through agri-environment schemes) is resulting in the return of high numbers of breeding and wintering birds. Adjacent grassland that does not meet BAP criteria can still provide important habitat for wetland and farmland birds and act as a buffer to botanically-rich sites.

There are two main areas in the county where grazing marsh remains and/or with the best opportunities for habitat restoration and creation:

Lincolnshire Coast and Marshes NCA

- A significant proportion of the permanent neutral pasture remaining in Lincolnshire is located in the Lincolnshire Coast and Marshes NCA.
- Ridge and furrow is relatively common: surviving pastures may not have been ploughed for at least 200 years and potentially support a great diversity of species. However, intensification has resulted in most being rather poor floristically.
- Grasslands of high botanical nature conservation value in this area are now so scarce that most are protected as SSSIs or nature reserves managed by Lincolnshire Wildlife Trust and/or have been entered into agri-environment schemes.
- Drainage channels are subject to diffuse pollution and eutrophication, water levels are managed for flood risk purposes, and to support agricultural production and urbanisation. This has caused loss of biodiversity but some species, such as the water vole, remain widespread.
- The Lincolnshire Coastal Grazing Marshes Partnership has a vision for the NCA that the area will once again be a mosaic of grasslands rich in wildlife and intersected by a distinctive pattern of watercourses. Effort is being targeted in four priority areas in the NCA – Saltfleetby, Huttoft, Burgh Le Marsh and Gibraltar Point (also see Table 2 – page 19).

The Fens NCA

- Grassland was far more common in the Fens than it is today: beside many rivers there were washlands and damp, rushy pastures that flooded in winter. The Crowland and Cowbit Washes on the River Welland used to be of great importance for their breeding and wintering birds. There are opportunities here for re-creating grazing marsh in association with flood risk management operations.

- Work is taking place to re-create grazing marsh adjacent to the Wash bank – e.g. at Frampton Marsh.
- There are opportunities to re-create grazing marsh alongside other wetland habitats adjacent to the River Glen and Counter Drain through the South Lincolnshire Fenlands initiative (see page 20).

Other parts of the county

- Marshy pastures still occur, although often degraded, along many of Lincolnshire's river and stream corridors, including the Upper Witham and the Trent. For example, land adjacent to the Trent at Lea near Gainsborough provides important sites for wintering wildfowl and rare plants such as narrow-leaved water dropwort *Oenanthe silaifolia*.
- There are opportunities in these river corridors to restore/ re-create floodplain grazing marsh, particularly to benefit flood risk management.
- There are also opportunities to restore/re-create coastal grazing marsh adjacent to the Humber Estuary.

Coastal and floodplain grazing marsh is featured in the HLS targeting statement for the East Midlands (Theme 1): *Natural England will consider applications in the region offering to maintain and/or restore/link/buffer 'significant' areas of… coastal and floodplain grazing marsh within the Lincolnshire Coastal Grazing Marsh Project area and along river corridors.*

3. Threats in Lincolnshire

- **Agricultural intensification –** conversion to all-arable systems or intensive grassland management results in significant habitat loss with associated impact from diffuse pollution.
- **Decline in traditional livestock farming** driven by decreasing returns often leads to replacement by conversion to arable or other land use. The net loss of habitat and grassland mosaic contributes to biodiversity decline.
- **Aggregate extraction** along river corridors, leading to direct loss of habitat.
- **Development** on former grazing marsh removes the possibility of future restoration.
- **Lowered water tables** as a result of land drainage, flood risk management and groundwater abstraction.
- **Pollution of groundwater supplies** through point source and diffuse entry, causing eutrophication.
- **Sea-level rise** resulting in saltwater flooding and saline intrusion.

4. Progress towards Lincolnshire BAP targets 2006-2011

Target details*	Progress 2006-2011	Status 31/03/2011	3rd edition targets
Establish a baseline for existing extent and condition of grazing marsh in Lincolnshire by 2012.	Some progress digitising HLS information and through 2010 habitat audit.	On schedule.	Amended and included in 3rd edition.
Maintain the extent of grazing marsh in Lincolnshire by 2015.	Lincolnshire Coastal Grazing Marsh Partnership facilitating this. No losses reported.	On schedule.	Amended and included in 3rd edition.
Restore 2000ha of former grazing marsh by 2015.	187ha in HLS to restore/maintain grazing marsh.	Behind schedule.	Amended and included in 3rd edition.

Expand the extent of grazing marsh by 1000ha by 2015 through creation at suitable sites.	130ha in HLS to create grazing marsh. At least 282ha created through CSS.	Behind schedule.	Amended and included in 3rd edition.

* targets were reviewed in 2009 therefore some may differ from those published in 2006

5. Objectives

- Maintain momentum of the reversed trend of loss: habitat creation in addition to sensitive restorative management of surviving habitat.
- Improve awareness amongst farmers and the public of the value of grazing marsh for biodiversity, flood alleviation and landscape character.
- Achieve the vision of the LCGM Partnership on suitable sites including sites outside of the project area.

6. Targets and actions 2011-2020

Target	Details
LIN3_GRZ_T01	Update the 2010 baseline by 2014 to include details of condition (as well as extent) of grazing marsh in Lincolnshire.
LIN3_GRZ_T02	No net loss of grazing marsh between 2011 and 2020 (based on 2010 figures).
LIN3_GRZ_T03	Restore 800ha of former grazing marsh by 2015, and a further 1200ha by 2020.
LIN3_GRZ_T04	Create 800ha of new grazing marsh by 2015, and a further 1200ha by 2020.

Action	Details	Target links	Partners	Action date
LIN3_GRZ_A01	Update the 2010 baseline as more information becomes available.	1	NE, LCGMP, LBP	2014
LIN3_GRZ_A02	Develop criteria for selecting grazing marsh as LWSs.	1	**LWS Panel,** LBP, LAs, LWT	2012
LIN3_GRZ_A03	In LCGM priority areas, target conservation management, restoration and recreation under Environmental Stewardship and other grant schemes.	2,3,4	**LCGMP**, FWAG, NE, LWT	Ongoing
LIN3_GRZ_A04	Where land in CSS has produced good results and agreements expire, prioritise these for entry into HLS to ensure continuity of management.	2,3	**NE**, FWAG, LCGMP	Ongoing
LIN3_GRZ_A05	Identify target sites in the Wash/ Fens area and initiate restoration and creation projects (using feasibility maps already produced).	3,4	**EA, LWT, RSPB, NE,** FWAG	2012

LIN3_GRZ_A06	Identify target sites in river floodplains and initiate restoration and creation projects (using feasibility maps already produced).	3,4	**EA, NE, LWT,** FWAG	2015

7. Further information

- The Lincolnshire Coastal Grazing Marshes Project, (2006) A Vision for the Future – opportunities for people and wildlife through protecting and restoring grazing land.
- Natural England HLS data on approved appropriate options.

Revised 2011

Roger Wardle (Farmland and Grassland BAP Habitat Group Chair), Catherine Collop (Lincolnshire Biodiversity Partnership), Caroline Steel (Lincolnshire Wildlife Trust).

Hedgerows and hedgerow trees

Summary

UK BAP
Hedgerows – priority habitat.

Current national trend
Fluctuating – probably stable.

Estimated Lincolnshire resource
Total resource unknown. 13,470km maintained/restored/planted since January 2000 through agri-environment schemes and cross compliance, plus 12.8km since 2006 through other projects and grants.

Lead Partner
Natural England

1. Introduction

Hedgerows are linear strips of shrubs and trees often associated with features such as ditches, banks and grass verges. They resemble woodland edge and scrub habitats and may contain relics of ancient woodland vegetation. This is especially so for ancient features such as parish boundaries and enclosure hedges pre-dating the main Parliamentary Enclosure Acts period in the 1600s and 1700s. The original functions of hedgerows were to mark parish territory and retain livestock. Over time, they have become important habitats in themselves – they are a primary habitat for at least 47 extant species of conservation concern in the UK, including 13 globally threatened or rapidly declining ones, more than for most other key habitats. They are especially important for butterflies and moths, farmland birds, bats and dormice: these and many other species are increasingly dependent on hedgerows for food, shelter, song posts, nesting sites and dispersal opportunities within intensively managed agricultural landscapes.

Hedgerow trees are also traditionally part of the UK landscape and provide additional benefits for wildlife together with the hedgerow, increasing the structural diversity of the habitat. Of an estimated 1.8 million hedge trees, nearly a third are over a century old and may disappear from the landscape at any time over the next 25 years so there is an immediate need to establish new hedgerow trees.

Hedgerows depend on appropriate active management for long-term survival and in its absence most would gradually decline and revert to lines of individual bushes and trees. The quality of habitat is strongly influenced by management regimes, adjacent land use and by the structure and species composition of the hedge. Species diversity is often related to age and, as with many habitats, ancient hedgerows are frequently more diverse than more recently planted ones.

Since 1945, there has been a dramatic loss of hedgerows in the UK, especially in the eastern counties of England. Neglect and indirect damage, for example from agricultural spray drift, have overtaken removal as the principal cause of hedgerow loss.

More recently, losses of hedgerows have been minimised by the Hedgerow Regulations 1997 (in England and Wales) and by cross compliance rules (introduced in 2005 as part of the Single Payment Scheme), which relate to cultivating or spaying near hedgerows, hedgerow cutting and hedgerow removal.

2. Current status in Lincolnshire

Hedgerows are found across the whole of Lincolnshire (though they are less widespread in parts of the coastal grazing marshes and the intensively farmed Fens). However, many kilometres of hedgerow – including many ancient boundary hedges – have been removed since the 1940s and the extent of interconnecting corridors has been much reduced. Mature native trees and valued historic remains, such as ditches and banks rich in biodiversity, have also been removed. Dutch elm disease caused the loss of large numbers of mature elm trees in hedgerows.

It is thought that most parishes still contain some ancient species-rich hedgerows, especially alongside old routes and trackways, woodland edges and undisturbed parish boundaries, but the majority of the county's hedges date from the Parliamentary Enclosure Acts period (17th-18th century) or are the result of recent planting.

Many of the hedges that do remain are no longer managed in the traditional manner as the labour-intensive practices of hedge-laying and coppicing have been replaced by mechanical trimming. Unless sympathetically performed, this can lead to gappiness and a decline in overall habitat quality.

Extensive planting of new/replacement hedges under agri-environment schemes and through other funding has reversed some of the past losses in length, but cannot compensate for the loss of species in ancient hedgerows.

Hedgerows are key to the survival of the brown hairstreak butterfly in Lincolnshire. This species is very rare in the county and reliant on well managed hedges with an abundance of blackthorn. The remaining colonies are highly geographically isolated and confined to the Bardney Limewoods, where Butterfly Conservation Lincolnshire Branch has been carrying out monitoring and habitat management. The species' recent recolonisation of Scotgrove Wood has been shown to have occurred along restored hedgerows; demonstrating the importance of this habitat as a wildlife corridor.

3. Threats in Lincolnshire

- **Over-frequent, too severe and badly timed cutting**. This risk has declined since the introduction of cross compliance and the extension of agri-environment schemes, but it can still be an issue.
- **Abandonment,** reflecting modern high labour costs and loss of traditional skills. In the absence of cutting or laying, hedgerows develop gaps and revert to a line of trees and shrubs, losing much of their biodiversity value.
- **The loss of hedgerow trees** through old age, neglect and removal is coupled with a general lack of recruitment of new trees due to mechanical cutting regimes.
- **Hedgerow and root damage** from ploughs, mechanical excavators, road improvements and the laying of service pipes. Lowered water tables make older or very young plants vulnerable in times of low rainfall.
- **Non–agricultural development.** Hedges are often removed in advance of a wide range of developments. The Hedgerow Regulations (1997) have helped to reduce or compensate for this but even when retained they are frequently degraded as a result of the altered environment.

- **Increased stocking rates** particularly of sheep, leading to hedgerow damage and the need to fence fields. The presence of fences reduces the agricultural necessity for hedge maintenance and so hastens their decline. Rabbits feeding on and undermining hedgerows can also be a problem, though it is difficult to prevent.
- **Contamination by pesticides and fertilisers.** Again, cross compliance rules have reduced applications of chemicals close to hedgerows, however, contamination by spray drift and over-spreading of fertilisers still remains a risk.
- **Introduction of non-native species/cultivars** threatens the genetic diversity of hedges by replacing local or native species with plants derived from genetic sources from abroad e.g. that flower at different times.

4. Progress towards Lincolnshire BAP targets 2006-2011

Target details*	Progress 2006-2011	Status 31/03/2011	3rd edition targets
Establish a baseline for the existing extent and condition of UK BAP hedgerows and hedgerow trees in Lincolnshire by 2012.	No resources available to undertake this.	No progress.	Amended and included in 3rd edition.
Maintain the current extent of ancient and species-rich hedgerows and hedgerow trees in Lincolnshire (based on the baseline figure from T01) by 2015.	No baseline available. 13,470km maintained/ restored/ planted since Jan 2000 through agri-environment schemes and cross compliance.	On schedule.	Amended and included in 3rd edition.
Achieve 75% of the resource under appropriate management by 2015.	% contribution unknown. But agri-environment and cross compliance resulting in improved management and natural infilling of gaps - expected to far exceed target.	On schedule.	Amended and included in 3rd edition.
Restore/re-create 100km per year of hedgerow and hedgerow trees.	1,450m hedgerow restored and 60 hedgerow trees with LWCS grant aid. 1341m hedgerows created through LCC Community Wildlife Grant. Plus 10km through LCC hedgerows grant. 13,470km maintained/ restored/ planted since Jan 2000 through agri-environment schemes and cross compliance.	Achieved.	Amended and included in 3rd edition.

* targets were reviewed in 2009 therefore some may differ from those published in 2006

5. Objectives

- To protect and restore remaining species-rich hedgerows and semi-natural features such as hedgerow trees and parish boundaries.
- To maximise the effectiveness of hedgerows as wildlife corridors by concentrating effort in areas where greatest gains will be achieved e.g. Lincolnshire Limewoods and Wolds Edge woodlands.

6. Targets and actions 2011-2020

Target	Details
LIN3_HDG_T01	Publish a report by 2016 on the extent and condition of hedgerows and hedgerow trees in Lincolnshire.
LIN3_HDG_T02	No loss of ancient or species-rich hedgerows or hedgerow trees in Lincolnshire between 2011 and 2015.
LIN3_HDG_T03	Reverse the unfavourable condition of over-managed hedgerows by increasing the length of hedgerows managed through agri-environment schemes by 5% by 2015 (based on 2010 data).
LIN3_HDG_T04	Restore/plant 75km of hedgerow including hedgerow trees by 2020.

Action	Details	Target links	Partners	Action date
LIN3_HDG_A01	Carry out a desk study to estimate the extent of the hedgerow resource in Lincolnshire; particularly ancient and/or species-rich hedgerows and trees (where possible).	1	**LBP**, FWAG, LAs, LNU, LWT, NE	2016
LIN3_HDG_A02	Monitor the use of Hedgerow Regulations at a local level and record hedgerow losses. Where road and other developments take place, replacement of hedges should be a requirement.	2	**LAs,** LWT, NE	Ongoing
LIN3_HDG_A03	Provide information and training on good practice in the establishment and management of hedgerows and hedgerow trees to farmers, landowners, land managers and contractors.	2,3,4	**FWAG**, **NE**, BTCV, LAs, LWCS, LWT	2015
LIN3_HDG_A04	Provide information and advice on grants for hedgerow restoration and creation.	3,4	**FWAG**, LAs, LWCS, LWT, NE, NFU	2015
LIN3_HDG_A05	Monitor the management of hedgerows; particularly those in agri-environment schemes.	3	**NE,** FWAG, NFU	Ongoing
LIN3_HDG_A06	Identify areas where the planting of new hedges can bring conservation benefits by linking other important habitats.	4	FWAG, LWCS, LWT, NE	2012
LIN3_HDG_A07	Ensure that key sites for the brown hairstreak are safeguarded and under appropriate management.	2,4	**BC, FC**, NE, LWT	Ongoing

7. Further information

- Bickmore, C. (2002) Hedgerow Survey Handbook. Defra, London.
- Lincolnshire County Council, (1994) Lincolnshire State of the environment Report.
- Rural Payments Agency, (2010) The Guide to Cross Compliance in England 2011 edition.
- Smith, P and Cawdell, P. *et al.* The Limewoods Brown Hairstreak Project 1994-2009*.* Unpublished data.

Revised 2011

Vanessa NcNaughton (Natural England), Catherine Collop (Lincolnshire Biodiversity Partnership).

Lowland calcareous grassland

Summary

UK BAP
Lowland calcareous grassland – priority habitat.

Current national trend
Decline in area and quality – this trend is repeated in Lincolnshire.

Estimated Lincolnshire resource
Approx. 400ha

Lead Partner
Lincolnshire Wildlife Trust

1. Introduction

In the UK calcareous grasslands develop on shallow, lime-rich soils derived from limestone and chalk strata. These grasslands are now largely found on topographic features such as escarpments or dry valley slopes, on road verges and disused quarries. They are typically managed as components of pastoral or mixed-farming systems.

The very rich flora of characteristic lime-loving plants makes the habitat important for a large range of invertebrates and a number of scarce and declining birds. Calcareous grassland is part of a mosaic of different habitats: scrub has always been part of this habitat, and its presence in small quantities is important in providing shelter and breeding sites for many species, but a balance must be achieved.

There is an estimated 33,000-41,000ha of lowland calcareous grassland in the UK[60]. It can be found in nearly every county, but is unevenly distributed, with 75% in Wiltshire. All calcareous grassland in Lincolnshire falls within the UK BAP definition of lowland calcareous grassland.

2. Current status in Lincolnshire

Calcareous grasslands in Lincolnshire are found on the lime-rich soils of the chalk Wolds and of the Jurassic limestone 'uplands'. The chalk is found in the Lincolnshire Wolds NCA; while the limestone forms part of the Kesteven Uplands and South Lincolnshire Edge NCAs, which stretch from Stamford in the south northwards to Lincoln, with a steep scarp slope defining the western edge. Outside this area the limestone forms a narrow ridge, again with a steep western scarp, north of Lincoln as part of the Northern Lincolnshire Edge with Coversands NCA. It has been estimated that more than 55% of chalk grassland and more than 35% of limestone grassland was lost from Lincolnshire between 1940 and 1995[61].

Until the middle of the 18th century, the chalk Wolds and limestone uplands probably had extensive areas of semi-natural grassland that were ancient in origin and rich in plants and animals. Drove roads up to 20m wide had wide verges, used for grazing and cut for hay. By the mid-19th century Lincolnshire was probably the leading agricultural county, with most of the land intensively cultivated. As a result calcareous grassland is now highly fragmented, although many wide road verges still exist. In recent years, loss of habitat has continued due to ploughing, re-seeding, agricultural

improvement, afforestation and cessation of grazing, leading to invasion by coarse grasses and scrub.

Survey work since 2005 has shown that past estimates of the remaining Lincolnshire resource[62] were underestimates: over 400ha have so far been identified by gathering together data from LWS surveys, Lincolnshire Wildlife Trust reserves and roadside verges in the Kesteven Uplands and South Lincolnshire Edge[63]. Life on the Verge surveys in 2009 and 2010 identified previously unrecorded grassland meeting LWS criteria, resulting in 40 new LWSs being proposed. It is expected that verge surveys elsewhere would yield similar results. 150ha of restorable grassland on RAF bases were also identified by the Project.

The majority of calcareous grassland sites within farmland are relatively small and scattered, many have no protection and most of the entire resource is at severe risk of grazing abandonment. Other calcareous grassland sites in Lincolnshire occur in old quarries and along road verges where management considerations are different from grazed grassland sites.

Road verges have suffered from lack of management as only in special cases (such as SSSIs and RNRs) are the entire width of the verge cut and the arisings removed. The partnership between Lincolnshire County Council and Lincolnshire Wildlife Trust to manage RNRs (formerly Protected Road Verges) has been an important factor in maintaining grassland quality (50 of 64 RNRs are on chalk or limestone).

Restoration and creation of calcareous grassland is taking place on and adjacent to nature reserves (for example at Red Hill nature reserve), roadside verges and on private land through Environmental Stewardship. There are many other areas that, with appropriate management, could be restored (for example on RAF land, see above).

3. Threats in Lincolnshire

- **Undergrazing and overgrazing** both affect species richness. Type and timing of grazing is also important. Undergrazing, or no grazing at all, has become common with the decline in sheep and cattle farming. Undergrazing leads to the development of coarse grasses and scrub with a loss of characteristic plants and invertebrates.
- **Decline in traditional livestock farming**, resulting in grassland being converted to arable.
- **Under- or over-management of roadside verges** – the majority of verges are managed primarily for road safety i.e. a 1.1m visibility strip is mown frequently throughout the summer, with few species able to flower and seed. The remainder of the verge is unmanaged, with the same effect as undergrazing.
- **Damage to road verges** – by farm and other vehicles, by service providers, dumping of ditch spoil, road repairs and road building, and unsympathetic tree planting.
- **Spray drift and fertiliser run-off** – the small size and linear shape of many sites makes them particularly vulnerable to pollution from these sources.
- **Resumption of quarrying** in disused sites and infilling of disused quarries where grassland has developed.
- **Overgrazing by rabbits** – very high populations can cause problems.

4. Progress towards Lincolnshire BAP targets 2006-2011

Target details*	Progress 2006-2011	Status 31/03/2011	3rd edition targets
Establish a baseline for existing extent and condition of calcareous grassland in Lincolnshire by 2010.	Significant proportion of existing resource identified through 2010 habitat audit. Still more information to be added.	Completed for this period.	Amended and included in 3rd edition.
Maintain the extent of calcareous grassland in Lincolnshire by 2015.	No losses reported. Life on the Verge Project contributing to improved management. Some maintenance through HLS – 7ha identified (maintenance) though may be more not picked up by reporting.	On schedule.	Target carried forward.
Achieve favourable condition on all calcareous grassland SSSIs and all Local Wildlife Sites in positive management by 2015.	Likely to be possible for SSSIs, less achievable for all LWSs – limited resources available to advise on/ influence management.	On schedule.	Amended and included in 3rd edition (two separate targets).
Expand the extent of calcareous grassland habitat by 150ha by 2015 through restoration and recreation at suitable sites.	25ha verges received restorative cuts. 34ha restoration near Pickworth. 14ha grazed at Grimsthorpe, plus 0.8ha scrub removal. 0.1ha scrub removal at RAF Barkston Heath. Total = 74ha. 55ha in HLS (restoration) identified in reporting.	On schedule.	Amended and included in 3rd edition.

* targets were reviewed in 2009 therefore some may differ from those published in 2006

5. Objectives

- To prevent further reduction in extent and quality of existing calcareous grassland sites.
- To re-create extensive areas of well-managed flower-rich calcareous grassland in appropriate areas: linking and buffering existing fragmented sites.
- To re-develop a network of well-managed flower-rich calcareous grassland alongside public highways on the chalk of the Lincolnshire Wolds and the limestone in the west of the county.

6. Targets and actions 2011-2020

Target	Details
LIN3_LCG_T01	Update the 2010 baseline by 2015 to include details of condition (as well as extent) of calcareous grassland in Lincolnshire.
LIN3_LCG_T02	No net loss of calcareous grassland in Lincolnshire between 2010 and 2015 (based on 2010 figures).

LIN3_LCG_T03	Achieve positive conservation management on all calcareous grassland SSSIs by 2015.
LIN3_LCG_T04	Achieve positive conservation management for 90% of calcareous grassland LWSs by 2018.
LIN3_LCG_T05	Expand the extent of calcareous grassland habitat by 275ha by 2015 through restoration and creation at suitable sites.

Action	Details	Target links	Partners	Action date
LIN3_LCG_A01	Complete survey of roadside verges, quarries and other potential LWSs on limestone in the Kesteven Uplands and South Lincolnshire Edge NCAs.	1	**LWT, NE,** LAs	2014
LIN3_LCG_A02	Complete survey of roadside verges, quarries and other potential LWSs on chalk in the Lincolnshire Wolds NCA.	1	**LWT, NE,** LWCS, LAs	2015
LIN3_LCG_A03	Complete survey of roadside verges, quarries and other potential LWSs on limestone in the Northern Lincolnshire Edge with Coversands NCA.	1	**LWT,** LAs	2018
LIN3_LCG_A04	Ensure all calcareous grassland SSSIs remain/ come into positive conservation management by providing advice and incentives e.g. via HLS.	2,3	**NE,** LCC, LWT	Ongoing
LIN3_LCG_A05	Ensure 90% of calcareous grassland LWSs are in positive conservation management by 2018 by providing advice and incentives e.g. via HLS and RNR scheme. Kesteven Uplands and South Lincolnshire Edge NCAs by 2016. Lincolnshire Wolds NCA by 2017. Northern Lincolnshire Edge with Coversands NCA by 2018.	2,4	**NE, LWT,** LAs, LWCS	2018
LIN3_LCG_A06	Develop by 2012 and implement by 2015 management regimes for calcareous grassland roadside verges – ensuring positive conservation management for those meeting LWS criteria.	2,4	**LCC, NLC, NELC, LWT**	2015
LIN3_LCG_A07	Restore 75ha of chalk grassland and 100ha of limestone grassland through improved management.	5	**NE,** LWT, LAs, FWAG	2015
LIN3_LCG_A08	Create 50ha of chalk grassland and 50ha of limestone grassland with priority given to buffering, linking or expanding sites meeting LWS criteria and sites of particular value to communities.	5	**NE, LWT, LAs**	2015

7. Further information

- English Nature, (1995) English Nature Grassland Inventory. English Nature, Peterborough.
- English Nature, (2004) Lowland Calcareous Grassland – A scarce and special habitat. English Nature, Peterborough.

Revised 2011

Mark Schofield (Lincolnshire Wildlife Trust), Catherine Collop (Lincolnshire Biodiversity Partnership), Caroline Steel (Lincolnshire Wildlife Trust).

[60] UK Biodiversity Group, (1998) Tranche 2 Action Plans. Volume 2 – terrestrial and Freshwater Habitats. English Nature, Peterborough.
[61] Lincolnshire Wildlife Trust, (1996) Nature in Lincolnshire. Horncastle.
[62] 50ha chalk grassland, 92ha limestone grassland in 1995: Lincolnshire Wildlife Trust, (1996) Nature in Lincolnshire. Horncastle.
[63] LBP biodiversity audit. Unpublished.

Lowland meadows

Summary

UK BAP
Lowland meadows – priority habitat.

Current national trend
Decline – this trend is repeated in Lincolnshire.

Estimated Lincolnshire resource
724ha

Lead Partner
Lincolnshire Wildlife Trust

1. Introduction

This action plan deals with permanent grassland occurring on neutral soils and retaining elements of semi-natural swards through less-intensive agricultural management. It covers grassland that is normally grazed (pasture) and sites where hay is still cut and the sward grazed before winter (meadow).

This action plan only refers to species-rich examples of grassland of high nature-conservation importance or areas that are restorable to such habitat. In non-agricultural settings, examples may be found on roadside verges, and in amenity areas or churchyards. Grasslands in such areas that do not fit this definition are covered in other plans for example churchyards and cemeteries, and parks and open spaces.

Unimproved neutral grasslands have declined dramatically across the UK since 1945. Only 3% of the unimproved neutral grasslands in lowland Britain present in 1930 still remain; most were lost through agricultural intensification[64]. It is estimated that there is less than 15,000ha of species-rich neutral grassland left in the UK[65]. Good examples of traditionally managed neutral meadows and grasslands are scattered across the country.

2. Current status in Lincolnshire

Meadow and pasture habitat was abundant across Lincolnshire in the past as part of mixed farming systems; and was especially notable in the Coast and Marshes, Central Clay Vale, Fens and parts of the Trent Vale. In the early part of the 20th century 34% of farmland in Lincolnshire was permanent pasture, dropping to 17% in 1965 and by 1996 this was estimated at 8%[66]. Of this, only a fraction remains as species-rich habitat meeting the BAP definition for lowland meadows and LWS criteria. Much of the county's permanent pasture occurs in its grazing marshes: most of this is not species rich and, where appropriate, it is covered by the grazing marsh action plan (see page 70).

The Central Clay Vale of Lincolnshire had numerous species-rich neutral grassland meadows within a mixed farming environment. Today, these meadows are scarce, often small and fragile due to fragmentation, and under threat from alternative uses. Other fragments are scattered throughout the county, including on roadside verges.

Neutral grasslands are particularly important for many species of farmland and grassland birds such as the barn owl *Tyto alba*, lapwing *Vanellus vanellus*, snipe *Gallinago gallinago*, quail *Coturnix coturnix*, yellow wagtail *Motacilla flava*, skylark *Alauda arvensis*, grey partridge *Perdix perdix* as well as wintering waders and thrushes. These grasslands are also considered important as feeding grounds for bats and other mammals such as brown hare *Lepus europaeus*.

Most of the richest meadows are designated as SSSIs or LWSs or are managed as nature reserves. Some sites that are not designated have been entered into agri-environment schemes to support the use of traditional management techniques; the remainder are very threatened with unsuitable management – including abandonment.

Road verges have suffered from lack of management, as only in special cases (for example RNRs) is the entire width of the verge cut and the arisings removed. The partnership between Lincolnshire County Council and Lincolnshire Wildlife Trust to manage RNRs (formerly Protected Road Verges) has been an important factor in maintaining grassland quality.

3. Threats in Lincolnshire

- **Agricultural change** from traditional to modern farming practices i.e. grazing and cutting for hay with little or no chemical input. Habitat loss or damage occurs through activities including ploughing; re-seeding; drainage; application of fertilisers/herbicides and pesticides (including avermectins, which affect dung communities and insect predators); under-grazing and over-grazing; shift from hay to silage production; supplementary livestock feeding; abandonment.
- **Under-/over-management of roadside verges.** The majority of verges are managed primarily for road safety i.e. a 1.1m visibility strip is mown frequently throughout the summer, with few species able to seed. The remainder of the verge is unmanaged, with the same effect as undergrazing.
- **Spray drift and fertiliser run-off.** The small size and linear shape of many sites makes them particularly vulnerable to pollution from these sources.
- **Development and urbanisation** resulting in direct habitat loss.
- **Damage to road verges** – by farm and other vehicles, by service providers, dumping of ditch spoil, road repairs and road building, and unsympathetic tree planting.
- **Inappropriate tree planting** leading to loss of habitat.

4. Progress towards Lincolnshire BAP targets 2006-2011

(Meadow and pasture HAP)

Target details*	Progress 2006-2011	Status 31/03/2011	3rd edition targets
Establish a baseline for existing extent and condition of meadow and pasture in Lincolnshire by 2010.	Significant proportion of existing resource identified through 2010 habitat audit. Majority of data come from LWS surveys so updates to be added.	Completed for this period.	Amended and included in 3rd edition under new HAP title.
Maintain the extent of meadow and pasture in Lincolnshire (based on 2010 data from Target 1) by 2015.	No losses reported. Some maintenance through HLS.	On schedule.	Target carried forward.

Achieve favourable condition for all meadow and pasture Local Wildlife Sites by 2015.	May not be possible for all LWSs – limited resources available to advise on/ influence management.	Behind schedule.	Amended and included in 3rd edition.

* targets were reviewed in 2009 therefore some may differ from those published in 2006

5. Objectives

- To prevent further reduction in extent and quality of existing lowland meadow sites, including roadside verges.
- To restore lowland meadow sites not currently meeting BAP criteria.

6. Targets and actions 2011-2020

Target	Details
LIN3_LME_T01	Update the 2010 baseline by 2015 to include details of condition (as well as extent) of lowland meadow in Lincolnshire.
LIN3_LME_T02	No net loss of lowland meadow in Lincolnshire between 2010 and 2015 (based on 2010 figures).
LIN3_LME_T03	Achieve positive conservation management on all lowland meadow SSSIs by 2015.
LIN3_LME_T04	Achieve positive conservation management for 90% of lowland meadow LWSs by 2020.
LIN3_LME_T05	Expand the extent of lowland meadow habitat by 65ha by 2015 through restoration and creation at suitable sites.

Action	Details	Target links	Partners	Action date
LIN3_LME_A01	Complete survey of potential LWSs on roadside verges on neutral soils.	1	**LWT, NE,** LAs	2018
LIN3_LME_A02	Ensure all lowland meadow SSSIs remain/ come into positive conservation management by providing advice and incentives e.g. via HLS.	2,3	**NE,** LWT	Ongoing
LIN3_LME_A03	Develop by 2012 and implement by 2015 management regimes for neutral grassland roadside verges which provide positive conservation management for those meeting LWS criteria.	2,4	**LCC, NLC, NELC, LWT**	2015
LIN3_LME_A04	Ensure 90% of lowland meadow LWSs are in positive conservation management by providing advice and incentives e.g. via HLS and RNR schemes.	4	**NE, LWT, LAs,** FWAG	2020
LIN3_LME_A05	Restore 25ha of lowland meadow, including roadside verges, through improved management.	5	**NE, LWT, LAs**, FWAG	2015

LIN3_LME_A06	Create 40ha of lowland meadow with priority given to buffering, linking or expanding sites meeting LWS criteria and sites of particular value to communities.	5	**NE, LWT, LAs**	2015

7. Further information

- UK Biodiversity Group, (1998) Tranche 2 Action Plans. Volume 2 – terrestrial and freshwater habitats. English Nature, Peterborough.

Revised 2011

Roger Wardle (Farmland and Grassland BAP Habitat Group Chair), Catherine Collop (Lincolnshire Biodiversity Partnership), Caroline Steel (Lincolnshire Wildlife Trust).

[64] UK Biodiversity Group, (1998) Tranche 2 Action Plans. Volume 2 – terrestrial and Freshwater Habitats. English Nature, Peterborough.
[65] UK Biodiversity Group, (1998) Tranche 2 Action Plans. Volume 2 – terrestrial and Freshwater Habitats. English Nature, Peterborough.
[66] Lincolnshire Wildlife Trust, (1996) Nature in Lincolnshire. Horncastle.

11. Heathland and peatland

Vision for Lincolnshire's heathland and peatland

- Existing heaths and lowland acid grasslands have been extended and are managed in a favourable way, with livestock where possible.

- Heathlands and lowland acid grasslands have been re-created on a landscape scale in areas where this habitat had become fragmented or lost altogether – corridors and stepping stones have been created, and core areas buffered.

- Remaining peatland habitats are protected and have been extended where possible, with management carefully planned to benefit priority species.

- Heathland, acid grassland and peatland sites are appreciated by the public as places to visit to relax and see wildlife.

- No further loss from the county of species that depend upon heathland, peatland and acid grassland habitats.

- All use of peat phased out by 2030 as outlined in The Natural Choice (public sector contracts by 2015; domestic use by 2020; and professional horticulture by 2030).

Introduction to heathland and peatland action plans

Lincolnshire's heathland and peatland resource stretches from the coversands in the north-west of the county, around Scunthorpe, to the fen-edge sands and gravels in Woodhall Spa. These little-known heaths form an extraordinary mosaic of heather, mire and inland sand dunes.

The peatlands of Lincolnshire have been extensively exploited in the past, but still remain rich in wildlife as well as ecological history. Raised bog in Lincolnshire is confined to the extreme north-west of the county in the Isle of Axholme: Crowle Moors and Epworth Turbary and Haxey Turbary are the remnants of the vast complex of moor, bog and fen that once surrounded the water-logged head of the Humber Estuary.

These habitats have been vastly reduced over the last century, with a falling water table, agricultural intensification, urbanisation, and extraction of sand, gravel and peat all playing a role. Recent conservation work through the Coversands Heathland Project (2001-2009) helped to reduce fragmentation of these habitats; populations of typical heathland species have been maintained and, in some locations, have strengthened their strongholds. There are a number of UK BAP priority species occurring on the heathland and peatland of Lincolnshire (including woodlark *Lullula arborea*, nightjar *Caprimulgus europaeus*, hazel pot beetle *Cryptocephalus coryli* and mire pill beetle *Curimopsis nigrita*). Reptiles such as adder *Vipera berus* and common lizard *Zootoca vivipara* are in decline in Lincolnshire and are increasingly confined to heathland and peatland habitats.

The aim now is to continue to reduce fragmentation, by extending areas of heathland and peatland and maintaining the existing habitat for the benefit of wildlife, whilst encouraging local communities to visit the sites and appreciate their value.

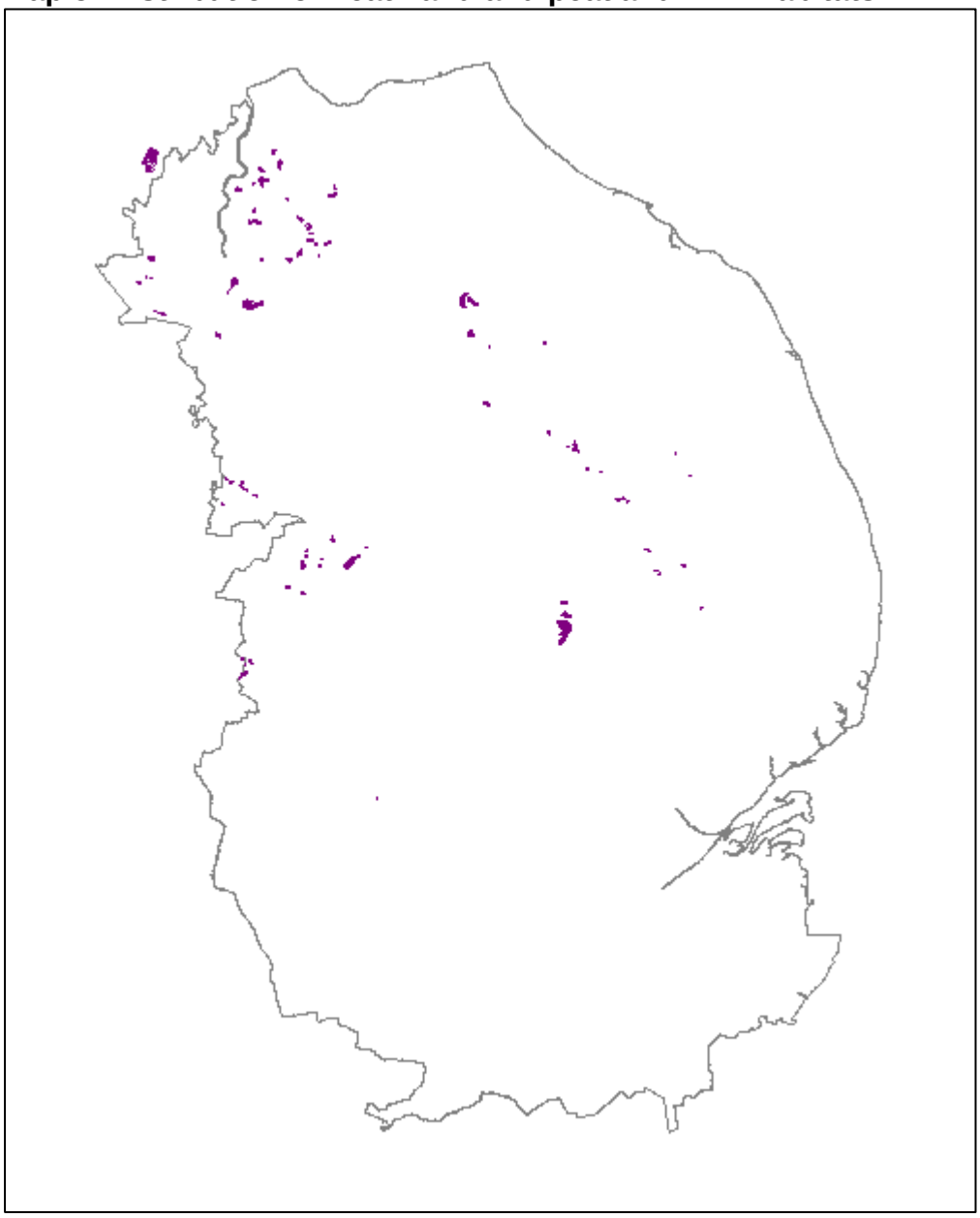
Selection of Habitat Action Plans[67]

Heathlands and peatlands in Lincolnshire tend to consist of mosaics of habitats, including lowland heathland, lowland dry acid grassland, lowland raised bog, pioneer birch woodland and elements of lowland calcareous grassland. The Coversands Heathland Project and Lincolnshire BAP 2nd edition addressed all of these habitats together; however, this did present problems when reporting actions against UK BAP priority habitats.

For this edition two action plans have been written: heathland and peatland habitats are still considered together, but lowland dry acid grassland is considered separately – more closely reflecting the UKBAP habitat definitions for lowland heathland, lowland raised bog, and lowland dry acid grassland. (Lowland calcareous grassland is considered separately in the Farmland and Grassland section – see page 80). Purple moor-grass and rush pastures may also be associated with these habitats; however they are not present in Lincolnshire in significant enough quantity to warrant having a separate HAP.

Habitat Action Plans:

Map 5: Distribution of heathland and peatland BAP habitats



Also see Appendix 4.

UK BAP species associated with Lincolnshire's heathland and peatland

Also see the Species section on page 171

		Heathland and peatland HAP	Lowland dry acid grassland HAP	Species Action Plan
Fossombronia foveolata	Pitted frillwort	✓		
Euphrasia anglica	Glandular eye-bright	✓	✓	
Lycopodiella inundata	Marsh clubmoss	✓		
Mentha pulegium	Pennyroyal	✓	✓	
Pilularia globulifera	Pillwort	✓		
Scleranthus annuus	Annual knawel	✓	✓	
Bembidion humerale	Thorne pin-palp	✓		
Cryptocephalus coryli	Hazel pot beetle	✓		
Curimopsis nigrita	Mire pill beetle	✓		
Harpalus froelichii	Brush-thighed seed-eater		✓	
Coenonympha pamphilus	Small heath	✓	✓	
Coenonympha tullia	Large heath	✓		
Hipparchia semele	Grayling	✓		
Plebejus argus	Silver-studded blue	✓		
Chrysis fulgida	Ruby-tailed wasp	✓		
Phaonia jaroschewskii	Hairy canary fly	✓		
Bufo calamita	Natterjack toad	✓		✓
Vipera berus	Adder	✓	✓	
Zootoca vivipara	Common lizard	✓	✓	
Alauda arvensis	Skylark	✓	✓	✓*
Anthus trivialis	Tree pipit	✓	✓	
Caprimulgus europaeus	Nightjar	✓	✓	
Carduelis cabaret	Lesser redpoll	✓		
Carduelis cannabina	Linnet	✓		✓*
Lullula arborea	Woodlark	✓	✓	

* Species is included in a grouped Species Action Plan.

[67] Also see section 6.1.2 Criteria for selecting HAPs and SAPs

Heathland and peatland

Summary

UK BAP
Lowland heathland – priority habitat.
Lowland raised bog – priority habitat.

Current national trend
Lowland heathland: increasing – this trend is repeated in Lincolnshire.
Lowland raised bog: fluctuating, probably declining.

Estimated Lincolnshire resource
Lowland heathland: approximately 140ha (plus areas in a mosaic with other habitats)
Lowland raised bog: approximately 190ha

Lead Partner
Natural England

1. Introduction

Lowland heathland is described as a broadly open landscape on impoverished, acid mineral and shallow peat soil, which is characterised by the presence of plants such as heathers and gorses. It is generally found below 300m altitude.

Good quality heathland consists of an ericaceous layer of varying heights and structures, plus some or all of the following additional features: gorse; wet heaths; bogs; open water; scattered trees; lichens; and areas of bare ground. Lowland acid grassland often forms a mosaic with dwarf shrub heath and is an integral part of lowland heathland landscapes (see the lowland dry acid grassland HAP). Lowland heathland is a dynamic habitat, which undergoes significant changes in different successional stages. In terms of distinguishing between lowland heathland and genuine acid grassland, less than 25% dwarf shrub cover should be considered acid grassland, and more than 25% cover should be assessed as heathland.

In this action plan, the term 'peatland' is used to refer to the UK BAP habitat, lowland raised bog, which is a particular feature of cool, rather humid regions in the UK. High groundwater tables or impermeable substrata result in waterlogging, providing anaerobic conditions which slow down the decomposition of plant material, leading to the production of peat. This habitat develops primarily in lowland areas such as the heads of estuaries, and characteristic vegetation is similar to that of wet heaths, but with bog mosses and cotton grasses being more abundant.

The presence and numbers of characteristic birds, reptiles, invertebrates, vascular plants, bryophytes and lichens are important indicators of habitat quality. Heaths and peatlands are important for curlew, nightjar, tree pipit and woodlark. The hazel pot beetle *Cryptocephalus coryli* is found at its most northerly known location on young birch on Lincolnshire heathland. Other rare and localised invertebrates include the bog bush cricket *Metrioptera brachyptera*; the ground beetle *Bembidion humerale*, the mire pill beetle *Curimopsis nigrita* and the scarce vapourer moth *Orgyia recens*.

In England there are around 58,000ha of lowland heathland, and 17,400ha lowland raised bog. Both habitats are protected under Annex 1 of the Habitats Directive.

2. Current status in Lincolnshire

Calluna/*Erica* dwarf shrub heath occurs in a mosaic with acid grassland in Lincolnshire on the Fen-edge sands and gravels in the Woodhall Spa area; on the Trent Valley sand and gravel deposits to the west and south-west of Lincoln; and on the coversands in the north-west of the county where blown sand has formed dune systems. Birch and oak scrub also forms an important element of the habitat for heathland birds and invertebrates.

The heathland soils are mostly free-draining, but in low-lying areas, or those with impeded drainage, pools and boggy conditions allow the development of wet heath vegetation characterised by the bog mosses *Sphagnum* spp., purple moor grass *Molinia caerulea*, cross-leaved heath *Erica tetralix*, cotton grasses *Eriophorum spp.* and rarer species like marsh gentian *Gentiana pneumonanthe*, bog asphodel *Narthecium ossifragum*, sundews *Drosera* spp. and deer-grass *Trichophorum cespitosum*.

The area of heathland in Lincolnshire has been drastically reduced in the last hundred years by agricultural intensification, afforestation, sand and gravel extraction and, in the case of the coversands, by ironstone mining and industrial and urban encroachment. There was an 88% loss between 1920 and 1995 (when 628ha remained). Of this surviving 628ha approximately 533ha was dry and 95ha wet heath. The Coversands Heathland Project (2001-2009) sought to help reverse these losses: carrying out restoration work on sites covering 953ha and re-creation work in 256ha (N.B. these figures are for heathland and acid grassland combined). Project Partners have an ongoing commitment, as part of the funding contract, to continue to manage the sites to maintain the heathland and acid grassland.

Lowland raised bog in Lincolnshire is confined to the extreme north-west of the county in the Isle of Axholme, where Crowle Moors and the turbaries at Epworth and Haxey represent remnants of the vast complex of moor, bog and fen that once surrounded the water-logged head of the Humber Estuary. These areas have been extensively dug for peat in the past, degrading the raised bog profile.

Though fragmented, most of the remaining heathland and peatland resource is protected by SSSI status and much of the rest is covered by other designations. The Humberhead Peatlands (including Crowle) are designated as a NNR. The Humberhead Levels Partnership is addressing the need for landscape scale conservation: many of the remaining sites are separated by distances of several kilometres; however, in places it is possible and indeed important to re-connect fragmented habitat through heathland re-creation and restoration. Isolated sites can be extended to create more viable habitat in larger blocks. For peatland sites, it is also important to provide hydrological buffering through lag fen and wetland creation. At the time of writing, the peatland SSSIs in the Isle of Axholme all have Water Level Management Plans in production.

3. Threats in Lincolnshire

- **Lack of grazing** due to the decline in livestock farming – leading to increasing dominance of coarse grasses, bracken, and invasion by scrub and trees.
- **Falling water table** – this is one of the principal factors leading to scrub invasion of open heath and peatland and the decline of wet heath and bog vegetation.
- **Peat extraction** – a review of peat extraction consents affecting Crowle Moors has revealed that a number of consents need to be revoked or amended to avoid an adverse effect on the integrity of the internationally important sites.

- **Agricultural intensification** – large areas of heath have been converted to arable land in the past. Agricultural intensification on adjacent land can also cause problems for both heathland and peatland habitats.
- **Afforestation** – large areas of heath were converted to conifer plantation in the latter half of the twentieth century.
- **Encroachment of development** – e.g. housing and industry around Scunthorpe.
- **Atmospheric pollution** – several declining heathland plants are known to be particularly susceptible to pollution.

4. Progress towards Lincolnshire BAP targets 2006-2011

2nd edition HAP also covered acid grassland (see separate HAP in this edition)

Target details*	Progress 2006-2011	Status 31/03/2011	3rd edition targets
Establish a baseline for existing extent and condition of heathland and peatland in Lincolnshire by 2010.	Coversands Project maps digitised and combined with data from 2010 habitat audit. Some further interpretation required.	Completed for this period.	Amended and included in 3rd edition.
Maintain the extent of heathland and peatland in Lincolnshire (based on 2010 figures) by 2015.	No losses reported. Ongoing management commitment from Coversands Project partners. 90ha in HLS (maintenance).	On schedule.	Amended and included in 3rd edition.
Achieve favourable condition (SSSIs) or appropriate management (LWSs) on 95% of sites by 2010.	Limited resources available to advise on/ influence LWS management.	Behind schedule.	Amended and included in 3rd edition.
Expand the area of managed heathland and peatland to buffer, extend or link existing habitats – 100ha created/brought into management by 2015.	Re-wetting works at Crowle Moor. WLMPs at Epworth and Haxey Turbaries. Additional sites being identified as opportunities arise. 175.5ha acid grassland and 13.1ha heathland in HLS (restoration).	Achieved but need greater proportion of heathland.	Amended and included in 3rd edition.

* targets were reviewed in 2009 therefore some may differ from those published in 2006

5. Objectives

- To maintain existing heathland and peatland sites in favourable condition.
- To increase the area of heathland and peatland BAP habitat through restoration and recreation.
- To link existing sites and reduce habitat fragmentation.

6. Targets and actions 2011-2020

Target	Details
LIN3_HPL_T01	Update the 2010 baselines for heathland and lowland raised bog in Lincolnshire to include details of condition (as well as extent) by 2012.
LIN3_HPL_T02	No net loss of heathland or peatland in Lincolnshire between 2010 and 2015 (based on 2010 figures).
LIN3_HPL_T03	Achieve positive conservation management by 2015 for 95% of heathland and peatland SSSIs and LWSs.
LIN3_HPL_T04	Expand the area of managed heathland and peatland to buffer, extend or link existing habitats – 100ha created/ brought into management by 2020.

Action	Details	Target links	Partners	Action date
LIN3_HPL_A01	Update the 2010 heathland and raised bog baselines with details of site condition/ management through desk study and survey.	1	**LBP**, LWT, FC, NE, NLC	2012
LIN3_HPL_A02	Conduct further survey to identify and assess habitat not included in the 2010 baselines, and identify potential sites for restoration.	1	LWT, NLC, WLDC, ELDC	Ongoing
LIN3_HPL_A03	Conduct surveys for key heathland and peatland species – particularly for under-recorded taxa and sites.	1	LWT, NE, LNU, YNU, T&HMCF	Ongoing
LIN3_HPL_A04	Implement WLMPs for Haxey Turbary and Thorne and Hatfield Moors (including Crowle Moor).	2,3	EA, LWT, NE, IDBs	2012
LIN3_HPL_A05	Where appropriate, implement grazing on nature reserves, SSSIs and LWSs where heathland and peatland habitats are represented.	2,3,4	LWT, FC, NE, NLC, ELDC, WLDC	2015
LIN3_HPL_A06	Monitor the success of WLMPs and modify if necessary.	2,3	LWT, NE, IDBs	Ongoing
LIN3_HPL_A07	Assess feasibility and, where appropriate/ possible, implement conservation management and recovery programmes for BAP species reliant on heathland and peatland.	3	LWT, NE, T&HMCF	Ongoing
LIN3_HPL_A08	Support golf courses with the management of their *Calluna* heath.	3	NLC, NE, ELDC, LWT, WLDC	Ongoing
LIN3_HPL_A09	Secure the re-creation and restoration of 100ha of heathland and peatland through extension of existing sites, implementation of WLMPs and restoration of worked peatlands.	4	NLC, LCC, WLDC, ELDC, NKDC, CoLC, FC, LWT, NE	2020

7. Further information

- English Nature, (2002) Lowland Heathland – a cultural and endangered landscape. English Nature, Peterborough.
- UK Biodiversity Group, (1998) Tranche 2 Action Plans. Volume 2 – terrestrial and freshwater habitats. English Nature, Peterborough.
- UK Biodiversity Group, (1999) Tranche 2 Action Plans. Volume 6 – terrestrial and freshwater species and habitats. English Nature, Peterborough.

Revised 2011

Catherine Collop (Lincolnshire Biodiversity Partnership), Andrew Taylor (North Lincolnshire Council).

Lowland dry acid grassland

Summary

UK BAP
Lowland dry acid grassland – priority habitat.

Current national trend
Declining (slowly).

Estimated Lincolnshire resource
Approximately 400ha (plus areas in a mosaic with other habitats)

Lead Partner
Natural England

1. Introduction

This habitat typically occurs on nutrient-poor, generally free-draining soils overlying acid rocks or superficial deposits such as sands and gravels. It often forms a mosaic with dwarf shrub heath (see heathland and peatland HAP); and this definition also includes occurrences of acid grassland on roadside verges.

High quality acid grassland contains a significant number of rare and scarce vascular plant species, and supports several species of birds of conservation concern, as well as many specialist invertebrates not found on other types of grassland. Acid grasslands can have a high cover of bryophytes and parched acid grassland can be rich in lichens. See the UK BAP habitat description for a more comprehensive list. (Also see list on page 92).

As with other lowland semi-natural grassland types, acid grassland declined substantially in the 20th century, mainly as a result of agricultural intensification. There are estimated to be around 20,000ha of lowland dry acid grassland in England.

2. Current Status in Lincolnshire

In Lincolnshire the distribution of acid grassland is much the same as heathland: it occurs on the Fen-edge sands and gravels in the Woodhall Spa area; on the Trent Valley sand and gravel deposits to the west and south-west of Lincoln; and on the coversands in the north-west of the county where blown sand has formed dune systems (these nationally rare relic sand dunes support inland populations of the sedge *Carex arenaria*).

There are major restoration opportunities in the Kirkby Moor Living Landscape area (see page 20); also near Scotton in North Lincolnshire, and in the Witham Valley Country Park south and west of Lincoln. Restoration of minerals sites also offers significant opportunities for BAP habitat creation.

3. Threats in Lincolnshire

- **Lack of grazing** due to the decline in livestock farming – leads to increasing dominance of coarse grasses, bracken, and invasion by scrub and trees.
- **Under- or over-management of roadside verges.** The majority of verges are managed primarily for road safety i.e. a 1.1m visibility strip is mown frequently throughout the summer, with few species able to seed. The remainder of the verge is unmanaged, with the same effect as undergrazing.

- **Agricultural intensification** – large areas of acid grassland have been converted to arable. Agricultural intensification on adjacent land can also cause problems for acid grassland.
- **Afforestation** – large areas of acid grassland have also been converted to conifer plantation in the latter half of the twentieth century.
- **Urbanisation and development** – e.g. much of the acid grassland in North Lincolnshire lies around Scunthorpe; in the emerging LDF for the area, Scunthorpe will be the focus for development.
- **Atmospheric pollution** – many plants and lichens of acid grassland cannot survive in areas of poor air quality.

4. Current conservation

There is an ongoing commitment from Coversands Project partners for the management of acid grassland sites that were part of the project. And across the county, 20ha of acid grassland are being maintained through HLS; plus a further 175ha are under restoration. Around 5.5ha of acid grassland are in a good condition at Kirkby Airfield; with plans for about 50ha of grassland to be restored under HLS into mosaics of acid/neutral/marshy grassland. As mentioned above, the most significant opportunities for acid grassland creation are through restoration of minerals sites – such conditions have been included when granting planning permission, for example in North Lincolnshire.

5. Objectives

- To maintain existing acid grassland sites in favourable condition.
- To increase the area of acid grassland BAP habitat in Lincolnshire through restoration and recreation.

6. Targets and actions 2011-2020

Target	Details
LIN3_AGR_T01	Update the 2010 baseline for acid grassland in Lincolnshire to include details of condition (as well as extent) by 2012.
LIN3_AGR_T02	No net loss of acid grassland in Lincolnshire between 2010 and 2015 (based on 2010 figures).
LIN3_AGR_T03	By 2015 achieve and maintain favourable condition (SSSIs) or appropriate management (LWSs) on 95% of sites.
LIN3_AGR_T04	Expand the area of managed acid grassland to buffer, extend or link existing habitats – 35ha created/brought into management by 2015 and a further 35ha by 2020.

Action	Details	Target links	Partners	Action date
LIN3_AGR_A01	Update the 2010 acid grassland baseline with details of site condition/ management through desk study and survey.	1	**LBP**, LWT, FC, NE, NLC, ELDC, CoLC, NKDC, WLDC	2012
LIN3_AGR_A02	Conduct further survey to identify and assess habitat not included in the 2010 baseline, and identify potential sites for restoration.	1	LWT, NLC, WLDC, ELDC	Ongoing
LIN3_AGR_A03	Create 20ha of acid grassland through land reclamation around Scunthorpe.	2,4	NLC	2012

LIN3_AGR_A04	Restore/ create 50ha acid grassland on other identified sites (including the Kirkby Moor Living Landscape area and Witham Valley Country Park).	2,4	LWT, NE, FC, CoLC, WLDC, NKDC	2020
LIN3_AGR_A05	Where appropriate, implement grazing on nature reserves, SSSIs and LWSs in which acid grassland habitats are represented.	2,3	LWT, FC, NE, NLC	2015
LIN3_AGR_A06	Seek to ensure that policies requiring acid grassland restoration of sand and gravel extraction sites are included in LDFs and Mineral Development Plan documents.	2,4	NLC, LCC, WLDC, ELDC, NKDC	2013
LIN3_AGR_A07	Assess feasibility and, where appropriate/possible, implement conservation management and recovery programmes for BAP species of acid grassland.	3	LWT, FC, NE, NLC	Ongoing
LIN3_AGR_A08	Secure the creation of 25ha of acid grassland through mineral and development planning conditions: Secure conditions by 2015. Complete re-creation by 2045.	4	NLC, LCC, WLDC, ELDC	2015
LIN3_AGR_A09	Develop by 2012 and implement by 2015 management regimes for lowland dry acid grassland roadside verges – ensuring positive conservation management for those meeting LWS criteria.	2,3	LCC, NLC, NELC, LWT	2015

7. Further information

- UK Biodiversity Group, (1998) Tranche 2 Action Plans. Volume 2 – terrestrial and Freshwater Habitats. English Nature, Peterborough.
- UK Biodiversity Group, (1999) Tranche 2 Action Plans. Volume 6 – terrestrial and freshwater species and habitats. English Nature, Peterborough.

Revised 2011

Catherine Collop (Lincolnshire Biodiversity Partnership), Andrew Taylor (North Lincolnshire Council).

12. Rivers and wetlands

Vision for Lincolnshire's rivers and wetlands

- Wetland management safeguards and improves habitat condition and benefits species. Over abstraction is not an issue.
- Opportunities to extend habitats and connect rivers with their floodplain are explored in all schemes.
- Lincolnshire rivers and wetlands are appreciated for their wealth of wildlife and other benefits.
- Throughout Lincolnshire is a network of large-scale dynamic, healthy, functioning wetlands – providing valuable ecosystem services.

Introduction to rivers and wetlands action plans

Of all the habitats in Lincolnshire the rivers and wetlands of the county have seen some of the most dramatic changes over the last few centuries. The great Fens that extended throughout several eastern counties and dominated the landscape of south-east Lincolnshire have been drained and converted to farmland, leaving just a small fragment of what was once one of Britain's richest wildlife habitats. This created a vastly modified landscape with an extensive network of drainage dykes and a uniform, canalised and maintenance-dependent waterway system. Many of the specialist animals and plants associated with the Fens are now considered rare and vulnerable. However, the extensive drains and dykes that have replaced wild fen are also of value for biodiversity; supporting water voles *Arvicola amphibius*, otters *Lutra lutra* and a wide range of other animals and plants, and providing habitat connections across the county.

Extraction of clay for brick and tile making and, more recently, of sand and gravel for the construction industry has left a series of water-filled pits. These man-made habitats, plus the coastal pits dug for clay to repair sea-banks after the 1953 floods, have produced a network of reedbeds and patches of open water, replacing some of the lost fen and marsh, providing habitat for bitterns and other reedbed specialists.

Rivers, canals and drains provide important linear habitats in Lincolnshire. The Witham (which runs its entire course in the county), the Welland and the lower reaches of the Trent are all important for biodiversity. Canals have become significant wetland habitats in their own right, and refuges for aquatic plants such as grass wrack pondweed *Potamogeton compressus* which is found in parts of the Grantham Canal. The chalk streams of Lincolnshire are also a significant biodiversity resource, with good numbers of both large and small chalk streams occurring in the Lincolnshire Wolds.

The wide range of wetland habitats in Lincolnshire supports an impressive array of species. The county is now a national stronghold for the water vole – a species that has declined rapidly throughout Britain. The upper Witham supports a nationally important population of white-clawed crayfish *Austropotamobius pallipes* and the otter *Lutra lutra* can now be found in all river catchments in the county. Lincolnshire is also important for wetland birds, with breeding bittern numbers increasing; and reservoirs and linear water habitats providing important havens for wintering wildfowl. The range of the greater water-parsnip continues to increase as a result of ongoing reintroduction and management work.

Healthy wetland habitats provide valuable ecosystem services; for example flood protection through their water storage capacity, and storage of carbon that would otherwise be released into the atmosphere and contribute to climate change. See section 2.2.1 for more detail. As described in the following action plans, there are significant opportunities in Lincolnshire for landscape scale wetland habitat restoration and re-creation.

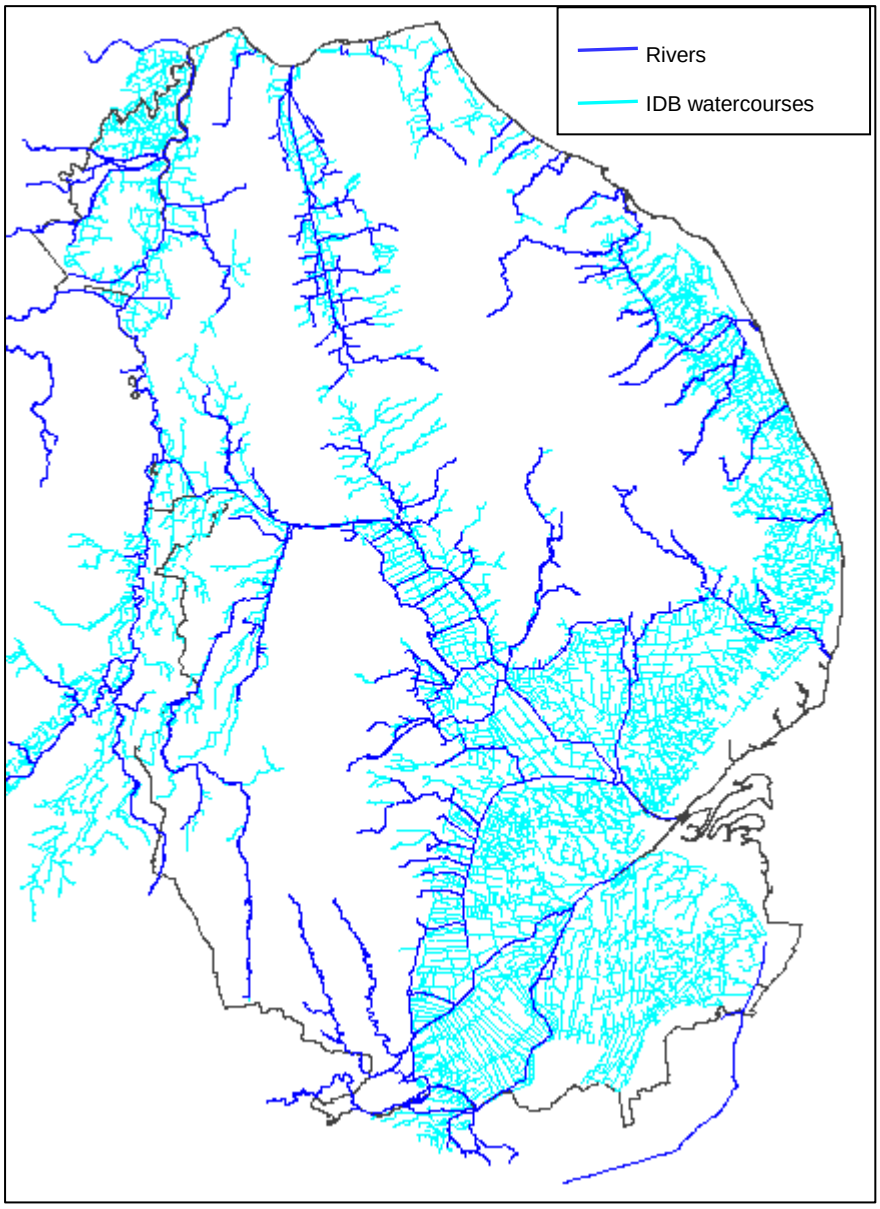
Selection of Habitat Action Plans[68]

The selection of HAPs reflects the wide range of wetland habitats in Lincolnshire and includes several national priority habitats (rivers, fens, reedbeds, ponds and eutrophic standing waters). A joint action plan for reedbeds and bittern was decided upon since most action for bitterns relates to having suitably large, quality reedbeds

for breeding and wintering birds. In addition to action plans for the UK BAP habitats that occur in Lincolnshire, action plans have also been written for locally important springs and flushes, and chalk streams.

Habitat action plans:

Map 6: Distribution of Lincolnshire watercourses



Also see Appendix 4.

UK BAP species associated with Lincolnshire's rivers and wetlands

Also see the Species section on page 171

		Chalk streams HAP	Fens HAP	Ponds, lakes and reservoirs HAP	Reedbeds and bittern AP	Rivers, canals and drains HAP	Springs and flushes HAP	Species Action Plan
Fossombronia foveolata	Pitted frillwort			✓				
Nitellopsis obtusa	Starry stonewort	✓		✓		✓		
Tolypella intricata	Tassel stonewort			✓		✓		
Tolypella prolifera	Great tassel stonewort			✓		✓		
Alisma gramineum	Ribbon-leaved water-plantain			✓		✓		
Pilularia globulifera	Pillwort			✓				
Potamogeton compressus	Grass-wrack pondweed	✓				✓		
Sium latifolium	Greater water-parsnip							
Pseudanodonta complanata	Depressed (compressed) river mussel			✓		✓		
Sphaerium solidum	Witham orb Mussel			✓		✓		
Omphiscola glabra	Mud pond snail			✓				
Bembidion quadripustulatum	Scarce four-spot pin-palp			✓				
Hydroporus rufifrons	Oxbow diving beetle		✓	✓				
Lipsothrix errans	Northern yellow splinter	✓				✓		
Bombus muscorum	Moss carder bee		✓		✓			
Bombus ruderatus	Large garden bumblebee		✓		✓			
Austropotamobius pallipes	White-clawed crayfish	✓			✓			✓
Saaristoa firma	a money spider		✓					
Lampetra fluviatilis	River lamprey	✓				✓		✓*
Petromyzon marinus	Sea lamprey	✓				✓		✓*
Anguilla anguilla	European eel	✓			✓	✓		✓*
Cobitis taenia	Spined loach	✓				✓		✓*
Osmerus eperlanus	Smelt	✓				✓		✓*
Salmo salar	Atlantic salmon	✓				✓		✓*
Salmo trutta	Brown trout and sea trout	✓				✓		✓*
Bufo bufo	Common toad			✓				
Triturus cristatus	Great crested newt			✓		✓		✓*
Natrix natrix	Grass snake			✓	✓	✓		
Emberiza schoeniclus	Reed bunting		✓		✓			✓*
Locustella naevia	Grasshopper warbler				✓			
Arvicola amphibius	Water vole	✓		✓		✓		✓
Micromys minutus	Harvest mouse				✓			
Pipistrellus pygmaeus	Soprano pipistrelle			✓		✓		✓*

* Species is included in a grouped Species Action Plan.

[68] Also see section 6.1.2 Criteria for selecting HAPs and SAPs

Chalk streams and blow wells

Summary

UK BAP
Rivers – priority habitat (includes chalk rivers).

Current national trend
Fluctuating, probably declining – this was the trend in Lincolnshire, but recent project work has arrested this.

Estimated Lincolnshire resource
80km (around 18 pure & mixed geology streams); ~16 blow well sites (though not all are active).

Lead Partner
Lincolnshire Chalk Streams Partnership

1. Introduction

Chalk rivers are fed from groundwater aquifers, producing clear waters and a generally stable flow and temperature regime. These conditions support a rich diversity of animals (including lamprey, brown trout, grayling and otter) and a characteristic calcicole (lime-loving) flora. Most may exhibit seasonal drying in their upper reaches due to lack of rainfall recharging the aquifer, but many also experience this due to drawdown due to abstraction pressure.

With approximately 35 main chalk rivers and major tributaries, England has the largest chalk river resource in Europe; corresponding with the distribution of chalk from Dorset to Kent, and up to Norfolk, Lincolnshire and Yorkshire; and reflecting the fact that chalk is an uncommon type of geology in the rest of Europe.

Blow wells are an unusual feature of the hydrogeology of north-east Lincolnshire. They are chalk-water springs occurring where high groundwater pressure has forced a flow path upward through the confining boulder clay and gravel[69]. Like chalk streams, blow wells also have characteristic associated flora and fauna, but their status as geological features make them worthy of protection in their own right.

Many chalk rivers and blow wells have suffered serious degradation due to physical modifications, unsustainable water abstraction, pollution, changes in land use, and from invasive non-native species. Nationally, some chalk rivers are designated as SSSIs. A few of these are SACs. There are no formal designations of chalk streams in Lincolnshire.

2. Current status in Lincolnshire

Lincolnshire has a number of chalk streams; including around 18 main-stem rivers such as the Great Eau, River Waring and the River Lymn, with perhaps twice as many again small tributaries such as Welton Beck, all of which rise in the Wolds. Some are located predominantly on chalk strata – ‘pure’ chalk streams, such as Waithe Beck – but most are ‘mixed geology’, rising from chalk springs, but running over other types of geology, such as sandstone: for example the River Lymn falls into this category.

Lincolnshire's chalk streams have been seriously degraded over the last century, in particular in the last 50 years, largely due to agricultural intensification. In spite of the scale of the county's chalk Wold uplands and designation as an Area of Outstanding Natural Beauty, none of the Wolds' chalk streams are currently formally designated as nationally or even regionally significant. In part, this is a result of degradation over a long timescale and because the 'mixed geology' nature of many also makes them less characteristic of the type-habitat.

There are around 16 sites with blow wells in Lincolnshire, from Barton-on-Humber to Fulstow, however, around half of these blow wells are no longer active. Blow wells in the form they occur in Lincolnshire are probably not found elsewhere in the UK. A national BAP species, the bryozoan *Lophopus crystallinus*, occurs at the Barton site. There is only one other site in the UK (in Oxfordshire) that is known to support this species. Restoration of modified or capped blow wells can offer opportunities for multiple benefits; for example through raising water levels to restore or create grazing marsh, or to meet Local Geological Site criteria.

3. Threats in Lincolnshire

- **Abstraction** from groundwater and rivers for public water supply, industrial use and irrigation has contributed to low flows. This can lead to streams drying out or to changes in aquatic vegetation, water quality and siltation, with knock-on effects on the resident fauna.
- **Physical modifications** such as existing impoundments for mills, or lake creation for fisheries. Land drainage and flood defence work may result in structural changes.
- **Catchment land use change** – a switch in farming practices from pastoral to arable can increase both nutrient input and siltation, also bringing pesticide residues into the habitat. Overgrazing on the remaining pasture can cause similar problems.
- **Climate change,** resulting in unpredictable swings in weather patterns, may affect the distribution of animals and plants within chalk streams through changes in water quality and quantity, but also via temperature-mediated responses.
- **Fish farming**, primarily for trout, leading to impoundment, enrichment of water through feeding and high stocking densities, potential introduction of non-native fish and diseases.
- **Invasion by non-native species** – invertebrates, such as signal crayfish *Pacifastacus leniusculus*, modify the resident fauna, directly through predation or indirectly via habitat modification. They also impact on the flora, in part as a knock-on effect from faunal changes. The rivers Bain and Lymn are both heavily infested. Invasion by non-native plants such as Himalayan Balsam *Impatiens glandulifera* can also modify habitat, flora and fauna.
- **Pollution**, including nutrients from sewage works and agriculture. This can lead to changes in plant and animal communities, generally resulting in dominance by flora and fauna adapted to exploit enrichment. Biomass may increase, but species diversity usually declines.

4. Progress towards Lincolnshire BAP targets 2006-2011

Target details*	Progress 2006-2011	Status 31/03/2011	3rd edition targets
Restore 80km of chalk streams through management by 2015.	Restoration work undertaken on 50km since start of project.	Ahead of schedule.	Amended and included in 3rd edition.
Restore 25 chalk springs (including blow wells) through management by 2015.	11 springs included in HLS agreements since start of project. EA invertebrate surveys of extant blow wells.	On schedule.	Amended and included in 3rd edition.

* targets were reviewed in 2009 therefore some may differ from those published in 2006

5. Objectives

- To maintain the current extent of chalk streams and blow wells in the county and to improve the habitat quality to benefit biodiversity.
- To continue to undertake monitoring work – both *ad hoc* and routine – to assess success of enhancement programmes and drive water quality improvements.

6. Targets and actions 2011-2020

Target	Details
LIN3_CHS_T01	Restore and enhance 90km of the physical habitat of chalk streams by 2020.
LIN3_CHS_T02	Restore and enhance 20 chalk springs or blow wells through management by 2020.

Action	Details	Target links	Partners	Action date
LIN3_CHS_A01	Maintain, restore and enhance the characteristic habitats and associated species of chalk streams in Lincolnshire by working with land managers.	1,2	**LCSP**, EA, FWAG, IDBs, LWT, NFU	2020
LIN3_CHS_A02	Monitor the impacts of site specific river/ riverside restoration schemes with pre- and post-scheme monitoring surveys.	1,2	**LCSP**, EA, IDBs	Ongoing
LIN3_CHS_A03	Ensure that development adjacent to, or directly impacting on chalk streams, springs and blow wells is minimised by advising civil engineering programs, developers and landowners in the planning stages.	1,2	**LAs**, EA, LCSP, LWT	Ongoing
LIN3_CHS_A04	Target Environmental Stewardship and other grants to benefit the management of chalk streams, springs and blow wells.	1,2	**NE**, FWAG, NLC, LCSP	2020
LIN3_CHS_A05	Deliver specific advice on river corridor and catchment management to riparian owners, land managers and fishery organisations and achieve practical enhancements of chalk streams and springs.	1,2	**LCSP**, EA	Ongoing

LIN3_CHS_A06	Promote the value of Lincolnshire chalk streams and raise awareness of their associated species and threats (target statutory agencies, landowners, angling groups, schools, community groups as well as the general public).	1,2	**LCSP**, LAs, EA, NE, LWT	2020
LIN3_CHS_A07	Collect monitoring survey information to identify where an abstraction is found to be damaging the quality of a chalk stream habitat and consider amending revoking or issuing time-limited water abstraction licenses.	1,2	**EA**, LCSP	Ongoing
LIN3_CHS_A08	Identify and map the locations of capped/intercepted blow wells.	2	**AW**, EA, FWAG, IDBs, LCSP, LWT	2012
LIN3_CHS_A09	Work with land owners/managers to restore the blow wells identified in A08.	2	**AW**, EA, FWAG, IDBs, LCSP, LWT	2020

7. Further information

- Environment Agency, (2004) A biodiversity action strategy for Anglian region.
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- Environment Agency, (2005) Desk Study on Lincolnshire Blow Wells.
- Environment Agency, (2005) Habitat Survey. Lincolnshire Blow Wells.
- Lincolnshire Chalk Streams Project, (2005) Chalk streams of Lincolnshire factsheet.
- UK Biodiversity Group, (1991) Tranche 1 Action Plans. English Nature, Peterborough.

Revised 2011

Ruth Snelson (Lincolnshire Chalk Streams Project), Richard Chadd (Lincolnshire Biodiversity Partnership), Catherine Collop (Lincolnshire Biodiversity Partnership).

[69] Berridge, N. and Pattinson, J. (1994) Grimsby and Patrington. Memoir for sheets E90, E91,E81 and E82. British Geological Survey.

Fens

Summary

UK BAP
Lowland fens – priority habitat.

Current national trend
Increasing from a very low resource position – this trend is repeated in Lincolnshire.

Estimated Lincolnshire resource
100-150ha (see LWT wetland audit 2010).

Lead Partner
Lincolnshire Wildlife Trust

1. Introduction

The term 'fen' can cover a variety of wetland habitats, including swamps, reedbeds, wet grassland and carr woodland. Fens may form deep peatlands of partly decayed plant material and receive water and nutrients from a variety of sources including rivers, springs, groundwater and rainfall.

Lincolnshire's remaining fenlands, the subject of this action plan, are primarily 'rich-fens' fed by mineral-rich calcareous water of pH5 or more, and consist mainly of aquatic plants, mosses, sedges, rushes, reeds and wet-grasses. Small areas of more acidic 'poor-fen' may also form in these areas, developing into 'raised mire,' dominated by sphagnum moss and in the past ling heathers (for example the historic West Fen near Coningsby). The largest areas of raised mire in Lincolnshire are found at Crowle in the Isle of Axholme and are covered in the heathland and peatland HAP (see page 93).

Fens, as part of larger wetland habitats, are of immense conservation value; supporting rare plants and animals, including greater water-parsnip *Sium latifolium* and the fenland diving beetle *Dytiscus dimidatus* – both specially adapted to, and reliant upon, this habitat for their survival. Fens are also important carbon dioxide sinks and banks, because of the way they capture and store organic material (carbon) derived from atmospheric gases. The estimated storage value of the River Witham peatlands is in the order of 2.4 million tonnes of carbon dioxide, which is equivalent to the annual output from 3-400,000 households. Fens may also provide a source of thatching material (reed and sedges); and they can be used for livestock; for recreational purposes; and as washlands for flood protection (for example at Baston and Hagnaby) and so have an increasingly important economic value.

In England there are estimated to be approximately 8,000ha of fen remaining[70]. Many sites are small and isolated. The habitat has declined dramatically throughout Europe in the past century and a large proportion of the surviving fen is thought to be in the UK.

2. Current status in Lincolnshire

Fen habitat was once extensive in Lincolnshire (up to 100,000ha) but is now rare. Most former fenland areas have been drained for conversion to intensive agriculture. Since the 17th century, approximately 99% of wet-fenland habitats in the Fens have been lost. Baston Fen (35ha) is one of the few, and largest remaining examples of this habitat.

The total fenland habitat resource in Lincolnshire (excluding large reedbeds – see the reedbed BAP) is estimated to be in the region of 100-150ha. Most areas of fen are small (less than 2ha) and fragmented, lying in the few poorly drained corners and margins of the county's river valleys. More extensive areas however, occur at Baston and Thurlby Fens (linked by the River Glen and Counter Drain to Willow Tree Fen, where habitat is being created), with additional small areas of fen at Hagnaby Lock and Boultham Mere. All of these sites are nature reserves and/or managed for biodiversity.

Sand and gravel extraction may provide significant opportunities to create additional areas of wet-fenland in the county. Good opportunities exist in abandoned pits at Baston and Langtoft in Deeping Fen; in the Trent Vale to the west and south-west of Lincoln; the Isle of Axholme; the lower Bain valley at Kirkby and Tattershall; and in a number of areas along the Fen-edge where rapid surface water run-off and spring lines from the high ground along the Wold- and limestone edge, meet the low, flat, slow-draining historic fenland.

The most significant fenland areas are notified as SSSIs: Baston Fen is also a SAC for its population of spined loach *Cobitis taenia*.

3. Threats in Lincolnshire

- **Lack of appropriate management** resulting in drying out of fenland habitats, scrub encroachment and natural succession to woodland.
- **Water abstraction** for public water supply and crop irrigation lowers the water table and disrupts river flow and springs.
- **Pollution of freshwater supplies** through siltation, toxic chemicals and eutrophication.
- **Sea-level rise and climate change** is predicted to result in the loss of further fenland habitats through excessive flooding of marginal aquatic plants through uncontrolled surface water run-off and 'tidal locking'.
- **Land drainage and conversion to intensive agriculture** have significantly contributed to loss of fenland habitats in the past. No longer a current threat, however food security issues could threaten future fenland restoration.

4. Progress towards Lincolnshire BAP targets 2006-2011

(Fens, swamps and wet reedbeds HAP)

Target details*	Progress 2006-2011	Status 31/03/2011	3rd edition targets
Establish a baseline for existing extent and condition of all fens, swamps and wet reedbeds of at least 0.5ha by 2008.	Some of existing resource identified through 2010 habitat audit. Majority of data come from LWS surveys so updates and other info sources to be added e.g. SSSI info.	Completed for this period.	Amended and included in 3rd edition.

Maintain the current extent of fens, swamps and wet reedbeds in Lincolnshire (based on 2008 figures) by 2015.	20ha fens in HLS (maintenance). No losses reported.	On schedule.	No equivalent target in 3rd edition.
For 95% of sites achieve favourable condition (SSSIs) or favourable management (LWSs) by 2015.	Difficulties reporting.	Behind schedule.	Amended and included in 3rd edition.
Expand the area of fens, swamps and wet reedbeds in Lincolnshire – 280ha by 2015.	22.45ha reedbed creation through HLS. 21ha reedbed planted at Alkborough.	Behind schedule.	Amended and included in 3rd edition.

* targets were reviewed in 2009 therefore some may differ from those published in 2006

5. Objectives

- To achieve large-scale fen habitat recreation – especially through the South Lincolnshire Fenlands initiative and wider partnerships.
- To create a county-wide network of well-managed fenland.

6. Targets and actions 2011-2020

Target	Details
LIN3_FEN_T01	Establish a baseline by 2012 for the existing extent and condition of all fens in Lincolnshire of 0.4ha or more.
LIN3_FEN_T02	Develop and promote two large-scale (100ha+) fen habitat exemplar sites with public access and interpretation by 2015.
LIN3_FEN_T03	Achieve positive conservation management by 2020 for 95% of SSSIs and LWSs with fenland habitats.
LIN3_FEN_T04	Expand the area of fenland in Lincolnshire – 1000ha total by 2020.

Action	Details	Target links	Partners	Action date
LIN3_FEN_A01	Develop an accurate baseline map with details of the extent and condition of the remaining fenland habitat in Lincolnshire.	1	**LBP,** NE, LWT, WESG	2012
LIN3_FEN_A02	Identify priority sites for habitat recreation and expansion.	1,2,4	**NE**, LBP, LWT, EA, IDBs	2012
LIN3_FEN_A03	Develop and promote a suite of fenland leaflets, booklets and other educational and promotional materials to engage with and inform landowners and the public of the value and heritage of Lincolnshire's historic, present and future fenlands.	2,3,4	**LWT**, EA, LAs, NE, IDBs	2013
LIN3_FEN_A04	Promote the maintenance of fenland habitats and encourage restorative management on appropriate sites where they occurred in the recent past.	1,2,3,4	**LWT,**NE, LCC	Ongoing

LIN3_FEN_A05	Continue to investigate the feasibility of large-scale fenland habitat recreation in partnership with flood defence and water resource needs in all Lincolnshire's fenland regions.	2,3,4	**EA,** AW, LWT, NE, LAs, RSPB, IDBs	2015
LIN3_FEN_A06	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.	2,3,4	**LWT**, RSPB, NT, EA, LAs, NE,	2020

7. Further information

- Holman, I./Cranfield University (2009) An estimate of peat reserves and loss in the East Anglian Fens. For RSPB, Sandy.
- Gauci, V. (2008) Carbon Balance and Offset Potential of the Great Fen Project. Open University
- UK Biodiversity Group, (1998) Tranche 2 Action Plans. Volume 2 – terrestrial and Freshwater Habitats. English Nature, Peterborough.

Revised 2011

Mark Tarttelin (Lincolnshire Wildlife Trust), Catherine Collop (Lincolnshire Biodiversity Partnership).

[70] Lead partner reporting on BARS website. See http://ukbars.defra.gov.uk.

Ponds, lakes and reservoirs

Summary

UK BAP
Eutrophic standing waters – priority habitat.
Ponds – priority habitat.

Current national trend
Declining slowly (eutrophic standing waters) – no evidence to suggest that this is repeated in Lincolnshire. Possible net gain.

Estimated Lincolnshire resource
2100-2400ha (see LWT wetland audit 2010).

Lead Partners
Natural England

1. Introduction

Standing open waterbodies comprise a range of habitat types, both natural and artificial. Ponds are generally defined as small bodies of water – between 1m^2 and 2ha in area – which hold water for more than four months in a year. Anything larger than 2ha is defined as a lake. Small ponds make up the majority of waterbodies in the UK.

Artificial stillwaters include reservoirs and ponds of many types[71] (fishing ponds, public amenities, supply reservoirs, etc). They also include ponds and lakes created by flooding of old industrial sites, such as quarries, gravel pits or old brick clay workings. Other stillwaters occur as a result of all manner of natural processes, including depressions created by glacial action or buckling of strata, exposure of aquifer surfaces, or fluvial processes, for example, ox-bows, where meanders are cut-off by sediment deposition. In addition to permanent waterbodies, ponds that seasonally dry out are important for a variety of species of conservation concern, adapted to ephemeral habitats.

Ponds have suffered a huge decline, with a loss of more than 75% over the last 100 years. The current number of ponds in the UK has been estimated around 400,000 (excluding garden ponds), with approximately 60% of these in lowland Britain. Many have suffered ecological decline due to agricultural intensification and urbanisation, resulting in eutrophication, physical destruction or poor management. Some have been severely damaged by introduction of invasive species, or overstocking with fish or wildfowl.

Stillwaters are of great importance for wildlife: around 3,500 of the UK's invertebrate species live in freshwater and up to half of these live in ponds. Over 60% of nationally rare invertebrates occur in ponds, as do 300 species of vascular plants, including half of the UK's wetland species. Larger stillwaters are of particular importance to bird life and many are commonly fringed by other important wetland habitats such as reedbed, fen, marshy grassland and wet woodland.

2. Current status in Lincolnshire

In Lincolnshire, most stillwaters are fully artificial or exist as a consequence of human activity. The extraction of clay for brick and tile making, lime quarrying and peat extraction in the 19th and early 20th centuries, and sand and gravel workings more recently, have left a legacy of water-filled pits. Most are small (but no less important for that), but several are substantial, with a particularly important series of large clay pits, now fringed with extensive reedbeds, along the Humber Bank from Barton to New Holland. Many clay and gravel pits and ornamental waters are now intensively used for recreation, including angling and water-skiing, and are consequently subject to varying degrees of disturbance. Many more have been infilled with domestic, agricultural or industrial refuse. Additionally, many new ponds have been formed by damming river systems or digging-out groundwater-fed wetlands to form fishing-ponds or duck decoys, but many are over-managed and of limited wildlife value.

Sand and gravel extraction has also created extensive wetlands on the Isle of Axholme, at Messingham south of Scunthorpe, to the west and south-west of Lincoln, on the Fen edge in the Tallington/Deeping area and in the Baston/Langtoft area, and in the lower Bain valley at Kirkby and Tattershall. These support nationally important communities of plants, invertebrates and birds.

FWAG, Natural England and other Partners have been instrumental in encouraging farmers to create new ponds, with many hundreds added. It is largely this activity that is likely to have resulted in a net gain in the county's valuable pond resource in recent years.

There are few large lakes and reservoirs in Lincolnshire. Some of these, the largest being Covenham Reservoir, are entirely artificial storage areas, with hard-engineered, steeply shelving sides with little marginal vegetation and hardly any invertebrate interest. They do, however, support large numbers of wintering wildfowl and other aquatic and waterside birds. Other reservoirs in Lincolnshire include agricultural reservoirs used for irrigation purposes, and balancing lakes, which are built to offset the effects of increased run-off from the development of land. Though of limited aesthetic appeal, agricultural water-storage areas, in particular, can be of significant conservation value. The value of balancing lakes depends largely on their design, but they can support aquatic communities of some value.

3. Threats in Lincolnshire

- **Neglect/lack of management** – leads to natural succession, resulting in silting, build-up of dead plant matter or overgrowth of vegetation. (In some cases this may not be classed as a threat, since some high-succession ponds and lakes may become shallow marshland, of conservation value in their own right).
- **Over-zealous clearance**, resulting in loss of habitats around the edge of waterbodies and/or over deepening of natural shallow-water habitats. Reedbed and swamp vegetation is often cleared during conservation work to maintain areas of open water. However, management should ensure that at least some of this important habitat is retained, as shallow or stagnant areas can be of national importance.
- **Direct loss of ponds** through development, drainage or infilling - probably the single largest cause of UK pond loss. Highly valuable very shallow ponds, perhaps no more than a few centimetres in depth, are frequently seen as of little value and consequently destroyed.
- **Damage and disturbance** caused by recreational use of waterbodies, including boating, overstocking with fish or wildfowl, over-enrichment by bait use and faecal input via stocked species, or physical disturbance.

- **Pollution** from many sources affects waterbodies. In urban areas many ponds receive rainwater runoff directly from roads and buildings. In more rural environments, siltation due to over tillage, and resultant contamination with pesticides and fertilisers, causes direct and indirect, acute and chronic toxic effects and eutrophication.
- **Reduced water supply** due to water abstraction and climate change causing waterbodies to dry out.
- **Introduced species** of flora and fauna can cause a range of problems including the loss of native aquatic species (see invasive non-native species action plan page 233).
- **Isolation** of ponds previously open to pasture or woodland, due to agricultural intensification or urban development, can disrupt ecological functioning e.g. amphibians unable to return to breeding habitat.
- **Lost opportunities** for habitat creation due to restoration of minerals extraction sites without taking biodiversity into account.

4. Progress towards Lincolnshire BAP targets 2006-2011

Target details*	Progress 2006-2011	Status 31/03/2011	3rd edition targets
Establish a baseline for existing extent and condition of standing open waterbodies over 100m^2 in Lincolnshire by 2008.	Some progress – approx. 1/3 of county mapped. Little info on condition available.	Behind schedule.	Amended and included in 3rd edition.
Maintain the current extent of standing open water in Lincolnshire (based on 2008 figures) by 2015.	No full assessment. No losses reported.	On schedule.	No equivalent target in 3rd edition.
For 95% of sites achieve favourable condition (SSSIs) or favourable management (LWSs) by 2015.	No full assessment. 300 ponds of high value maintained under HLS.	Behind schedule.	Amended and included in 3rd edition.
Create 200 new wildlife ponds and scrapes/flushes where appropriate on land of low conservation importance in Lincolnshire by 2015.	Three 7ha freshwater scrapes created on former arable land at Frampton Marsh. LMDB: new pond created as compensation for culverting at Golden Sands Holiday Park Mablethorpe – already colonised by water voles. New pond and wetland areas have been created through the LCC pond and wetland grant. 24 HLS agreements containing pond creation options since 2006.	On schedule.	Target carried forward.

* targets were reviewed in 2009 therefore some may differ from those published in 2006

5. Objectives

- To improve the condition in terms of flora, fauna and water quality of Lincolnshire's ponds, lakes and reservoirs.
- To create new wildlife ponds.
- To reduce the levels of pollution entering Lincolnshire's waterbodies.

6. Targets and actions 2011-2020

Target	Details
LIN3_PND_T01	Update the 2010 baseline for waterbodies in Lincolnshire by 2014 to include details of site condition (as well as extent).
LIN3_PND_T02	Achieve positive conservation management by 2020 for 95% of SSSIs and LWSs with ponds, lakes or reservoirs.
LIN3_PND_T03	Create 200 new wildlife ponds and scrapes/flushes where appropriate in Lincolnshire by 2015.
LIN3_PND_T04	Reduce diffuse input of nutrients and fertilisers to stillwater habitats by 2015 (compared to 2010).

Action	Details	Target links	Partners	Action date
LIN3_PND_A01	Use existing information (and carry out further surveys as necessary) to determine the condition of identified sites.	1	LBP, EA LAs, NE	2014
LIN3_PND_A02	Manage SSSIs and LWSs, in conjunction with landowners and managers, to ensure habitat is maintained and enhanced in accordance with each site's primary habitat/ species interest.	2	AW, EA, LAs, LWT, NE, WESG	2015
LIN3_PND_A03	Identify and promote sources of funding/ grants for pond creation and management.	2,3	**LAs**, BTCV, FWAG, LWT, LWCS, WESG	2015
LIN3_PND_A04	Implement habitat improvements/creation through maintenance and capital works schemes and minerals sites restoration.	2,3	**LAs,** AW, EA, FWAG, IDBs, NE	Ongoing
LIN3_PND_A05	Offer advice and encourage landowners, schools, parish councils, local authorities, community groups and the public to construct new ponds for wildlife.	3	**FWAG**, LWT, BTCV, IDBs, LAs, NFU	Ongoing
LIN3_PND_A06	Offer advice and encourage use of sediment runoff reduction technologies and techniques around existing ponds and lakes on agricultural land.	4	**FWAG**, EA, NE, NFU	2015

7. Further information

- UK Biodiversity Group, (1998) Tranche 2 Action Plans. Volume 2 – terrestrial and Freshwater Habitats. English Nature, Peterborough.

Revised 2011

Richard Chadd, (Lincolnshire Biodiversity Partnership), Catherine Collop (Lincolnshire Biodiversity Partnership).

[71] N.B. Garden ponds are covered in the gardens and allotments action plan in the urban section of the BAP.

Reedbeds and bittern

Botaurus stellaris

Summary

UK BAP
Reedbeds – priority habitat.
Bittern – priority species.

Current national trend
Reedbeds – increasing.
Bittern – Returning to 1950s peak levels: five-fold increase in occupied sites in last 10 years, more than 80 males located in 2009.

Estimated Lincolnshire resource
100+ha.
Bittern breeding population small and probably stable at 1-3 females annually.

Lead Partner
Lincolnshire Wildlife Trust

1. Introduction

Reedbeds are wetland habitats dominated by stands of common reed *Phragmites australis*, where the water table is at or above ground level for most of the year. Often occurring in association with other wetland habitats (for example wet woodland, ponds and lakes, rivers and drains, fens and marshes, and saline lagoons), they are of immense conservation value, supporting a range of species.

This action plan focuses on reedbeds and bittern, but attention should also be paid to other key reedbed species, all specially adapted to and reliant on this habitat for their survival. These include marsh harrier *Circus aeruginosus*, Cetti's warbler *Cettia cetti*, and bearded tit *Panurus biarmicus*; reedbeds also provide roosting and feeding sites for migratory species (including the globally threatened aquatic warbler *Acrocephalus paludicola*) and are used as roost sites for several raptor species in winter. Several Red Data Book invertebrates are also closely associated with reedbeds.

In England there are approximately 5200ha of reedbeds: while some linear reed stands along rivers can be quite extensive, many sites are small and isolated, and only around 50 sites are greater than 20ha in extent. The most significant reedbed areas are notified as SSSIs and many are also notified under the Ramsar Convention and as a SPA. However, in the wider countryside many reedbeds remain in poor condition for key species and in some cases they may be deteriorating if ongoing management is not being undertaken.

The **bittern** is a localised and rare breeding species in the UK. It is confined almost entirely to reedbed habitats, where it feeds principally on fish and amphibians. The UK population had declined to just 11 booming males at seven sites in 1997 from a peak of 70-80 booming males in the 1950s. Intensive study showed in most cases the decline was due to deterioration in habitat. Wetland creation and restoration for bitterns began in the mid-1990s, and the decline has now been halted and reversed, with 82 males booming in 2009.

However, there remains a discrepancy between the numbers of males and breeding females. In 2009, booming males were present at 43 sites, but nesting females only occurred at 18 of these, and the majority of chicks are produced at only three sites on the Suffolk coast. These sites are threatened by sea-level rise.

The bittern is listed on Annex 1 of the Birds Directive and Appendix III of the Bern Convention. It is protected in the UK under Schedule 1 of the Wildlife and Countryside Act. It is a Red List species and a UK BAP species.

2. Current status in Lincolnshire

In Lincolnshire reedbed is now frequently found fringing water-filled pits that occur as a result of extraction of clay for brick and tile making and for the manufacture of cement in the 19th and early 20th centuries, and more recent pits that are the legacy of sand, clay and gravel extraction. Linear stands of reeds also line many of Lincolnshire's waterways (around 650ha of growth is removed annually by Internal Drainage Boards in order to maintain water flow). Many IDBs are redesigning watercourses to include berms; these assist with conveyance and flood storage but also increase the extent of habitat and provide connectivity; normally berms colonise with reed.

The estimated reedbed resource in Lincolnshire is around 100ha. Most areas of reedbed are small and fragmented, however more extensive areas occur along the Humber Bank, from Barton to New Holland.

Bittern bred in the Fens and other parts of the county before drainage, but was extinct by the 1850s. The Humber bank clay pits were recolonised in the 1940s and the species bred here from 1949 to 1979, with up to 10 booming males present. Breeding began again in March 2000 at Far Ings Nature Reserve, and booming males have been present there and at other sites on the Humber Bank and North Sea coast every year since. However, chick survival, the most critical parameter for population increase, is not high nationally, and these sites are considered unlikely to be contributing to a population increase as yet.

Wintering and passage birds have been recorded at 19 sites in Lincolnshire since 2000, increasing from 3-4 in the early part of the decade to 10 in 2009. A core group of 6-7 sites appears to hold bitterns in most winters.

Sand and gravel extraction sites provide the main opportunities to create additional areas of reedbed in the county, with good opportunities for restoration of abandoned pits in the Isle of Axholme; at Messingham south of Scunthorpe; in the Trent Vale to the west and south-west of Lincoln; on the Fen edge at Tallington to Deeping Gate; and in the lower Bain valley at Kirkby and Tattershall. Other opportunities may arise through managed realignment schemes, Landscape Scale Project work, and work by IDBs.

3. Threats in Lincolnshire

<u>Reedbeds</u>

- **Lack of appropriate management** resulting in drying out, scrub encroachment and natural succession to woodland.
- **Sea-level rise due to climate change** is predicted to result in the loss of further reedbed habitat in coastal areas.
- **Pollution of freshwater supplies** to reedbeds through siltation, and by fertilisers, pesticides and heavy metals.

Bittern

- **Loss of suitable large reedbeds**
- **Reduced food availability**, especially of eels and small fish, affected by inappropriate habitat management and pollution.
- **Salt water intrusion** into coastal reedbeds, increasing water salinity and decreasing fish populations and **unseasonal freshwater flooding** (especially during the nesting season).
- Vulnerability to **severe winter weather.**
- **Small population size**. This is likely to continue to be a concern for some time, at least until further inland sites can be restored to a suitable condition. RSPB work has shown that it takes around 10 years for newly created or restored habitat to become suitable for breeding.

4. Progress towards Lincolnshire BAP targets 2006-2011

(Bittern SAP – see fens action plan, above, for 2nd edition reedbed targets)

Target details*	Progress 2006-2011	Status 31/03/2011	3rd edition targets
Establish the extent of suitable areas of breeding and wintering habitat for bittern (by 2010) and ensure these areas are managed favourably by 2015.	List of sites produced where bittern have bred/wintered in the past. Ongoing.	On schedule.	Amended and included in 3rd edition.
50% of sites identified in Target 1 with booming males or wintering birds by 2015.	Wintering and booming males regularly seen/heard.	On schedule.	Target carried forward.
Increase the breeding population in Lincolnshire to 10 booming males before the year 2010.	Fluctuates around 6.	Behind schedule.	Amended and included in 3rd edition.

* targets were reviewed in 2009 therefore some may differ from those published in 2006

5. Objectives

- To create a county-wide network of well-managed reedbeds and associated habitats capable of supporting key species.
- To establish areas in Lincolnshire, particularly inland, that provide suitable habitat for breeding bitterns, to allow an expansion in range and provide a safeguard against sea-level rise.

6. Targets and actions 2011-2020

Target	Details
LIN3_RDB_T01	Update the 2010 baseline for reedbeds by 2012 with details of condition, including extent of inland areas suitable for restoration or creation of breeding habitat for bittern.
LIN3_RDB_T02	Achieve favourable conservation management by 2015 for 95% of SSSIs and LWSs with reedbeds, and for sites newly created for bittern.
LIN3_RDB_T03	Increase the total area of reedbeds in Lincolnshire compared to 2010 figures – additional 500ha by 2020.
LIN3_RDB_T04	50% of suitable sites with booming males or wintering birds by 2015.
LIN3_RDB_T05	Increase the breeding bittern population in Lincolnshire to at least 5 sites with breeding females, 3 of them inland, by 2020.

Action	Details	Target links	Partners	Action date
LIN3_RDB_A01	Use existing information (and carry out further surveys as necessary) to determine the condition of identified sites.	1	**LBP,** LWT, RSPB, LWC, LWS Panel	2012
LIN3_RDB_A02	Identify priority sites for habitat creation and expansion (especially for the benefit of bitterns).	1,3,4,5	**RSPB,** LBP, LWT, NE	2012
LIN3_RDB_A03	Encourage the construction of reedbeds as a means of water treatment, including community and public facility use.	3	AW, EA, FWAG, IDBs, LAs, NE	2015
LIN3_RDB_A04	Produce assessments of the suitability and management for bitterns of occupied and unoccupied sites to identify the main features of each site and the principal actions required to improve or maintain them.	1,2	**LWT, NE**	2012
LIN3_RDB_A05	Monitor reedbed habitats, water quality and food availability at key bittern sites.	1	**LWT, NE**, LBP	Ongoing
LIN3_RDB_A06	Ensure management for bittern within designated reedbeds where appropriate.	2,4,5	**LWT**, NE, RSPB	2020
LIN3_RDB_A07	Survey all suitable reedbed sites annually for bittern activity. Ensure accurate recording of the presence of all breeding and wintering individuals throughout the county.	4,5	**LWT, NE, RSPB**, LBC, LBP	Annually
LIN3_RDB_A08	Ensure that any bittern corpses or addled eggs are analysed for presence of heavy metals and pesticides.	5	**LWT, NE, RSPB**	Ongoing

7. Further information

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Revised 2011

Anne Goodall (Lincolnshire Bird Club), Catherine Collop (Lincolnshire Biodiversity Partnership).

Rivers, canals and drains

Summary

UK BAP
Rivers – priority habitat.

Current national trend
The Water Framework Directive is focusing work to improve surface freshwaters (including lakes, streams and rivers).

Estimated Lincolnshire resource
Rivers: 1412km main river (Lincolnshire county).
Drains: IDB maintained > 5440 km.

Lead Partner
Environment Agency/ Lincolnshire County Council (as lead local flood authority)

1. Introduction

In their natural state, rivers are dynamic systems, continually modifying their form. However, in many cases, their ability to rejuvenate and create new habitat through natural processes has been reduced or arrested by flood-defence structures and impoundments. Canalisation, urban development, agricultural change and the removal of tree cover in historic times have resulted in changes in the frequency and magnitude of flooding; altering seasonal patterns of flows. In addition, flow regulation has altered patterns of sediment and nutrient transport in river systems.

The mosaic of features found in rivers and streams supports a diverse range of species. For example, riffles and pools support aquatic species; and exposed sediments such as shingle beds and sand bars are important for a range of terrestrial invertebrates, notably ground beetles, spiders and craneflies. Marginal and bankside vegetation support an array of wild flowers and animals. Watercourses can connect fragmented habitats in intensively farmed areas, and provide wildlife corridors utilised by species such as water voles and barn owls.

The definition for UK BAP-quality rivers is restricted to natural and near-natural running waters, headwaters, and those that support designated species. However, this action plan covers all of Lincolnshire's watercourses – natural, modified and man-made (excluding chalk streams – see page 105).

2. Current status in Lincolnshire

Lincolnshire has a wide variety of watercourses, ranging from completely artificial or greatly modified to largely semi-natural. Smaller watercourses near their headwaters tend to be the most semi-natural in appearance, such as small spring-fed becks, and streams running off the Wolds and the western limestone uplands. Here can be found swift-flowing, stony-bedded reaches – a scarce habitat that is of special importance for its fauna.

In contrast, much of lowland Lincolnshire is dominated by an arable landscape incorporating many largely or entirely man-made watercourses, many of which were constructed in the 18th and 19th centuries to facilitate transport of agricultural and industrial products. Since then, other semi-natural wetlands have been damaged or destroyed, leaving artificial waterways as important refuges for aquatic plants; two of

the key areas being the Isle of Axholme and the South Lincolnshire Fens. Some drain banks (particularly on calcareous soils) support diverse plant communities; and the Grantham Canal supports a rich aquatic flora. Also of importance for wildlife are the physically modified lower reaches of rivers such as the Trent, Nene, Witham and Welland.

Industrial and sewage pollution, although now very reduced, has had serious long-term effects on the fish and other aquatic life of rivers and streams. However, the hundreds of miles of existing waterway still support a considerable proportion of Lincolnshire's wildlife. Otters *Lutra lutra* are present in all of the county's river catchments, and Lincolnshire is one of the UK's strongholds for water vole *Arvicola amphibius*. The lower Welland is noted for its wintering waterfowl and passage migrants, and Cross Drain SSSI, in Deeping Fen, and Baston Fen SSSI on the Glen, are also noted for their rare plant and invertebrate communities.

Very few of Lincolnshire's waterways have any formal protection. The Water Framework Directive requires the delivery of "good ecological and chemical status" for all surface water bodies. Unfortunately, funding and powers for retrospective restoration are politically and financially limited. Improvement targets are largely aimed at long-term water quality objectives although some river restoration has taken place. All engineering works are now screened for environmental impact.

3. Threats in Lincolnshire

- **Water abstraction** for public water supplies and spray irrigation has a considerable impact on the county's rivers. Low flow (or even no flow) conditions lead to deoxygenation and a deterioration of water quality, and channel choking by flow-intolerant marginal vegetation. Following the Water Act 2003, all abstractors have a responsibility not to let their abstraction cause damage: from 2012 the Environment Agency will be able to amend or revoke abstraction licenses if they are causing serious damage to the environment.
- **Navigational and flood defence structures and impoundments** – these may be temporary or permanent structures which can prevent the local feeding and migratory movements by fish and invertebrates.
- **Land drainage and management.** In the upper reaches of rivers, interception of springs and the drainage of wet flushes and mires have considerably reduced the supporting 'soak' and 'trickle feed effect' to head waters.
- **Chemical enrichment and pollution (including sedimentation)** has an overriding influence on water quality, impacting on the aquatic flora and fauna present. Measures to reduce diffuse pollution have been promoted via catchment sensitive farming initiatives.
- Increased frequency of **ditch clearance** in response to flood risk concerns reduces the availability of marginal and in-stream vegetation habitats.
- **Development within the floodplain**. The Flood and Water Management Act 2010 encourages the use of SuDS and places a duty on local flood authorities to develop, maintain, apply and monitor a strategy for local flood risk management in its area. It is anticipated that this will lead to more holistic management and appropriate weight being given to flood-risk when preparing development plans and considering individual proposals for development.
- **Climate change** – species' distribution will be affected as climate change alters the characteristics of river systems; possibly including the spread of invasive, non-native species.

4. Progress towards Lincolnshire BAP targets 2006-2011

Target details*	Progress 2006-2011	Status 31/03/2011	3rd edition targets
Achieve favourable condition for all designated rivers, canals and drains by 2010.	No full assessment. Will be ongoing progress through WFD.	Behind schedule.	Amended and included in 3rd edition.
Restore 100ha of degraded floodplain by 2015.	Work at Willow Tree Fen.	Behind schedule.	Amended and included in 3rd edition.

* targets were reviewed in 2009 therefore some may differ from those published in 2006

5. Objectives

- To improve water quality, water resources and habitat diversity of key rivers, canals and drains and to maintain their current extent.
- To enhance the characteristic flora and fauna of Lincolnshire's rivers, canals and drains.

6. Targets and actions 2011-2020

Target	Details
LIN3_RIV_T01	31% of Lincolnshire's waterways achieving good or high ecological status/potential by 2021 (based on WFD objectives for Lincolnshire catchments).
LIN3_RIV_T02	Restore 150km degraded riparian habitat by 2020.
LIN3_RIV_T03	No net reduction in area of IDB managed drains (e.g. due to culverting) between 2011 and 2015.

Action	Details	Target links	Partners	Action date
LIN3_RIV_A01	Continue to implement appropriate channel maintenance and mitigation for capital works to ensure no net loss of biodiversity, and if possible biodiversity gains. e.g. minimise disturbance to channel bed and margins.	1,3	**EA,** BW, IDBs, NE	Ongoing
LIN3_RIV_A02	Ensure that water level management strategies take biodiversity into account e.g. re timing and volume of water.	1	**EA,** IDBs	Ongoing
LIN3_RIV_A03	Ensure the CAMS programme takes the needs of current wildlife sites and species into account; that data are collected on sites where issues need resolving; and a programme is put in place to resolve these issues (e.g. more water needed for new wetland creation).	1	**EA**, LWT, NE	2012

LIN3_RIV_A04	Work with anglers, fishing clubs, boat users and riparian owners to identify and address areas of bankside erosion (due to non-natural processes) and the associated impacts.	1,2	**EA**, NE, FWAG, GAAFFS, IDBs	2015
LIN3_RIV_A05	Target the most valuable/ vulnerable waterways for protection with buffer strips through agri-environment schemes.	1,2	**NE**, EA, FWAG, IDBs	Ongoing
LIN3_RIV_A06	Implement habitat improvements (including floodplain restoration) on the most suitable watercourses.	2	**EA,** BW	2015
LIN3_RIV_A06	Ensure protection of drains/ ditches within new developments and implement habitat improvements wherever possible. Avoid inappropriate culverting.	3	**LAs,** EA, IDBs	Ongoing

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Revised 2011

Chris J Manning, (Lindsey Marsh Drainage Board), Catherine Collop (Lincolnshire Biodiversity Partnership).

Springs and flushes

Summary

UK BAP
Local action plan only.

Current national trend
Declining.

Estimated Lincolnshire resource
150-200

Lead Partner
Environment Agency

1. Introduction

This plan deals with springs other than those on chalk (which are covered by the chalk streams and blow wells HAP – see page 105). In Lincolnshire, non-chalk springs predominantly rise from limestone strata.

These habitats are important in supporting invertebrate taxa adapted to a cool, low nutrient, high alkalinity environment. Such environments, and hence the associated species, are limited in distribution. Additionally, they support a rich bryophyte/ pteridophyte flora, broadly unique to this type of habitat. This flora, in turn, provides additional important habitats for invertebrates, for example the nationally notable hill soldierfly *Oxycera pardalina* is intimately associated with submerged mosses at spring heads, especially under scrub in hilly country, as found in western Lincolnshire.

Springs and their associated wet flush habitats, with their own important flora and fauna, have suffered a dramatic decline over the last century. Deterioration of these habitats has occurred primarily through abstraction of groundwater for domestic and industrial use; land drainage; contamination by nitrates and phosphates from agricultural fertilisers; and physical destruction of the habitat, including piping, culverting and digging-out for fish ponds.

2. Current status in Lincolnshire

Springs may be found throughout Lincolnshire, though most of the non-chalk ones are in the western half of the county, associated predominantly with the band of limestone running from Stamford in the south, through Grantham and Lincoln and meeting the Humber near Whitton. They form where underground water tables meet the surface (for example, where an aquifer is ‘perched’ on a hill) or by a hydraulic head of pressure, which forces water to spring from the ground. This may occur at almost any altitude, though at higher altitudes, the pressure tends to be lower and springs may dry out in high summer.

Springs have a profound effect on the surrounding waterlogged soils and the upper reaches of the watercourses they supply. The wet flushes which many springs support can often be without obvious spring heads, but where they remain these conditions support both typical (though increasingly less widespread) and rare bog and marshland plants and birds. The upper reaches of many watercourses which are

reliant on spring-flow conditions are also critical to such creatures as the native white-clawed crayfish *Austropotamobius pallipes* and brown trout *Salmo trutta*, as well as a range of headstream specialist invertebrates and plants.

Protection of spring sites currently lies largely in the hands of the Environment Agency and water companies through abstraction controls and ownership of a number of the more high-profile sites. The majority of smaller springs and flushes, however, have no protection and rely mostly on benign ownership. Many of these smaller springs have been altered to some degree: some have been partially degraded by insensitive dredging to create day ticket fisheries or to create a new wildlife pond. Where springs occur on agricultural land, efforts have often been made to drain them, culvert them or use them as piped supply for livestock.

Strategies for conservation and/or restoration of non-chalk springs should focus on education of relevant landowners (to preserve the relatively natural ones), removal of hard engineering (pipes, etc.) and reinstatement of surrounding scrub/woodland cover or less intensively managed pasture. All such strategies need to be supported by provision of monitoring data, which will largely be provided by the Environment Agency, and will also help to inform potential LWS designation.

3. Threats in Lincolnshire

- **Abstraction of groundwater** reduces the head pressure and therefore the flow to surface springs. The significance of this reduced flow depends on existing natural head pressure, timing and quantity of the abstraction, and the proximity of the abstraction point to the spring head.
- **Land drainage** on and around spring heads and their associated flushes was largely implemented between the 1950s and late 1970s, although some may still continue today. This has resulted in not only the loss of the springs but also significant areas of wet flush. Smaller springs and flushes that survive usually do so in a degraded condition or are vulnerable to the effects of surrounding land use, especially fertiliser run-off and spray drift. Close to built-up areas, disturbance of land by development may alter the hydrology, causing damage to springs.
- **Pollution of underground aquifers** – the Environment Agency estimates approximately two thirds of all groundwater is affected to some degree by fertilisers leaching into water-bearing rock strata. Increased enrichment of spring waters encourages algal blooms and the deoxygenation of water due to bacterial action. This may lead to the loss of light and oxygen sensitive plants and invertebrates. It is likely that many springs are also polluted by pesticides and spreading of organic matter, such as manure or abattoir waste.

4. Progress towards Lincolnshire BAP targets 2006-2011

Target details*	Progress 2006-2011	Status 31/03/2011	3rd edition targets
Produce a report on non-chalk springs in Lincolnshire by 2008.	Previously no resources to do this. Surveys began winter 2010/11.	Behind schedule.	Amended and included in 3rd edition.
Ensure no loss of springs and flushes within designated sites by 2015.	No full assessment. No losses reported.	On schedule.	Amended and included in 3rd edition.
Enhance 25 non-chalk springs and flushes through management by 2015.	Through stewardship. CAMS process prevents aquifers drying up. Proposals to be developed from results of T01.	Behind schedule.	Amended and included in 3rd edition.

* targets were reviewed in 2009 therefore some may differ from those published in 2006

5. Objectives

- To restore degraded spring systems, and maintain those that are currently relatively undamaged.
- To improve awareness of the value of springs and flushes and reduce abstraction pressure.

6. Targets and actions 2011-2020

Target	Details
LIN3_SAF_T01	Produce a report by 2014 on the ecological status of non-chalk springs in Lincolnshire.
LIN3_SAF_T02	No loss of springs and flushes that have been identified to be of significant conservation value between 2011 and 2015.
LIN3_SAF_T03	Enhance 30 non-chalk springs and flushes through management by 2020.
LIN3_SAF_T04	Develop an understanding among civil engineers, developers and landowners as to the risk of damage to hydrology of groundwaters by insensitive development (roads, buildings, etc) through provision of information/ advice.

Action	Details	Target links	Partners	Action date
LIN3_SAF_A01	Undertake survey work to develop an understanding of the ecology and conservation status of non-chalk springs in Lincolnshire. Produce a report.	1	**EA**, LBP, LWT, NE	2012
LIN3_SAF_A02	Through the CAMS and National Environment Programme processes ensure that all LWSs with springs and flushes are identified and their water requirements recognised and addressed. Data should be collected if necessary to inform these processes.	1	**EA**, AW, LAs, LWT	2012

LIN3_SAF_A03	Identify major sites in Lincolnshire and obtain management agreements to ensure that there is adequate protection and management of spring head and associated wet flush habitats.	2	**NE**, EA, AW, FWAG, LWT, LAs	2015
LIN3_SAF_A04	Maintain, enhance and restore habitat features that are of benefit to springs and flushes.	2,3	AW, EA, FWAG, IDBs, LAs, NE	2015
LIN3_SAF_A05	In the planning stages advise civil engineering programmes, developers and landowners on the merits of development sensitive to groundwater hydrology.	4	**LAs,** LWT, EA, NE, FWAG	Ongoing

7. Further information

- Environment Agency, (April 2004) A biodiversity action strategy for Anglian region.

Revised 2011

Richard Chadd (Lincolnshire Biodiversity Partnership), Catherine Collop (Lincolnshire Biodiversity Partnership).

13. Trees and woodland

Vision for Lincolnshire's trees and woodland

- Healthy woodlands are normal in Lincolnshire with a diverse range of species and age classes, glades, deadwood and other biodiversity-rich features.
- New native woodland is created using trees of local provenance with appropriate species for the relevant area of the county where possible.
- Relict/unmanaged traditional orchards, wood-pasture and parkland are protected, restored and managed for their biodiversity, historic and cultural value.
- Woodland management is productive and sustainable through support from Government grants and other funding, and meeting increased demand for local woodland products.
- The value of field-side and roadside groups of trees, and ancient and veteran trees is recognised and they are retained in the landscape.
- Core areas such as ancient woodlands have been buffered, and linked with habitat corridors and stepping stones.

Introduction to trees and woodland action plans

Just over 4% of Lincolnshire is covered by woodland, making it one of the least wooded counties in Britain. Here, as in much of lowland eastern England, the dominance of agriculture means that woodland is confined to those areas of least value for food production. In the process, woodlands have not just become reduced in extent but have also become more fragmented, even in those areas where substantial blocks remain.

There has not only been a reduction in the quantity of woodland but also in the quality. Many of the existing woods are former ancient woodland sites now given over to conifers or other non-native trees (PAWS), or are plantations on formerly non-woodland sites. When the figures are adjusted to include only ancient semi-natural woodlands, the figure drops to around 1% of the county's area.

Where significant areas of native woodland remain, they are of national importance for their biodiversity. There is a range of designated woodland sites across the county including alder-dominated woodlands along the southern edge of the Wolds; lime-dominated woodlands in the central clay vale (including Bardney Limewoods NNR – the only woodland NNR in the county); Wolds-edge woodlands; and a range of ash and oak woodlands on calcareous soils in the south-west of the county. These woodlands form the minimum base stock from which action to deliver real biodiversity benefits can spread. The restoration of ancient woodlands stocked with conifers – PAWS restoration – will also help to deliver these benefits, as will action to ensure appropriate management is carried out to maintain vibrant, wildlife-rich and economically valued woodlands. While, newly planted native woodland cannot be as species rich as ancient woodland, it plays a valuable role in reconnecting this fragmented habitat, and provides opportunities for people to experience and enjoy woodland. National guidelines now allow up to 20% non-native species to be incorporated into new native planting schemes to improve adaptability of new woodland to predicted future climate change.

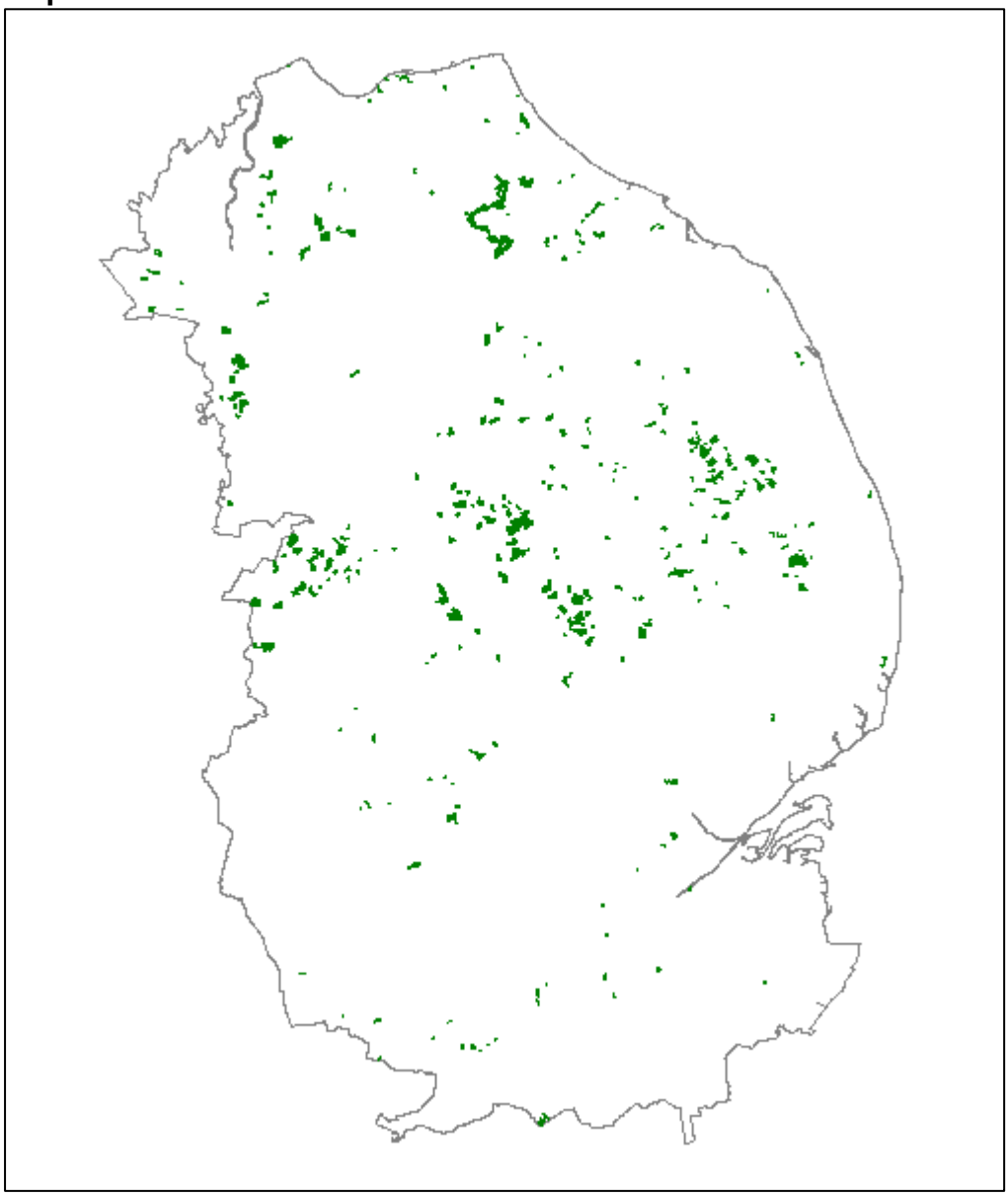
Lincolnshire's woodlands support a range of national BAP priority species, including a variety of woodland birds, and the brown hairstreak butterfly, for which a significant amount of management takes place in the Bardney Limewoods. Both chequered skipper *Carterocephalus palaemon* and dormouse *Muscardinus avellanarius* are confined to single woodland sites as part of official introduction projects related to the national SAPs for these species. Dormice however, have spread out significantly from the original release site, making use of connecting hedgerow and woodland habitat.

Selection of Habitat Action Plans[72]

The selection of HAPs reflects the distribution of woodland habitats in Lincolnshire. The 2nd edition Lincolnshire BAP included an Ancient Semi-natural Woodland HAP – this has now been expanded to include all lowland mixed deciduous woodland as covered by the UK BAP definition. Although the nature of the woodland plants and animals will vary according to the underlying geology and tree stand types, the threats are common to the full range of native woodlands and for brevity these individual stand-types will be considered together. Wet woodland still has its own HAP, and two new HAPs (wood-pasture and parkland, and traditional orchards) have been added.

Habitat Action Plans:

Map 7: Distribution of woodland BAP habitats



Also see Appendix 4.

UK BAP species associated with Lincolnshire's trees and woodland

Also see the Species section on page 171.

		Lowland mixed deciduous woodland HAP	Traditional orchards HAP	Wet woodland HAP	Wood-pasture and parkland HAP	Species Action Plan
Monotropa hypopitys hypophegea	Bird's-nest	✓				
Cryptocephalus coryli	Hazel pot beetle	✓				
Cryptocephalus sexpunctatus	Six-spotted pot beetle	✓				
Carterocephalus palaemon	Chequered skipper	✓				
Hamearis lucina	Duke of Burgundy	✓				
Limenitis camilla	White admiral	✓				
Satyrium w-album	White letter hairstreak	✓			✓	
Thecla betulae	Brown hairstreak	✓				
Lipsothrix errans	Northern yellow splinter			✓		
Formicoxenus nitidulus	Shining guest ant	✓				
Carduelis cabaret	Lesser redpoll	✓				
Coccothraustes coccothraustes	Hawfinch	✓				
Dendrocopos minor	Lesser spotted woodpecker	✓			✓	
Lullula arborea	Woodlark	✓				
Muscicapa striata	Spotted flycatcher	✓				
Passer montanus	Tree sparrow	✓				✓*
Phylloscopus sibilatrix	Wood warbler	✓				
Poecile montanus kleinschimdti	Willow tit	✓		✓		
Poecile palustris palustris/dresseri	Marsh tit	✓		✓		
Pyrrhula pyrrhula	Bullfinch	✓				✓*
Turdus philomelos	Song thrush	✓	✓	✓	✓	✓*
Barbastella barbastellus	Barbastelle	✓			✓	✓*
Muscardinus avellanarius	Dormouse	✓				
Nyctalus noctula	Noctule	✓		✓	✓	✓*
Pipistrellus pygmaeus	Soprano pipistrelle			✓		✓*
Plecotus auritus	Brown long-eared bat	✓			✓	✓*

* Species is included in a grouped Species Action Plan.

[72] Also see section 6.1.2 Criteria for selecting HAPs and SAPs

Lowland mixed deciduous woodland

Summary

UK BAP
Lowland mixed deciduous woodland – priority habitat.

Current national trend
Increasing.

Estimated Lincolnshire resource
13,000ha

Lead Partner
Forestry Commission

1. Introduction

Lowland mixed deciduous woodland, as covered by the UK BAP definition, includes woodland growing on the full range of soil conditions from very acidic to base-rich, and takes in most semi-natural woodland in southern and eastern England. Many are ancient woods; as such the aims and objectives of the 2nd edition Ancient Semi-Natural Woodland HAP have been incorporated into this action plan.

This habitat occurs largely within enclosed landscapes, usually on sites with well-defined boundaries. At least 80% of the canopy should comprise of species that are suited to the site and are within their natural range, taking into account both history and future climate change. ASNWs have been wooded continuously since at least 1600, and are composed predominantly of trees and shrubs native to the site that do not obviously originate from planting. They include woods that may have been managed by coppicing or pollarding in the past, as well as those where the tree and shrub layer has grown up by natural regeneration. PAWS are also ancient woodland, where the original native tree cover has been felled and replaced by planted trees, most commonly of a species not native to the site. Despite conversion to non-native plantations, many of the sites still contain some of the special wildlife associated with ASNW, especially along ride margins and wood edges. These sites are priorities for restoration to native broadleaved woodland.

2. Current Status in Lincolnshire

Woodland of all types in Lincolnshire today covers around 22,500ha, 12,944ha of which is mixed deciduous broadleaf woodland, including approximately 6,300ha of ASNW.

Lincolnshire lost most of its ASNW very early: by the time of the Doomsday Book the pattern of woodland distribution seen today was already established, with three concentrations remaining: the Bourne woods area on the Kesteven uplands; the Wragby to Woodhall Spa group (including the Limewoods) on the central Clay Vale; and the eastern Wolds edge on the Middle Marsh. Following this there was extensive felling for agriculture in the Victorian ‘high farming’ period. Since the 1940s/50s relatively little woodland has been cleared for farming in Lincolnshire but large areas have been converted to conifer plantation. There are many examples of PAWS with varying degrees of coniferisation. In recent years a process of restoration has begun, converting much of this plantation back to native broadleaved woods.

The distribution of lowland mixed deciduous woodland in Lincolnshire reflects the agricultural development of the county and the underlying geology, with woodland remaining on areas with heavy, difficult-to-work, clay soils.

See the 2nd edition action plan for a more detailed description of distribution of ancient semi-natural woodland.

3. Threats in Lincolnshire

- **Clearance/felling and conversion to other land uses**. This threat is reduced through the Felling Licence system, the UK Forestry Standard and UK Woodland Assurance Standard. The greatest threat is to small woods, which could be progressively removed without the need for a Felling Licence.
- **Overgrazing by deer and rabbits/hares** leads to a change in woodland structure, ground flora impoverishment and difficulties for regeneration. However, native deer are also an essential component of the woodland ecosystem.
- **Neglect/lack of appropriate management**. One reason for neglect or lack of appropriate management is the shortage of markets for the lower-grade woodland produce.
- **Loss of fringing grassland and woodland edge habitat.** Woodland edge habitat is valuable in its own right, but is also important as it provides a buffer between woodland and the adjacent land. Many woodland sites now have sharply defined edges with no ecotones.
- **Perception of woodland**. Owners often fail to recognise the importance of their woodland and often see woodlands as 'messy' and wish to take action to tidy the site.
- **Invasion by non-native species.** Colonisation by or replanting with non-native species can reduce the ecological value of ancient semi-natural woodlands in particular.
- **Near total loss of elm trees due to Dutch elm disease.** This disease has changed the structure and composition of many woods since the early 1970s and recurrences may still be affecting them. Elm is rarely eliminated, but is usually reduced to the status of an underwood species. Canopies opened by disease are susceptible to invasion by undesirable species.
- **Game rearing/shooting**. The regeneration and growth of ground flora, shrubs and trees can be inhibited or damaged by inappropriately sited pheasant release pens and straw-covered feeding rides.
- **Disease risk.** Diseases such as acute oak decline may play a part in the reduction of quality of some woodlands and in their species composition. There may be biosecurity issues in the future regarding visitors to these woodlands.

4. Progress towards Lincolnshire BAP targets 2006-2011

(Ancient Semi-Natural Woodland HAP)

Target details*	Progress 2006-2011	Status 31/03/2011	3rd edition targets
Undertake 100 surveys of woodlands to identify and determine ecological value of ancient semi-natural woodland not on the Natural England inventory by 2010.	Over 220 woodland LWSs selected since 2004, some of which passed under the criterion for ancient woodland not on the inventory. Need to compile list for next inventory update.	Achieved.	Amended and included in 3rd edition under new HAP title.
Restore 400ha of PAWS to appropriate native broadleaved woodland by 2015.	Around 200ha completed with a further 100ha underway.	On schedule.	Amended and included in 3rd edition.
Establish a further 25ha of new native woodland in the limewoods by 2015.	Over 120ha planted.	Achieved.	Amended and included in 3rd edition
Maintain the extent of ASNW in Lincolnshire identified on the NE inventory by 2015.	~364ha woodland in HLS (maintenance of native semi-natural woodland) ~257 of which is ASNW. Approx 1000ha ASNW is in EWGS. No known losses.	On schedule.	Amended and included in 3rd edition

* targets were reviewed in 2009 therefore some may differ from those published in 2006

5. Objectives

- To improve knowledge of the extent and condition of the current resource, particularly smaller sites.
- To restore targeted sites through management and planting using suitable species of local provenance.
- To encourage management of all lowland mixed deciduous woodland in Lincolnshire.

6. Targets and actions 2011-2020

Target	Details
LIN3_MDW_T01	Undertake 50 surveys of woodlands by 2020 to identify (and determine ecological value of) ASNW not on the NE inventory.
LIN3_MDW_T02	Restore 100ha of PAWS to appropriate native broadleaved woodland by 2020.
LIN3_MDW_T03	Establish a further 200ha of managed lowland mixed deciduous woodland by 2020.
LIN3_MDW_T04	No loss of extent or condition of ancient woodland sites (including PAWS) identified on the NE inventory between 2011 and 2020.

Action	Details	Target links	Partners	Action date
LIN3_MDW_A01	Identify and survey 50 woods to determine status and ecological condition – add to ancient woodland inventory as appropriate.	1	**LAs**, FWAG, LBP, LWT, LNU, NE	2020

LIN3_MDW_A02	Keep the 2010 baseline up to date with details of extent and condition of known woodland sites.	1	**LBP**, FC, LAs, LWT, WT	Ongoing
LIN3_MDW_A03	Promote the availability of grant money to encourage creation of native woodland, particularly adjacent to existing ASNW, linking areas of existing habitats, and through restoration of PAWS to native broadleaved woodland.	2,3	**FC, NE, WT,** FWAG, LWCS, LWT, NFU, LAs	2020
LIN3_MDW_A04	Where PAWS restoration is not an objective of the woodland owner, encourage management for biodiversity gains e.g. ride management, open habitats, structural diversity etc.	2	**FC, NE**, LWT	2020
LIN3_MDW_A05	Encourage management of all woodlands through promotion of increased markets and grant assistance where applicable.	2,4	**FC,** NE, LAs, LWT, LWCS, WT	2020
LIN3_MDW_A06	Assess deer populations and promote co-ordinated deer management to minimise impact of deer on woodland habitat.	4	**LDG,** FC, NE	2020
LIN3_MDW_A07	Ensure that all ancient woodland sites (including PAWS) on the NE inventory are retained for growing wood and not developed to the detriment of the woodland biodiversity and character.	4	**FC, LAs,** LWCS, LWT, NE	2020

7. Further information

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- Rackham, O. (1986) The history of the countryside. J.M. Dent & Sons Ltd, London.
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Revised 2011

David White (Forestry Commission), Catherine Collop (Lincolnshire Biodiversity Partnership).

Traditional orchards

Summary

UK BAP
Traditional orchards – priority habitat.

Current national trend
Declining - over 60% loss since 1950s.

Estimated Lincolnshire resource
124ha

Lead Partner
Natural England

1. Introduction

For the purposes of this action plan, traditional orchards are defined as groups of fruit or nut trees planted on vigorous rootstocks at low densities in permanent grassland, and managed in a low intensity way. This means little or no use of chemicals; relatively long-lived trees allowed to reach the veteran stage; and a permanent grass sward that is usually grazed by cattle or sheep, or cut for hay. The minimum size of a traditional orchard is defined as five trees, with crown edges less than 20m apart (planting density will depend on the species of tree).

Traditional orchards are composite habitats – defined by their structure rather than vegetation type – which can include trees, scrub, grassland, ponds, hedgerows and hedgerow trees. This mosaic of habitats makes traditional orchards important for a wide range of species: including mammals such as dormice, hares and bats; birds such as barn owls, woodpeckers, bullfinches, tree sparrows and thrushes; rare insects such as noble chafer and stag beetle; plants such as mistletoe; as well as a range of lichens.

Prime traditional orchard consists of grazed grassland with fruit trees of varying age and structure, with an abundance of standing and fallen dead and decaying wood. However, the potential interest of sites with fewer than five trees, such as relict orchards and individual trees within gardens is also acknowledged: where appropriate these sites should be considered as potential restoration sites.

There has been a 63% loss of orchards since the 1950s – this figure includes all orchards and does not differentiate between management types – anecdotal evidence suggests the loss of traditional orchards is higher than the overall figure of 63%.

2. Current status in Lincolnshire

Lincolnshire's orchards can be split into three categories:

- Large-scale orchards that were mainly planted on flat, fertile lands reclaimed from the sea, such as can be found around the towns of Holbeach, Boston and Spalding. Apples and pears were the principal fruits grown with most of the annual harvest transported by rail, and later on mainly by road, to wholesale markets in the Midlands and North.
- Smaller, more domestic-scale orchards typically of apples and plums, associated with farmhouses and larger country houses e.g. in the upland areas of the Wolds.
- A third category of orchards has recently emerged; those planted in the last 10 years, usually as community orchards, or on school grounds.

The Traditional Orchards Inventory[73], produced by PTES on behalf of Natural England, has identified 124ha of traditional orchards in the historic county of Lincolnshire based on aerial photograph interpretation. At the time of writing this information is in the process of being ground-truthed, but is nonetheless a useful mapped baseline to work from.

In the last fifty years many of the county's old orchards have been cleared to be replaced by arable crops; been developed for housing; or lost through neglect. A century ago Lincoln was surrounded by old orchards; of these, today just one old pear orchard on Cross O'Cliff Hill survives as a community orchard and nature reserve. There is also a well-established, traditionally managed orchard at Orchard House, Gunby Hall plus a number of smaller orchards (in need of restoration) elsewhere on the estate.

It is expected that agri-environment schemes will be the main mechanism for delivering restoration of traditional orchards and habitat creation.

3. Threats in Lincolnshire

- **Development** – orchards on the edge of settlements are prime locations for development, leading to direct loss of habitat.
- **Neglect/disuse** – without scrub control, tree management and additional planting, orchards become derelict and lose their biodiversity value.
- **Inappropriate grazing** e.g. with horses.
- **Agricultural subsidies** and cheaper imported fruit are disincentives for maintaining traditional orchards.

4. Current conservation

Cross O' Cliff orchard, which is owned and managed by Lincolnshire County Council with the help of local residents, is currently in HLS to fund a programme of restorative pruning and replanting.

Stamford Community Orchard Group is working to preserve Stamford's old orchards, establish new orchards, and rediscover old apple varieties. A community orchard was planted in 2008, and a nursery has been established on which to grow re-found varieties. The group holds annual Apple Days. In June 2011, the group won the Best Community Award in the Lincolnshire Environmental Awards.

Lea Park near Gainsborough planted a new community orchard in 2008.

Forty nine schools each planted at least three traditional apple trees via funding from Lincolnshire County Council in 2010. Two other schools each planted a traditional orchard in 2010, containing over 25 trees.

5. Objectives

- Determine the distribution and status/condition of Lincolnshire's remaining traditional orchards and bring them into positive management.
- Improve habitat connectivity and increase extent of traditional orchards across Lincolnshire.

6. Targets and actions 2011-2020

Target	Details
LIN3_TRO_T01	Establish a baseline by 2015 for the extent and condition of traditional orchards in Lincolnshire.
LIN3_TRO_T02	Achieve positive conservation management for 95% of LWSs with traditional orchards by 2020.
LIN3_TRO_T03	Create at least 9ha of new traditional orchards by 2020.
LIN3_TRO_T04	Improve awareness of the importance of traditional orchards by 2015.

Action	Details	Target links	Partners	Action date
LIN3_TRO_A01	Ground-truth the PTES orchard inventory data using publicity and local volunteers.	1	**PTES**	2015
LIN3_TRO_A02	Determine the condition of orchards by interpreting data collected by local volunteers.	1	**PTES**	2015
LIN3_TRO_A03	Facilitate at least 1ha of orchard restoration per year through HLS or other schemes.	2	**NE,** NT	Annually
LIN3_TRO_A04	Seek funding to facilitate the creation of 9ha of new traditional orchard by 2020.	3	Community groups, PTES, NE, NT	2020
LIN3_TRO_A05	Ensure that traditional orchards are recognised as a BAP habitat in need of protection within the planning system .	4	**LAs**	2015
LIN3_TRO_A06	Promote events to encourage wider awareness of orchards (e.g. annual Apple Day).	4	**All Partners**	Annually

7. Further information

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- East of England Apples and Orchards Project: www.applesandorchards.org.uk.
- Natural England, (2010) Technical Information Note TIN012 – Traditional orchards: a summary.
- Natural England, (2010) Technical Information Note TIN013 – Traditional orchards: site and tree selection.
- Natural England, (2010) Technical Information Note TIN018 – Traditional orchards: restoring and managing mature and neglected orchards.
- Natural England, (2010) Technical Information Note TIN020 – Traditional orchards: orchards and wildlife.

- Orchard Network (UK HAP delivery): www.orchardnetwork.org.uk/content/local-habitat-action-plans.

Drafted 2011
Catherine Collop (Lincolnshire Biodiversity Partnership), Fran Hitchinson (Lincolnshire Biodiversity Partnership).

[73] Burrough, A., Oines, C., Oram, S. and Robertson, H. (2010) Traditional Orchard Project in England – The creation of an inventory to support the UK Habitat Action Plan. Natural England Commissioned Reports, Number 077.

Wet woodland

Summary

UK BAP
Wet woodland – priority habitat.

Current national trend
Fluctuating – probably increasing.

Estimated Lincolnshire resource
~200ha

Lead Partner
Forestry Commission

1. Introduction

Wet woodland occurs on poorly drained and seasonally wet soils – on floodplains alongside rivers and streams, on fens, on mires and bogs and in wet areas of other woodland types. They can also occur on flushed slopes well above valley bottoms and on plateaux where a high water table is maintained throughout the year. Alder *Alnus glutinosa*, willow *Salix spp.* and birch *Betula spp.* tend to be the dominant species.

Wet woodlands have typically been managed as coppice in the past, but a large number have become neglected. Many have been lost during the course of drainage work on watercourses and surrounding farmland.

A large number of invertebrates are associated with alder, birch and willows, though some are now confined to just a few sites. Even quite small seepages may support craneflies such as *Lipsothrix errans* and the near endemic *Lipsothrix nervosa*. Dead wood in association with water provides specialised habitats not found in dry woodland types - the cranefly *Lipsothrix nigristigma*, for example, is associated with log jams in streams. The humid conditions also favour bryophyte growth; and wet woodland can provide cover and breeding sites for otters *Lutra lutra*.

2. Current Status in Lincolnshire

Wet woodlands in Lincolnshire fall into the following categories: springline alder woods found in the Wolds; wet woods on fen edge sands and gravels, such as the wetter areas of ancient woodland at Tattershall Carrs SSSI; recently formed wet woodland due to high water tables (particularly around old gravel workings or on former wet heathland); wet woodland around blow wells; and carr woodland bordering rivers.

See the 2nd edition action plan for a fuller description of the wet woodland types.

Finding opportunities for restoration/creation can be difficult: some opportunities arise as a small part of larger forestry schemes, and through Environmental Stewardship. However, the most significant contribution is likely to be through minerals sites restoration plans.

3. Threats in Lincolnshire

- **Clearance/felling and conversion to other land uses**. This threat is reduced through the Felling Licence system, the UK Forestry Standard and UK Woodland Assurance Standard. The greatest threat is to small woods, which could be progressively removed without the need for a Felling Licence.
- **Perceived low conservation value.** Wet woodland is commonly perceived as having limited value for conservation compared to other wetland habitats. This leads to management intervention to prevent wetlands from developing into woodland by natural succession.
- **Inappropriate management or lack of management** may lead to a loss of ground flora, shrub layer and prevent regeneration of trees.
- **Lack of opportunity for natural expansion of wet woodland**. There are few suitable sites for wet woodland creation, and sites are often used for agriculture, industrial or residential development instead, or are otherwise important for conservation as wetland sites. As such, wet woodlands often have sharply demarcated edges with no buffer zones to adjacent habitats.
- **Lowering of water tables** through drainage or water abstraction resulting in a change to drier woodland types.
- **Invasion or planting of non-native species**.
- **Rubbish dumping.**
- **Water pollution**, including nutrient enrichment, which changes the composition of the ground flora.

4. Progress towards Lincolnshire BAP targets 2006-2011

Target details*	Progress 2006-2011	Status 31/03/2011	3rd edition targets
Establish a baseline for existing extent and condition of wet woodland in Lincolnshire by 2010.	Significant proportion of existing resource identified through 2010 habitat audit and local knowledge. Info on condition still to be added.	Completed for this period.	Amended and included in 3rd edition.
Maintain the current extent of wet woodland as identified in Target 1 by 2015.	No full assessment. No losses reported.	On schedule.	Amended and included in 3rd edition.
Achieve favourable condition at 75% of identified wet woodland sites by 2015.	Grant schemes and advisory visits facilitating this. No full assessment yet of condition/ management.	Behind schedule.	No equivalent target in 3rd edition.
Expand the area of wet woodland in Lincolnshire – 25ha created by 2015.	19ha completed and a further 17ha underway. Plus future opportunities through minerals site restoration.	On schedule.	Amended and included in 3rd edition.

* targets were reviewed in 2009 therefore some may differ from those published in 2006

5. Objectives

- Determine the extent and condition of wet woodlands in Lincolnshire.
- To change the perception of wet woodland as not being a high priority for conservation.
- Improve management of all wet woodland in Lincolnshire.

6. Targets and actions 2011-2020

Target	Details
LIN3_WWO_T01	Update the 2010 baseline by 2015 to include details of condition (as well as extent) of wet woodland in Lincolnshire.
LIN3_WWO_T02	No net loss of wet woodland between 2010 and 2020 (based on 2010 figures).
LIN3_WWO_T03	Expand the area of wet woodland in Lincolnshire – 15ha restored/ created by 2020.

Action	Details	Target links	Partners	Action date
LIN3_WWO_A01	Update the 2010 baseline through desk study and survey work as new information on location, condition and composition becomes available.	1,2	**LBP,** FC, FWAG, LWT, LWCS, LAs, NE, WT	2015
LIN3_WWO_A02	Encourage the appropriate management of wet woodland through the provision of advice to wet woodland owners.	2	**NE,** FC, Limewoods Project, LWCS, LWT, WT	Ongoing
LIN3_WWO_A03	Seek opportunities to increase the extent of wet woodland in Lincolnshire e.g. through planning conditions and minerals sites restoration plans .	3	**LAs,** FC, LWCS, LWT, RSPB	Ongoing

7. Further information

- Forestry Commission, (1994) The management of semi-natural woodlands: 8 – Wet woodlands, Forestry Commission Practice Guides. Forestry Commission, Edinburgh.

Revised 2011

David White (Forestry Commission), Catherine Collop (Lincolnshire Biodiversity Partnership).

Wood-pasture and parkland

Summary

UK BAP
Wood-pasture and parkland – priority habitat.

Current national trend
Fluctuating - probably stable.

Estimated Lincolnshire resource
114.5ha at Grimsthorpe Park, 323ha at Belton Park, plus others – needs investigating. More than 80 parks have been created since the medieval period, though few now remain (Manning, 2006).

Lead Partner
Natural England

1. Introduction

Lowland wood-pastures and parkland are the remnants of historic land management systems, often dating back to the 10th century or earlier, where a long established system of grazing has allowed the survival of multiple generations of trees, characteristically with at least some veteran trees or shrubs. Typically they are associated with the remnants of the forests, chases and parks of medieval England, but even recently established parks may contain older trees derived from an earlier landscape.

The habitat represents a vegetation structure rather than a particular plant community; typically consisting of large, open-grown or forest trees (often pollards) at various densities in a matrix of grazed grassland, heathland and/or woodland floras. It is an important component of the English countryside; the continuity of land-use having created a habitat of significant cultural, aesthetic and wildlife value.

As per the UK BAP habitat description, this action plan includes:

- Lowland wood-pastures and parklands derived from medieval forests and emparkments, wooded commons, parks and pastures with trees in them. Some have subsequently had a designed landscape superimposed in the 16th to 19th centuries. A range of native species usually predominates amongst the old trees but there may be non-native species which have been planted or regenerated naturally.
- Parklands with their origins in the 19th century (or later) that contain much older trees derived from an earlier landscape.
- Under-managed and unmanaged wood-pastures with veteran trees, in a matrix of secondary woodland or scrub that has developed by regeneration and/or planting.
- Parkland or wood-pasture that has been converted to other land uses such as arable fields, forestry and amenity land, but where surviving veteran trees are of nature conservation interest. Some of the characteristic wood-pasture and parkland species may have survived this change in state.

It does not include parklands with 19th century origins or later with none of the above characteristics.

Unfortunately there are currently no reliable statistics on the extent of the overall UK resource, or on historical and current rates of loss or degradation.

Wood-pastures and parkland are particularly important for their ancient and veteran trees and associated distinctive saproxylic fauna and epiphytic flora. Such habitats are more abundant in Britain than elsewhere and considered outstanding at a European level. They are also of interest for bats, birds and fungi and may preserve tree genotypes.

Ancient trees:

- Are trees, which by virtue of their great age and physical condition, are of exceptional value biologically, aesthetically or culturally in the landscape or for wildlife.
- Physical attributes include extensive hollowing of the trunk; other cavities and associated decay fungi; large amounts of dead wood in the crown; general very knarled appearance.
- Trees in the mature/third or final stage of life.
- Trees that are old relative to others of the same species.

Veteran trees:

- They will generally include old trees but also younger, middle aged trees where premature aging characteristics are present.

2. Current status in Lincolnshire

Lincolnshire has a rich heritage of parks with over 80 listed[74] however no reliable baseline exists for the full extent and condition of Lincolnshire's remaining wood-pasture and parkland.

The best known of Lincolnshire's parks is Grimsthorpe Park (SSSI), established on the site of a former Cistercian Abbey in 1536. In addition, Belton Park (established before 1656 and with 500-year-old trees present) is the 11th most important site in the East Midlands for saproxylic beetles and is second only to Grimsthorpe Park in Lincolnshire, though is not statutorily designated.

The longest established park may have been Irnham Park, which was emparked for nearly 700 years. Some other parks are still visible as landscape features; with the pale (deer park boundary) of Goltho mostly intact. Others only have historical records as their legacy, perhaps with an assemblage of ancient trees.

3. Threats in Lincolnshire

- **Skewed age structure** with a lack of younger generations of trees and no continuity of dead wood habitat and loss of associated species.
- **Loss of veteran trees through disease** (e.g. oak dieback), physiological stress, and competition with younger trees.
- **Loss of veteran trees** and dead wood through perceptions of safety and tidiness where sites have high amenity use; forest hygiene; the supply of firewood; or vandalism.
- **Damage to trees and roots** as a result of soil compaction and erosion due to trampling by livestock and people, car parking, machinery.
- **Isolation and fragmentation** of the remaining parklands and wood-pasture sites in the landscape.
- **Pasture loss** through conversion to arable and other land-uses; improvement through reseeding; deep ploughing; and/or fertiliser and other chemical treatments.
- **Inappropriate grazing levels.** Under-grazing leads to loss of habitat structure through bracken and scrub invasion; and over-grazing results in bark browsing,

soil compaction, and loss of nectar plants and the next generation of young trees. The grazing may be from domestic livestock or wild deer.
- **Loss of traditional rural practises** i.e. pollarding, coppicing and hedgelaying.
- **Changes to groundwater levels** due to abstraction, drainage, development and climate change.
- **Pollution** derived either remotely from industry and traffic, or locally from agro-chemical application, and nitrogen enrichment from pasture overstocking, causing damage to epiphyte communities and changes to soils.

4. Current conservation

There are currently 11 ELS/HLS agreements containing maintenance of wood-pasture and parkland, cumulatively accounting for 206ha. A further seven ELS/HLS agreements containing options for re-creation of wood-pasture cumulatively account for 186ha.

There are plans to convert some arable land to wood pasture on the Ancaster Estates farms as well as in Grimsthorpe Park. They form part of a management plan initiated by the Grimsthorpe and Drummond Castle Trust Ltd and some of the conservation management will be supported by HLS funding.

In 2008 an assessment was carried out on the Belton Park National Trust estate of the assemblages of saproxylic invertebrates to assess their condition and whether appropriate management practices were in place.

English Heritage has a Register of Parks and Gardens of Special Historic Interest, which includes designated sites in Lincolnshire. Whilst historic parks and gardens are not statutorily protected, local planning authorities should protect registered parks and gardens in preparing development plans and in determining planning applications. The effect of proposed development on a registered park or garden or its setting is a material consideration in the determination of a planning application.

5. Objectives

- Determine the extent and condition of Lincolnshire's surviving wood-pasture and parkland.
- Improve condition and increase extent of wood-pasture and parkland.

6. Targets and actions 2011-2020

Target	Details
LIN3_WPP_T01	Establish a baseline by 2013 for the extent and condition of surviving wood-pasture and parkland in Lincolnshire.
LIN3_WPP_T02	No loss of or significant damage to known wood-pasture and parkland sites between 2011 and 2020 (based on data from T01).
LIN3_WPP_T03	Achieve positive conservation management for 20% of known wood-pasture and parkland sites by 2015; and a further 20% by 2020.
LIN3_WPP_T04	Increase the extent (restore/ link/ buffer) of parkland in good condition by 100ha by 2020. Each individual site should be no less than 5ha.

Action	Details	Target links	Partners	Action date
LIN3_WPP_A01	Produce a map of the remaining wood-pasture and parkland sites in Lincolnshire through desk study and survey.	1	**LBP,** FC, LAs, LWT, NE, NT	2012

LIN3_WPP_A02	Incorporate details of site condition into the map produced in A01.	1	**LBP**, LAs, LWT, NE	2014
LIN3_WPP_A03	Develop and implement management plans for wood-pasture and parkland sites. Include young tree planting and management, reversion from arable to pasture, and reinstatement of grazing.	2,3,4	**NE,** FWAG, LAs, LWCS, NT	2015
LIN3_WPP_A04	Promote/ implement the restoration of wood-pasture and parkland on sites where old trees remain.	2,3,4	**NE**, FWAG, LAs, LWCS, NT	Ongoing
LIN3_WPP_A05	Survey at least four wood-pasture and parkland sites for characteristic species e.g. saproxylic fauna.	2,3	**NE,** LNU, NT,	2015

7. Further information

- Bullock, D. and Alexander, K. (1998) English Nature Research Report 295: Parklands - the way forward. English Nature, Peterborough.
- Castle, G and Mileto, R. (2005) English Nature Research Report 628: Development of a veteran tree site assessment protocol. English Nature, Peterborough.
- Manning, C. (2006) Deer and Deer Parks of Lincolnshire. Lincolnshire Naturalists' Union.
- Read, H. (2000) English Nature Information Note 13: Veteran Trees: a guide to good management. English Nature, Peterborough.
- UK Biodiversity Group, (1998) Tranche 2 Action Plans. Volume 2 – terrestrial and Freshwater Habitats. English Nature, Peterborough.

Drafted 2011

Chris J Manning (Lincolnshire Wildlife Trust Woodland Team), Catherine Collop (Lincolnshire Biodiversity Partnership), Colin Horton (North Lincolnshire Council).

[74] Manning, C. (2006) Deer and Deer Parks of Lincolnshire. Lincolnshire Naturalists' Union.

14. Urban

Vision for Lincolnshire's urban habitats

- Wildlife flourishes in public spaces, with visible displays of native wild flowers.
- New developments are built sustainably and include provision for wildlife in their open spaces and structures.
- Gardens and allotments throughout Lincolnshire are wildlife-friendly, adding to the network of habitats in the urban environment.
- Communities expect accessible natural greenspace and work for the retention and enhancement of important habitats and green networks.

Introduction to urban action plans

Urban habitats occur within Lincolnshire's one city, around two dozen towns and about 1000 villages. However, away from the south bank of the Humber, the Scunthorpe and Lincoln areas and the holiday coast, urban habitats are confined to small clusters of buildings and associated 'spaces' within extensive areas of mainly agricultural land. Most residential buildings have a garden and most villages and many hamlets possess a churchyard.

The buildings mostly originate from the last three centuries but their potential to support, for example, birds and bats has decreased as building styles and techniques have changed. Many animals in urban areas now depend more on the provision of nesting/roosting habitat in the form of separate structures.

All local authorities are required by Government to produce a LDF to help shape the future development of towns, villages and countryside over the next 10-20 years. LDFs will consist of a number of documents, including a Core Strategy, outlining a vision for the future of the areas and how it will be achieved. These plans and policies are key to ensuring that development takes biodiversity into account and provides green infrastructure for the benefit of people and wildlife.

An increasing awareness of climate change and the ecosystem services provided by natural habitats, including benefits for health and wellbeing should help to influence changes to people's lifestyles and building and open space designs. Many new designs provide opportunities to incorporate bat- and swift-friendly roofing; garden ponds (which can double as water storage); and micro-energy generation, to name a few.

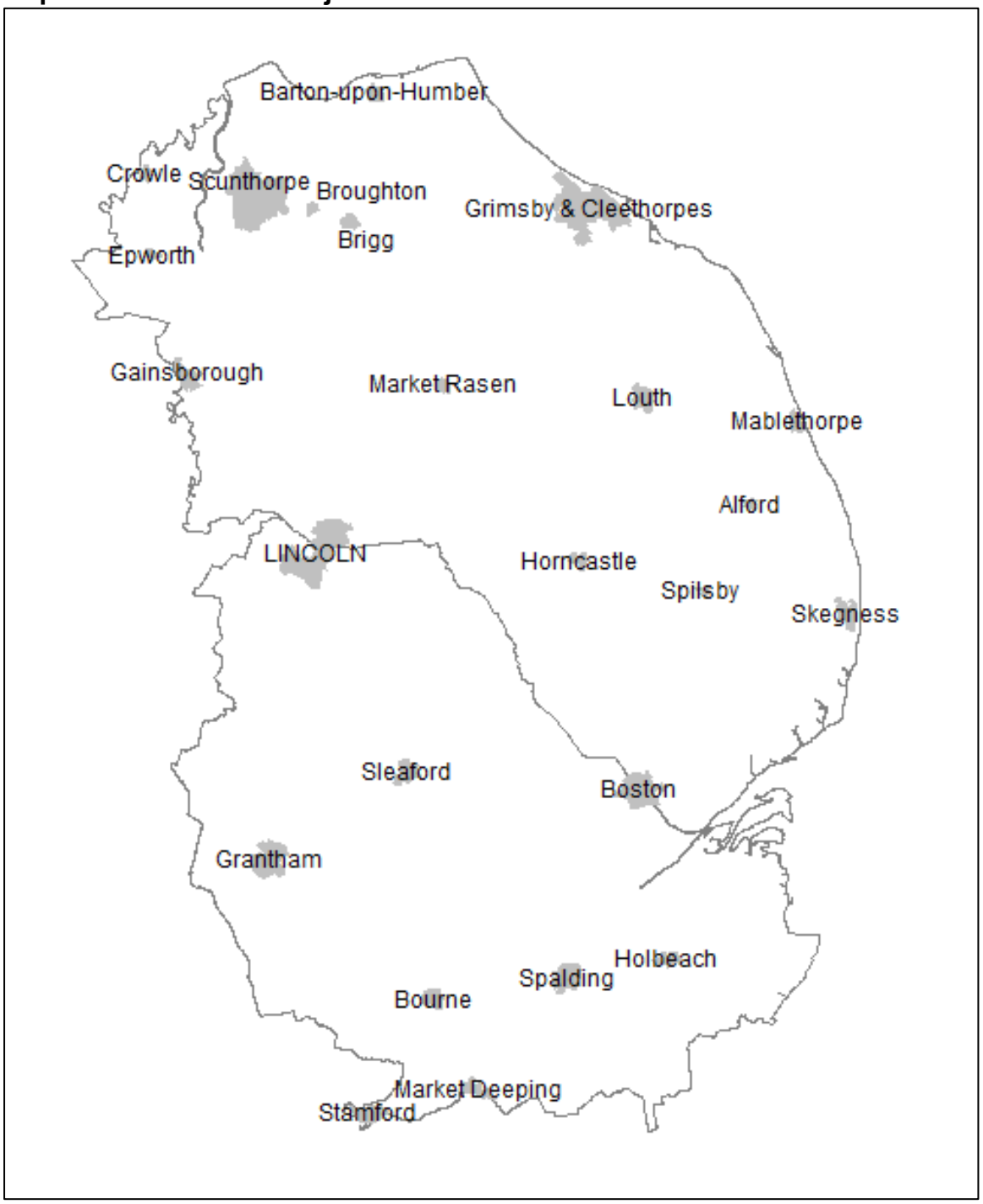
Selection of Habitat Action Plans[75]

The aim of these action plans is to conserve existing biodiversity associated with traditional buildings, structures and open spaces and to raise awareness of how residential building, with or without an individual garden, can contribute to enhancement of biodiversity.

The titles of the HAPs included in this section are the same as in the 2nd edition, with one addition: brownfield. While churchyards and cemeteries, gardens and allotments, and parks and open spaces are not UK BAP priority habitats they, along with brownfield, can still offer many opportunities for improving the urban landscape for biodiversity, as well as providing accessible greenspace for local communities. The promotion of these habitats as places where people can enjoy and interact with nature is essential.

Habitat Action Plans:

Map 8: Lincolnshire's major urban areas



UK BAP species associated with Lincolnshire's urban habitats

Also see the Species section on page 171.

		Brownfield HAP	Churchyards and cemeteries HAP	Gardens and allotments HAP	Parks and open spaces HAP	Species Action Plan
Anaptychia ciliaris ciliaris	a lichen				✓	
Galeopsis angustifolia	Red hemp-nettle	✓				
Ophonus stictus	Oolite downy-back	✓				
Hipparchia semele	Grayling	✓				
Bufo bufo	Common toad	✓	✓	✓	✓	
Triturus cristatus	Great crested newt	✓		✓	✓	✓*
Anguis fragilis	Slow worm	✓	✓	✓	✓	
Natrix natrix	Grass snake	✓	✓	✓	✓	
Zootoca vivipara	Common lizard	✓	✓	✓	✓	
*Apus apus***	Swift	✓	✓	✓	✓	✓*
Muscicapa striata	Spotted flycatcher	✓	✓	✓	✓	
Passer domesticus	House sparrow	✓	✓	✓	✓	✓*
Prunella modularis	Dunnock	✓	✓	✓	✓	
Pyrrhula pyrrhula	Bullfinch	✓	✓	✓	✓	✓*
Sturnus vulgaris	Starling	✓	✓	✓	✓	✓*
Turdus philomelos	Song thrush	✓	✓	✓	✓	✓*
Erinaceus europaeus	Hedgehog	✓	✓	✓	✓	
Pipistrellus pygmaeus	Soprano pipistrelle	✓	✓	✓	✓	✓*
Plecotus auritus	Brown long-eared bat	✓	✓	✓	✓	✓*

** Not a UK BAP species, but is amber listed and of local importance

[75] Also see section 6.1.2 Criteria for selecting HAPs and SAPs

Brownfield

Summary

UK BAP

Open mosaic habitats on previously developed land – priority habitat.

Current national trend
Decreasing.

Estimated Lincolnshire resource
Approximately 750ha of previously developed, vacant or derelict land; area of land of high biodiversity value is not known.

Lead Partner
Local authorities

1. Introduction

The term "brownfield" generally refers to sites that have been altered by human activity. Examples include disused railway land; abandoned mines; quarries and gravel pits; landfill sites; contaminated land; disused airfields; and demolished or derelict industrial and housing sites. It does not normally include agricultural or forestry land. Brownfield sites are most often associated with urban and industrial centres but can also be found in rural areas.

Generally it is viewed that prioritising these sites for development over greenfield sites is the most sustainable option to achieve national housing growth. Current Government targets are to prioritise 60% of new housing on brownfield land.

While not all brownfield sites will be of high value for biodiversity, many have important features because of the mosaic of habitats that they support; comprising early successional communities, and areas of loose, bare substrate. Areas of bare ground can provide basking spots for reptiles and important habitat for burrowing invertebrates. Nutrient-poor soils allow for a greater diversity of flowering plants, which in turn provides a resource for nectar-loving invertebrates. Brownfield habitats have been shown to support 35 UK BAP priority invertebrate and reptile species and can have as many Red Data and Nationally Scarce invertebrate species as ancient woodlands[76]. These sites are also quite often characterised by derelict buildings which may themselves provide important habitat for birds and bats. In a wider context, brownfield sites play an important role in the network of urban greenspace, linking isolated pockets of biodiversity with the wider countryside.

Brownfield sites often suffer from a negative image due to their sometimes unattractive appearance and association with anti-social behaviour. However, their usual proximity to centres of population makes them ideally located for local appreciation of and education about nature.

Brownfield sites as priority development sites

The most recent report on previously developed land from the Department for Communities and Local Government shows that, between 2002 and 2007 the total amount of vacant and derelict land in England decreased by 17.5%[77]. As priorities for development, there is a risk that if a site's biodiversity value is not known and compensated for as part of the development, a net loss in biodiversity could result.

Opportunities for maximising biodiversity value from brownfield priority development sites include;

- The retention or re-creation of habitats.
- The retention or creation of valuable green corridors or networks.
- The inclusion of green roofs and SuDS as part of the development.
- The incorporation of features for priority species in building design and construction.

2. Current status in Lincolnshire

In 2007 the estimated Lincolnshire resource of previously developed, vacant or derelict land and buildings was 754 hectares[78]. However, not all of this land will fit the UK BAP Open Mosaic Habitats on Previously Developed Land priority habitat definition, so this figure only serves to provide a guide as to the maximum possible area of the resource available. The value of brownfield margins along networks such as railtracks/roads also needs to be considered. Further study is required in order to establish the actual area and biodiversity value of this BAP habitat type in the county.

North and North East Lincolnshire are home to much of the industrial development in the historic county, with major centres around the steel works at Scunthorpe and port-related developments in the Immingham area. These areas, in addition to the main urban centres, may provide suitable opportunities for creation of open mosaic habitats. A number of brownfield sites around Scunthorpe are of value for their importance in supporting populations of grayling butterfly *Hipparchia semele* (a UK BAP species). In Lincolnshire, this species is restricted to these few sites and is dependent on open heathy vegetation for breeding.

Lincolnshire has a number of active and disused quarries and gravel pits, which may also provide opportunities for expanding the total area of this habitat type in Lincolnshire. A number may already qualify as or have plans to restore other BAP habitats, such as calcareous grassland or freshwater lakes, however where suitable, provision should also be made for restoration to include open mosaic habitats.

The Flood and Water Management Act (2010) requires all construction (including roads) with drainage implications to meet new standards for design, construction, operation and maintenance of SuDS: the opportunities to maximise biodiversity benefits need to be recognised. Opportunities for biodiversity gain from new development need to consider the growth strategies for the county. These will emerge through the plan-making processes of the relevant local planning authority. One of the aims of emerging national policy in respect of developing such plans is that local communities should be more empowered in the decision making processes. Implementation and monitoring of local plan objectives will also be important in supporting and recording the performance of new developments in delivering biodiversity gains.

3. Threats in Lincolnshire

- **Lack of understanding** of the potential biodiversity value of brownfield sites.
- **Missed opportunities** by not realising the potential to retain and maximise the biodiversity of brownfield land when redeveloped.
- **Increased fragmentation and isolation** of urban habitats and species as a result of incremental brownfield development and loss of habitat mosaics.
- **Negative public image** of sites which may be associated with anti-social behaviour, fly-tipping and vandalism.
- **Inappropriate management** and **non-native landscaping schemes** aimed at ‘tidying’ brownfield and new development sites to make them more aesthetically pleasing to the public.

- **Habitat loss due to natural succession**. Lack of site monitoring and management, may result in priority and mosaic habitats being lost through succession.

4. Current conservation

Most Local Plans recognise the importance of protecting, promoting and enhancing local wildlife and are supported by National Policy. Several Green Infrastructure Studies have already been undertaken around the county and others are being considered. Such will facilitate a more strategic approach to open space project delivery and design, particularly with regard to achieving biodiversity gain. Other strategic projects, such as the Witham Valley Country Park to the southwest of Lincoln, are underway and should help to raise awareness with partners and communities of the importance of biodiversity in and around urban/post-industrial areas.

A number of sites are designated as SSSIs or LWSs (for example Greetwell Hollow SSSI and LWS; Bishop's Road Brownfield Site, Lincoln LWS).

The use of green roof technology has been introduced and used in developments within the county, including three sites in Lincoln and the EPIC centre.

In 2010, as part of their National Brownfield Stepping Stones Project, Buglife embarked on a three year project to carry out survey work and creation/restoration of import brownfield habitat in order to conserve vulnerable invertebrate populations. Working in partnership with Lincolnshire Wildlife Trust, North Lincolnshire Council and Humber INCA, the Scunthorpe Stepping Stones Project is focusing on a number of sites including Tata Steelworks, Ashbyville Lake LNR, Sawcliffe LNR, Conesby Quarry and Messingham Sand Quarry Lincolnshire Wildlife Trust reserve). One of the main aims of the project is to carry out Phase 1 Habitat and detailed invertebrate surveys at the above sites. Data gathered will be used to inform habitat enhancement and creation works, and will provide the basis for the production of new site management plans, or directly feed into and support existing plans.

5. Objectives

- To improve knowledge and awareness of the value of brownfield land for biodiversity.
- To ensure no net loss of significant biodiversity habitat as a result of prioritising development in Lincolnshire on brownfield land.

6. Targets and actions 2011-2020

Target	Details
LIN3_BRO_T01	Establish a baseline by 2013 for the extent and biodiversity value of brownfield land in Lincolnshire. (High biodiversity value sites will be candidates for LWS designation).
LIN3_BRO_T02	No net loss of brownfield land of high biodiversity value between 2011 and 2015.
LIN3_BRO_T03	Achieve positive conservation management for 75% of LWSs with brownfield habitats by 2015.

Action	Details	Target links	Partners	Action date
LIN3_BRO_A01	Identify brownfield sites for inclusion in LWS survey/ resurvey using the National Land Use Database and Strategic Housing Land Availability Assessment reports.	1	LBP, LAs	2012
LIN3_BRO_A02	Evaluate sites identified in A01 and develop a database/ map of brownfield land, with an indication of priority for conservation.	1	Buglife, LBP, LAs	2013
LIN3_BRO_A03	Support the development management process to ensure that the potential value of brownfield land is taken into account where sites have been prioritised for development.	2,3	**LBP,** Buglife, NE, EA, LAs, LWT	Ongoing
LIN3_BRO_A04	Monitor whether developments on brownfield sites retain and/or include provisions for biodiversity gain.	2	LAs	Ongoing
LIN3_BRO_A05	Publicise and undertake education programmes/ events about the value of brownfield land habitats and associated species.	2,3	**Buglife**, all Partners	Ongoing
LIN3_BRO_A06	Develop criteria for selecting brownfield land of conservation value as LWSs.	3	**LWS Panel,** LAs, LWT	2012
LIN3_BRO_A07	Work with owners/ managers of LWSs with brownfield habitats to encourage favourable management (e.g. through advice and planning obligations).	3	LAs, HINCA, LWS Panel	Ongoing
LIN3_BRO_A08	Promote living roofs in new developments and also consider retrofitting on suitable existing buildings.	2	**Buglife,** HINCA, LAs	Ongoing

7. Further information

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[78] Department for Communities and Local Government, (2008) Previously-developed land that may be available for development: England 2007.

Churchyards and cemeteries

Summary

UK BAP
Local action plan only.

Current national trend
The Caring for God's Acre Project in Diocese of Hereford aims to inspire and support local communities in caring for churchyards and burial grounds in a way that benefits both people and wildlife. The project provides the secretariat for the National Network of Churchyard and Burial Ground Conservation and works with any group outside of Hereford that asks for advice and support.

Estimated Lincolnshire resource
700+ churchyards (based on number of parishes in the county).

Lead Partner
Churches Together in all Lincolnshire

1. Introduction

Churchyards are defined as burial grounds associated with an identifiable church building or place of worship. However, during the latter half of the 18th century some churches established extramural burial grounds due to the shortage of space within their churchyards and many of these 'church gardens' have since been turned into public gardens. Cemeteries are often interdenominational burial grounds, which include private burial grounds (mostly constructed during the Victorian era) and more recently established local authority burial grounds.

There is no national action plan for churchyards and cemeteries. However, the unique biodiversity value of churchyards for wildlife, together with the particular difficulties of maintaining appropriate management, distinguish them enough from other habitats to merit a separate action plan in Lincolnshire. Churchyards and cemeteries can provide a variety of habitats, supporting a wide range of species. Many older churchyards contain grassland which is the remnant of ancient meadows, supporting species lost or in decline in the surrounding countryside. The building itself may contain roosting or breeding sites for bats and barn owls, whilst the stone of the church, headstones and memorials often support a rich diversity of lichen, liverwort, moss and fern flora. Mature trees are often found within the site or form part of the boundary, many of which are specimen yew trees.

Due to their nature and location within rural settlements, churchyards and cemeteries can provide refuges for habitats and species lost from the surrounding farmed landscape; whilst in urban settings, they can provide a sanctuary for wildlife in areas lacking other types of greenspace. They can provide the local population with an easily accessible open space to visit, explore and use for quiet reflection – a key role for churchyards and cemeteries. Churchyards and cemeteries have also been the focus of increasing interest in genealogy and attract many visitors and tourists researching family history.

Management of churchyards is administered by the Parochial Church Council and is either undertaken by volunteers from the local community, local contractors or, once

closed, passed over to the local authority. Cemeteries and burial grounds are normally managed via the local authority. All management must take account of and be sympathetic to the primary purpose of the site and its main users, whilst ideally taking account of the wide range of habitats and species that these sites support.

2. Current status in Lincolnshire

In Lincolnshire, almost every parish has at least one churchyard and cemetery (there are more than 700 parishes). In addition, there are burial sites of other denominations, and cemeteries managed by local authorities.

The Lincolnshire Churchyard Conservation Project, a joint venture between the Lincolnshire Wildlife Trust and the Diocese of Lincoln, surveyed more than 200 churchyards between 1989 and 1994 with assistance from many volunteers. In addition, the British Lichen Society has surveyed 549 churchyards in Lincolnshire, with some being identified as of national importance for their lichen flora.

The surveys found that many churchyards and cemeteries have a diverse range of habitats, however, a considerable number are closely mown and managed to maintain a well-ordered, tidy appearance. For a number of reasons, management for wildlife is often not considered:

- It is often perceived as untidy.
- Help and advice is often not readily available.
- Existing management is often undertaken by volunteers and any suggested change in routine can be difficult to implement.

The Lincolnshire Wolds Countryside Service began a God's Acre Project in 2007 for church community groups within the Wolds. The first year saw 26 church community groups receiving churchyard management action packs, maps for surveying, invitations to seminars and the provision of education material. This work has proved successful and numerous practical work and community projects have resulted, and a further ten church community groups have joined the God's Acre Project. The seminars and management advice provided is in line with that in action packs produced by the Caring for God's Acre Project in Hereford Diocese.

A number of these churchyards now include areas managed for wildlife and quiet contemplation, and are often well used by local groups and visitors where access is welcoming and information is readily available. The provision of a seat and a notice board with information about churchyard management is of huge benefit for the church community group in spreading the message to locals and visitors alike that churchyards are available for everyone to enjoy.

A questionnaire survey carried out by Lincolnshire County Council in 2010 demonstrated that there is demand for the scope of the God's Acre Project to be expanded to include all churches in the Lincolnshire Diocese.

3. Threats in Lincolnshire

- **Inappropriate management for biodiversity**, often due to lack of awareness of the ease of some management techniques that benefit biodiversity.
- **Over-cleaning of headstones and monuments** by family historians can remove important colonies of mosses and lichens. Cleaning should be confined to the text area only, and use of detergents avoided. See guidelines provided by the British Lichen Society.
- **Perception that land managed for biodiversity is untidy**. Some important features for biodiversity are often viewed as untidy and neglected, but in most

churchyards a compromise is possible by providing both formal and wildlife areas.

- **Lack of resources** for a dedicated officer to address the issues of churchyard and cemetery conservation across the whole of Lincolnshire. For many church community groups, undertaking wildlife management and enhancement in their churchyard is not a priority due to other commitments (such as the building itself). A dedicated officer would be able to raise awareness of biodiversity issues with church community groups and assist these groups in carrying out surveys of sites and producing and implementing management plans.
- **Decline in church attendance** can lead to fewer volunteers able or willing to manage sites, and potentially the amalgamation of parishes leading to churches and chapels being closed and sold for development.
- **Lack of appreciation** of the significant contribution that churchyards and cemeteries can make to providing accessible biodiversity opportunities and improving quality of life.

4. Progress towards Lincolnshire BAP targets 2006-2011

Target details*	Progress 2006-2011	Status 31/03/2011	3rd edition targets
Survey/re-survey 20 churchyards/cemeteries across Lincolnshire by 2015.	Surveys through LWS, God's Acre, community grants and protected species work. Total = 30.	Achieved.	No equivalent target in 3rd edition.
Get 10 churchyards/cemeteries under sympathetic management (using management plans) by 2015.	2 received management recommendations through LCC community wildlife grant (Saltfleetby) and a further 6 received funding for management works. BAP group members working with 6 churchyards near Lincoln in 2011.	On schedule.	Increased target based on aspiration for county-wide project.

* targets were reviewed in 2009 therefore some may differ from those published in 2006

5. Objectives

- To provide a county-wide, coordinated approach to assisting church community groups with managing churchyards and cemeteries and enhancing biodiversity within them – through survey work and the implementation of management plans.
- To promote churchyards and cemeteries as publicly accessible open spaces for the enjoyment of local biodiversity.

6. Targets and actions 2011-2020

Target	Details
LIN3_CHY_T01	Establish an active God's Acre Project for the whole of Lincolnshire by 2012.
LIN3_CHY_T02	Achieve positive conservation management for at least 60 churchyards and cemeteries by 2015 and a further 40 by 2020.

Action	Details	Target links	Partners	Action date
LIN3_CHY_A01	Secure funding for a God's Acre Project co-ordinator for the whole of Lincolnshire.	1	**Churches Together, LBP,** LAs, LWCS, LWT, BTCV	2012
LIN3_CHY_A02	Promote and provide advice on churchyard/cemetery management to volunteers and staff in relevant organisations and wider public. (2x media coverage per year).	1,2	**Churches Together,** LAs, LWCS, LWT, BTCV	Annually
LIN3_CHY_A03	Survey a representative range of churchyards/cemeteries across Lincolnshire. Aim for 5 sites per year until 2015.	2	**Churches Together,** BTCV, LAs, LWCS, LWT, NE	Annually to 2015
LIN3_CHY_A04	Involve local volunteers in survey and monitoring for educational purposes and to aid after-survey management.	1,2	**Churches Together,** LAs, LWCS, LWT, BTCV	Ongoing

7. References

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Revised 2011

Helen Gamble (Lincolnshire Wolds Countryside Service), Catherine Collop (Lincolnshire Biodiversity Partnership).

Gardens and allotments

Summary

UK BAP
Local action plan only.

Current national trend
Unknown, but number of gardens likely to be increasing.

Estimated Lincolnshire resource
Unknown

Lead Partner
Lincolnshire Wildlife Trust

1. Introduction

Over recent years, gardens and allotments have become increasingly important habitats for wildlife. Although not a UK BAP priority habitat, this local action plan has been written because wildlife-friendly gardens can provide a wide range of habitats in a relatively small area. In towns and cities, a large proportion of the available wildlife habitat is provided by gardens, forming important wildlife corridors through the urban environment. Among other things, they provide sources of food and nesting places for urban birds; food for bats; ponds for declining amphibians; and early-flowering cultivars offer spring pollen and nectar sources, which are otherwise scarce in the landscape. With climate change bringing about earlier activity of species that are temperature sensitive, these early flowering plants are increasingly important. Gardens also play an important role in allowing people to have close contact with nature.

Many gardening practices, however, are detrimental from a biodiversity perspective and more work is needed to encourage wildlife-friendly gardening. Gardeners can also have an impact on wildlife conservation in the wider countryside: the use of peat and water-worn limestone in gardens has detrimental effects on peatlands and limestone pavement habitats respectively (which are both UK BAP priority habitats). The Government-set target of growing media to be 90% peat free by 2010 was not met and was replaced in March 2010 with a new target for all bagged amateur growing media to be peat free by 2020. Gardens and garden ponds can also be a source of spread of invasive non-native species into the wider environment: ~70% of the UK garden flora is exotic in origin[79].

Allotments can cover a significant area of land in towns and cities and therefore make a valuable contribution to the wildlife potential of urban areas. The diversity of habitats found in allotments – cultivated and fallow ground, grassy areas, empty overgrown plots, compost heaps, sheds etc – make them important for a wide range of plants and animals. Allotments offer benefits for the whole community and contribute to the sustainable regeneration of towns and cities, providing green areas in urban environments. Authorities are duty bound to provide allotments under section 23 of the Small Holdings and Allotment Act 1908. Statutory allotments regarded as surplus to requirements may only be sold with the consent of the Secretary of State under section 8 of the Allotment Act 1925.

2. Current status in Lincolnshire

There are a wide variety of gardens in the county, from large rural gardens to small city gardens. The greatest concentrations of gardens are found in built-up areas but gardens also act as valuable wildlife reserves in areas of intensive farmland. Allotments are mainly associated with built-up areas and the number of occupied allotments varies throughout the county. Demand for allotment plots is increasing nationally with numbers of people on waiting lists for allotments increasing by 20% between 2009 and 2010[80] and there is likely to be a similar trend in Lincolnshire.

Although the trend for wildlife-friendly gardening is popular, there are still opportunities to increase the biodiversity resource in gardens and allotments. Since gardens are under private control, this can only be achieved through education and promotion of wildlife-friendly practises. This action plan will seek to address this. Research needs to be conducted on sites that would be suitable as demonstration gardens or allotments. There may be suitable wildlife friendly gardens that are advertised through the National Gardens Scheme, which lists gardens open to the public on selected days of the year, or it may be necessary to carry out a competition for entries. A set of criteria would need to be agreed on what constitutes a best practice site and may require 'judges' to visit candidate sites. Agreement also should be made on what would be expected of demonstration gardens.

3. Threats in Lincolnshire

- **Garden management is often inappropriate for wildlife**. Many people prefer 'tidy' gardens, and remove valuable habitats for garden wildlife.
- **The use of chemicals** greatly reduces garden biodiversity, and can also impact on neighbouring habitats through spray drift and run-off into watercourses.
- Non-statutory allotments and larger gardens are under increasing pressure from **development.**
- **Lack of awareness** about the wildlife value of the current resource.
- **Inappropriate planting of cultivars** that provide no wildlife or ecosystem benefits (no nectar, pollen, seeds, berries, palatable foliage etc.).

4. Progress towards Lincolnshire BAP targets 2006-2011

Target details*	Progress 2006-2011	Status 31/03/2011	3rd edition targets
Five demonstration sites of best practice wildlife gardens and allotments throughout Lincolnshire by 2015.	LWT area groups held garden open days. Banovallum House garden. Lincoln Conservation Volunteers' allotment. Whisby container wildlife-friendly garden being created for use by school groups.	On schedule	Target carried forward
Wildlife gardening/biodiversity information packs provided to residents in at least 50% of new major housing developments by 2015.	Some local authorities and housing companies already do this re recycling/energy saving maybe also re biodiversity. Needs full assessment.	Behind schedule due to lack of reporting.	Amended and included in 3rd edition.
Wildlife-friendly gardens and allotments in Lincolnshire providing feeding and breeding habitats and acting as wildlife corridors.	Two LCC grants awarded to plant hedges around allotments. Need a way to measure this.	Behind schedule due to lack of reporting.	Amended and included in 3rd edition.

* targets were reviewed in 2009 therefore some may differ from those published in 2006

5. Objective

- A network of gardens and allotments throughout Lincolnshire that are sustainable and wildlife-friendly – providing feeding and breeding habitats for wildlife, and contributing to wildlife corridors.

6. Targets and actions 2011-2020

Target	Details
LIN3_GAR_T01	Establish five accessible demonstration sites of best practice wildlife gardens and allotments throughout Lincolnshire by 2015.
LIN3_GAR_T02	Improved awareness and ease of access to advice on wildlife-friendly gardens and allotments – including via web resources and demonstration sites – by 2013.
LIN3_GAR_T03	More gardens and allotments in Lincolnshire managed with wildlife in mind by 2015 compared to 2011.

Action	Details	Target links	Partners	Action date
LIN3_GAR_A01	Identify potential demonstration sites around the county and work with owners to establish and promote them as publicly accessible best practice demonstration gardens/ allotments.	1	LAs, LWT, NT, RSPB	2015
LIN3_GAR_A02	Identify and promote existing information on wildlife-friendly gardening – including advice specific to allotments.	2	**LBP,** LWT, NE, RSPB	2013
LIN3_GAR_A03	Work with housing developers and garden centres to provide biodiversity information to new home owners/ customers.	2,3	LAs, LBP, LWT	2015
LIN3_GAR_A04	Use events and newspaper/ magazine articles to promote sustainable, wildlife-friendly gardening.	2,3	**LWT,** all Partners	Ongoing
LIN3_GAR_A05	Promote at least two ongoing public surveys of gardens and allotments per year and encourage public participation (e.g. Garden Bird Feeding Survey, Big Pond Dip, Homes for Wildlife etc.).	3	**LBP**, all Partners	Annually
LIN3_GAR_A06	Develop a way to assess the number of wildlife friendly gardens in Lincolnshire e.g. using the Garden Bird Feeding Survey or RSPB Homes for Wildlife.	3	**LBC**, LBP	2013

7. Further information

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Parks and open spaces

Summary

UK BAP
Local action plan only.

Current national trend
Not known.

Estimated Lincolnshire resource
Approximately 12000ha (1.7% of total area).

Lead Partner
Local authorities

1. Introduction

The term parks and open spaces is used here to refer to a range of green spaces including urban parks, Local Nature Reserves, commons, community woodlands, school and community playing fields, 'pocket parks' and other areas accessible to communities. They can include a wide range of natural and semi-natural habitats and support a variety of common species and also some that are of conservation concern. For example bats, house sparrow *Passer domesticus*, song thrush *Turdus philomelos,* great crested newt *Triturus cristatus* and small heath butterfly *Coenonympha pamphilus*.

Parks and open spaces have multiple uses: they provide local, easily accessible greenspace; some may be available for sport and recreation; they can provide a focus for community action and contribute to the diversity, character and heritage of urban areas. In addition, they can be excellent resources for education and provide important models of best practice for gardeners if they demonstrate composting, recycling and the minimal use of pesticides.

Recent studies[81] have found that there is widespread use of parks and greenspaces and that people value them for use for their health and wellbeing; 77% of respondents to the BAP public consultation visit local greenspaces more than once a week (see Appendix 6). Providing good quality local greenspace is an effective way to tackle inequality[82] and living in close proximity to well managed and quality greenspace has been shown to reduce the gap in life expectancy between rich and poor[83].

Although many open spaces are seen to be used primarily for amenity and recreational purposes it is important to remember that they still have the potential for habitat conservation. Many of the natural connections in our countryside have been degraded or lost, leading to isolation of sites; and too few people have easy access to wildlife[84]. Green spaces contribute to green corridors/networks through or across urban areas, linking pockets of biodiversity to each other and the countryside beyond. These corridors are vital for provision of an ecological network that is able to cope with habitat losses, to distribute genetic material and for species to cope with the effects of climate change (see section 3.2). However, little is known about the current extent of greenspace nationally as many features are simply not covered in reporting – any figure is likely to be an under estimate.

In The Natural Choice Government announced plans to consult in 2011 on proposals for a new Green Areas designation which will give local people an opportunity to protect greenspaces that have significant importance to their local communities. The aim is to introduce the designation by April 2012.

2. Current status in Lincolnshire

Sites are owned and managed by a wide range of groups and organisations so their management varies considerably. However, few parks and open spaces are managed with wildlife in mind and even those that are must balance wildlife concerns with the requirements of recreation. They are usually managed under large-scale local authority contracts. Many parish council or community sites are also very formal and consist of short grass and flower beds. Many have been established for more than 150 years and so contain mature trees and are bounded by hedgerows. Few have formal environmental management plans. However some sites do have management plans combining wildlife enhancement with informal recreation needs. In these cases, management often involves, or is initiated by, community groups and conservation volunteers, who may obtain support, training and funding with help from conservation organisations.

The importance of ecological networks/ green infrastructure is now being recognised as a key part of achieving sustainable communities. Planned networks of multi-functional greenspace and interconnecting links designed to meet environmental, social and economic needs of communities should become more common over the next few years. For example positive steps are being taken in Lincolnshire with the development of Witham Valley Country Park. Several Green Infrastructure studies have already been undertaken around the county and others are being considered.

3. Threats in Lincolnshire

- **Perceived need to keep parks and open spaces tidy** to address amenity requirements. Extreme tidiness may be necessary in some places but not in others.
- **Badly-timed or inappropriate management**. The effects of hedge-cutting and mowing on wildlife vary significantly according to the time of year they are carried out.
- **Lack of widespread public understanding and appreciation** of the benefits of managing areas for wildlife or lack of awareness that areas are indeed being managed for wildlife.
- **The need to keep parks and open spaces 'safe'** for public use with regard to health and safety requirements. Old or dead trees may be removed, since they are seen as a potential source of danger. Similarly ponds may be filled in. In most cases an alternative solution should be possible that keeps people safe and retains the habitat.
- **Tendency to plant non-native species.** While this may not be such a problem in these artificial situations (if they provide a biodiversity function for example pollen, nectar, berries etc.), the use of native species should be considered, since they can be used for demonstration purposes, and do not require as much chemical input or management.
- **Vandalism, fly-tipping, litter-dropping.**
- **Insufficient resources** and lack of awareness of need to improve sites.
- **Development.** Infilling of spaces in villages and towns – these open areas can often be valuable land for development.

4. Progress towards Lincolnshire BAP targets 2006-2011

Target details*	Progress 2006-2011	Status 31/03/2011	3rd edition targets
Get all Lincolnshire LAs signed up to best practice guidelines for park and open space management by 2015.	Lots of useful publications produced by CABE (now part of the Design Council www.designcouncil.org.uk). Further work required.	Behind schedule.	Target carried forward.
Carry out 20 surveys of parks and other open spaces (not including LNRs) across Lincolnshire by 2010 to determine biodiversity value.	LWS surveys, though majority in Lincoln area.	Behind schedule.	No equivalent target in 3rd edition.
Use the information from T02 to produce biodiversity management plans for 10 sites by 2015 (in addition to plans produced for LNRs).	6 Parish Councils received LCC Community Wildlife Grants to plant trees in parks and recreation grounds. No full assessment of existence of biodiversity management plans.	Behind schedule.	Target carried forward.
Establish LNRs in local authority areas at a minimum level of one hectare per thousand population by 2015.	Full assessment needed. New LNRs declared at South Thoresby Warren near Alford (2008) and Lea Park near Gainsborough (2010).	Behind schedule.	No equivalent target in 3rd edition.

* targets were reviewed in 2009 therefore some may differ from those published in 2006

5. Objectives

- To enhance the current quality and extent of wildlife habitat in public parks and open spaces.
- To raise awareness of how open space management can be improved to enhance access to nature for urban communities.

6. Targets and actions 2011-2020

Target	Details
LIN3_PRK_T01	Get all Lincolnshire LAs to demonstrate delivery against best practice guidelines for park and open space management by 2013.
LIN3_PRK_T02	Ten sites with biodiversity management plans by 2015 (in addition to plans produced for LNRs).
LIN3_PRK_T03	All built up areas are within 300m of accessible greenspace by 2015.

Action	Details	Target links	Partners	Action date
LIN3_PRK_A01	Identify and promote best practice guidelines for LA-managed parks and open spaces.	1	LBP, LWT, LAs	2012

LIN3_PRK_A02	Share best practice on the conservation and management of parks and open spaces e.g. via training courses, seminars and advice notes.	1,2	**LAs**, BTCV, LWT, NE	Ongoing
LIN3_PRK_A03	Work with LAs to produce management plans/ contracts for the maintenance of their parks and open spaces in a way that is sympathetic to wildlife.	2	LAs, LWT, LBP, NE	2015
LIN3_PRK_A04	Promote the use of planning obligations to provide community space with a management plan to benefit biodiversity and funding to implement.	3	**LAs**	Ongoing
LIN3_PRK_A05	Assess the availability, quality and connectivity of Lincolnshire's green infrastructure.	3	**LAs**	2014
LIN3_PRK_A06	In areas where green infrastructure availability, quality or connectivity is not adequate, take steps to address this.	3	**LAs,** NE	2015

7. Further information

- CABE, (2010) Urban green nation: building the evidence base.
- CABE, (2010) Community Green: using local spaces to tackle inequality and improve health.
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- Lawton, J. et al. (2010) *Making Space for Nature: a review of England's wildlife sites and ecological network*. Report to Defra.

Revised 2011

Catherine Collop (Lincolnshire Biodiversity Partnership), Ruth Simons (City of Lincoln Council).

[81] CABE, (2010) Urban green nation: building the evidence base.
[82] CABE, (2010) Community Green: using local spaces to tackle inequality and improve health.
[83]Mitchell, R. and Popham, F. (2008) Effect of exposure to natural environment on health inequalities: an observational population study. *The Lancet* **372**: 1655-1660
[84] Lawton, J. et al. (2010) *Making Space for Nature: a review of England's wildlife sites and ecological network*. Report to Defra.

15. Species

Vision for species conservation in Lincolnshire

- Healthy, sustainable populations of native species.
- No further extinctions of native species in the historic county.
- Return of native species, as appropriate, that have previously been lost from individual sites/ the whole county.
- Widespread species recording and monitoring takes place throughout Lincolnshire, covering all taxa.
- Species' needs are considered when planning habitat management and development.
- Damaging effects of invasive non-native species are under control.

Introduction to Species Action Plans

200 out of 1150 UK BAP priority species have been recorded[85] in Lincolnshire within the last ten years (also see list in Appendix 4). While habitat management and creation delivers benefits for many associated species, there are certain cases where species require very specific action to address their conservation needs. Therefore action for most species in Lincolnshire will be delivered through work on the relevant HAPs, and those that have more specific needs are addressed here in the SAPs.

Lincolnshire remains a stronghold for some species that are declining in other parts of the country (for example barn owl *Tyto alba*, brown hare *Lepus europaeus* and water vole *Arvicola amphibius*); however, there are many species that are not faring so well. For example, the natterjack toad is present at only two sites in Lincolnshire and suffering the effects of low genetic diversity; and the white-clawed crayfish *Austropotamobius pallipes* remains on only one stretch of the River Witham.

Selection of Species Action Plans[86]

Decisions about which species would benefit from a Lincolnshire SAP were made based on at least two of the following criteria being applicable.

- Species on UK BAP list and present in Lincolnshire (currently, recently or potentially in the future).
- Species whose needs cannot be delivered by an associated HAP.
- Species considered of local importance.
- Species for which action can be undertaken in Lincolnshire that adds value to the national Species Recovery Programme.

Following these selection criteria, some species that were covered in the 2nd edition do not have their own SAP in this edition. The brown hare SAP has been removed because of its widespread status in Lincolnshire; it is therefore not a local priority for action. Similarly, the otter *Lutra lutra* is known to be present in most Lincolnshire river catchments and is likely to continue to spread provided that watercourse management continues to offer suitable habitat. Monitoring will continue to take place for these species on an *ad hoc* basis even though no specific actions have been identified. Conversely, there will no longer be a river mussels SAP because very little action can be taken for these species that is not part of national action plan work, and *Sphaerium solidum* may even be extinct in Lincolnshire. Again, *ad hoc* recording will continue to take place.

Three new action plans have also been added: seals; freshwater fish; and commercial (marine) fish. Action plans for other marine species on the UK BAP list – such as sharks, skates and rays, small dolphins, and harbour porpoise *Phocoena phocoena* – were not included here because they are all mobile, widespread species, for which conservation action would be outside the remit of a Local BAP. The scope of the great crested newt action plan has been widened to incorporate action for all three native species of newt. In addition to the SAPs for priority native species, it was also considered necessary to include an action plan to deal with the negative impacts of invasive non-native species on Lincolnshire's biodiversity.

Monitoring

Each SAP will be allocated to at least one Habitat Group[87], which will be responsible for overseeing identifying priorities for action, and reporting and monitoring of progress towards the targets. In some cases it will be relevant for a SAP to be considered and reported on by more than one Habitat Group.

Species action plans:

[85] Data from Lincolnshire Environmental Records Centre accessed 16/06/2011
[86] Also see section 6.1.2 Criteria for selecting HAPs and SAPs
[87] Also see section 6.1.5 The role of the habitat groups

Bats

Whiskered bat *Myotis mystacinus*, Brandt's bat *Myotis brandti*, Natterer's bat *Myotis nattereri*, Daubenton's bat *Myotis daubentonii*, noctule *Nyctalus noctula*, Leisler's bat *Nyctalus leisleri*, common pipistrelle *Pipistrellus pipistrellus*, soprano pipistrelle *Pipistrellus pygmaeus*, Nathusius' pipistrelle *Pipistrellus nathusii*, barbastelle *Barbastella barbastellus*, brown long-eared bat *Plecotus auritus*

Summary

UK BAP
Noctule, soprano pipistrelle, barbastelle, brown long-eared bat – priority species.

Current national trend (2009)
Noctule - significant upward trend
Soprano pipistrelle – stable
Barbastelle – not known - more data needed
Brown long-eared – stable

Estimated Lincolnshire resource
Bats have been recorded in all 10km squares in the county, though not always to species level. Under-recorded areas include the Isle of Axholme, north of Scunthorpe and Grimsby, and west of the A1.

Lead Partner
Lincolnshire Bat Group

1. Introduction

This is a generic action plan covering all bats recorded in Lincolnshire. In England, Scotland and Wales, all species of bats are fully protected under the Wildlife and Countryside Act. Other relevant EU and UK protection includes: Bern Convention; Bonn Convention; Habitats Directive.The noctule, soprano pipistrelle, barbastelle and brown long-eared bat are priority species in the UK BAP and have national action plans.

2. Current Status in Lincolnshire

Eleven species of bat have been recorded in Lincolnshire, though continuing surveys, particularly where bats are examined in the hand, may show that other species are also present.

Whiskered bat
Status in Lincolnshire: Fairly common and thought to be under-recorded.
Distribution: Widespread, from woodland and urban sites, to the Fens. Scattered populations have been found everywhere in the county apart from the north-east. Needs searching for.
Roosts: Domestic buildings and trees.
Hibernation sites: Subterranean sites in small numbers. Other sites not known.
Comments: Visually, easily confused with pipistrelle spp, and on a heterodyne detector with soprano pipistrelles.

Brandt's bat
Status in Lincolnshire: Not known. First identified in the county in the 1980s.
Distribution: Known to be present, possibly quite widespread, in the central Limewoods.
Roosts: Little known. Has been found at one brown long-eared bat maternity colony.
Hibernation sites: Has been found in small numbers in underground sites in the Louth area.
Comments: As for whiskered. The two species are difficult to separate.

Natterer's bat
Status in Lincolnshire: Local.
Distribution: Regularly found along the western edge of the county, with scattered populations elsewhere, including near the coast.
Roosts: Buildings (particularly stone barns) and trees. Two domestic roosts are known.
Hibernation sites: Underground in disused railway tunnels, abandoned cellars, and other similar subterranean sites
Comments: A very mobile species, changing roosts frequently. Their roosts are at risk from barn conversions.

Daubenton's bat
Status in Lincolnshire: Common.
Distribution: Found wherever suitable wetland habitat is present, including over ponds, lakes, fenland drains and rivers.
Roosts: Culverts, bridges and other waterside buildings; trees; occasionally churches.
Hibernation sites: Not fully known. Found underground in some disused railway tunnels and other subterranean sites.
Comments: Population appears stable.

Noctule
Status in Lincolnshire: Thought to be declining in some areas.
Distribution: Relatively common across the northern half of the county, but scarce in the south and appears to be declining in central Lincolnshire.
Roosts: Almost exclusively in holes in trees; very occasionally in buildings. Few roosts known.
Hibernation sites: No sites known. Past records suggest in trees, and single animals have also been found in bat boxes.
Comments: Decline thought to be attributable to loss of suitable roost holes as old trees are felled or collapse; loss of pasture and therefore loss of food; and predation by hobbies, which will actively hunt them at dusk. Wind farms may be an issue – further research is needed.

Leisler's bat
Status in Lincolnshire: Rare, but thought to be under-recorded.
Distribution: There appears to be a distinct southern bias, but more work needed here, as can be confused with noctule.
Roosts: Trees, buildings and bat boxes. Few known.
Hibernation sites: No sites known.
Comments: Frequently difficult to separate from noctule.

Common pipistrelle
Status in Lincolnshire: Common
Distribution: Found throughout the county, though sometimes only in small numbers. See map 9, below.

Roosts: In houses, with a distinct preference for those built after 1960, in soffits, under roof tiles and flashing, and behind hanging tiles. Also in churches and other buildings.
Hibernation sites: Few found, but appears to be in buildings.
Comments: Roost sizes can vary from 20-120. A highly mobile species, with frequent changes of roosts and a colony spread out over a number of buildings. Vulnerable to soffit and hanging tile replacement. One of the few species found foraging in really exposed areas, including over arable fields. Bats seen foraging over saltmarsh are thought to be this species – or possibly Nathusius' pipistrelle – see below.

Soprano pipistrelle
Status in Lincolnshire: Common, but less so than common pipistrelles.
Distribution: Widespread; found throughout the county, particularly in areas close to large water bodies.
Roosts: In buildings, as for common pipistrelle, but shows a marked preference for cavity walls. Also found in churches and other buildings that offer suitable niches. Colonies appear to be less mobile than those of common pipistrelles and can sometimes reach 300-400, though this is now unusual, and most colonies currently recorded consist of 100-200 animals.
Hibernation sites: Mostly not known.
Comments: Their preference for single roost sites makes them very vulnerable to harm from building work, and cavity wall insulation is a particular issue.

Nathusius' pipistrelle
Status in Lincolnshire: Rare. A strongly migratory species.
Distribution: Not known. Has been recorded from coastal sites and from a few scattered sites inland.
Roosts: None now known. The small colony recorded in 1995 (the first in the UK) at Skegness abandoned their roost after 1999.
Hibernation sites: Not known.
Comments: Easily confused with common pipistrelle. Needs searching for, particularly in coastal and wetland areas.

Barbastelle
Status in Lincolnshire: Uncommon.
Distribution: Widespread. It has now been found in many woodlands from a line south of Market Rasen to Louth, with concentrations in the central Limewoods area and in the South Kesteven woods and parklands. See map 10, below.
Roosts: In trees; this is essentially a woodland animal. A breeding colony has been confirmed in the Limewoods.
Hibernation sites: Barns, outbuildings and some underground sites. Possibly also in trees.
Comments: The first county record was from Holton-le-Moor, north of its present known distribution. Little survey work has been done on the northern woodlands and it needs searching for in all areas of mature woodland. It has also been recorded in the coastal marshlands and the Fens, mainly in late summer and autumn.

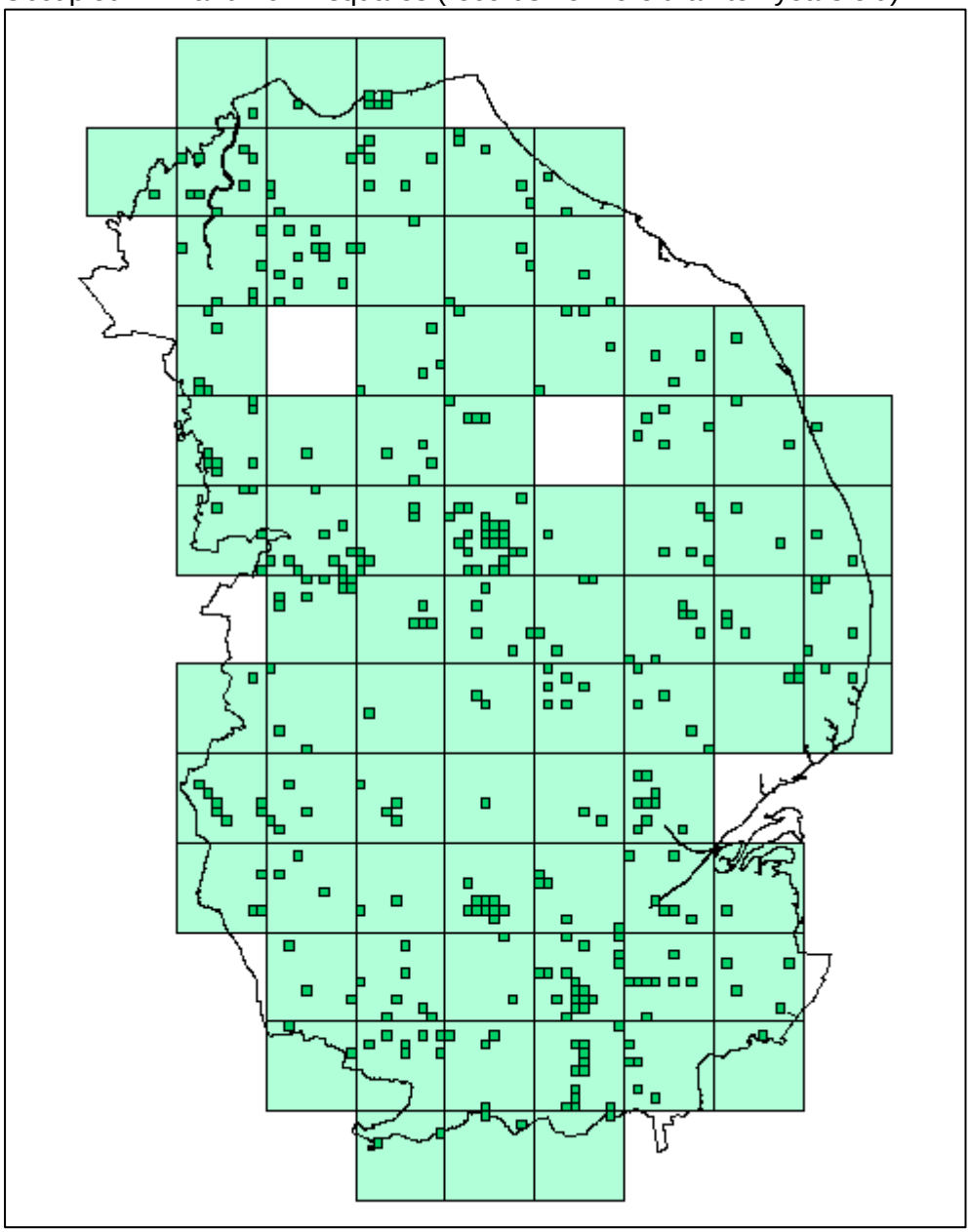
Brown long-eared bat
Status in Lincolnshire: Common.
Distribution: Very uneven; from nationally important colonies in the centre and north, to colonies of barely double figures in the Fens.
Roosts: In roof voids of older buildings, barns, churches, trees.
Hibernation sites: Mostly unknown. A small number have been found in buildings and subterranean sites.
Comments: This bat is very vulnerable to both re-roofing of older buildings, and barn conversions, and many colonies have been lost as a result. It should be noted that

although they are generally described as a woodland bat they are regularly found in the Fens and Marsh area, and have been mist-netted in sand dunes along the coast.

Serotine *Eptesicus serotinus*
Withdrawn from the Lincolnshire list, as no confirmed records, and now thought to have been confused with Leisler's.

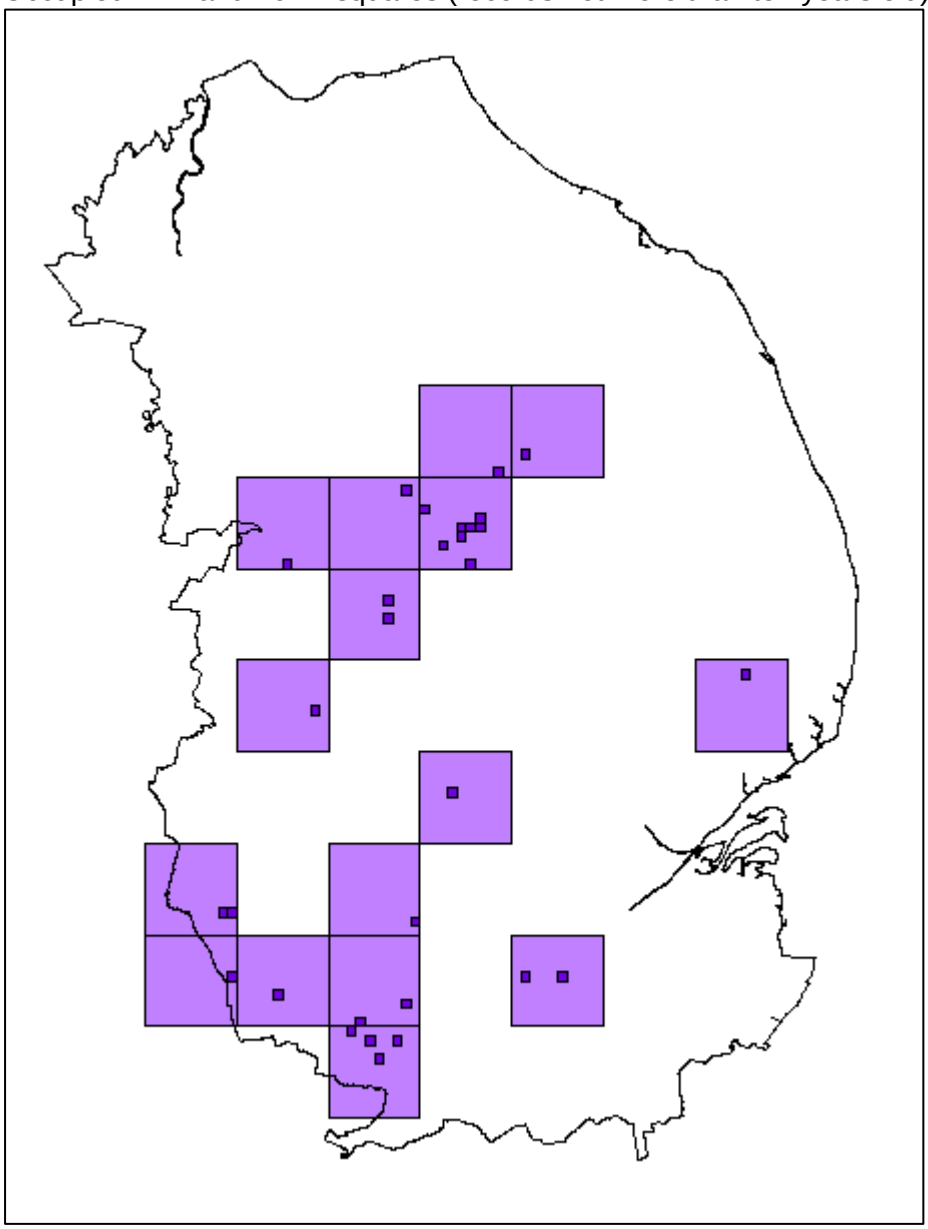
Map 9: Distribution of common pipistrelle

Occupied 1km and 10km squares (records no more than ten years old)



Data courtesy of Lincolnshire Environmental Records Centre. Accessed 17/08/2011.

Map 10: Distribution of barbastelle
Occupied 1km and 10km squares (records not more than ten years old)



Data courtesy of Lincolnshire Environmental Records Centre. Accessed 17/08/2011.

3. Threats in Lincolnshire

- **Loss of breeding and winter hibernation sites** in buildings, old trees and farmyard features, especially old stone farmyard buildings; through decay, demolition or conversion of buildings to other uses; or felling trees without suitable mitigation.
- **Disturbance and destruction** of roosts e.g. due to building work, particularly re-roofing (timber treatment chemicals are much safer than in the past, but can still be a hazard if the correct advice is not sought); conversion of soffits from wood to plastic, replacement of hanging tiles; and the use of cavity wall insulation.
- **Reduction in insect prey** due to widespread pesticide use. Deterioration of water quality has also been shown to affect food supply: contamination from a range of sources including pesticides, oil and fertilisers can affect invertebrate populations.

- **Loss of feeding and commuting habitats** – through reduction in the quality and quantity of hedgerows, mature trees, ditches, drains, ponds and riverside habitats. Continuing loss of permanent pasture is especially concerning for some species.
- **Widespread confusion over/ ignorance of/ flouting of the law** regarding bats.
- **Floodlighting of churches and other buildings** causing disturbance.

4. Progress towards Lincolnshire BAP targets 2006-2011

Target details*	Progress 2006-2011	Status 31/03/2011	3rd edition targets
Establish a baseline for the status and range of bats in Lincolnshire by 2010.	Bat Group records digitised and stored in LERC database. Ongoing updates.	Behind schedule.	Amended and included in 3rd edition.
Maintain and enhance the existing populations and range of bats in Lincolnshire. This will require the successful completion of T01.	Ongoing long-term bat conservation work – raising awareness, improving habitats, monitoring known populations. Results not easy to measure.	On schedule.	No equivalent target in 3rd edition.
Increase the quantity and quality of suitable bat habitat for roosting, hibernating and particularly feeding.	Ongoing long-term bat conservation work – raising awareness, improving habitats, monitoring roosts and hibernacula. Results not easy to measure.	On schedule.	No equivalent target in 3rd edition.
Monitor at least 30 roost sites and 12 hibernation sites per year by 2015.	Approx 20 bat group members take part in the National Bat Colony Survey.	On schedule.	No equivalent target in 3rd edition. Surveys ongoing.
By 2015 all LAs requesting bat surveys with planning applications that involve buildings with the potential for use by bats.	LAs introduced to a protected species checklist piloted in SHDC.	On schedule.	Amended and included in 3rd edition (two separate targets).

* targets were reviewed in 2009 therefore some may differ from those published in 2006

5. Objectives

- To protect roosts in trees as well as buildings.
- To continue to improve and widen understanding of the needs of bats, the threats to them, and the rationale for their legal status.
- To ensure that the available legal protection is fully used by local authorities, in development control and all other aspects of their operations.

6. Targets and actions 2011-2020

Target	Details
LIN3_BAT_T01	Establish and publish by 2012 a current baseline, using data available to the end of 2010, for the status and distribution of bats in Lincolnshire.
LIN3_BAT_T02	Update this baseline using new survey and monitoring data, by the end of 2015, and five-yearly thereafter.
LIN3_BAT_T03	Continue to implement an annual programme of talks, walks, demonstrations, local press releases and attendance at local and regional fairs, shows etc., aimed at widening understanding of bats among the general public and professional land and buildings managers.
LIN3_BAT_T04	By 2012 bat survey reports are submitted with felling licence and Tree Preservation Order applications where indicated necessary by best practice guidelines.
LIN3_BAT_T05	By 2012 bat survey reports accompany planning or listed building consent applications for any building or structure with the potential for use by bats.

Action	Details	Target links	Partners	Action date
LIN3_BAT_A01	Publish a baseline report on the known status and distribution of each species, including roosts and hibernacula, to the end of 2010.	1	**LBG,** LBP	2012
LIN3_BAT_A02	Continue to monitor and improve all known and accessible hibernation sites annually, and seek to locate others and take them into the monitoring programme.	2	**LBG**	Annually
LIN3_BAT_A03	Continue to update records with the results of surveys and monitoring of bats across the county.	2	**LBG**, LBP	Annually
LIN3_BAT_A04	For verification of difficult or scarce species records (i.e. barbastelle, Leisler's, Nathusius's pipistrelle) advise surveyors to provide a sonogram or details of the expert who verified it.	2	**LBG,** LAs, LBP	Ongoing
LIN3_BAT_A05	Aim to give as many talks, walks or demonstrations to the general public, and to relevant professionals with responsibility for managing or safeguarding bat habitat. Attend and publicise bats at as many local events in each LA area as is practicable.	3	**LBG**	Annually
LIN3_BAT_A06	Continue to provide advice and support to roost-owners and landowners who wish to improve their land (including gardens and public open spaces) for foraging bats.	3,4	**NE**, **LBG,** FWAG, LAs	Ongoing
LIN3_BAT_A07	Encourage suitable management of woodland for barbastelles, including woodland expansion where appropriate and improved connectivity.	4	**NE,** FC, LBG, LWT, WT	Ongoing

LIN3_BAT_A08	Recommend bat surveys to be carried out prior to work on trees with Tree Preservation Orders that have potential for bat roosts.	4	**LAs**	Ongoing
LIN3_BAT_A09	Continue to provide advice and support to personnel with responsibilities for the maintenance and management of churches, trees and bridges in order to help protect and enhance bat roosting sites.	3,4,5	NE, LBG	Ongoing
LIN3_BAT_A10	Produce targeted advice on bat habitat protection, restoration and creation specific to each LA area, and ensure that this is provided to all applicants for planning, and all ecologists requesting bat data.	4,5	**LBG**, LBP, LAs	2015
LIN3_BAT_A11	Ensure all LA Development Control officers refer to NE's Protected Species Guidelines (2011) and the Lincolnshire Bat Group Checklist (2009) identifying applications that should include a bat survey. This also includes historic buildings.	5	**LAs, LBG,** NT	Ongoing

7. Further information

- UK Biodiversity Group, (1998) Tranche 2 Action Plans. Volume 1 – vertebrates and vascular plants. English Nature, Peterborough.
- Bat Conservation Trust (2010) The National Bat Monitoring Programme: Annual Report 2009.
- Bat Conservation Trust (2011) The National Bat Monitoring Programme: Annual Report 2010.

Revised 2011

Annette Faulkner (Lincolnshire Bat Group), Anne Goodall (Lincolnshire Bat Group), Catherine Collop (Lincolnshire Biodiversity Partnership).

Commercial fish (marine)

Plaice *Pleuronectes platessa*, sole *Solea solea,* edible crab *Cancer pagurus,* lobster *Homarus gammarus*

Summary

UK BAP
Plaice, sole – priority species.

Current national trend
Fishing mortality is high for both plaice and sole so both are at risk of being fished unsustainably.

Estimated Lincolnshire resource
The Lincolnshire coast and estuaries are important fish nursery grounds, and support the commercially high value species such as lobster and edible crab, which are also key components of the marine ecosystem.

Lead Partner
Natural England

1. Introduction

This action plan does not to cover the same species as the national action plan because trends and targets for these species occur at a far broader scale than the Lincolnshire BAP group can influence. Instead, it focuses on locally commercially important species such as crab and lobster and juvenile sole and plaice: Lincolnshire's coastal areas have been found to be important for young commercial demersal species, particularly sole and plaice, before they are recruited into the adult fisheries[88].

Value of local commercial catch

The Lincolnshire BAP marine region falls into the ICES sub-rectangle 35 F0. From this region the most valuable fisheries are shellfisheries, such as brown shrimp, crab and lobster, although there is also a mixed fin-fishery operating in the area for species that include whiting, cod, skates, rays and brill[89].

Action undertaken as part of this SAP for commercial species will also benefit other marine species that are subject to the same threats.

2. Current status in Lincolnshire

Plaice

The Lincolnshire coast and The Wash and Humber estuaries are major nursery grounds for this species as shown by the MAFF/CEFAS Young Fish Survey[90]. The spawning stock biomass of plaice in the North Sea has declined to levels just above the safe biological limit since the mid-1980s. In addition, the amount of plaice discarded for being below the minimum landing size has gradually increased. These have reduced the reproductive capacity of the plaice stock and it is now considered to be at risk of collapse. The present fishing mortality is high and may not be sustainable[91].

Sole

The Wash and Humber estuaries and Lincolnshire coast are also important sole nursery grounds. Since the mid-1990s the fishing efforts exploiting the North Sea

sole has decreased. The stock is above the safe biological limit but is still declining and is at risk of having a reduced reproductive capacity[92].

Young Fish Survey
CEFAS carry out an annual young fish survey in the North Sea, using a specialised beam trawl, for juvenile flatfish. The data from 2008 and 2009 show that the Lincolnshire coast has a high number of juvenile sole present and the 2010 data show higher numbers of juvenile sole further north in the Humber region. In contrast juvenile plaice in the North Sea were found in higher numbers in The Wash for all 3 years. These two species form commercially important fisheries in the North Sea. Juveniles of these species tend to occur fairly close to the shore in areas along the Lincolnshire coast and in The Wash.

The juvenile fish are of particular conservation importance as declines in these populations would impact ecosystem processes and linkages in the food chain. In addition, declines in juvenile populations would impact the adult population and relevant fisheries to which they are recruited following their development to adulthood. These commercial fish species (and others) are important food sources for other fish, marine mammals and seabirds.

Edible crab
As one of the top three species by value in Lincolnshire waters, edible crab is commercially important to the area. This species is also important as a prey species for many other commercial fish species in the region. There is a dearth of information on the population structure, life history and migration of this species, which require further investigation.

Lobster
As the third most important species by value in Lincolnshire waters, lobster are particularly commercially important. Again this species is important to maintain the integrity of the ecosystem, and as a prey species for other organisms, especially as a juvenile.

3. Threats in Lincolnshire

- **Over-fishing** is a major threat to fish species nationally. Juveniles are not subject to over-fishing directly as they are not targets but are vulnerable to by-catch.
- Caught fish that are not the target species are known as **by-catch**. By-catch does not significantly affect the crab and lobster fisheries, however juveniles demersal fish in the area could be impacted by this threat. One example of this is the by-catch of juvenile sole and plaice by shrimp fisheries.
- **Ghost fishing** – lost or discarded pots or nets do not biodegrade and continue to catch fish which are never landed. This can continue for many years. The nets can fill with fish which die and cause it to sink to the sea bed. As the catch rots the net rises and fish can become caught again.

4. Current conservation

For crab and lobster, there is a minimum landing size and prohibition to land berried lobsters in the region – these fisheries are therefore considered to be adequately managed to the threat of over fishing.

The introduction of a veil on shrimp fishery trawl nets has reduced levels of by-catch of sole and plaice in recent years. Nevertheless by-catch is still an issue given the sensitivity of flatfish spawning and nursery grounds. The situation is anticipated to improve when the Lincolnshire Belt recommended MCZ is formally designated.

While the MMO has overall control of marine management issues, inshore fisheries management in England is the primary responsibility of the IFCAs. The vision for IFCAs is that they will lead, champion and manage a sustainable marine environment and inshore fisheries. The Lincolnshire marine environment is covered by the Eastern IFCA and North Eastern IFCA.

5. Objectives

- Raise awareness of sustainable fishing practices to avoid ghost fishing and bycatch.
- Raise awareness of certification schemes, to encourage fisheries to be sustainable and operate to best practice guidelines.

6. Targets and actions 2011-2020

Target	Details
LIN3_CFS_T01	Reduce the number of incidences of ghost fishing as a result of discarded fishing gear between 2011 and 2015.
LIN3_CFS_T02	Increase the number of fisheries entered into sustainable fisheries schemes between 2011 and 2015.
LIN3_CFS_T03	Identify by 2015 key nursery grounds and areas for fish spawning.

Action	Details	Target links	Partners	Action date
LIN3_CFS_A01	Raise awareness of ghost fishing by discarded fishing gear.	1	**NE,** IFCAs, LWT	Ongoing
LIN3_CFS_A02	Draw attention to/ distribute information on fisheries accreditation, and provide advice/ support to those interested in the scheme.	2	**NE,** IFCAs, LWT	Ongoing
LIN3_CFS_A03	Work with IFCAs, MMO, Fisherman's Association and CEFAS to access survey information and identify key fish spawning and nursery grounds.	3	**NE,** IFCAs, LBP	2015

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Written 2011

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Farmland birds

Grey partridge *Perdix perdix,* lapwing *Vanellus vanellus,* yellow wagtail *Motacilla flava,* skylark *Alauda arvensis,* corn bunting *Miliaria calandra,* linnet *Carduelis cannabina,* yellowhammer *Emberiza citronella,* reed bunting *Emberiza scheoeniclus,* turtle dove *Streptopelia turtur,* bullfinch *Pyrrhula pyrrhula,* starling *Sturnus vulgaris,* tree sparrow *Passer montanus,* snipe *Gallinago gallinago,* curlew *Numenius arquata,* redshank *Tringa totanus,* barn owl *Tyto alba*

Summary

UK BAP
Grey partridge, lapwing, yellow wagtail, skylark, corn bunting, linnet, yellowhammer, reed bunting, turtle dove, bullfinch, starling, tree sparrow, curlew – priority species.

Current national trend
Variable.

Estimated Lincolnshire resource
See species accounts.

Lead Partner:
Lincolnshire Bird Club

1. Introduction

This is a generic plan covering a group of birds associated with farmland. However, farmland encompasses a wide variety of habitats, including arable land, meadows and pasture, wet grassland, scrub, small woodlands, ponds, streams and ditches, hedges and hedgerow trees. While all these species share a general requirement for some aspect of farmland, their basic needs are often otherwise quite different, and most of them are best considered in the five different sub-habitat groups described below. These species have all declined since the 1970s and all have been identified nationally as birds of conservation concern. Increased uptake of farms in Environmental Stewardship is key to halting and reversing these declines.

The exception is barn owl which in Lincolnshire is a relatively successful, widespread species, and is therefore considered separately.

2. Current status in Lincolnshire

A. Birds of open fields. All these species are ground-nesters with a core preference for either grassland (headlands sufficient in some cases) or cereals but most will use other arable crops also. All of them feed on the ground and need a good supply of soil invertebrates, at least for their young, though most also need or will eat weed seeds. Resident species can be found in this habitat all year, though they may also use similar open habitats, particularly coastal saltmarshes.

Grey partridge

Common resident with recent decline, especially in the south of the county.

Resident in Lincolnshire all year, breeding distribution is patchy but highest numbers are found in central and north Lincolnshire, with particular concentrations in the Clay Vales, Upper Witham Fens and the Lincolnshire limestone around and north of Lincoln. Lower numbers are found on the Wolds and Middle Marsh. Other than along the main drains and major rivers, breeding birds are scarce in Fenland and over much of the limestone south of Sleaford, but there are concentrations along the

county boundary in the south-west and in the Bourne-Deepings area. Wintering distribution is similar, but even more closely concentrated in mid-Lincolnshire.

Grass margins in Environmental Stewardship have provided nesting areas on many farms.

Lapwing
Common resident and very common passage migrant and winter visitor. Decline in breeding numbers.

Lapwing density is highest on the Wolds; in a narrow strip around The Wash; in the northeast from the Ancholme Valley, across the limestone ridge and into the Trent Valley; and in a band across mid-Lincolnshire from the Marsh, along the northern Fen edge, across the Wragby clay triangle, the Witham Fens, the limestone south of Lincoln and again into the Trent Valley. Elsewhere distribution is patchy with very few in the Marsh or Fens except for a narrow strip along the Welland and Glen corridors. In winter, four-figure flocks were found in most 10km squares, with the highest concentrations along the coast, along the western fen edge and in the Trent Valley. There has been some success with various measures under agri-environment on farms with notable increases.

Proved or probable breeding was recorded in 851 tetrads during the Atlas survey (1991-95), though not all of these would have been used in every year. The British Trust for Ornithology sample survey of 1987 found 89 pairs in 21 of the 61 Lincolnshire tetrads surveyed, at a mean density of 4.2 pairs/occupied tetrad (range 1-24). For the whole county this would approximate to 2670 pairs in that year. A repeat of this survey in 1998 gave an estimated population of 3800 for the entire East Midlands, a reduction of 59% since 1987. In Lincolnshire, the survey found a reduced range and a mean density of 3.5 pairs/occupied tetrad (range 1-12). On these figures, the Lincolnshire population had halved to about 1340 pairs in the 11 years. This accords with other studies: for example a 10km square covering part of the Wolds and Clay Vales which held more than 100 pairs in 1987, in colonies of up to 12 pairs, had only 23 pairs in 1997 and a maximum colony size of 3-4 pairs. Agri-environment schemes have proved valuable in increasing breeding success. Wet grassland schemes, where correctly managed with grazing, have been very successful, as have some schemes on arable farms with sympathetic spring-cropping measures. Since 1989, the number of wintering sites with four-figure flocks has also decreased inland, but very much higher numbers now occur along the coast.

Skylark
Very common resident, passage migrant and winter visitor; breeding numbers have declined in recent years.

Resident in Lincolnshire all year, with numbers increased outside the breeding season by passage migrants and winter visitors from north-east Europe. Breeding skylarks prefer mixed farms, or at least those with a diversity of crops, which provide a series of nest-sites and food sources through the seasons. Spring-sown cereals (now infrequent in the county), mown grassland and set-aside are the preferred breeding areas, with autumn-sown cereals, hayfields and oil-seed rape becoming too dense to walk through in summer. Wintering skylark form flocks on farmland and coastal marshes, feeding on seed or grain where this is available but otherwise grazing crop seedlings. Breeding skylarks have been recorded in almost every part of the county. The breeding population was estimated at 54,000 pairs in 1989; territory numbers on Common Birds Census plots in the county have fluctuated rather

randomly since then, mainly related to distribution of set-aside and other crops, so it is difficult to discern any trend. Reported winter flocks since 1989 have also fluctuated but show no particular trend.

Yellow wagtail
Common summer visitor and passage migrant, breeds mainly in lowland areas.

Traditionally birds of damp grassland and spring-sown crops and mainly associated with the low-lying river valleys, and the major Fenland drains, together with the Marshes and the Coastal strip, including the margins of The Wash. Since both these land-uses are now rare in Lincolnshire, breeding birds may be found in cereal fields or oilseed rape early in the year but show a preference for other crops, including potatoes, legumes, sugar beet and horticultural crops, once these grow up.

Based on Common Birds Census densities, the population was estimated at 2,500-3,000 pairs in the late 1980s. Since that time the birds have disappeared from many areas and have been lost on Waterways Survey plots in the county. It is likely that the population had declined by at least a third by the late 1990s, with a similar but patchier distribution.

Corn bunting
Common resident and partial migrant, decline noted in recent years.

Resident in Lincolnshire all year, these are birds of the open country, usually under arable cultivation. In winter grain and weed seeds form their diet and wintering birds form flocks with other seed-eaters.

The breeding distribution is very patchy – there are concentrations in the north-east, parts of the Wolds, the upper Ancholme Valley, the central part of the Marsh (from Tetney to Mablethorpe and inland to the Wolds), the limestone south of Lincoln, the silt Fens around the edge of The Wash, and the Bourne-Deepings area. Elsewhere they are largely absent or very thinly scattered, and winter distribution is similar.

The breeding population was estimated at just over 14,000 pairs in 1989 (but with quite a wide error margin due to the very patchy distribution). This species is not covered by routine monitoring, but the records indicate that the population probably benefited from the introduction of set-aside.

B. Birds of 'ancient' or more enclosed farmland. These species feed in open fields, particularly in winter, but they also require hedges or bushes for song-posts and may nest in them or on or close to the ground below them. They feed their young invertebrates gathered from foliage, including crops, bushes and weeds, but also eat weed seeds and grain.

Linnet
Very common resident, passage migrant and winter visitor, but has declined in recent years.

A resident and partial migrant in Lincolnshire. Some breeding birds may move south to France, Spain and Portugal in winter and at the same time a small number may arrive from Scandinavia. The preferred breeding habitats in Lincolnshire are thick hedges and scrub, particularly blackthorn, and coastal dunes. In winter, linnets join flocks of other finches and buntings, once common but now scarce on farmland, and roost in thick shrubs.

The Atlas survey (1991-95) found linnets breeding over most of the county with particular concentrations in the north-east, especially in the northern half of the Marshes and on the coast south to Mablethorpe, and in all the main river valleys, particularly the Welland-Glen system. Winter flocks showed a similar distribution but were also more widespread throughout the Fens, along the coast to The Wash, and the limestone plateau just south of Lincoln. They can also be found in fenland areas where there is a mosaic of crops and sequential harvesting of field vegetables. There are positive signs of recovery where agri-environment scheme measures have been adopted. The breeding population in 1989 was estimated at about 18,000 pairs – numbers may now be stable at this level.

Yellowhammer
Very common resident, some decrease in recent years.

Resident in Lincolnshire and found in all parts of the county all year, though with lower numbers in all seasons in Fenland, where hedges are scarcer as field boundaries. Breeding habitat is typically arable or mixed farmland with either good hedges or woodland edges which have adjacent ditches and a wide marginal grass strip. The nest is on or close to the ground in tall grass close to the shrubs. Like other buntings and finches, yellowhammers flock on open fields in winter and small numbers move to the coast in that season, but most birds remain closer to their breeding habitats. Both adults and young feed on invertebrates in summer, with grain, grass seeds and weed seeds taken in winter.

Monitoring has shown that numbers increased from the 1970s to peak in the mid-early 1980s when the population may have been up to 40,000 pairs. However it then declined for the rest of the decade to perhaps half of this. Since that time numbers have fluctuated around this lower level.

Reed bunting
Common resident and passage migrant, some decline in recent years.

Resident in Lincolnshire all year although some breeding birds may move south and some wintering birds may arrive from north-west Europe and Scandinavia, especially along the coast. Most breeding birds are found near water with the preferred habitats being reedbeds and marshy birch/willow/alder scrub on the margins of rivers, drains, ponds and gravel pits. Drier habitats, including farmland hedges, may also be used when the preferred habitat is not available. Wintering birds feed in mixed species flocks and roost in reedbeds or wetland scrub.

Atlas data (1991-95) found that breeding birds were largely absent from the Wolds and the limestone plateau, all the coversands and much of the Fens except where these areas are crossed by river valleys. The densest populations are found all the way along the coast, from the Humber to The Wash, in the Marsh, Ancholme Valley, Isle of Axholme and a broad band across South Lincolnshire from Boston to Stamford. Winter distribution was similar, again highlighting the coast and river valleys. They are present in the Lymn valley and tributaries

C. Birds of the farmland/woodland edge. These are species which nest in tall, dense scrub, found in both woodland and farmland with suitable hedges. They take mainly vegetable matter, including tree buds and seeds, but will also feed on grain and weed seeds.

Turtle dove
Summer visitor and passage migrant, marked decline in recent years.

A passage migrant and summer visitor to Britain, confined to the south-east; including Lincolnshire. In the 1980s breeding birds were widely distributed throughout the county with no obvious concentrations but with possibly a lower density in the Outmarsh and along the western edge of the Lincolnshire limestone, both north and south of Lincoln. Population estimates at that time range from 3,000-7,000 but the Trends Guide shows a steady decline nationally through the 1980s, and this is borne out by spring passage concentrations in Lincolnshire which were regularly in the range 100-500 in the early 1980s but rarely reached 100 by the late 1980s. A figure towards the lower end of this range is therefore considered probable by that time. A small sample survey in the late 1990s indicated that the population might be only 20-40% of its 1980s level, with a much sparser distribution; this decline has continued since.

Bullfinch
Common resident.

Resident all year in Lincolnshire with rare influxes of continental birds. The breeding habitat is typically woodland although untrimmed hedges, and scrub on farmland are also used. Bullfinch breeding distribution in Lincolnshire is closely linked to the distribution of woodland, including the Kesteven Woods, Bardney Forest, Willingham Forest, Skellingthorpe-Doddington Woods, Twigmoor Woods, Broughton Woods and woodland along the Fen edges and eastern side of the Wolds. Elsewhere, smaller concentrations occur but distribution is patchy and breeding bullfinches are absent from most of the Fens and Marsh and much of the Lincolnshire limestone, Trent Valley, Ancholme valley and the northern half of the Isle of Axholme.

Since the birds are resident, winter distribution is similar. Family parties are more conspicuous in winter, when they may move out of woodland along adjoining hedges and are commonly seen in villages and especially orchards. Bullfinches are not birds of deep woodland however, being associated with wood and ride edges, particularly where there is good cover of medium-tall blackthorn. They will also use this habitat away from woodland – in parks, large gardens and good dense patches of farmland scrub.

The breeding population was estimated at 6500 pairs in 1989. Ringing data from Constant Effort Sites have also shown fluctuations in both adult and juvenile numbers handled over this period but again no clear trend.

D. Birds of farmland trees. These species nest in tree-holes and will use both woodland and non-woodland trees, providing the latter are close to farmland; they will also make use of suitable holes in farm buildings. They are ground-feeders, needing invertebrate prey for their young in summer and forming or joining flocks to feed on grain or weed seeds in open fields in winter.

Starling
Very common resident, passage migrant and winter visitor.

Found in all parts of the county. Soil invertebrates, especially leatherjackets, are fed to the young, and nesting success is usually higher on sites near grassland, including amenity grassland of parks and sports fields, but nesting sites in arable areas are also used. Families join feeding flocks by June, and later in the year these amalgamate to form the typical large winter roosts. Grain is the preferred food in winter and birds will travel long distances from roosts to good feeding areas.

The population in the late 1980s was estimated at perhaps 50,000-60,000 pairs, but since then, in common with most of the country, Lincolnshire has seen a substantial decline and breeding birds have become scarce in many parts.

Tree sparrow
Common resident and partial migrant, marked decline in past 20 years.

Resident all year in Lincolnshire. At one time tree sparrows joined mixed-species flocks later in the year to take grain and seeds on farmland, but this is now rare. There is a possible breeding concentration in the north-east, particularly the northern half of Middle Marsh and north-east margin of the Wolds. There is also a clear link with the major rivers, including the Witham, Steeping and Nene and particularly the Welland-Glen system. Elsewhere in the county distribution is patchy, with tree sparrows absent from most of Fenland and much of the southern limestone, away from the river systems. Birds are more widespread in winter, but the general distribution is similar. The breeding population was estimated at around 7,000 pairs in 1989, following a severe decline in the mid-late 1970s, and numbers now appear to be stable.

E. Birds of open wet grassland. These species typically nest on moorland, saltmarsh and freshwater marshes but will use lowland wet grassland inland providing that the soil remains wet enough for chicks to probe through the summer.

Snipe
Scarce resident, common passage migrant and winter visitor, scarce and local breeder.

Now very local throughout most of England and Wales, where both numbers and range have declined, but more generally distributed in the uplands and moorlands where the population is probably stable. Wintering birds, arriving from northern and western Europe, tend to concentrate in the southern half of Britain and Ireland. Breeding snipe are restricted by the availability of wet grassland and marsh, since breeding success depends on the soil remaining moist enough to probe for earthworms, tipulid (cranefly) larvae and other soil invertebrates. Nests are normally in tussocks. Wintering snipe typically rest close to water by day, moving out to feed at night. Bogs, lake and river margins, salt and freshwater marshes are all used and temporary floodwater flashes on farmland will also be exploited. Maintenance and creation of wet grassland through Environmental Stewardship has provided more sites across the county for wintering birds.

During the Atlas survey (1991-95), breeding snipe were closely associated with the major river valleys, including the Great Eau, Lud, Bain and smaller streams draining the Wolds in the east, the Ancholme and Lower Trent in the north-west, the upper Witham, Brant and Slea in the south-west, the middle Witham from Lincoln to Bardney and the Welland and Glen above Spalding. Elsewhere records were very scattered and very sparse. Proven or probable breeding was recorded at a total of 180 sites between 1981-89, with 1-3 drumming males at most sites, but not all sites were used in every year. There are now fewer than 10 known sites, although not all

possible sites are regularly checked. Wintering birds have always been more widespread however and this still holds. The winter densities tend to be found in the same river valleys, but smaller numbers regularly occur elsewhere.

Curlew
Common passage migrant and winter visitor, scarce and local breeder.

In the lowlands, curlew nest in rough damp pasture and even in crops, laying beginning in mid-April. Broods are taken into or remain in tall cover, where they search for invertebrates. British breeders move to large estuarine mudflats in winter, where they feed on worms, crabs and molluscs. Some birds, especially the smaller males, feed inland on permanent pastures; they may fly to the coast to roost at night, or may roost on wetlands inland. The main breeding areas in Lincolnshire are the sandy heathlands, the Isle of Axholme and the Ancholme Valley in the north-west and the Upper Witham in the west and south-west. Proved or probable breeding was reported from 47 1km squares during the Atlas survey (1991-95), with a total population of perhaps 50-100 pairs. The current population is likely to be lower but in the same range.

Redshank
Common resident, passage migrant and winter visitor. Relatively small numbers occur inland where it is a scarce breeder.

Breeding redshank nest on the ground, commonly among rough grass or rushes and often weaving a grass canopy over the nest, but sometimes in the open. Eggs are laid from early April and the chicks are led to wet areas, sometimes at a distance from the nest, where they are guarded by both parents. In winter, many redshank remain on inland wet grassland while it is frost free, but then move to feed on coastal and estuarine flats and marshes. Probably no more than 50 pairs bred inland during the Atlas survey (1991-95); mainly along the Welland, Glen, Ancholme, Witham and Trent valleys. There is evidence that this population has also declined in recent years. Large numbers of redshank breed on saltmarshes on the Lincolnshire coast, while in winter this coast hosts large flocks of foreign-bred birds.

F. Barn owl
Fairly common resident and partial migrant.

Barn owls are hole-nesters, using buildings, stacks, woodland and non-woodland trees, and they take well to nest-boxes. They hunt for small mammals over any short vegetation but are mainly seen over grassland, including road verges, in summer, and over cropped land when the crops are young, or after harvest.

This species is notoriously difficult to census and no full county survey has been carried out. However, estimates based on the number of occupied 1km squares during the 1980s indicate a population in the range 400-450 pairs at that time. Continuing loss of farmland trees and conversion of suitable farm buildings to other purposes has reduced the availability of traditional nest-sites, but this has probably been more than matched by the erection of boxes. The population is subject to large swings due to cyclical changes in the availability of its preferred prey species, but there is no evidence for a population decline in Lincolnshire. In 1998 breeding was confirmed in TF05, a conspicuously blank square from the 1980s Atlas survey, following the erection of boxes there. In the period 2004-2008 the nestbox schemes alone produced 400-950 pulli of ringable size per year.

3. Threats in Lincolnshire

- **The loss of permanent and relatively species-rich grasslands** still remains a threat, as traditional livestock enterprises are presently very uneconomic. The loss of grazing livestock is an increasing problem that threatens to lead to abandonment, other than topping for cross compliance of many once-rich habitats. While topping is beneficial to some species, grasslands that are grazed and managed traditionally have their own suite of species that cannot use longer topped grass.
- **Increased chemical usage** including fertilisers, pesticides and use of broad spectrum and persistent animal treatments like avermectins. Although the pesticides are safer than previously, their effectiveness results in a decline in food (weed seeds and invertebrates) and dense unsuitable habitat.
- Agronomical and mechanical advances have resulted in **greater density and uniformity within crops**, therefore offering fewer opportunities for birds to feed and nest.
- The **decline of mixed farming**.
- **Loss of hedgerow trees** through old age and removal for safety and other reasons. This is coupled with a lack of replacement by natural processes due to mechanical cutting regimes and farmers' reluctance to plant because of the effects on production.
- **Hedgerow removal** is now much less of a threat due to legislation and agri-environment incentive schemes. Nevertheless it still takes place, especially outside agriculture, with major road-widening schemes and building projects.
- **Poor management of remaining hedges**; particularly over-frequent and too low trimming. This is a much-reduced threat with the introduction of cross compliance and agri-environment schemes. However while these measures control the time of cutting and closeness of cultivations they do not cover all hedgerows.
- **Drainage of arable land** decreasing the potential for nesting lapwing and reducing the ability of chicks to probe for food.
- **Crop mosaic is increasingly under threat** as farmers strive to save costs by block cropping and simplification of their farming systems with a detrimental effect on bird populations.
- **Nest destruction** by agricultural machinery, especially green harvested crops such as silage and vining peas. Also non-replacement of old nest boxes for barn owls could reduce future availability of nesting sites.

4. Progress towards Lincolnshire BAP targets 2006-2011

Target details*	Progress 2006-2011	Status 31/03/2011	3rd edition targets
Determine trends in populations and status since 2000 by 2010, by analysis of existing information, and identify monitoring methods for each.	Trends identified – see species accounts above. Carry forward target to identify monitoring methods.	Completed for this period.	Amended and included in 3rd edition.
Ensure that at least 20 sites with post-1990 breeding records for scarce breeding birds of wet grassland (curlew, redshank and snipe) are managed appropriately for these birds by 2015.	Not yet assessed.	Not started.	Target carried forward.

For all other farmland bird species stabilise populations at 2000 levels or above by 2015 and 1990 levels by 2020.	Not yet assessed.	Not started.	Target carried forward.

* this action plan was updated in 2010 so the targets differ from those published in 2006

5. Objectives

- To gain a better understanding of farmland bird populations and distribution in the county.
- To continue the use of agri-environment schemes to reverse the habitat deterioration which impacts on farmland birds.

6. Targets and actions 2011-2020

Target	Details
LIN3_FMB_T01	Identify monitoring methods for each species and implement by 2012.
LIN3_FMB_T02	Ensure that at least 20 sites with post-1990 breeding records for scarce breeding birds of wet grassland (curlew, redshank and snipe) are managed appropriately for these species by 2015.
LIN3_FMB_T03	For all other farmland bird species stabilise populations at 2000 levels or above by 2015 and 1990 levels by 2020.

Action	Details	Target links	Partners	Action date
LIN3_FMB_A01	Make information available on trends in population and status of farmland birds in Lincolnshire.	1	**LBC**	2011
LIN3_FMB_A02	Set up schemes to monitor populations/ status of farmland birds in Lincolnshire.	1	**LBC**, LBP, RSPB	Ongoing
LIN3_FMB_A03	Use existing records and contacts to identify all sites with probable/ confirmed post-1990 breeding records for curlew, redshank and snipe.	2	**LBC**, FWAG, LCGMP, RSPB	2011
LIN3_FMB_A04	Survey identified sites to determine current management and suitability for creation/ restoration of wet grassland.	2	**LBC**, LCGMP, LNU	2013
LIN3_FMB_A05	Encourage and monitor take up of HLS options for creation/ restoration of wet grassland.	2	**NE**, FWAG	Ongoing
LIN3_FMB_A06	Promote and implement the Farmland Birds Package for Environmental Stewardship agreements as a toolkit to reverse the long-term decline in farmland birds.	3	**RSPB, NE,** FWAG, LWCS, NFU	Ongoing
LIN3_FMB_A07	Encourage the use of other farm management options that benefit farmland birds, including spring sowing with over-winter stubbles on suitable soils; and sowing of bird food crops.	3	**NE,** FWAG, LWCS, NFU	Ongoing
LIN3_FMB_A08	Investigate setting up and monitoring winter feeding stations for farmland birds on suitable sites (e.g. land owned/ managed by LBP Partners and other interested parties).	3	LBC, LBP, RSPB	Ongoing

LIN3_FMB_A09	Promote positive management of farm hedges to provide a range of heights, and autumn fruit.	3	**NE,** FWAG, LWCS, NFU	Ongoing

7. Further information

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Revised 2011

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Freshwater fish

European eel *Anguilla anguilla*, spined loach C*obitis taenia*, sea lamprey *Petromyzon marinus*, river lamprey *Lampetra fluviatilis*, smelt *Osmerus eperlanus*, brown trout and sea trout *Salmo trutta*, Atlantic salmon *Salmo salar*

Summary

UK BAP
All priority species.

Current national trend
Variable.

Estimated Lincolnshire resource
Unknown

Lead Partner
Environment Agency

1. Introduction

This is a generic action plan covering priority freshwater fish species found in Lincolnshire. The species listed are all UK BAP priority species, and are all associated with BAP habitats: including rivers, canals and drains; ponds, lakes and reservoirs; chalk streams; fens; and reedbeds. River lamprey, sea lamprey, Atlantic salmon and spined loach are protected under Annex II of the Habitats Directive and Appendix III of the Bern Convention.

Freshwater fish species are used as biological indicators of the state of complex freshwater ecosystems. Where environmental quality of a freshwater ecosystem is poor, then no fish will be present. Their presence is indicative of the state of both the living system (animals, plants and micro-organisms) and the physical system (water, dissolved gases and substrate etc.).

2. Current Status in Lincolnshire

European eel

Eels are present in all Lincolnshire rivers, however numbers entering freshwaters from the sea have declined dramatically. It has been estimated that over 90% of recruitment to national stocks by elvers swimming up rivers has been lost in the last 20 years.

The Eels (England and Wales) Regulations 2009 permit the Environment Agency to require an eel pass at locations where the passage of eels is impeded or likely to be impeded. However, it is not just barriers that are thought to be responsible for the species' decline: disease, parasites, over exploitation, subtle changes in oceanic flow patterns and loss of freshwater habitat are all likely contributing factors.

Spined loach

The spined loach population in Lincolnshire appears to be healthy. Records have been collected over the last 20 years from routine fisheries surveys, though it is not possible to quantify these populations since much of the information is limited to simple presence or absence records. Only at Baston Fen SSSI and SAC, where spined loach are listed as an interest feature, has any attempt been made to make some estimate of population levels. Detailed surveys have shown that they are present and healthy in low numbers. Spined loach are currently found in the following watercourses: the West Fen drain system; the South Forty Foot drains; Counter

Drain near Baston Fen; River Glen near Thurlby Fen; River Welland; the River Witham and its tributaries; the Hobhole system; Grantham Canal; and the River Ancholme system. Research indicates genetic differences between Witham/Trent populations and Welland/Nene populations.

Sea and river lamprey
Brook lamprey (not a priority BAP species) is a species that is common within upper river catchments and is reasonably abundant in Lincolnshire. River lamprey, however, have only been recorded at one site on the River Lymn and in the Humber Estuary. Records of sea lamprey are restricted to those individuals that occur in the Humber Estuary – both species are key designation features of the Humber European Marine Site.

Smelt
This species is limited to only a small number of sites within Lincolnshire, with low numbers of individuals being recorded by routine Environment Agency fishery surveys. In addition, anecdotal reports of smelt being captured in commercial fyke nets set for eels have also been made at a number of sites across the county. To date, smelt have been found in the lower reaches of the South Forty Foot Drain; the lower River Witham; South Holland Main Drain; and the Humber Estuary. It is likely they are also present in the mouth of the Welland, with occasional individuals finding their way into the non-tidal river. Smelt are anadromous, i.e. they migrate from brackish water as mature adults to freshwater rivers to spawn.

Brown trout and sea trout
The upper River Witham and tributaries, the rivers Slea, Great Eau, Lymn, Waithe Beck, Bain, Waring, Glen and Welland all contain brown trout. The Waring population is perhaps the least affected by restocking and remains the closest to what could be termed a wild population. Recreational fisheries exist on the Witham, Welland and Great Eau and these rivers are stocked with farmed fish on a regular basis. The sea-going form of this species is present in the Great Eau, Witham and Welland, but apart from the occasional report of larger fish from further upstream, most sea trout are restricted to areas downstream of tidal sluices. It is essential for sea trout to be able to migrate upstream to find suitable spawning habitat and major obstructions such as the tidal barrier at Saltfleet on the Great Eau and Tallington Weir on the Welland are almost impossible for ascending fish to pass.

Atlantic salmon
Salmon spawning is not thought to occur in any Lincolnshire river, however occasional fish are reported, mainly in the Welland and the Trent. Water quality is probably good enough to support these fish, but high temperatures and low flows during the summer deter would-be spawners.

Burbot *Lota lota*
N.B. Burbot has not been included in this plan because the species is now thought to be extinct in Lincolnshire (and nationally). Climate change has been a contributing factor in the species' decline: it requires ice under which to spawn, so warmer winters in the UK have left few suitable spawning areas. A record of a burbot from the South Forty Foot Drain near Bicker in the early 1960s is perhaps the last known reasonably accurate report[93].

3. Threats in Lincolnshire

- **Changes in river/land use** could have a negative impact upon populations of fish species. Rivers may suffer from eutrophication, sedimentation and changes in water quality and quantity. Populations are also at risk of becoming genetically

homogenised due to watercourses being joined up, and water transferral (which also increases the risk of the spread of disease).

- The **extraction of water** causes loss of habitat and spawning grounds for many fish communities. Climate change could exacerbate this. Pumps can also impact on fish numbers by moving or killing fish.
- Flood management works such as **de-silting and river level management** have the potential to have a major impact by removing fish species and the habitats they rely on.
- Migratory fish species are under threat from **barriers to migration**. Barriers limit the amount of spawning habitat available or prevent individuals reaching the habitats they need to flourish. The threat of further tidal barriers being introduced for power generation could have a devastating impact. The effects of climate change will result in less time to open tidal doors. Pollution can also prevent migration; poor water quality can delay or completely block the passage of fish through a section of river.
- **Irresponsible angling activity** can often be in conflict with wildlife conservation; causing disturbance, leaving litter and potentially impacting on habitats.
- Persecution through **unregulated commercial fishing** can also have huge impacts on fish species with low longevity; whereby populations struggle to repopulate.
- **Introduction of new fish species** may cause the elimination of native species through natural displacement, damage to habitats and spread of disease or parasites.
- Some fish species are particularly sensitive to **pollution**. Even localised pollution events can have major effects on fish communities in the whole system. It can be devastating to populations, especially those species with a short lifespan, affecting fish stocks in future years.
- **Climate change** is responsible for extreme changes in water flow. Extreme high flows leave very few areas of refuge for fish species. Extreme low flows can result in a drop in dissolved oxygen content, increased risk of predation and a loss of habitat.

4. Current conservation

The Environment Agency implemented 'Environmental Options' – best practice guidance for maintenance operators to ensure that works on watercourses are carried out in a more sensitive way for wildlife, especially for freshwater fish. A series of species awareness leaflets on freshwater fish have been published by Environment Agency and Natural England.

Survey work is ongoing, and enhancement projects take place as opportunities arise; including work on the River Welland in 2009 to benefit sea trout and other migratory fish (see LBP annual review 2009/10).

The European Commission instigated a European wide stock recovery plan with the adoption of the European Eel Regulations (2007) – this was transposed into English and Welsh law by The Eels Regulations 2009, which came into force on the 15 January 2010. To help Internal Drainage Boards better understand these new regulations and the threat to eel populations, the Association of Drainage Board Authorities Lincolnshire Branch organised a workshop in Newark in October 2010 with speakers including eel experts, staff from the Environment Agency's fisheries team and Natural England[94].

5. Objectives

- To maintain and where possible enhance fish and eel populations at existing sites.
- To conduct further survey and monitoring of fish and eel passage use.
- To continue working with anglers to promote environmentally friendly fishing.

6. Targets and actions 2011-2020

Target	Details
LIN09_FWF_T01	Maintain all known populations of these fish species in Lincolnshire: no losses between 2011 and 2015.
LIN09_FWF_T02	Develop projects for adaptation of barriers for migratory fish: remove barriers to migration or install 5 fish passes and 10 eel passes by 2015.
LIN09_FWF_T03	Increase habitat quantity by 15km (and quality) for BAP priority fish species by 2015.

Action	Details	Target links	Partners	Action date
LIN3_FWF_A01	Implement a rolling programme of surveys to monitor those species not normally captured during routine fisheries surveys.	1	**EA**, BW, IDBs, IWA, NE	2012
LIN3_FWF_A02	As new legislation with implications for fish is adopted ensure that it is implemented and delivered to benefit biodiversity.	1	**EA**, BW, IDBs, IWA, NE	Ongoing
LIN3_FWF_A03	Raise the profile of best practice options for management of watercourses containing BAP species and restoring habitat for fish.	1,2,3	**EA**, BW, IDBs, IWA, LCSP,	2012
LIN3_FWF_A04	Increase/ improve communication with angling organisations to help promote environmentally-friendly fishing, monitor existing fish populations and preserve stocks.	1	**EA,** BW, IWA	Ongoing
LIN3_FWF_A05	Review water level management of watercourses and consider impacts on BAP fish species and other biodiversity, particularly when structures are replaced and refurbished.	2,3	**EA**, IDBs, LAs	2015
LIN3_FWF_A06	Reduce the occurrence of fish deaths during works on rivers i.e. due to impingement in temporary and permanent pumps. Educate field teams on the impact their works can have on fish in the river system.	1,2	**EA**, AW, BW, IDBs, IWA	2015
LIN3_FWF_A07	Expand the Catchment Sensitive Farming Initiative to deliver ecological outcomes so that sediment load and water quality effects from farming do not reduce fish habitat quality.	3	**CSFI**, NE, EA	2012
LIN3_FWF_A08	Promote best practice re improving fish passage.	2	**EA**, BW, IDBs, IWA	2015
LIN3_FWF_A09	Implement fish passes; remove barriers to allow for fish migration and design out barriers in future river engineering works.	2	**EA**, BW, IDBs, IWA	2015

LIN3_FWF_A10	Monitor sites with fish passes to ensure that they are working and achieving their aim.	2	**EA**, BW, IDBs, IWA	2015
LIN3_FWF_A11	Where a watercourse contains BAP fish species ensure that best practice is followed regarding management of fish stocks, vegetation and sediment; reduction of diffuse and point source pollution; and channel maintenance.	1,3	**EA**, BW, IDBs, IWA, NFU	2015
LIN3_FWF_A12	Ensure any loss of BAP species' habitat is compensated for by new habitat creation or opening up waterways for fish migration (fish passes).	1,2,3	**EA**, BW, IDBs, IWA, LAs, NE	Ongoing
LIN3_FWF_A13	Adapt rivers to cope with predicted effects of climate change and deliver the WFD. Plan for three stage channels and restoration of hydromorphological characteristics.	3	**EA**, BW, IDBs, IWA, LAs	Ongoing

7. Further information

- Maitland, P. and Campbell, R. (1992). Freshwater Fishes. Harper Collins.
- Environment Agency (2011) Eel Manual.
- Lincolnshire Biodiversity Action Plan (2006) Action for Wildlife in Lincolnshire.

Drafted 2011

Ruth Snelson (Environment Agency), Catherine Collop (Lincolnshire Biodiversity Partnership), Nick Kite (Environment Agency), Reuben Page (Environment Agency), Chris Randall (Environment Agency), Chris Reeds (Environment Agency), Caroline Tero (Environment Agency).

[93] pers. comm. Environment Agency 2000.
[94] www.ada.org.uk/morenews.php?fs=andid=82&id=82

Greater water-parsnip

Sium latifolium

Summary

UK BAP
Greater water-parsnip – priority species.

Current national trend
Declining.

Estimated Lincolnshire resource
Approx 200 plants in the wild. Range has increased through BAP re-introduction programme, but overall plant numbers are presently declining.

Lead Partner
Lincolnshire Wildlife Trust

1. Introduction

The greater water-parsnip is a tall (1-2m), perennial plant with pinnate leaves and white flowers arranged in umbels. It flowers July to September and likes its roots wet at all times. Some shading from other plants is tolerated but the species is excluded by the growth of carr woodland. It grows in the margins of tall-herb fens and along lakes, ponds and drain margins; it also persists in ditches where occasional clearance maintains some areas of open water. It grows in shallow, still or slow-moving, alkaline water, and is generally found on peat or alluvial soil. The plant does not tolerate over-frequent management (i.e. being cut or grazed for extended periods) but bare ground is needed for seedlings to establish. It is normal for populations to vary from year to year, and flowering plants are not always recorded at known sites every year.

In the past greater water-parsnip was most commonly found on rafts of semi-floating vegetation at the margins of lakes and large rivers and was once typical of very wet, species rich, tall-herb fen. However, following the drainage and reclamation of fens in the UK, it is now most often found in drainage ditches in the south and east of England. It is found across most of Europe, although it is rare in the Mediterranean region.

There has been a substantial decline of this species and the greater water-parsnip is a priority species in the UK BAP. It is a nationally scarce plant and a good indicator of healthy fen-type communities.

2. Current status in Lincolnshire

Along with many other wetland species, the greater water-parsnip has declined rapidly in Lincolnshire since the late 1950s. The plant appeared to be present only on seven wetland sites in 2003, all of them nature reserves, mostly in South Holland district.

From 2004 to 2010 the species was re-introduced to 15 new sites in the lower River Welland, River Witham and Louth coastal catchments using seed taken under licence from other sites in the county. This work was sponsored by the Environment Agency and carried out by Wild Planet Ltd along with Lincolnshire Wildlife Trust volunteers, with additional support from Lindsey Marsh Drainage Board and English

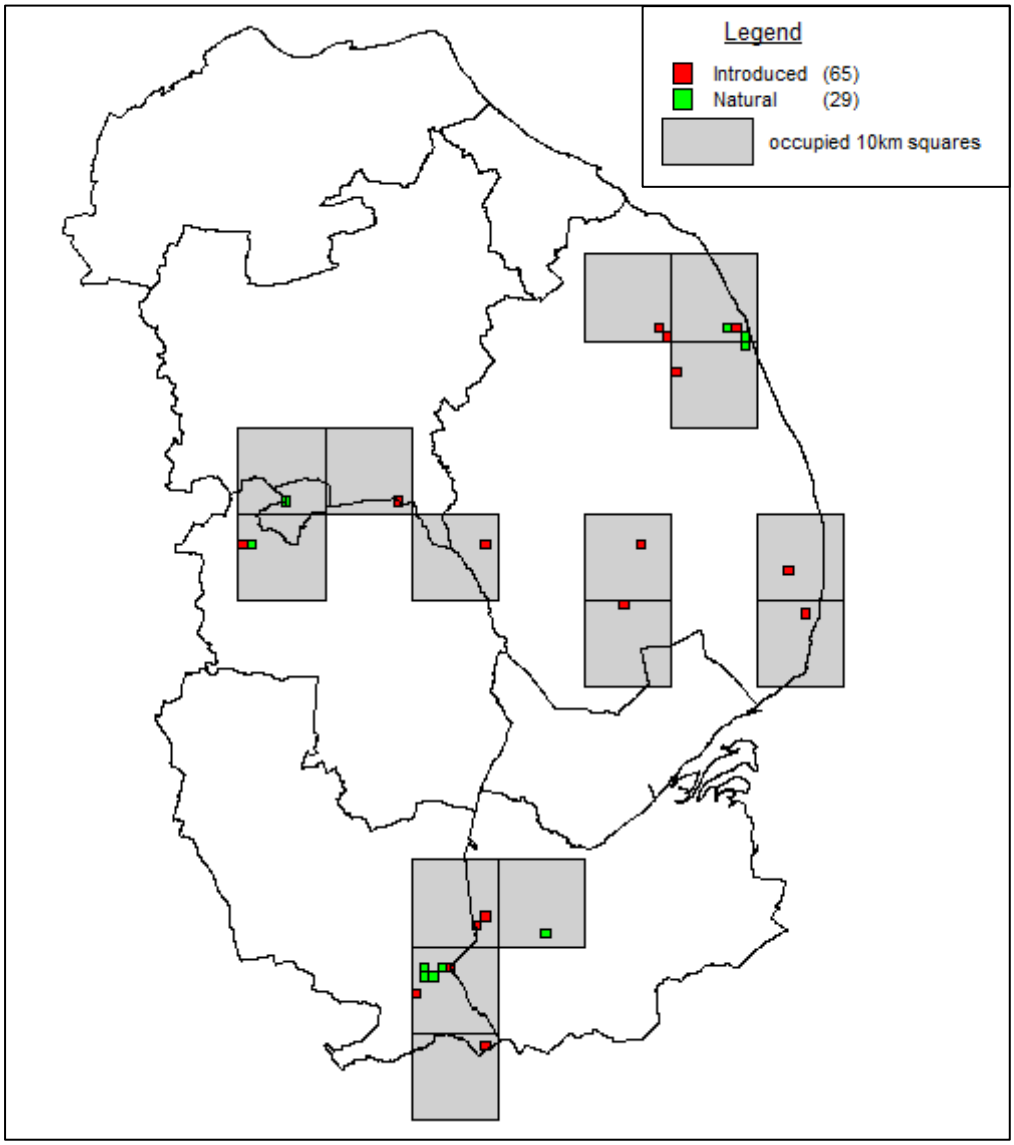
Nature. A number of these reintroduction sites will continue to be supplemented with additional plants in 2011 and monitored through and beyond this period. Sensitive management of the many miles of wet drains remaining in Lincolnshire could provide abundant sites for re-colonisation and benefit other wetland wildlife, although the most productive reintroduction sites are on the margins of shallow open water bodies for example Deeping Pits Nature Reserve old gravel workings. There will also be opportunities for introduction at Willow Tree Fen.

Recording during the 2008 and 2009 seasons revealed a significant decline in flowering plants in a number of previously established areas and many of the reintroduced sites. At present it is too early to know whether this is part of a natural seasonal flux or other widespread trend. Records of flowering plants vary considerably from year to year and can be absent in some years, and then vigorous in following years. It is also too early to know whether the reintroduction sites have established sustainable populations; secondary seeding is known to have taken place at one site but this is rare despite prolific seeding. Where plants are still present at reintroduced sites, these are usually part of the original stocking – with some plants now producing in excess of 20 flowering heads (individual plants/root stock may survive 10 years or more) – or from natural propagation/division via propagules.

3. Threats in Lincolnshire

- **Lack of bare ground** for seedlings to develop. To thrive long-term the plant does need disturbed ground or exposed wet sediments from time to time (e.g. through occasional/ seasonal lowering of water levels): it needs dynamic wetland systems.
- **Too-frequent cutting of ditches and banksides**.
- Exposure to prolonged **heavy grazing.**
- **Abandonment** of ditch management leading to reed and scrub invasion.
- **Drainage** of sites and land reclamation – e.g. historic loss of shallow seasonal fenland meres.
- **Extended periods of lowered or excessively fluctuating water tables** leading to the plants' roots drying out or exposure to damaging frost during the winter.
- **Nutrient enrichment** – runoff from farmland, or released by excessive amounts of rotting vegetation.

Map 11: Re-introduction and known native sites



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Data courtesy of Lincolnshire Environmental Records Centre. Accessed 17/08/2011.

4. Progress towards Lincolnshire BAP targets 2006-2011

Target details*	Progress 2006-2011	Status 31/03/2011	3rd edition targets
Maintain the current (2005) range of greater water-parsnip in Lincolnshire and ensure that viable populations are present at all extant sites by 2015.	Reintroduced populations continue to be monitored. No known loss from range.	On schedule	Amended and included in 3rd edition.
Regenerate plants from the seed-bank for further reintroduction and stocking to suitable additional sites in Lincolnshire creating 25 self-sustaining county locations by 2010.	25 sites but not yet clear if self-sustaining. More resources needed.	Behind schedule	Amended and included in 3rd edition.

* targets were reviewed in 2009 therefore some may differ from those published in 2006

5. Objectives

- To establish a self-sustaining population without the need for further introductions.
- To remove the species from the endangered species list in Lincolnshire by 2015.

6. Targets and actions 2011-2020

Target	Details
LIN3_GWP_T01	Produce GIS map by 2012 with details of distribution and population size for greater water parsnip (update by 2015).
LIN3_GWP_T02	Maintain the current (2011) range of greater water-parsnip in Lincolnshire and ensure that viable populations are present at all extant sites by 2020.
LIN3_GWP_T03	25 self-sustaining county locations (in different 1km squares) by 2015.

Action	Details	Target links	Partners	Action date
LIN3_GWP_A01	Complete baseline surveys and produce site based management plans to retain viable populations.	1,2	**NE,** LWT, EA, IDBs	2012
LIN3_GWP_A02	Advise landowners and relevant bodies of the habitat requirements and suitable management for the greater water-parsnip.	2,3	**LWT, NE, EA, IDBs**	2012
LIN3_GWP_A03	Identify sites in the north of the county where greater water-parsnip has previously been recorded, and re-establish two sustainable populations via management or from suitable seed stock.	3	**NE,** LWT, EA, IDBs,	2013
LIN3_GWP_A04	Provide opportunities for the spread of greater water-parsnip from extant sites to encourage natural dispersal into the wider countryside.	1,2,3	**LWT, EA,** AW, IDBs	2015
LIN3_GWP_A05	Monitor populations of greater water-parsnip at known baseline sites in Lincolnshire every 3 years.	1,2	**LWT,** LBP	Ongoing

7. Further information

- Environment Agency (2004) A biodiversity action strategy for Anglian region.
- UK Biodiversity Group, (1998) Tranche 2 Action Plans. Volume 1 – vertebrates and vascular plants. English Nature, Peterborough.
- Wild Planet Ltd, (2005) Greater water-parsnip reintroduction project scoping report.

Revised 2011

Mark Tarttelin (Lincolnshire Wildlife Trust), Catherine Collop (Lincolnshire Biodiversity Partnership).

Natterjack toad

Epidalea calamita

Summary

UK BAP
Priority species.

Current national trend
Fluctuating, probably declining – this trend is repeated in Lincolnshire.

Estimated Lincolnshire resource
Breeding at 2 sites.

Lead Partner
Lincolnshire Wildlife Trust

1. Introduction

The natterjack toad is a short-legged toad with a distinctive yellow stripe down the length of its back. During the breeding season, which lasts from April until June, the male 'churrs' loudly at night. The species needs freshwater to breed in, short turf for hunting for food and dry sandy ground for burrowing and hibernating. It can be found in pools and on short turf in open heath and sandy habitats and also in dune slacks or the upper saltmarsh transition zone on coasts. The tadpoles are poor competitors, only thriving in temporary or seasonal waters.

The natterjack is Britain's rarest amphibian, having declined dramatically in numbers and range during the 20th century due to habitat loss. The species can be found at just 56 sites in the UK – 49 of these are in England (N.B. these figures include translocations and introductions).

It is a priority species in the UK BAP and is listed in Appendix II of the Bern Convention, Annex IVa of the Habitats Directive and protected under Schedule 5 of the Wildlife and Countryside Act.

2. Current status in Lincolnshire

In Lincolnshire the natterjack's favoured habitat is sand dunes, though the species used to be far more widespread across the county – probably across sandy soils inland as well as on the coast. The species declined considerably after the 1950s and was almost lost as a breeding species in Lincolnshire at the end of the 1970s. This was largely as a result of the loss of rabbit-grazed dunes (due to myxomatosis); scrub colonisation of foraging areas and slacks with breeding pools, and associated spread of competitive common toads; and installation of sea walls, truncating the upper saltmarsh/freshwater interface habitats that undoubtedly supported the species.

Natterjacks are now known to be present at just two sites, where they are reliant on scrub clearance and intensive management of the breeding pools to remove predators/competitors to ensure that the populations continue to persist. The main population occurs in the Saltfleetby-Theddlethorpe area, and the second is a re-established population – under English Nature's Species Recovery Programme – at Gibraltar Point.

The Gibraltar Point population was established using spawn from Saltfleetby, and it is likely that both are becoming genetically isolated, leading to breeding and developmental problems. It has been shown that inbred tadpoles have lower growth rates and therefore higher mortality rates than those of outbred populations[95]. Between 2007 and 2009 a policy of minimal intervention was implemented in order to determine whether the population was able to sustain itself: it appeared that there would be almost no productivity without intervention. However, males were heard calling in the adjacent Jackson's Marsh for the first time in 2010 so the situation may not be as bad as first thought.

In an attempt to boost genetic viability and productivity, tadpoles from a genetically distinct population were introduced to the site at Saltfleetby in 2009 and 2010. It is too soon to know the results, but the possibility of doing the same at Gibraltar Point is also being pursued – significant pond management works were carried out in 2010 to this end.

Alongside management work at and adjacent to existing sites, consideration should also be given to the potential for reintroducing the species at other suitable sites along the coast or inland on heathland sites where appropriate.

3. Threats in Lincolnshire

- **Low genetic diversity** of the Lincolnshire population is contributing to poor breeding success and low recruitment rates.
- **Inappropriate grazing and scrub encroachment.** The natterjack uses areas of short turf for feeding. These can be lost if grazing ceases.
- **Lack of suitable breeding pools.**
- **Fixation of dune systems** and prevention of tidal inundation, through the creation of sea defences removes the ephemeral nature of breeding habitats required by the species.
- **Competition** from large populations of common toad *Bufo bufo*.

4. Progress towards Lincolnshire BAP targets 2006-2011

Target details*	Progress 2006-2011	Status 31/03/2011	3rd edition targets
A self-sustaining population of natterjack toad not requiring active management at existing sites by 2015.	Both populations still require intensive management. Spawn/ tadpoles introduced at Saltfleetby 2009 and 2010 to help boost genetic viability.	Behind schedule.	Amended and included in 3rd edition.
Expand the number of populations within the species' former range by carrying out further introductions to suitable sites by 2015.	Exploring options, but no plans to introduce in the near future. Relies on being closer to achieving T01.	No progress.	Medium to long-term aspiration for 3rd edition.

* targets were reviewed in 2009 therefore some may differ from those published in 2006

5. Objective

- To achieve viable and sustainable populations of natterjack toad in Lincolnshire that are not reliant on high levels of active management (spawn rearing).

6. Targets and actions 2011-2020

Target	Details
LIN3_NAT_T01	Establish by 2015 self-sustaining populations of natterjack toad, not requiring active management (spawn rearing) at both existing sites.
LIN3_NAT_T02	Increase the number of breeding females between 2011 and 2015 (based on counting spawn strings).
LIN3_NAT_T03	Establish by 2020 at least two new populations on suitable habitat in Lincolnshire.

Action	Details	Target links	Partners	Action date
LIN3_NAT_A01	Monitor existing populations (breeding females, spawn strings, calling males, toadlets reared etc.). Train volunteers in survey and rearing techniques where needed.	1	**LWT, NE,** LARG, LBP	Ongoing
LIN3_NAT_A02	Maintain suitable breeding habitat for natterjacks at existing sites: mimick natural ephemeral pools through rotational pond management.	1,2	**NE, LWT**	Ongoing
LIN3_NAT_A03	Establish and maintain suitable feeding habitat for natterjacks at existing sites: maintain open turf through grazing and scrub control.	1,2	**NE, LWT**	Ongoing
LIN3_NAT_A04	Seek to introduce to the Gibraltar Point population genetic material from outside Lincolnshire in order to strengthen its genetic viability.	1,2	**LWT,** NE	2015
LIN3_NAT_A05	Continue current spawn rearing routines and removing common toads from natterjack breeding pools until sites can support sustainable populations.	1,2	**NE, LWT**	2015
LIN3_NAT_A06	Seek opportunities to manage and/or purchase areas adjacent to existing breeding sites to facilitate natural range expansion.	2,3	LWT, NE, LAs	2015
LIN3_NAT_A07	Make advice available re habitat management and restoration; target owners/ managers of land adjacent to existing sites.	2,3	**LWT**, NE	Ongoing
LIN3_NAT_A08	Identify suitable reintroduction sites to establish new populations in Lincolnshire.	3	**NE, LWT**	2012
LIN3_NAT_A09	Reintroduce natterjack toads to suitable sites where feasible (and as long as biologically viable populations have been established at existing sites).	3	**NE, LWT**, LARG	2020

7. Further information

- Beebee, T. (1996) Natterjack toad conservation handbook. English Nature, Peterborough.
- Lincolnshire Wildlife Trust internal annual reports on Gibraltar Point natterjack toad population since1992.

- Buckley, J. and Beebee, T. (2004) Monitoring the conservation status of an endangered amphibian: the natterjack toad *Bufo calamita* in Britain. *Animal Conservation*, **7**: 221–228.
- Rowe, G. and Beebee, T. (2005) Intraspecific competition disadvantages inbred natterjack toad (*Bufo calamita*) genotypes over outbred ones in a shared pond environment. *Journal of Animal Ecology*, **74**: 71–76.

Revised 2011
Catherine Collop (Lincolnshire Biodiversity Partnership), Kevin Wilson (Lincolnshire Wildlife Trust).

[95] Rowe, G. and Beebee, T. (2005) Intraspecific competition disadvantages inbred natterjack toad (*Bufo calamita*) genotypes over outbred ones in a shared pond environment. *Journal of Animal Ecology*, **74**: 71–76.

Newts

Great crested newt *Triturus cristatus,* palmate newt *Lissotriton helveticus*, smooth newt *Lissotriton vulgaris*

Summary

UK BAP
Great crested newt – priority species.

Current national trend
Declining (slowly) – though this trend may not be the case in Lincolnshire.

Estimated Lincolnshire resource
64 occupied 10km squares (out of 91) – see species accounts below.

Lead Partner
Lincolnshire Wildlife Trust

1. Introduction

This action plan covers all three species of newt that are found in the UK, all of which are present in Lincolnshire.

Smooth newt

The smooth newt is the UK's most widespread newt species, found throughout Britain and Ireland. Like the common frog, smooth newts may colonise garden ponds. Outside of the breeding season, newts come onto land and are often found in damp places, frequently underneath logs and debris in the summer months.

Smooth newts are protected under the Wildlife and Countryside Act; it is illegal to sell or trade them in any way.

Great crested newt

The great crested newt is the largest species of newt in the UK and is also the most threatened. It uses a variety of standing waterbody types for breeding during early spring through to mid-summer. For the remainder of the year this species requires suitable terrestrial habitat that provides both opportunities for foraging, as well as refuge sites for overwintering. Adults leave the breeding sites from July onwards, and can typically range for a distance of up to 500m.

The species is widely distributed but uncommon throughout Britain. However, the British population is among the largest in Europe, where the newt is under threat in several different countries. The UK therefore has an important role to play in conservation of the species.

Due to enormous declines in range and abundance in the last century, the great crested newt is strictly protected by British and European law: Annexes II and IV of the Habitats Directive and Schedule 5 of the Wildlife and Countryside Act; it is also listed under Appendix II of the Bern Convention. It is an offence to: kill, injure, capture or disturb them; damage or destroy their habitat; and to possess, sell or trade; and this law refers to all great crested newt life stages, including eggs.

Palmate newt

This is Britain’s smallest newt species and gets its name from the distinctive webbed feet of the breeding male. In contrast, the females are very similar to, and difficult to

differentiate from smooth newts unless closely examined in the hand. Palmates favour shallow water bodies and gentle running waters that have a neutral to very slightly acid pH, and as a result are more commonly found in heathland and moorland habitats. The species occurs throughout Britain, with the exception of Ireland. It is at its most abundant in western Britain and Scotland, but rare in much of the Midlands and eastern England. The pattern of its annual life cycle and terrestrial habitat requirements are similar to those of great crested newts.

Like the smooth newt, palmate newts are protected under the Wildlife and Countryside Act; it is illegal to sell or trade them in any way.

2. Current status in Lincolnshire

Smooth newt

In line with its UK status, this species appears to be widespread and common in Lincolnshire; with records of smooth newts from 50 out of 91 10km squares. Like other amphibians, its status depends on the availability of inter-connected networks of ponds and terrestrial habitats.

Great crested newt:

Great crested newt populations appear to be relatively widespread in the county (43 occupied 10km squares) but there is a lack of comprehensive data on the distribution and population size of the species. The loss of ponds due to agricultural intensification and increasing development in the county over recent years is well documented and this can only result in less suitable wet habitat for newts. The terrestrial habitat required by the species is also suffering from development and changes in agriculture. Moats and other water bodies associated with the county's sites of historic interest can often be found to support colonies of this species.

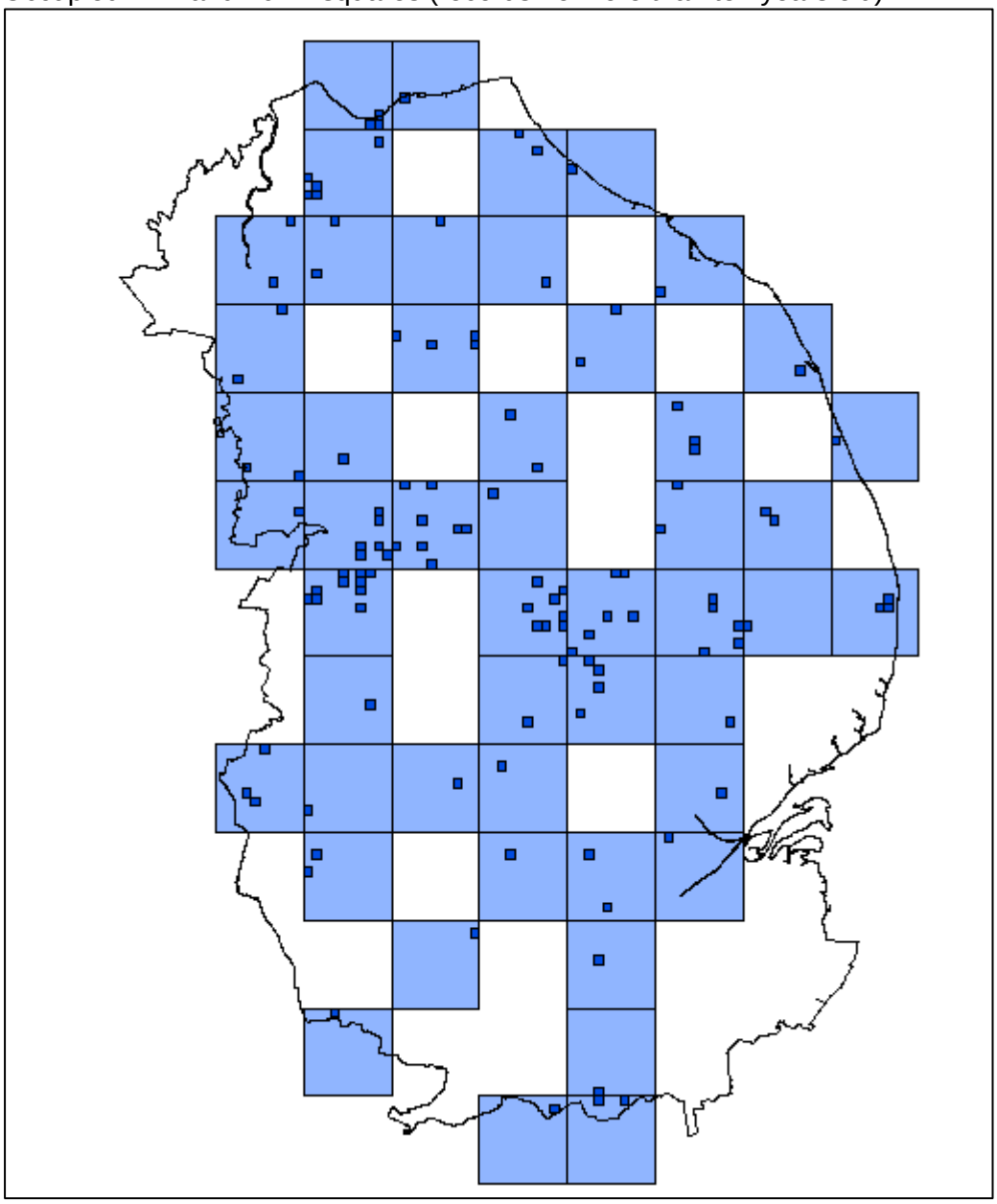
The primary source of new site records for this species is currently the result of work carried by ecological consultants while conducting surveys in connection with planning applications. Some survey work is also carried out by LARG under the National Amphibian and Reptile Recording Scheme.

Palmate newt

The palmate newt has to date only been recorded at four sites in Lincolnshire (plus a number of other, unconfirmed, sites), making it significantly rarer in the county than either smooth newt or great crested newt. It may, however, be under recorded; being an elusive species that is relatively difficult to differentiate from the much more frequently encountered smooth newt. Further survey work, particularly targeted towards areas supporting more acid water bodies, may in time reveal the existence of additional colonies of this species.

Map 12: Distribution of smooth newt

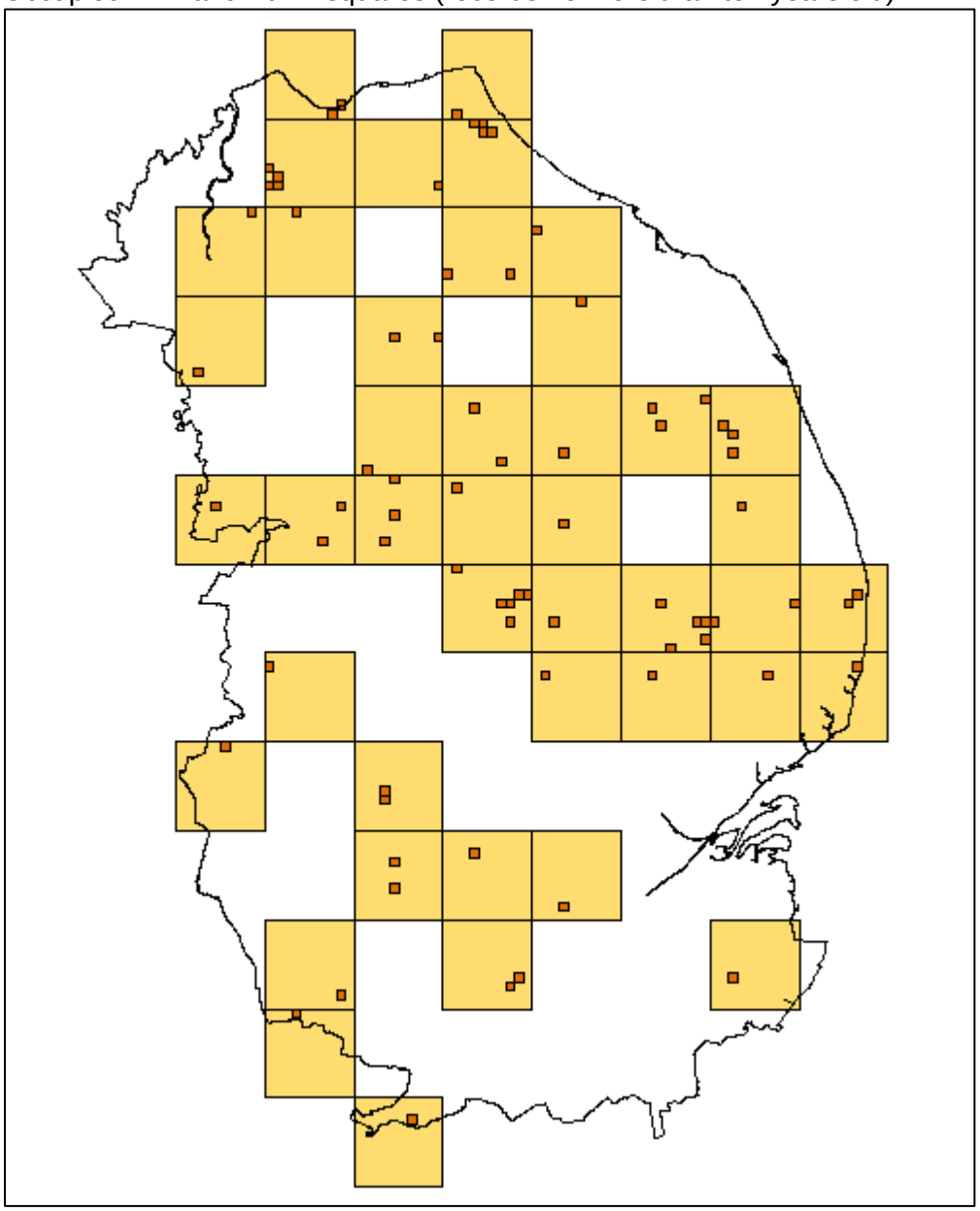
Occupied 1km and 10km squares (records no more than ten years old).



Data courtesy of Lincolnshire Environmental Records Centre. Accessed 17/08/2011.

Map 13: Distribution of great crested newt

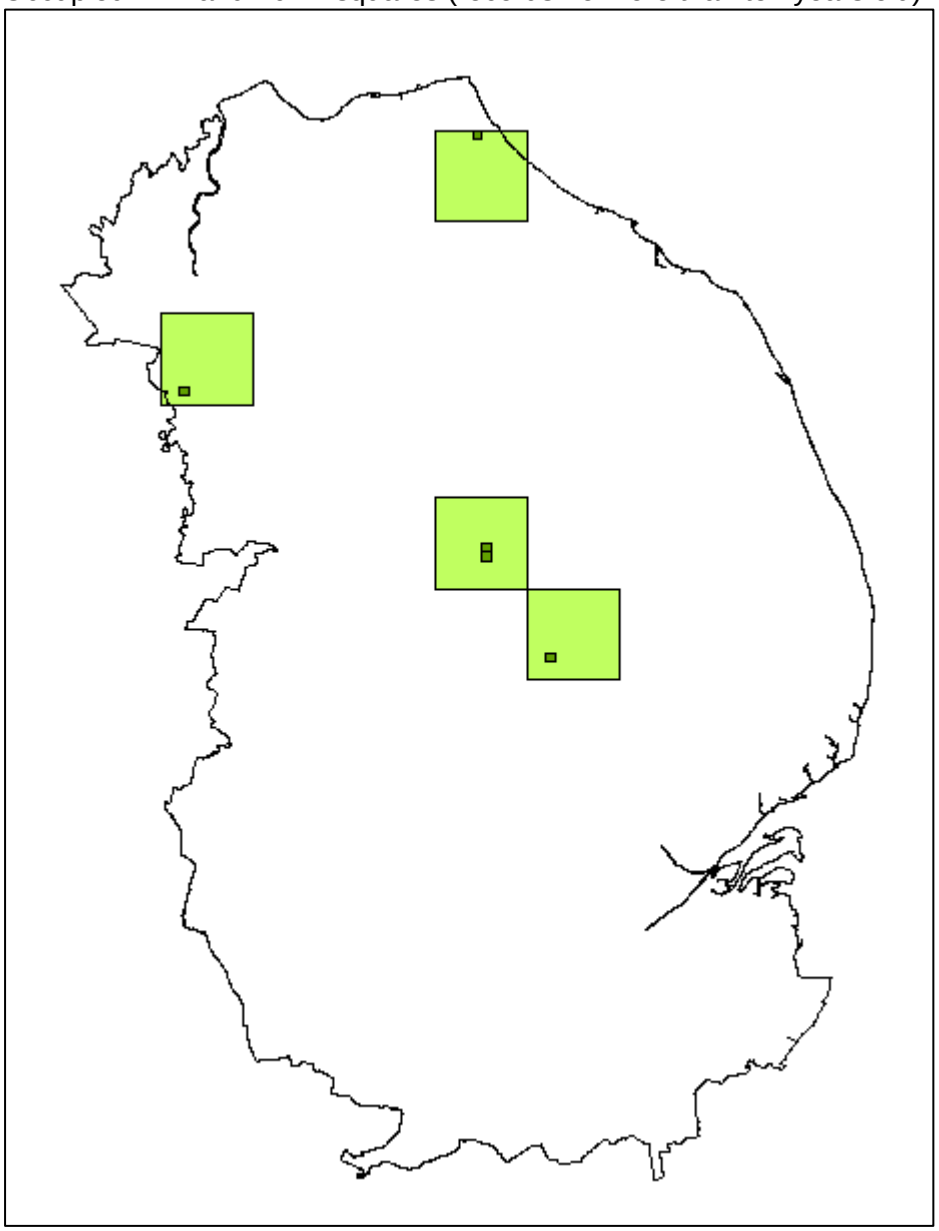
Occupied 1km and 10km squares (records no more than ten years old).



Data courtesy of Lincolnshire Environmental Records Centre. Accessed 17/08/2011.

Map 14: Distribution of palmate newt

Occupied 1km and 10km squares (records no more than ten years old)



Data courtesy of Lincolnshire Environmental Records Centre. Accessed 17/08/2011.

3. Threats in Lincolnshire

- **Loss of suitable breeding ponds** due to lowered water-tables; infilling for development, farming or waste disposal; neglect; natural succession; shading from surrounding vegetation.
- **Degradation, loss and fragmentation of terrestrial habitats**.
- **Introduction of fish** into breeding ponds, which eat young newts and eggs.
- **Chemical pollution**, eutrophication and toxic effects of agrochemicals.

4. Progress towards Lincolnshire BAP targets 2006-2011

(Great crested newt SAP)

Target details*	Progress 2006-2011	Status 31/03/2011	3rd edition targets
Set up a functioning and active Amphibian and Reptile Group in Lincolnshire by 2010.	Group established and committee set up. Formal constitution still to be agreed.	Behind schedule.	No equivalent target in 3rd edition.
Publish a statement on the population and distribution of great crested newts in Lincolnshire by 2010. (Also include information on the status of the palmate newt in Lincolnshire).	Data are available in LERC, no statement published yet. Some information summarised in current status section of 3rd edition SAP.	Behind schedule.	Amended and included in 3rd edition.
Maintain the number and distribution of sites in Lincolnshire (based on 2010 figures) occupied by the great crested newt by 2015.	No full assessment done, though GCN is considered to be doing well in Lincolnshire.	On schedule.	Amended and included in 3rd edition.

* targets were reviewed in 2009 therefore some may differ from those published in 2006

5. Objectives

- To achieve a better understanding of the distribution of newts in Lincolnshire.
- To maintain and enhance current newt populations through habitat improvements and creation.

6. Targets and actions 2011-2020

Target	Details
LIN3_NWT_T01	Publish a statement by 2012 on the population and distribution of newts in Lincolnshire.
LIN3_NWT_T02	No net loss in the number of sites in Lincolnshire with newt records between 2010 and 2015 (based on 2010 figures).
LIN3_NWT_T03	Increase the number of recent great crested newt records held by LERC to 60 occupied 10km squares by 2020.

Action	Details	Target links	Partners	Action date
LIN3_NWT_A01	Collate existing records of newts in Lincolnshire to identify key sites and any knowledge gaps.	1	**LBP**	2011
LIN3_NWT_A02	Follow up results of 2009-10 ponds and amphibians survey using trained surveyors to verify great crested newt presence.	1,2	**LARG**, LBP, LNU	2012
LIN3_NWT_A03	Carry out further surveys to identify breeding sites. Use survey work to identify potential sites for habitat enhancement.	2,3	**LARG,** LNU, LWT	Ongoing
LIN3_NWT_A04	Work with landowners/ managers to safeguard and manage identified key sites.	3	**LAs, LWT, NE**, LARG, NT	2015

LIN3_NWT_A05	Carry out habitat restoration and creation – in particular near to existing sites – to facilitate population expansion. (Aim for one enhancement scheme per year).	3,4	FWAG, LAs, LWT	Annually
LIN3_NWT_A06	Provide advice to owners of ponds containing great crested newt or palmate newt populations re management of the ponds, terrestrial habitat, legal issues etc.	3	FWAG, HINCA, LARG, LWT, NE	Ongoing

8. Further information

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Revised 2011

Catherine Collop (Lincolnshire Biodiversity Partnership), Garry Steele (Lincolnshire Amphibian and Reptile Group).

Seals

Common seal *Phoca vitulina* and grey seal *Halichoerus grypus*

Summary

UK BAP
Common seal – priority species.

Current national trend
Common seal – declining – this trend is repeated in Lincolnshire.
Grey seal – increasing – this trend is repeated in Lincolnshire.

Estimated Lincolnshire resource
Common seal – breeding in The Wash, haul-out sites in The Wash and at Donna Nook. Grey seal – breeding at Donna Nook.

Lead Partners
Common seal – Natural England, SMRU
Grey seal – Lincolnshire Wildlife Trust

1. Introduction

This is a grouped action plan covering the two seal species that inhabit British waters; common seal and grey seal. The common (or harbour) seal is a priority species in the UK Biodiversity Action Plan. Both species are listed in Appendix III of the Bern Convention; Appendix II of the Bonn Convention and Annexes II and V of the Habitats Directive. In England and Wales, both species are protected under the Conservation of Seals Act (1970) during close seasons. On the east coast of England, common and grey seals have additional, year-round protection under The Conservation of Seals (England) Order (1999).

Under the Conservation of Seals Act, the Natural Environment Research Council has a statutory responsibility to provide scientific advice relating to the management of seal populations to the Government. One fundamental component of this advice is up-to-date information on the distribution and number of seals around the UK coast. The Sea Mammal Research Unit (SMRU) is responsible for providing the necessary information on various aspects of seal biology to the Research Council and thereafter to the Government. The SMRU updates the information each year and Research Council's Special Committee on Seals scrutinises it before submitting it to the Government.

Common seal

Common seals feed at sea but regularly haul out on to rocky shores or intertidal sandbanks to rest. Adult seals appear to remain faithful to favoured haul-out areas from year to year.

Unlike the grey seal, common seals do not gather together during the breeding season. Females give birth to a single pup in June or July each year. Pups are very well developed at birth and can swim and dive within just a few hours. In August, soon after breeding, common seals undergo the annual moult of their fur, during which they spend much of their time ashore.

The common seal is widespread around the west coast of Scotland and throughout the Hebrides and Northern Isles. On the east coast, distribution is more restricted with concentrations in The Wash, the Firth of Tay and the Moray Firth.

It is very difficult to obtain accurate information on the numbers of pups born in any location in any year because the pups can swim within a few hours of birth, and because their mothers do not breed in large groups. Instead, common seals are monitored by the SMRU during their annual moult, when it is believed that the greatest and most consistent numbers of animals may be found ashore. Using the 2006-2008 counts at all UK sites, the UK population of common seal was estimated to be a minimum of 24,466 (an unknown proportion of the population will be at sea when surveys are carried out). The English population was estimated to be a minimum of 3,230. The UK population has decreased, particularly in Shetland, Orkney, the east and north coasts of Scotland and in East England. Between population estimates in 1994 and 2007 there was a decline of approximately 3-4%[96]. The reasons for the continuing population decline are unknown. Possible reasons are further outbreaks of phocine distemper virus (PDV) and possibly reduced availability of food resources and competition with grey seals.

Grey seal

Grey seals spend about two-thirds of their time at sea where they hunt and feed. Between foraging trips the seals haul out and rest; they tend to be based at specific haul out sites. Grey seals come ashore to pup in the autumn. They breed at traditional colonies where females give birth in November or December to a single white-coated pup. About a month after being born the pups shed their white coats and leave their birth sites for the sea.

Grey seals can be seen regularly throughout the North Sea, south-west England and the Irish Sea. In Britain, the grey seal breeding colonies are found predominately in the Hebrides and Orkney. There are additional colonies in Shetland, on the north and east coasts of mainland Britain and in Devon, Cornwall and Wales. Outside the breeding season, in August, grey seals are more widespread with the largest haul-out aggregations at locations affording good access to offshore foraging areas.

Since grey seals gather together to breed in particular colonies and because their pups are relatively easy to spot, the numbers of pups born at the major breeding colonies can be monitored. In 2008 the UK grey seal population was estimated to be 206,000; through the 1980s and 1990s, the number of pups born increased by about 6% a year, but in more recent years the rate of increase has declined as pup production in the UK stabilises[97].

2. Current status in Lincolnshire

Common seal

The extensive intertidal flats in The Wash provide ideal conditions for common seal breeding and hauling-out. This site holds 80% of England's common seal population and 10% of the total UK population. Common seal is a key designation feature of The Wash European Marine Site. The flats at Donna Nook are also used as haul-out sites.

Monitoring surveys of these haul-out sites in The Wash and at Donna Nook are carried out annually by the SMRU. Since SMRU surveys began, the peak count in The Wash has been c. 3,000 seals – achieved in 1988 and in 2000-2002 prior to the two PDV epidemics. The seal population in The Wash declined by 52% following the 1988 PDV epidemic to c. 1,600 seals in 1989, and by 22% following the 2002 epidemic to c. 2,500 seals in 2003. The Wash population has continued to decline

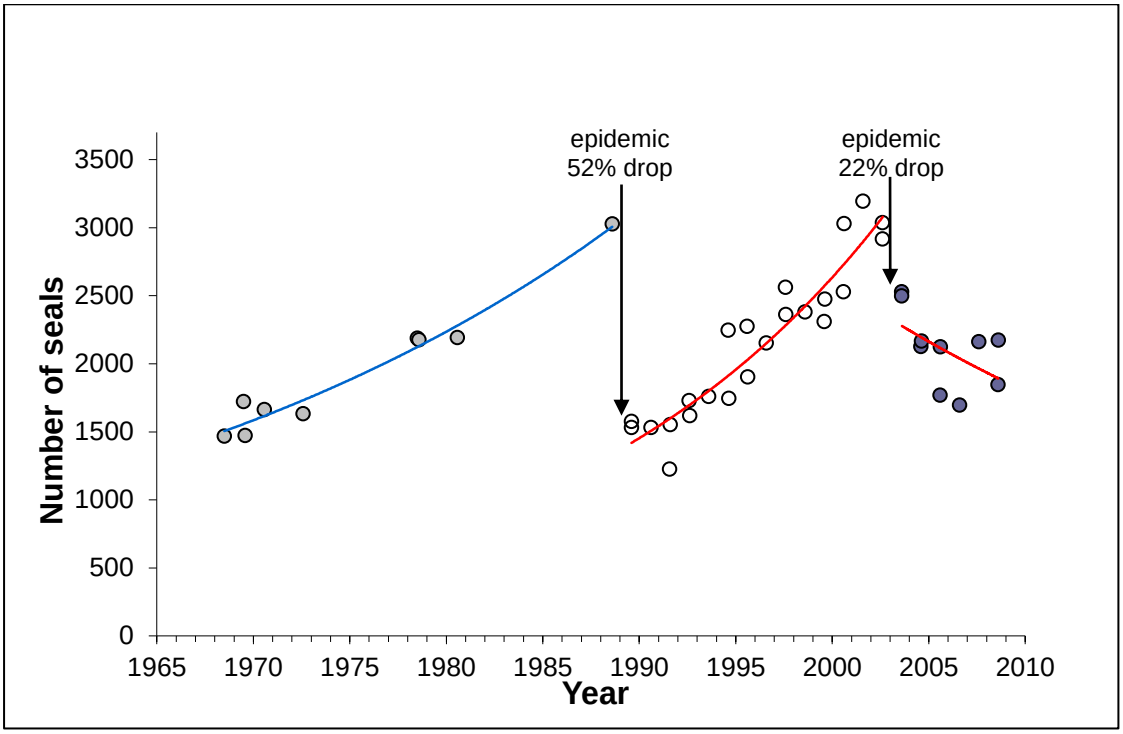
gradually further and has dropped by 22% since the PDV epidemic in 2002 (see Chart 6).

At Donna Nook, the peak population reached over 400 seals in 2000, but decreased to 231 following the PDV epidemic in 2002, after which numbers gradually increased to 470 in 2005. However, the population decreased again in 2006 and 2007 with counts of c. 300 and c. 200 respectively. There was a slight increase in 2008 with a count of c. 250. However, variation between 200 and 300 at Donna Nook may be within day-to-day haul out variability rather than an actual change in the local population.

Interestingly, in contrast to the declines recorded through the adult moulting surveys there appears to have been a big increase in the breeding population of the common seal in The Wash; pup production in 2006-2008 (c. 1000 pups) was double the 2001 level (550 pups). The reasons for this increase are unknown.

Chart 6: Counts of common seals in The Wash in August, 1967-2008.

(Reproduced from Special Committee on Seals Briefing Paper 09/03 with permission of the authors)

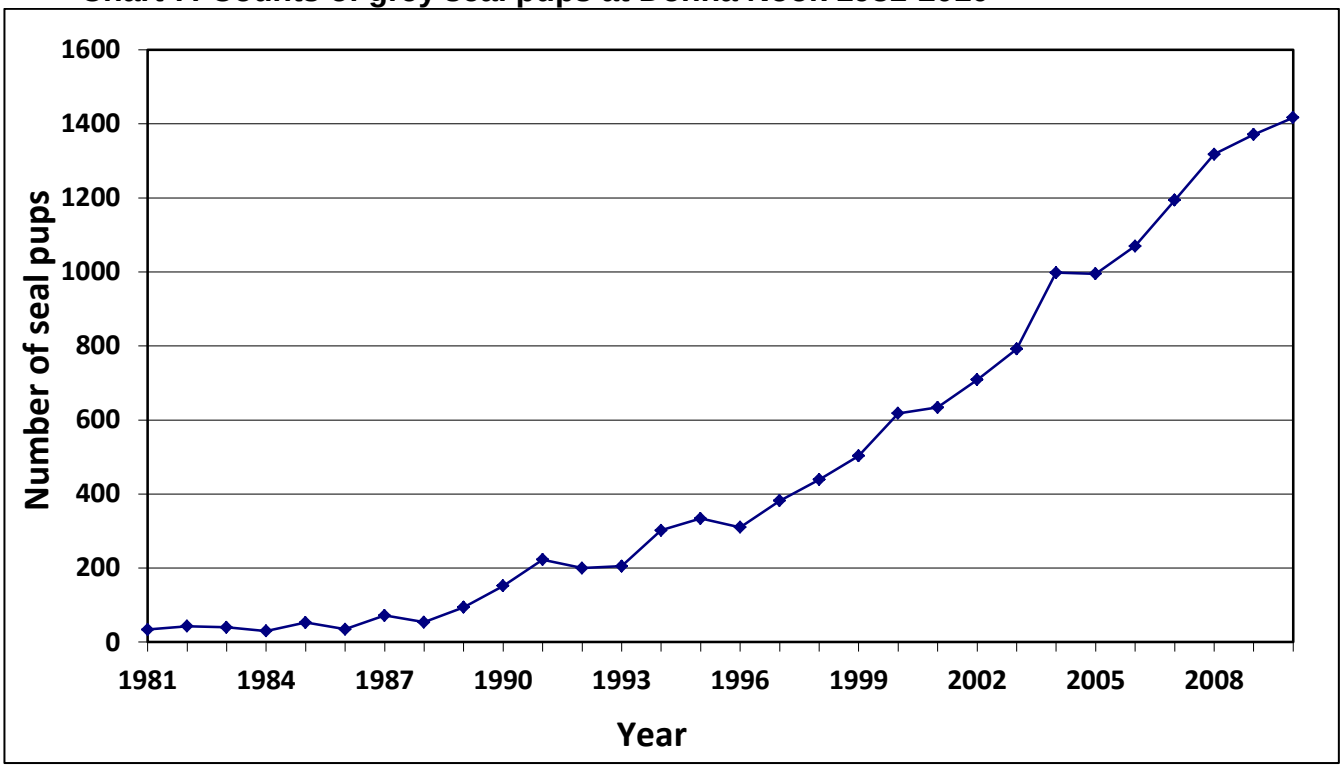


Grey seal

Donna Nook NNR on the Humber Estuary holds one of the largest grey seal breeding colonies in England; and the species is a key designation feature of the Humber European Marine Site. Grey seals have been breeding at Donna Nook since the early 1970s. The Lincolnshire Wildlife Trust manages the sites a nature reserve through an agreement with the Ministry of Defence.

Ground counts of pups carried out annually by the Lincolnshire Wildlife Trust have shown that the colony continues to grow each year (see Chart 7). 1417 pups were produced in 2009 compared to 34 in 1981. The reason for this increase is unknown.

Chart 7: Counts of grey seal pups at Donna Nook 1981-2010



3. Threats in Lincolnshire

- **Disturbance on land and at sea** (recreation, industry e.g. renewables, oil and gas, aggregate extraction). Although there is evidence that seals can become habituated to human presence, unfamiliar or sudden noises or movements may cause disturbance and can displace seals from their haul-out sites or breeding grounds. Female seals are particularly susceptible to disturbance during pupping, which is likely to have an adverse effect on pups' survival rates. The effects of the vibrations from the rotating blades of off-shore wind turbines are as yet unknown. However, the noise created by their installation has the potential to affect seals.
- **Environmental change** (effects of fishing and possibly climate change). Declines in fish stocks caused by climate change and intensified fishing practices could bring about declines in seal numbers.
- **Boat activities** – both noise and physical disturbance caused by vessel activities affect seals. Boats can injure and kill seals if they collide. The noise from engines may disturb seals causing them to move to unfavoured, less productive areas.
- **Environmental contaminants (toxic substances at sea, marine debris)** from anthropogenic activities. Many toxic contaminants are known to bioaccumulate in marine mammals with sub-lethal toxicological effects such as lowered reproductive capacity and a suppressed immune system. In the UK, both grey and common seals have been found to have high levels of pollutants in their bodies. Seals are also sensitive to debris, such as small plastic fragments that may be ingested, or plastic packing bands that may get caught around a seal's neck.
- **By-catch** – seals have been recorded as a by-catch of fisheries. They become tangled in fishing nets and eventually drown.
- **Disease** e.g. phocine distemper virus. Possible recurrence every 15 years (approximately).

- **Coastal squeeze** – intertidal habitats provide important haul-out sites; as sea levels rise there will be a reduction in intertidal habitat, which could adversely affect seal populations if important haul-out sites are lost.

4. Current conservation

A good practice guide for the Wash and North Norfolk Coast European Marine Site has been produced to promote responsible use of the estuary and coast to ensure the internationally important wildlife (including common seals) found around the site is maintained in good condition. Similarly, the Humber Management Scheme has produced codes of conduct to promote responsible use of the estuary and its environs, to safeguard its habitats and species (including grey seals). Both guides encourage people not to disturb wildlife and to dispose of waste properly.

The RAF bombing range at Donna Nook provides seals with a relatively disturbance-free site for hauling out. The seals do not appear to be concerned by the planes and the staff at RAF Donna Nook make every effort to make sure that no harm comes to any animal as a result of military activity.

During the breeding season visitor numbers to Donna Nook are high with an estimated 60,000 visitors between November and January each year. A fence has been erected along the dune frontage to manage the visitors and minimise disturbance to the seals. Dogs are banned from this part of the site during the pupping season. The Lincolnshire Wildlife Trust employs a warden to monitor the seals who with the help of volunteers protects the seals from disturbance; protects the public against injury; and provides information. Whilst the visitor management along the dune frontage is fairly successful, there is increasing concern about the number of people accessing the outer colony at weekends and the resulting disturbance.

Annual ground counts of grey seal pups have indicated increasing levels of pup mortality in the outer area. Disturbance, leading to abandonment, is thought to be one of the main causes of this increased pup mortality. To try and limit disturbance to the outer colony during the 2010 breeding season visitors were actively discouraged from going out amongst the seals. The negative impacts that disturbance has on the seals were explained to visitors in the hope that people would stay behind the fence along the dune frontage.

5. Objectives

- No contraction in the current ranges of the common and grey seal in Lincolnshire.
- No decline in the Lincolnshire breeding population of the grey seal.
- No decline in the Lincolnshire population of the common seal.

6. Targets and actions 2011-2020

Target	Details
LIN3_CGS_T01	Maintain the current range (based on 2010 data) of common and grey seals in Lincolnshire between 2011 and 2020.
LIN3_CGS_T02	Maintain the breeding population of the grey seal in Lincolnshire at approximately 1400 pups per year between 2011 and 2020.
LIN3_CGS_T03	Maintain the population of the common seal in Lincolnshire at approximately 2500 between 2011 and 2020 (based on counts when moulting).

Action	Details	Target links	Partners	Action date
LIN3_CGS_A01	Take action to reduce disturbance of breeding seals at Donna Nook and in The Wash.	1,2,3	**LWT, NE**, HMS, MMO	Ongoing
LIN3_CGS_A02	Continue to undertake survey and monitoring of breeding grey seal populations.	1,2,3	**LWT**	Annually
LIN3_CGS_A03	Continue to undertake survey and monitoring of breeding and moulting common seal populations.	1,3	**NE, SMRU**	Annually
LIN3_CGS_A04	Promote the importance of Lincolnshire's seals through research reports, events and education.	1,2,3	**LWT**, HMS, NE, WESG	Ongoing

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Drafted 2011

Elizabeth Biott (Lincolnshire Wildlife Trust), Catherine Collop (Lincolnshire Biodiversity Partnership).

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Urban birds

Swift *Apus apus,* song thrush *Turdus philomelos,* house sparrow *Passer domesticus*

Summary

UK BAP
House sparrow and song thrush – priority species.

Current national trend
Declining.

Estimated Lincolnshire resource
See species accounts below.

Lead Partner
Lincolnshire Bird Club

1. Introduction

This is a generic plan covering three bird species associated with urban areas. Nationally, all three species have suffered population declines. Both house sparrow and song thrush are on the Red List of Birds of Conservation concern (2009) and are national Biodiversity Action Plan (BAP) priority species. Swift has now been added to the Amber List since numbers are also declining nationally, though less steeply.

2. Current status in Lincolnshire

Swift
Very common summer visitor and passage migrant.

Swifts are present throughout Lincolnshire between late April and early September, breeding wherever there are suitable buildings, and they thus tend to be concentrated in the older parts of towns and villages. Based on sample surveys of Louth and Helpringham, the Lincolnshire population was estimated to be in the order of 10,000 pairs.

Both adults and young feed on airborne invertebrates and it is possible that climate changes, particularly wetter summers, may affect this food source. There is also now strong concern over the widespread loss of nest-sites due to house renovation, with new housing tending to be unsuitable. Where nest-sites remain available, there is no evidence that the population is declining and they have been shown to use suitable nestboxes where these are provided.

LWT surveys in 2003, 2008 and 2009 have confirmed 129 towns and villages in Lincolnshire (and there are likely to be many more) where swifts nest, most of which will support more than one discrete colony.

Song thrush
Very common resident, passage migrant and winter visitor.

Many native birds move south and west in winter and are replaced by continental birds. Birds from Scandinavia and northern Europe also pass through Britain in autumn to winter in France and Iberia. Song thrushes nest fairly low down, usually in hedges or bushes but using also a wide variety of other sites. They are ground-feeders, taking invertebrates – including molluscs in summer, plus fruit, seeds, etc in winter.

Song thrushes breed throughout Lincolnshire, while wintering birds appear to be concentrated close to the coast and in the south-west of the county, perhaps reflecting migrant distribution. The breeding population was estimated at about 38,000 pairs during the 1980s but monitoring has shown a steady decline since then, amounting to perhaps a third over that time, but there is no indication that distribution has changed. Nationally the number of young successfully fledging has also fallen and it appears that the causes are probably a shortage of good nesting habitat and food supply.

House sparrow
Very common resident and partial migrant.

Resident in Lincolnshire all year round and found throughout the county wherever there are towns and villages, although the species has been lost from many isolated farms and hamlets in recent years. House sparrows nest in suitable buildings and will also use nest-boxes. They are ground-feeders, taking invertebrates, fruit, seeds, grain, etc all year, and are one of the commonest species at garden feeding stations.

The population was considered to be in the order of 100,000 pairs in the 1980s but since that time the Lincolnshire Garden Bird Feeding Survey has shown a 20% decline in the proportion of survey weeks in which the species is recorded in gardens each winter, from 100% to 80%, and a two-thirds decline in the average peak count, from nearly 40 to around 13 birds per garden.

3. Threats in Lincolnshire

- **Loss of suitable feeding and breeding areas.**
- Trend towards **small and 'tidy' gardens.**
- **Predation** by domestic cat, sparrowhawk and other predators. It is likely that house sparrow and song thrush are particularly vulnerable to cat predation.
- Changes in agricultural (and related) practices which have brought about a **reduction in both weed seeds and invertebrates** in the wider countryside.
- **Loss of open space** as a result of high density development with less 'wild' habitat.
- **Use of pesticides, herbicides and molluscicides** (e.g. slug pellets). Molluscicides have been implicated in the decline of song thrushes as these birds tend to eat more slugs and snails than other species do, and may be dependent on this food source in some seasons.

4. Progress towards Lincolnshire BAP targets 2006-2011

Target details*	Progress 2006-2011	Status 31/03/2011	3rd edition targets
Determine trends in populations and status since 2000 by 2010, by analysis of existing information, and identify monitoring methods for each.	Trends identified – see species accounts above. Carry forward target to identify monitoring methods.	Completed for this period.	Amended and included in 3rd edition.
Stabilise urban bird populations at 2000 levels or above by 2015 and 1990 levels by 2020.	Not yet assessed.	Not started.	Target carried forward.

* targets were reviewed in 2009 therefore some may differ from those published in 2006

5. Objectives

- To determine current distribution and status.
- To encourage suitable management of urban habitats to maintain populations.

6. Targets and actions 2011-2020

Target	Details
LIN3_UBB_T01	Identify monitoring methods for each species and implement by 2012.
LIN3_UBB_T02	Stabilise urban bird populations at 2000 levels or above by 2015 and 1990 levels by 2020.

Action	Details	Target links	Partners	Action date
LIN3_UBB_A01	Make information available on trends in population and status of urban birds in Lincolnshire.	1	**LBC**, LWT, LBP	2011
LIN3_UBB_A02	Set up schemes to monitor population/status of urban birds in Lincolnshire, and promote participation in appropriate established monitoring schemes.	1	**LBC**, LBP, LWT, RSPB	Ongoing
LIN3_UBB_A03	Work with planning authorities to promote swift and house sparrow friendly designs or suitable nestboxes in new houses and development work where appropriate.	2	**LAs**, LWT, NE, RSPB	Ongoing
LIN3_UBB_A04	Work with planning authorities, developers and the building trade to ensure no loss of established swift breeding sites.	2	**RSPB,** LAs, LWT, NE	Ongoing
LIN3_UBB_A05	Promote the provision of nestboxes/ best practice management of nest sites for swift and house sparrow in existing buildings.	2	**LWT**, LAs, RSPB	Ongoing
LIN3_UBB_A06	Work with local authorities and community groups to ensure wildlife-friendly management of parks, allotments and other open spaces to provide nest boxes and year-round feeding opportunities.	2	**LAs,** LWT, RSPB	Ongoing
LIN3_UBB_A07	Promote wildlife-friendly gardening and encourage the use of alternatives to chemical pesticides, molluscicides and fertilisers.	2	**LWT**, NE, RSPB	Ongoing
LIN3_UBB_A08	Encourage year-round feeding in gardens.	2	**RSPB,** LWT	Ongoing

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Revised 2011

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Water Vole

Arvicola amphibius

Summary

UK BAP
Water vole – priority species.

Current national trend
Fluctuating – probably increasing.

Estimated Lincolnshire resource
The Lincolnshire water vole population appears to be stable, with a widespread distribution. Recent work on distribution and densities in England has identified two Regional Key Areas in Lincolnshire (Leggett and Perkins, 2010).

Lead Partner
Environment Agency

1. Introduction

The water vole is the largest of the British voles. This species rarely ventures far from water in Britain and is usually found on the vegetated banks of rivers, streams, ditches, dykes, drains and pools. Despite not being particularly adapted to an aquatic environment it swims and dives well.

Predominantly herbivorous, water voles feed mainly on the aerial stems and leaves of a wide variety of emergent waterside aquatic and bankside plants, such as sedges, reeds and rushes, which also provide good cover. In winter, water voles also feed on roots, bark, rhizomes and bulbs.

Once common and widespread, the water vole has suffered a long-term decline since 1900: formerly the most rapidly declining of all the priority vertebrate species in the UK BAP, its national status now appears more stable and the species is slowly expanding its range overall. This is due to localised range expansions enabled by concerted habitat creation, enhancement and management, in combination with sustained catchment-scale mink control. However, fragmentation of populations continues to be a problem due to mink predation, catastrophic flood events, etc., especially in south Wales, Northern England and Scotland,

The water vole is a UK BAP species and has a national action plan. In April 2008 it became fully protected under the Wildlife and Countryside Act.

2. Current status in Lincolnshire

The Lincolnshire population is significant to the persistence of the water vole nationally because in Lincolnshire, despite the national trend, they are widespread and the population is one of the most successful in the UK. Recent work on distribution and densities in England has identified two Regional Key Areas in Lincolnshire; one in the Lincolnshire Coastal Grazing Marshes and the other in the Welland and Deeping area[98].

Sightings of water voles, or signs of their activity, can be expected from most suitable watercourses throughout Lincolnshire. They have been recorded in the smallest of roadside ditches and the lower lengths of the county's major rivers. They show a

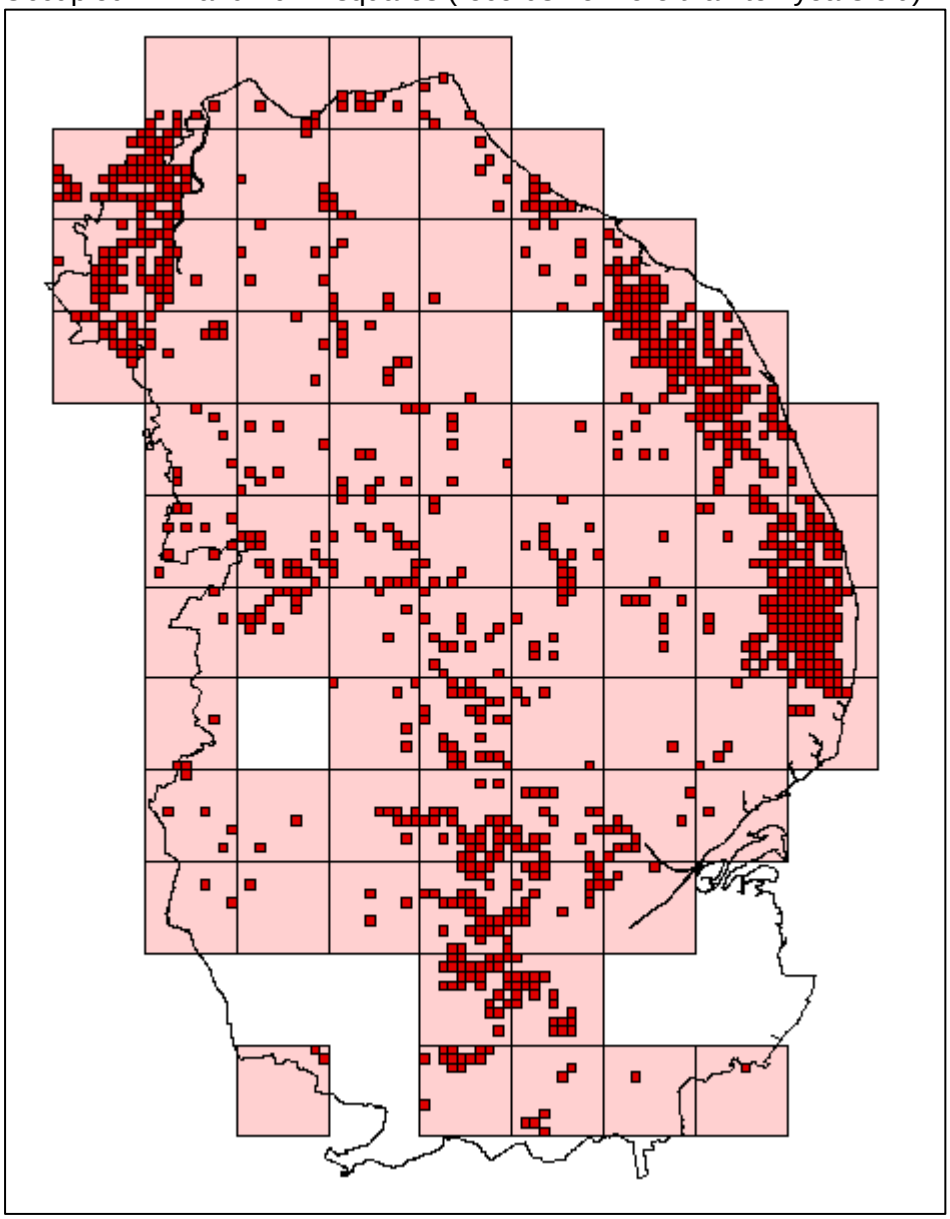
preference for steep, grassy banks rising from margins fringed with reeds and other emergent plants, along slow to moderately flowing watercourses in the county.

They are most abundant along the middle reaches of rivers and streams with summer water depths of about 0.3-2m and along the drains and ditches of the Lincolnshire marsh and fen. Even along the county's swifter watercourses in the Wolds and on the Lincolnshire limestone, water voles can be found inhabiting banks along 'glides' and pools. Extensive colonies are often found adjacent to and within urban and residential areas where human disturbance probably affects predators more than it affects the water vole.

Internal Drainage Boards, the Environment Agency and others take particular note of water vole habitat when carrying out improvement and maintenance works; some IDBs are incorporating water vole habitat creation into new capital works projects.

Map 15: Water vole

Occupied 1km and 10km squares (records no more than ten years old).



Data courtesy of Lincolnshire Environmental Records Centre. Accessed 17/08/2011.

3. Threats in Lincolnshire

- **Damage to (and loss of) habitat** due to insensitive routine maintenance of channel and bankside vegetation and the engineering of watercourses.
- **Developments within the floodplain** can result in the direct loss of water vole habitat.
- **Fluctuations in water level** due to land drainage, flood control, irrigation schemes and drought. Water voles create access holes to their burrows based on water levels during the active summer months; when water levels are lowered in the winter, burrow entrances can be left exposed and vulnerable to predation.
- **Population fragmentation** leaves colonies remote from their neighbours. Colonies isolated by lack of continuity of habitat are more at risk of local extinctions with no chance of repopulation.
- **Predation**, particularly by American mink. Though it has been suggested that the phocine distemper virus may have limited mink numbers on the Lincolnshire coast.
- **Pollution** of the aquatic environment by contaminants discharged from industry, agriculture and urban waste treatment.
- **Persecution** through the improper use of rodenticides.

4. Progress towards Lincolnshire BAP targets 2006-2011

Target details*	Progress 2006-2011	Status 31/03/2011	3rd edition targets
Maintain the current (2006) distribution of the water vole in Lincolnshire with no loss in range by 2015.	Monitoring is ongoing. Species has full protection under Wildlife and Countryside Act as of 06/04/08.	On schedule.	Amended and included in 3rd edition.
Successfully establish the Lincolnshire Marsh Water Vole Project.	Monitoring is ongoing. Two mink control training days held. Volunteers and a contractor operating rafts in EA & LMDB area.	Achieved.	No equivalent target in 3rd edition.

* targets were reviewed in 2009 therefore some may differ from those published in 2006

5. Objectives

- To maintain the nationally important Lincolnshire population of water vole at least at its current (2010) level.
- Ongoing survey work to monitor the species' status.

6. Targets and actions 2011-2020

Target	Details
LIN3_WAV_T01	Maintain or increase the current (2010) distribution of the water vole in Lincolnshire by 2015.

Action	Details	Target links	Partners	Action date
LIN3_WAV_A01	Ensure routine maintenance of riparian habitat is water vole friendly and where possible enhances the habitat.	1	**EA, IDBs**, LAs	Ongoing
LIN3_WAV_A02	All operating authorities to include water vole mitigation in capital works.	1	**EA, IDBs**, AW, LAs	Ongoing

LIN3_WAV_A03	All operating authorities to include recording water voles in operational activities, and submit those records to LERC.	1	**EA**, **IDBs**, AW, LAs	Annually
LIN3_WAV_A04	Ensure appropriate conditions are included in planning and other consents.	1	**EA, IDBs**, **LAs, NE**	Ongoing
LIN3_WAV_A05	Ensure information on water vole conservation and appropriate habitat management is available to relevant site owners and managers.	1	**EA, IDBs, LAs**, FWAG, NE, LBP, LWT.	2012 Ongoing updates

N.B. actions relating to control of mink are included in the invasive non-native species action plan (page 233).

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Revised 2011

Chris J Manning (Lindsey Marsh Drainage Board), Catherine Collop (Lincolnshire Biodiversity Partnership).

[98] Leggett, V. and Perkins, H. (2010) National Water Vole Database and Mapping Project Guide to the Use of Project Outputs. Environment Agency, Royal Society of Wildlife Trusts and People's Trust for Endangered Species.

White-clawed crayfish

Austropotamobius pallipes

Summary

UK BAP
White-clawed crayfish – priority species.

Current national trend
Declining.

Estimated Lincolnshire resource
Population continuous over 27km of the Upper Witham (found nowhere else in Lincolnshire).

Lead Partner
Environment Agency

1. Introduction

The white-clawed crayfish is the only species of freshwater crayfish native to the UK. It is one of the UK's largest mobile freshwater invertebrates, and can reach up to 12cm in length (excluding the tail). The strong pincers are nearly half as long as the body, with pale undersides – from which the species gets its name. The rest of the crayfish is brown or olive in colour.

Crayfish are found in clean, calcareous streams, rivers and lakes and are not often recorded unless searched for.

In England and Wales the species has been in severe decline since the 1970s due to loss of habitat, a decline in water quality, competition from non-native crayfish species and the spread of a fungal disease, known as crayfish plague, carried by those non-native species. This situation is mirrored in Europe. Many populations have been lost already, and most of those remaining in streams and rivers are at risk of loss in the future. Once lost from a river catchment, recolonisation is very slow.

At least three non-native crayfish species are now breeding in the wild in the UK and at least two others may occur in a non-breeding state. These were introduced into the country to be farmed but have since escaped into river systems. See the invasive species action plan (page 233) for more information.

The white-clawed crayfish is a priority species in the UK BAP. It is protected under schedule 5 of the Wildlife and Countryside Act in respect of taking it from the wild and sale. Schedule 9 of the Act makes it an offence to allow non-native crayfish to escape or to release them into the wild without a licence. The native species is also listed in Appendix III of the Bern Convention and Annexes II and V of the Habitats Directive. It is classed as Globally Threatened by the International Union for Conservation of Nature.

2. Current status in Lincolnshire

Following the national trend, native crayfish in Lincolnshire are under considerable threat. The only remaining Lincolnshire population of native crayfish occurs in a 27km stretch of the upper Witham and adjoining tributaries. This population is potentially of national significance due to its size.

In the past, white-clawed crayfish are known to have occurred in the River Bain north of Horncastle: this population is now extinct and signal crayfish are frequently recorded. There have been no reported cases of crayfish plague in Lincolnshire but non-native crayfish species are well established in a number of locations and at least two species are known to breed in Lincolnshire.

3. Threats in Lincolnshire

- **Direct competition from non-native crayfish** for food and habitat: signal crayfish out-compete white-clawed crayfish.
- **Inappropriate site management and habitat modification**. Suitable crayfish habitat can be damaged or destroyed by unsympathetic watercourse bed management.
- **Pollution**. The crayfish is susceptible to sewage and pesticides, particularly those that lower the oxygen concentrations in water. Watercourses with high levels of sediment due to soil erosion are also unsuitable for crayfish.
- **Low water levels** from drought or water abstraction.
- **Crayfish plague** – native crayfish are very susceptible to this disease caused by the fungus *Aphanomyces astaci*, which is carried by non-native crayfish.

4. Progress towards Lincolnshire BAP targets 2006-2011

Target details*	Progress 2006-2011	Status 31/03/2011	3rd edition targets
No contraction in range of the upper Witham population of white-clawed crayfish upstream of Long Bennington by 2015.	EA monitors 50% of sites each year. No range contraction reported.	On schedule.	Amended and included in 3rd edition.
Carry out 10 habitat enhancement schemes by 2015 along the upper Witham and its tributaries upstream of Long Bennington, to enhance the distribution and density of native crayfish along the river.	Three schemes since 2006.	Behind schedule.	Amended and included in 3rd edition.
No colonisation of the upper Witham catchment by non-native crayfish species by 2015.	Colonised but not online.	Abandoned.	No equivalent target in 3rd edition.

* targets were reviewed in 2009 therefore some may differ from those published in 2006

5. Objectives

- To maintain and enhance the existing population of native crayfish within the upper Witham.
- Establish offline ark sites with the potential for restocking catchments if necessary.
- No incidences of crayfish plague affecting white-clawed crayfish in Lincolnshire.

6. Targets and actions 2011-2020

Target	Details
LIN3_WCC_T01	No contraction in the range of the upper Witham population of white-clawed crayfish upstream of Long Bennington between 2011 and 2015.
LIN3_WCC_T02	Undertake ten schemes by 2020 to enhance the distribution and density of native crayfish along the upper Witham and its tributaries upstream of Long Bennington.

Action	Details	Target links	Partners	Action date
LIN3_WCC_A01	Continue to undertake a monitoring programme of native crayfish in the upper Witham. Review the monitoring data and undertake resurveys as required.	1	**EA**, LBP	2015
LIN3_WCC_A02	Progress investigation of designating part or all of the upper Witham system (Cringle Brook/ Wyville Brook and/or main river) as a SSSI for the crayfish and other wildlife and geomorphological interest. In the interim evaluate as a LWS.	1	**NE**, EA, LCC, LWT, SKDC	2015
LIN3_WCC_A03	Investigate the possibility of setting up an offline site to hold native crayfish from the upper Witham (potential to restock if a serious pollution incident took place). Site need not be within Witham catchment.	1	**EA**, AW, LWT, NT	2015
LIN3_WCC_A04	Identify suitable locations along the upper Witham for habitat enhancement schemes (maintaining or creating suitable habitat features, and ensuring appropriate management). Implement at least ten e.g. through agri-environment schemes or development mitigation work.	2	**EA, NE**, Angling clubs, FWAG, IDBs, NFU, NT, AW (Rivercare)	2015
LIN3_WCC_A05	Set up and promote a partnership project for the upper Witham.	1,2,3	**EA**, AW, NE, GAAFFS, LWT, NT	Ongoing
LIN3_WCC_A06	Provide advice on appropriate habitat management to landowners and managers along the upper Witham.	1,3	**EA**	2015
LIN3_WCC_A07	Provide advice on native and non-native species ID, and how to prevent the spread of crayfish plague.	1	**EA,** AW, GAAFFS LWT, NE	Ongoing

N.B. actions relating to non-native crayfish are included in the invasive non-native species action plan (see page 233)

7. Further information

- Applied Environmental Research Centre Ltd, (2000) The Upper River Witham Crayfish and Habitat Surveys 2000: Colsterworth to Little Ponton, Little Ponton to Grantham Centre and Manthorpe to Hougham.
- Bullen Consultants, (2000). The Upper Witham Catchment: Crayfish Survey.
- Environment Agency (2004) A biodiversity action strategy for Anglian region.
- Environment Agency (2004) The State of England's Chalk Rivers.
- Peay, S. (2000) Guidance on works affecting white-clawed crayfish. Report for English Nature and Environment Agency.

Revised 2011

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Invasive non-native species

Summary

Current national trend
Variable according to species but generally perceived to be an increasing problem.

Extent of problem in Lincolnshire
Variable according to species and not fully known.

Lead Partner
Defra agencies

1. Introduction

This is a generic plan covering a number of non-native invasive species i.e. species that are seen as having detrimental impacts on native habitats or species and which are not native to the area in which they are causing a problem. Invasive non-native species are identified as one of the main drivers of biodiversity loss in a global context[99].

With plants, the detrimental impacts usually arise from the fast growth and spread of the invasive species. For animals, many invasive species out-compete their rivals for food and/or carry a disease which devastates native populations; for example crayfish plague carried by signal crayfish. Invasive species can also have economic impacts on navigation, forestry and development for example, due to the cost of their management/removal. Dealing with invasive non-native species is estimated to cost £2billion every year in Britain[100].

However, many non-native species are not invasive and our response to these should be different to species that are invasive. Many non-native species are an important part of our culture and economy, for example sheep and wheat. Some species have been in the UK for so long that they are naturalised, and in the minds of the public they are part of our 'native' countryside, for example rabbits.

Some non-native invasive species are covered by legislation: under section 14 of the Wildlife and Countryside Act it is an offence to release, or cause to grow in the wild, any of the species listed on Schedule 9.

In 2011 the "Check, Clean, Dry" campaign was launched by Defra to help inform the public of the practical steps they can take to stop the spread of non-native aquatic plants and animals.

2. Current status in Lincolnshire

The current status of individual invasive species in Lincolnshire is not well understood as these species are generally only recorded at the site level for management purposes (the national survey for the harlequin ladybird is an exception). Some records of invasive species are available on the NBN, however, these are likely to be a considerable underestimate of both frequency and distribution.

There are too many invasive species known to be relevant to the UK to mention them all individually in this plan so only those with the most significant impacts and thought to be most relevant to Lincolnshire are listed here:

Floating pennywort	All non-native crayfish
Giant hogweed	Chinese mitten crab
Himalayan balsam	
Japanese knotweed	Zebra mussel
New Zealand pygmyweed/ Australian stonecrop	
Parrot's feather	American mink
Water fern	Muntjac deer

Some species are already well established and widespread so it unlikely to ever be possible to remove them from the countryside completely; however in many cases it remains desirable to carry out control on a site by site basis for example grey squirrel and American signal crayfish.

It should not be assumed, however, that invasive species of all types pervade our entire county. Results from the Countryside Survey 2007 described both Japanese knotweed and Himalayan balsam as 'relatively uncommon' despite their increasing frequency compared to the 1997 survey[101].

3. Impacts in Lincolnshire

The specific threats and impacts are too numerous to list, however they fall into four main categories;

- Reduction in habitat quality e.g. reduction in diversity due to monocultures of Japanese knotweed or oxygen starvation of invertebrates and fish in rivers suffering from invasion by floating pennywort.
- Spread of disease e.g. the loss of white clawed crayfish due to the spread of crayfish plague by the American signal crayfish.
- Loss of native species due to competition for food, habitat etc.
- Direct population reductions e.g. American mink predation on water vole.

4. Examples of management work to date

- Mink control by the Marsh Water Vole Project and IDBs.
- Environment Agency crayfish monitoring/ licensing of traps.
- Mechanical and chemical removal of waterweeds by IDBs and Environment Agency.
- Japanese knotweed and Himalayan balsam control by land managers.
- Grey squirrel/ non-native deer culling in woodland sites.
- Rhododendron removal from sites around Lincoln.

5. Objectives

- To understand the distribution and impacts of invasive non-native species in Lincolnshire.
- To carry out horizon scanning for new invasive non-native species entering Lincolnshire and prevent further spread.
- To reduce/eliminate the detrimental impacts of invasive non-natives on native species, habitats and people.
- Improve awareness of invasive non-native species; their impacts, spread and management.

6. Targets and actions 2011-2015

Target	Details
LIN3_INV_T01	Develop an invasive non-native species web resource by 2013 to increase awareness and provide information and guidance.
LIN3_INV_T02	Determine population/ distribution trends for invasive non-native species (listed above) in Lincolnshire by 2014.
LIN3_INV_T03	Implement by 2015 nine control projects (at least one per local authority).

Action	Details	Target links	Partners	Action date
LIN3_INV_A01	Collate partners' records of invasive non-native species in Lincolnshire.	2	LBP, all Partners.	2014
LIN3_INV_A02	Use the LBP website to bring together existing information on invasive non-native species' impacts, spread and management. (Produce additional material if necessary).	1	LBP, EA, NE	2013
LIN3_INV_A03	Launch web resource and promote through a media campaign to reach land managers, members of the public, businesses and anglers.	1	LBP	2013
LIN3_INV_A04	Actively publicise the threat to the natural environment in Lincolnshire of non-native species of animals and plants in stillwaters. Seek to reduce sale of these by diplomatic lobbying of retailers.	1	EA, LWT, FWAG, IDBs, LAs, LNU	2012
LIN3_INV_A05	Continue to control mink in the Lindsey Marsh via the Marsh Water Vole Project.	3	LMDB, EA, NE, LWT	Ongoing
LIN3_INV_A06	Instigate mink control across Lincolnshire.	3	IDBs, BW, EA, NE, FWAG, LAs, LWT	Ongoing
LIN3_INV_A07	Identify and prioritise locations where control of other species needs to be undertaken.	3	EA, LAs, LBP, LWT, NE	2014

LIN3_INV_A08	Monitor existing control projects to determine success.	3	Project Partners	Annually
LIN3_INV_A09	Identify reasons for success or failure of control projects – use results to inform future work plans.	2,3	All Partners	Ongoing
LIN3_INV_A10	Ensure that new control projects follow best practice/ lessons learned from other projects.	3	All Partners	Ongoing
LIN3_INV_A11	Use evidence from Lincolnshire to support further legislative measures, beyond those in Schedule 9 of the Wildlife and Countryside Act 1981, to control crayfish farming. (The upper Witham is one of the areas not included at present).	3	NE, EA, LWT	Ongoing
LIN3_INV_A12	Maintain a watching brief on the spread of non-native crayfish in the Witham catchment (including the Rivers Bain and Slea).	2	EA, LBP	Ongoing
LIN3_INV_A13	Promote simple biosecurity measures such as those described in the Check, Clean, Dry campaign.	1	AW, BW, EA, GAAFFS, IDBs, IWA, LAs, NE, WESG	Ongoing

7. Further information

- Defra (2003) Review of Non-Native Species Policy.
- Defra (2008) The Invasive non-native species framework strategy for Great Britain.
- Defra (2009) Guidance on section 14 of the Wildlife and Countryside Act, 1981.
- Defra (2011) Helping to prevent the spread of invasive non-native species: Horticultural Code of Practice.

Websites

- Cornwall knotweed forum- not just for the Cornish! http://projects.exeter.ac.uk/knotweed/
- Countryside survey www.countrysidesurvey.org.uk/index.html
- Defra section on non-native species legislation www.defra.gov.uk/wildlife-pets/wildlife/management/non-native/legal.htm
- Environment Agency invasive species section www.environment-agency.gov.uk/homeandleisure/wildlife/31350.aspx
- European network on invasive alien species www.nobanis.org/
- GB Non-native species secretariat website- a fantastic resource https://secure.fera.defra.gov.uk/nonnativespecies/home/index.cfm
- IUCN invasive species specialist group www.issg.org/
- Natural England non-native species section www.naturalengland.org.uk/ourwork/conservation/biodiversity/threats/nonnativespecies.aspx

- Office of public sector information- contains the latest updates of legislation i.e. the species listed on Schedule 9 of the Wildlife and Countryside Act 1981 www.opsi.gov.uk/legislation
- Plantlife invasive species campaign www.plantlife.org.uk/campaigns/invasive_plants/

Drafted 2011
Fran Hitchinson (Lincolnshire Biodiversity Partnership), Catherine Collop (Lincolnshire Biodiversity Partnership).

[99] Convention on Biological Diversity, (2002) COP6 decision VI/23
[100] Barry Gardiner, Minister for Biodiversity (2007) JNCC press release
[101] Countryside Survey: England Results from 2007 (published September 2009). NERC/Centre for Ecology & Hydrology, Department for Environment, Food and Rural Affairs, Natural England, 119pp. (CEH Project Number: C03259).

16. Acronyms

BAP	Biodiversity Action Plan
ASNW	Ancient Semi-Natural Woodland
BARS	Biodiversity Action Reporting System
BSBI	Botanical Society for the British Isles
CAMS	Catchment Abstraction Management Strategies
CEFAS	Centre for Environment, Fisheries and Aquaculture Science
CITES	Convention on International Trade in Endangered Species of Wild Fauna and Flora
CSS	Countryside Stewardship Scheme
Defra	Department for the Environment Food and Rural Affairs
ELS	Entry Level Stewardship
EWGS	English Woodland Grant Scheme
HAP	Habitat Action Plan
HLS	Higher Level Stewardship
ICES	International Council for the Exploration of the Sea
IUCN	International Union for Conservation of Nature
LBP	Lincolnshire Biodiversity Partnership
LDF	Local Development Framework
LERC	Lincolnshire Environmental Record Centre
LGS	Local Geological Site
LNR	Local Nature Reserve
LWS	Local Wildlife Site
MCZ	Marine Conservation Zone
MMO	Marine Management Organisation
MPA	Marine Protected Area
MSC	Marine Stewardship Council
NCA	National Character Area
NERC	Natural Environment and Rural Communities Act
NGO	Non-Governmental Organisation
NNR	National Nature Reserve
PAWS	Planted Ancient Woodland
PDV	Phocine Distemper Virus
PPS9	Planning Policy Statement 9
RDB	Red Data Book
RIGS	Regional Important Geological/Geomorphological Site
RNR	Roadside Nature Reserve
SAC	Special Area of Conservation
SAP	Species Action Plan
SINC	Site of Importance for Nature Conservation
SMRU	Sea Mammal Research Unit
SNCI	Site of Nature Conservation Importance
SPA	Special Protection Area

SSSI	Site of Special Scientific Interest
SuDS	Sustainable Drainage Systems
WFD	Water Framework Directive

17. Glossary of terms

Acid grassland - see the lowland dry acid grassland HAP.

Agri-environment - schemes under the Common Agricultural Policy offering farmers payment to implement environmentally-beneficial management and demonstrate good environmental practice on their farm. This is the overarching term for the variety of schemes which have operated since these payments began. The current scheme is called Environmental Stewardship.

Ancient woodland - an area that has been wooded continuously since at least 1600. See the lowland mixed deciduous woodland HAP and Natural England (2010) AWG1 - Ancient woodland: guidance material for local authorities.

Arable - land used for growing crops, rather than raising animals. In modern agriculture this requires the addition of significant quantities of fertilisers and pesticides.

Bern Convention - a European Council convention for the conservation and protection of wild plant and animal species and their natural habitats. It laid the groundwork for, and was the inspiration for, the Habitats Directive. The convention was agreed in Bern in 1979 and ratified by the UK in 1982.

Biodiversity - see box 2.

Biodiversity Action Plan (BAP) - a plan which lists actions to improve the state of threatened biodiversity. See sections 1-6 for detail on how this has works in policy and practice within the UK and Lincolnshire.

Birds Directive - the 1979 European Community Directive provides a framework for the conservation and management of wild birds in Europe. It is implemented in the UK through a variety of legislative means. See the JNCC website for more details.

Bonn Convention - a convention requiring signatories to work together to conserve migratory species and their habitats by providing strict protection for endangered migratory species. The convention was adopted in Bonn in 1979 and the UK ratified it in 1985.

Boulder clay soils - an unstratified soil deposited by a glacier; consists of sand and clay and gravel and boulders mixed together. A good soil for arable farming.

Calcareous - used here to mean an alkaline habitat. The alkalinity is derived from the soil/geology with the main alkaline rocks as chalk or limestone. In this BAP it is applies to the lowland calcareous grassland HAP; the fens HAP; the rivers, canals and drains HAP; the chalk steams HAP and the white-clawed crayfish SAP.

Chalk streams - see the chalk streams HAP.

Coastal and floodplain grazing marsh - a type of grazing marsh characteristic of Lincolnshire. See the grazing marsh HAP.

Common Agricultural Policy (CAP) - a system of European Union agricultural subsidies and programs. The CAP combines a direct subsidy payment for crops and

land which may be cultivated with price support mechanisms, including guaranteed minimum prices, import tariffs and quotas on certain goods from outside the EU. Reforms of the system are currently underway reducing import controls and transferring subsidy to agri-environment.

Community strategies - a statutory requirement for every local authority in order to promote and improve the economic, social and environmental well-being of their areas and contribute to achieving sustainable development. Each local authority should work with the voluntary sector and private sector, as well as local people, to agree the content.

Conservation - or nature conservation is a huge multi-faceted political, environmental and a social movement that seeks to protect natural resources including animal, fungus and plant species as well as their habitat for the future. Individual and group rationales and directions within the overall movement are wildly different and sometimes conflicting or competing.

Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES) - aims to regulate international trade in species which are endangered or which may become endangered if their exploitation is not controlled. It was agreed in Washington in 1973 and came into force in 1975. It is not limited geographically, and has over 175 signatories to date.

Coppice - a traditional method of woodland management in which young tree stems are cut down to a low level. In subsequent growth years, many new shoots will emerge. These stems would have been cut again at intervals of 7-14 years and used for a huge number of purposes including furniture making, fencing and the 'wattle' in wattle and daub houses. The method ensured a consistent supply of valuable wood at a time when metal and stone were too expensive for most people to use.

The Countryside and Rights of Way Act – is a key piece of conservation legislation across England and Wales. This 2000 Act's key feature was to allow public access on foot to large areas of the countryside. Less well known features are that it strengthened the protection for SSSIs, strengthened wildlife legislation enforcement and provided for better management of AONBs.

Dune - see the coastal sand dune HAP.

Ecosystem services - generically, the benefits humans receive from the natural environment. See section 2.2.1.

Environmental Stewardship - a scheme under the Common Agricultural Policy offering farmers payment to implement environmentally-beneficial management and demonstrate good environmental practice on their farm. Farmers must be receiving the Single Farm Payment to be eligible for this scheme. This is the current agri-environment scheme and has two tiers of payments; see the Natural England website for more information.

Eutrophication - the process of nutrient enrichment in a water body. This is seen as a negative impact as it leads to excessive growth of algae which in turn depletes oxygen levels in the water and restricts the amount of other, generally seen as beneficial, water life.

Fen/fenland - see the fens HAP.

Flood risk management – a recent term to encapsulate that flooding cannot be prevented entirely, but by looking at managing the risks the impact and damage can be minimised. The approach is about individual and organisational preparedness. E.g. knowing your evacuation route or having electric sockets moved in a room that frequently floods.

Geodiversity - the variety of rocks, minerals, fossils, soils and landscapes, together with the natural processes which form them. It is the link between geology, landscape, biodiversity and people.

Grazing marshes - a type of grassland which was traditionally grazed by livestock. See the grazing marshes HAP.

Green infrastructure - a strategically planned and delivered network of high quality green spaces and other environmental features. It should be a multifunctional resource capable of delivering a wide range of environmental and quality of life benefits for local communities. Green Infrastructure includes parks, open spaces, playing fields, woodlands, allotments and private gardens.

Greenspace - defined in a wide variety of ways and often used interchangeably with Green Infrastructure. It is also used much more informally to mean any kind of green area regardless of its contribution to a network. To the wider public the fields in the countryside may be greenspace even though they are not accessible, or often considered by conservationists to be greenspace. A one size fits all definition is not appropriate here.

Habitat - this term has two main uses. In this document it is used most to refer to the assemblages of plants and animals found together such as wet woodland or heathland. In its more strict, and second, sense it means the physical or natural environment in which a species or group of species live: the natural habitat of the natterjack toad is short turf and dry sandy ground.

Habitat Action Plan (HAP) - a BAP that is for a habitat, as distinct from one that is for a species. (BAP is the generic name covering habitat and species action plans).

Habitats Directive - the aim of 1992 European Community Directive is to promote the maintenance of biodiversity by requiring Member States to take measures to maintain or restore natural habitats and wild species at a favourable conservation status. It is enacted through the Conservation (Natural Habitats, &c.) Regulations 1994 and the Conservation of Habitats and Species Regulations 2010 in England and Wales.

Heathland - see the heathland and peatland HAP

Integrated Coastal Zone Management - a multi-disciplinary approach to sustainable coast management which has the involvement of stakeholders at its core. The aim is to balance environmental, economic, social, cultural and recreational objectives, all within the limits set by natural dynamics and over the long term.

Intertidal - the area between high and low tide marks. i.e. it is submerged at high tide but above water at low tide. The constant but periodic inundation results in a particular ecology and subset of species.

Invasive non-native species - any non-native species that has the ability to spread causing damage to the environment, the economy, our health and the way we live. See also native species.

Invertebrate - technically animals without a backbone. These include all butterflies, moths, beetles, worms, bugs and 'creepy crawlies'.

Landscape scale conservation- has many definitions but is characterised by the pursuit of multiple benefits across a defined area (e.g. water quality, biodiversity, access). The best examples also make links to wider economic and social priorities, where enhancing nature can provide benefits to the local economy and quality of life

Livestock - any domestic grazing animals such as sheep and cattle.

Local Development Framework (LDF) - the current spatial planning strategy introduced in England and Wales by the Planning and Compulsory Purchase Act 2004. The LDF replaces the previous system of county level Structure Plans and district level Local Plans, and Unitary Development Plans.

Local Nature Reserve (LNR) - areas designated by the local authority and protected through the Local Plan/LDF. One of a number of designations under the umbrella term Local Sites.

Local Plans - the previous spatial planning strategy which has been replaced by Local Development Frameworks. In a number of areas the Local Development Frameworks have not yet been adopted so the Local Plans are still extant.

Local Strategic Partnerships – first set up as a requirement of central government funding LSPs became a feature of nearly all local authorities in England. They bring together representatives from the local statutory, voluntary, community and private sectors to address local problems, allocate funding, discuss strategies and initiatives. They aim to encourage joint working and community involvement, and prevent 'silo working'. The structure of an LSP is flexible to a large degree, and is decided at the local level. The LSPs have been fundamental in the production and delivery of community strategies. However the requirement for an LSP was removed in 2010 and since then a number of LSPs in Lincolnshire have dissolved.

Local provenance - this term is almost exclusively applied to plants. The term provenance is used to describe the location from which the seed/plant/cutting was collected. Local implies it is close to the current location of the plant and by implication should have similar genetics. This is considered beneficial to continue/aid local genetic adaptations. Whether this is accurate or not has been debated but the practice is widely continued.

Local Wildlife Site (LWS) - areas designated by the local authority and protected through the Local Plan/LDF. One of a number of designations under the umbrella term Local Sites.

Lowland mixed deciduous woodland - see the lowland mixed deciduous woodland HAP.

Managed realignment - moving man-made sea defences back, removing or re-modelling them to creating new intertidal areas and essentially shifting of the boundary of coastal and maritime habitat inland. This process is usually in low lying estuarine areas and almost always involves flooding of land that has at some point in

the past been claimed from the sea. Managed realignment can be used to protect areas of land further inland rather than that near the coast by relying on natural defences to absorb the force of waves.

Marine and Coastal Access Act – is one single Act achieving much of what the multiple Acts and policies on land have achieved over many decades. The 2009 Act puts in place a new system for improved management and protection of the marine and coastal thereby seeking to ensure clean, healthy, safe, productive and biologically diverse oceans and seas. The Act is long, has many provisions and eight key areas that cannot be detailed here, see the JNCC website for more details.

National Character Area - see section 5.1.1.

National Nature Reserve (NNR) - represent many of the finest wildlife and geological sites in the country. They are selected from the Sites of Special Scientific Interest and so each NNR has at least two designations.

Native species – a species that occurs naturally in an area, and therefore one that has not been introduced by humans either accidentally or intentionally.

Natural Area - See 5.1.1 and Box 4.

Natural Environment and Rural Communities (NERC) Act – This 2006 Act applies to England and Wales and it is a key piece of conservation legislation. At the time it allowed the creation of Natural England from several other non-departmental government bodies. Sections 40 (requiring all public bodies to have regard for biodiversity, the so called 'biodiversity duty') and 41 (requiring the government to publish a list of habitats and species of principal importance for the conservation of biodiversity, essentially a legislative requirement for the BAP list) are two key areas.

Neutral - a habitat that falls in a very narrow pH range that is neither acidic or alkaline. In this BAP it is relevant to the grazing marsh HAP; lowland meadows HAP and newts SAP.

Peatland - see the heathland and peatland HAP.

Plantations on Ancient Woodland Sites (PAWS) – see the lowland mixed deciduous woodland HAP.

Pollard - a method of tree management similar to coppicing, except that the tree is cut at shoulder or head height rather than near the ground. The resulting stems had a wider variety of uses including fodder for livestock as well as the traditional uses of coppice wood. Pollarded trees are more often found on the edges of woodland or outside woodland.

Priority habitat - those that have been identified as being the most threatened and requiring conservation action under the UK BAP. The most-recent list of UK BAP priority species and habitats was published in August 2007 following a 2-year review of the BAP process and priorities, representing the most comprehensive analysis of such information ever undertaken in the UK. Through the review, UK species and habitats were considered by expert working groups against a set of selection criteria based on international importance, rapid decline and high risk. Following this review, the UK BAP priority list now contains 65 habitats. All of the original priority habitats, identified over 10 years ago, were re-selected.

Priority species - those that have been identified as being the most threatened and requiring conservation action under the UK BAP. The most-recent list of UK BAP priority species and habitats was published in August 2007 following a 2-year review of the BAP process and priorities, representing the most comprehensive analysis of such information ever undertaken in the UK. Through the review, UK species and habitats were considered by expert working groups against a set of selection criteria based on international importance, rapid decline and high risk. Following this review, the UK BAP priority list now contains1150 species. The majority of priority species identified over 10 years ago were re-selected.

Ramsar Site - the Ramsar Convention has three main 'pillars' of activity: the designation of wetlands of international importance as Ramsar sites; the promotion of the wise-use of all wetlands in the territory of each country; and international co-operation with other countries to further the wise-use of wetlands and their resources. The Convention came into force in 1975.

Red Data Book - provide a review of the status of particular species groups at global, regional or national levels.

Ride - generally a path or a track through a woodland. The essential feature is that it is more open than the woodland allowing sunlight to reach the floor which often results in a diverse ground flora and a wider variety of associated invertebrates than the adjacent woodland. For this reason much management effort is directed at rides.

Riparian - the area between land and a freshwater river or stream. This could be as discrete as a river bank or more complicated in the case of areas that seasonally or frequently flood.

Sand dune - see coastal sand dune HAP.

Saltmarsh - see saltmarsh HAP.

Secondary woodland - woodlands which have appeared, through planting or natural seeding, on land which has been used for other purposes since the last ice age. Secondary woods can be Ancient Woodland if they ‘re-grew’ before 1600.

Semi-natural - this term recognises that most if not all our ecological communities are affected by humans in some way (e.g. pollution, on-going management activities) and thus cannot be considered completely ‘natural’.

Single Farm Payments (SFP)/Single Payment Scheme (SPS) - The basic level of payment under the CAP, the vast majority of farmers in the UK receive this funding. Farmers receive payment for the land they manage and have to meet a number of basic standards. Farmers must receive SFP to be eligible for Environmental Stewardship.

Site of Special Scientific Interest (SSSI) - the national suite of sites providing statutory protection for the best examples of the UK's flora, fauna, or geological or physiographical features. These sites are also used to underpin other national and international nature conservation designations. Currently designated under the Wildlife and Countryside Act 1981.

Species Action Plan (SAP) - a BAP that is for a species, as distinct from one that is for a habitat. (BAP is the generic name covering habitat and species action plans).

Special Area of Conservation (SAC) - areas which have been identified as best representing the range and variety within the European Union of habitats and (non-bird) species listed on Annexes I and II of the Habitats Directive. SACs, together with SPAs, form the Natura 2000 network. SAC designation is underpinned by SSSI designation in the UK.

Special Protection Area (SPA) - areas of the most important habitat for rare (listed on Annex I of the Birds Directive) and migratory birds within the European Union. SPAs, together with SACs, form the Natura 2000 network. SPA designation is underpinned by SSSI designation in the UK.

Species - the basic unit of biological classification. A species is often defined as a group of organisms capable of interbreeding and producing fertile offspring. However, in many cases this definition is adequate and more precise or differing measures are often used such as similarity of DNA, morphology or ecological niche.

Sustainable - this term is constantly redefined and used in different ways. It is often seen as subtly different from sustainable development in that sustainability has ecological limits which we must live within.

Sustainable development - the most widely known definition is of “development that meets the needs of the present without compromising the ability of future generations to meet their own needs”. The Brundtland Commission, UN 1987.

Sustainable Drainage Systems (SuDS) - a concept to reduce the potential impact of new and existing developments with respect to surface water drainage discharges. The systems try to replicate natural systems that use cost effective solutions with low environmental impact to drain away dirty and surface water run-off through collection, storage, and cleaning before allowing it to be released slowly back into the environment, such as into watercourses.

Wetland - see the rivers and wetlands section.

Wet woodland - see the wet woodland HAP.

Wildlife and Countryside Act - this 1981 Act is the backbone of nature conservation protection in England. It provides for the designation of SSSIs, which underpin the designation of NNRs, SACs and SPAs. It also provides legal protection for species.

Woodland Grant Scheme - a Forestry Commission grant providing support for landowners wanting to create new woodland and carry out sustainable woodland management.

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Appendix 1: Lincolnshire BAP Partners and contributors

Lincolnshire BAP 3rd edition Partners

Ancholme IDB
Anglian Water
Black Sluice IDB
Boston Borough Council
British Waterways
Butterfly Conservation
Buglife
Churches Together in All Lincolnshire
City of Lincoln Council
Eastern Inshore Fisheries and Conservation Authority
Environment Agency
Forestry Commission
Farming and Wildlife Advisory Group
Inland Waterways Association
Isle of Axholme IDB
Lincolnshire Amphibian and Reptile Group
Lincolnshire Bat Group
Lincolnshire Bird Club
Lincolnshire Chalk Streams Project
Lincolnshire County Council
Lincolnshire Naturalists' Union
Lincolnshire Wildlife Trust
Lincolnshire Wolds Countryside Service
Lindsey Marsh Drainage Board
Lincolnshire Biodiversity Partnership Services
National Farmers' Union
National Trust
Natural England
North East Lincolnshire Council
North East Lindsey IDB
North Kesteven District Council
People's Trust for Endangered Species
Royal Society for the Protection of Birds
South Holland District Council
South Holland IDB
Thorne and Hatfield Moors Conservation Forum
University of Lincoln
Upper Witham IDB
Wash Estuary Strategy Group
Witham 1st District IDB
Witham 3rd District IDB
Welland and Deepings IDB
West Lindsey District Council
Witham Fourth District IDB
Woodland Trust

Other contributors

God’s Acre Project
Humber Industry Nature Conservation Association
Humber Management Scheme
Lincolnshire Limewoods Project
Wash and North Norfolk Coast EMS

Appendix 2: Becoming a Partner of the Lincolnshire BAP

Text from an information sheet sent to all BAP Partners and potential Partners:

What is the Lincolnshire BAP?
It is a plan that sets the direction for nature conservation action within the county; identifying important habitats and species for Lincolnshire and setting targets and actions for their conservation. People and organisations best placed to undertake each action are also listed. The 3rd edition of the Lincolnshire BAP is being drafted and will run from 2011 to 2015.

Who can become a BAP Partner?
Anyone with an interest in or duty to conserve the biodiversity of Lincolnshire: whether through the management of sites; assessing planning applications; raising awareness of local issues; or carrying out survey work. Partners can include local government/ statutory organisations, charities and NGOs, local naturalists groups, community groups and interested individuals. You do not have to be a member of Lincolnshire Biodiversity Partnership to become a BAP Partner.

What does it mean to become a BAP Partner?
It means you or your organisation are committing to helping to deliver the aims of the BAP by contributing to the actions. If everyone plays their part it should lead to achievement of the BAP targets and a better environment for wildlife and people in Lincolnshire. Some targets and actions are more aspirational than others and may not be achievable right away: some look ahead beyond the lifetime of this edition. A commitment to the BAP is a pledge to work in partnership with others to conserve and enhance Lincolnshire's biodiversity.

What are the benefits of becoming a BAP Partner?

- Efficient, effective biodiversity enhancement.
- Prevents duplication of effort.
- Helps meet statutory obligations.
- Recognition of contributions.
- Working in partnership, sharing expertise.
- Contribution to local and national conservation priorities.
- Can help funding applications for biodiversity project work that contributes to BAP actions.

Will it cost a lot of money?
No, it doesn't have to. It depends on the actions and how you choose to deliver them. Working in partnership can reduce costs and you may find some organisations already undertaking some parts of some actions already. Other actions will have resource implications, but it is not expected that those resources will necessarily be immediately available. Actions can be prioritised or they can form part of funding bids. Actions that are not currently possible can be picked up in the future if/when resources become available.

What do Partners have to do?

1. Think about how their day to day work contributes already to BAP actions, and if there are other things that could be done to contribute further. The BAP coordinator is available to discuss this.
2. Use the BAP when setting work plans and identifying priorities.
3. Liaise with the BAP coordinator to make sure contributions are reported and recognised.

4. Lead partners have been identified for each action plan, based on relevant expertise/ influence. It may be useful to talk to them when considering how to deliver actions.

Does this duplicate work on other BAPs?

No. The Lincolnshire BAP sits within a hierarchy of BAPs from the national BAP down to county BAPs and organisation BAPs. This does not result in duplication of work, but offers a framework that allows local work to feed into the national reporting system and local contributions to UK targets to be acknowledged.

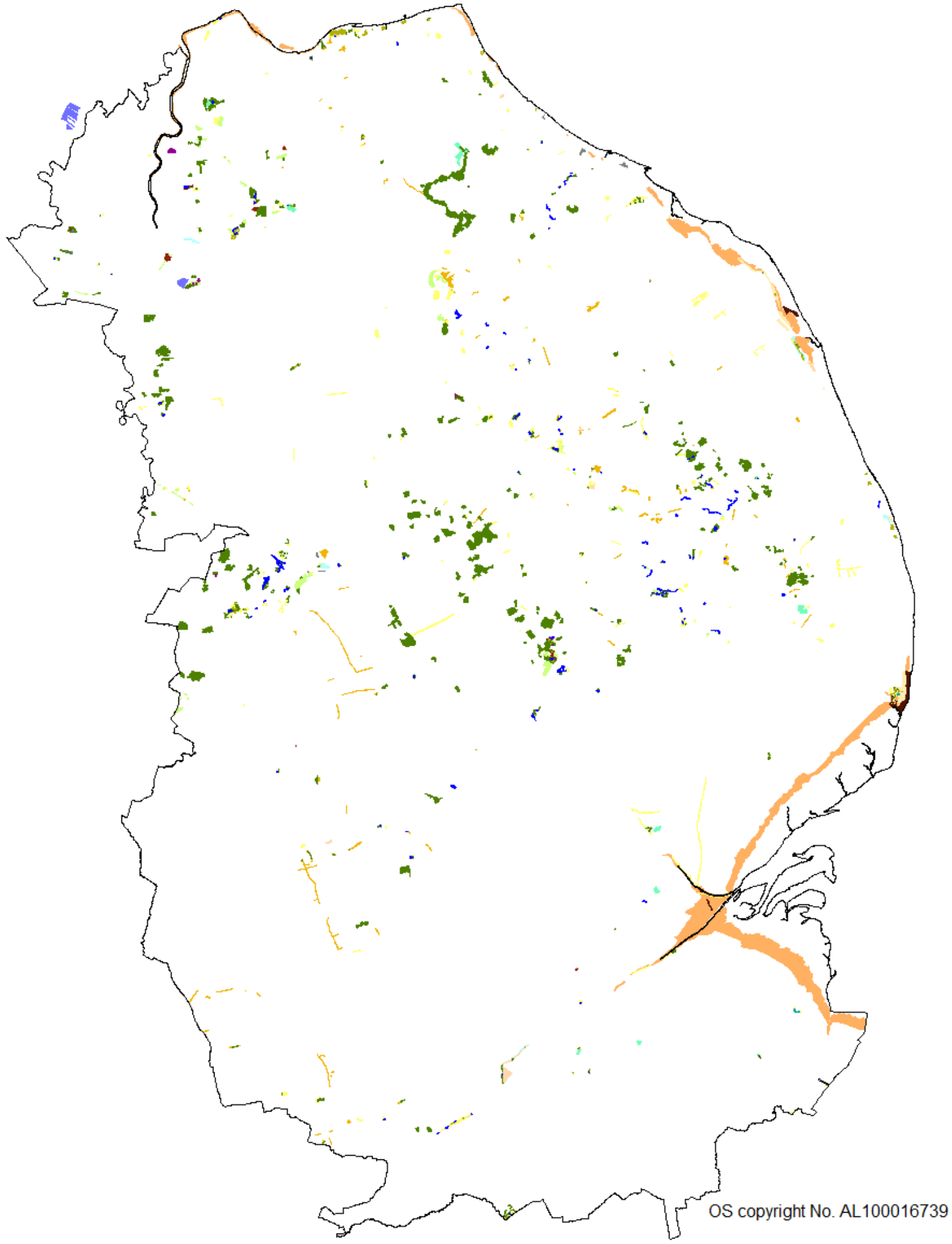
Where can I get more information?

- Public consultation on the draft BAP will take place for six weeks from 20th June 2011. More information will be on the Lincolnshire Biodiversity Partnership website www.lincsbiodiversity.org.uk.
- Information on the current (2nd) edition of the Lincolnshire BAP can be also found on the Lincolnshire Biodiversity Partnership website.
- Information on the UK BAP can be found on www.ukbap.org.uk.
- Further queries can be sent to the Lincolnshire BAP coordinator Catherine Collop 01507 526667 catherine.collop@lincsbiodiversity.org.uk.

Appendix 3: Links between Lincolnshire and UK BAP habitats

Lincolnshire BAP habitat	UK BAP habitat
Coastal and marine	
Coastal sand dunes	Coastal sand dunes
Peat and clay exposures	Peat and clay exposures
Sabellaria spinulosa reefs	*Sabellaria spinulosa* reefs
Saline lagoons	Saline lagoons
Saltmarsh	Coastal saltmarsh
Farmland and grassland	
Arable field margins	Arable field margins
Grazing marsh	Coastal and floodplain grazing marsh
Hedgerows and hedgerow trees	Hedgerows
Lowland calcareous grassland	Lowland calcareous grassland
Lowland meadows	Lowland meadows
Heathland and peatland	
Heathland and peatland	Lowland heathland Lowland raised bog
Lowland dry acid grassland	Lowland dry acid grassland
Rivers and wetland	
Chalk streams and blow wells	
Fens	Lowland fens
Ponds, lakes and reservoirs	Ponds Eutrophic standing waters
Reedbeds and bittern	Reedbeds
Rivers, canals and drains	Rivers
Springs and flushes	
Trees and woodland	
Lowland mixed deciduous woodland	Lowland mixed deciduous woodland
Traditional orchards	Traditional orchards
Wet woodland	Wet woodland
Wood-pasture and parkland	Wood-pasture and parkland
Urban	
Brownfield	Open mosaic habitats on previously developed land
Churchyards and cemeteries	
Gardens and allotments	
Parks and open spaces	

Appendix 4: Distribution of UK BAP habitats in Lincolnshire – LBP habitat audit (2010)



Appendix 5: Lincolnshire UK BAP species

Classification level	Taxon name	Common name
fungus (non lichenised)	*Mycena renati*	a fungus (non lichenised)
fungus (non lichenised)	*Podoscypha multizonata*	a fungus (non lichenised)
lichen	*Anaptychia ciliaris ciliaris*	a lichen
lichen	*Lecanora sublivescens*	a lichen
stonewort	*Nitellopsis obtusa*	Starry stonewort
stonewort	*Tolypella intricata*	Tassel stonewort
stonewort	*Tolypella prolifera*	Great tassel stonewort
bryophyte	*Bryum warneum*	Sea bryum
bryophyte	*Dicranum spurium*	Rusty fork-moss
bryophyte	*Fossombronia foveolata*	Pitted frillwort
vascular plant	*Aceras anthropophorum*	Man orchid
vascular plant	*Alisma gramineum*	Ribbon-leaved water-plantain
vascular plant	*Armeria maritima elongata*	Tall thrift
vascular plant	*Astragalus danicus*	Purple milk-vetch
vascular plant	*Blysmus compressus*	Flat-sedge
vascular plant	*Bupleurum tenuissimum*	Slender hare's-ear
vascular plant	*Carex divisa*	Divided sedge
vascular plant	*Carex ericetorum*	Rare spring-sedge
vascular plant	*Clinopodium acinos*	Basil thyme
vascular plant	*Coeloglossum viride*	Frog orchid
vascular plant	*Dianthus armeria*	Deptford pink
vascular plant	*Euphrasia anglica*	Glandular eyebright
vascular plant	*Euphrasia pseudokerneri*	Chalk eyebright
vascular plant	*Galeopsis angustifolia*	Red hemp-nettle
vascular plant	*Gentianella anglica*	Early gentian
vascular plant	*Hordeum marinum*	Sea barley
vascular plant	*Lycopodiella inundata*	Marsh clubmoss
vascular plant	*Mentha pulegium*	Pennyroyal
vascular plant	*Minuartia hybrida*	Fine-leaved sandwort
vascular plant	*Monotropa hypopitys hypophegea*	Bird's-nest
vascular plant	*Oenanthe fistulosa*	Tubular water-dropwort
vascular plant	*Orchis ustulata*	Burnt orchid
vascular plant	*Pilularia globulifera*	Pillwort
vascular plant	*Potamogeton acutifolius*	Sharp-leaved pondweed
vascular plant	*Potamogeton compressus*	Grass-wrack pondweed
vascular plant	*Pulsatilla vulgaris*	Pasqueflower
vascular plant	*Ranunculus arvensis*	Corn buttercup
vascular plant	*Salsola kali kali*	Prickly saltwort
vascular plant	*Scandix pecten-veneris*	Shepherd’s needle
vascular plant	*Scleranthus annuus*	Annual knawel
vascular plant	*Sium latifolium*	Greater water-parsnip
vascular plant	*Spartina maritima*	Small cord-grass
vascular plant	*Stellaria palustris*	Marsh stitchwort
vascular plant	*Torilis arvensis*	Spreading hedge parsley
bryozoa	*Lophopus crystallinus*	a bryozoan
mollusc	*Omphiscola glabra*	Mud pond snail

Classification level	Taxon name	Common name
mollusc	*Pseudanodonta complanata*	Depressed (or compressed) river mussel
mollusc	*Sphaerium solidum*	Witham orb mussel
dragonflies	*Aeshna isosceles*	Norfolk hawker
beetle	*Bembidion humerale*	Thorne pin-palp
beetle	*Bembidion quadripustulatum*	Scarce four-dot pin-palp
beetle	*Carabus monilis*	Necklace ground beetle
beetle	*Cryptocephalus coryli*	Hazel pot beetle
beetle	*Cryptocephalus sexpunctatus*	Six-spotted beetle
beetle	*Curimopsis nigrita*	Mire pill-beetle
beetle	*Harpalus froelichi*	Brush-thighed seed-eater
beetle	*Hydroporus rufifrons*	Oxbow diving beetle
beetle	*Lucanus cervus*	Stag beetle
beetle	*Ophonus laticollis*	Set-aside downy-back
beetle	*Ophonus melletii*	Mellets downy-back
beetle	*Ophonus stictus*	Oolite downy-back
beetle	*Panagaeus cruxmajor*	Crucifix ground beetle
beetle	*Pogonus luridipennis*	Yellow pogonus
butterfly	*Carterocephalus palaemon*	Chequered skipper
butterfly	*Coenonympha pamphilus*	Small heath
butterfly	*Coenonympha tullia*	Large heath
butterfly	*Cupido minimus*	Small blue
butterfly	*Erynnis tages*	Dingy skipper
butterfly	*Hamearis lucina*	Duke of Burgundy
butterfly	*Hipparchia semele*	Grayling
butterfly	*Lasiommata megera*	Wall
butterfly	*Limenitis camilla*	White admiral
butterfly	*Plebejus argus*	Silver-studded blue
butterfly	*Pyrgus malvae*	Grizzled skipper
butterfly	*Satyrium w-album*	White letter hairstreak
butterfly	*Thecla betulae*	Brown hairstreak
moth	*Acronicta psi*	Grey dagger
moth	*Acronicta rumicis*	Knot grass
moth	*Adscita statices*	The forester
moth	*Agrochola helvola*	Flounced chestnut
moth	*Agrochola litura*	Brown-spot pinion
moth	*Agrochola lychnidis*	Beaded chestnut
moth	*Allophyes oxyacanthae*	Green-brindled crescent
moth	*Amphipoea oculea*	Ear moth
moth	*Amphipyra tragopoginis*	Mouse moth
moth	*Apamea anceps*	Large nutmeg
moth	*Apamea remissa*	Dusky brocade
moth	*Aporophyla lutulenta*	Deep-brown dart
moth	*Arctia caja*	Garden tiger
moth	*Asteroscopus sphinx*	The sprawler
moth	*Atethmia centrago*	Centre-barred sallow
moth	*Athetis pallustris*	Marsh moth
moth	*Blepharita adusta*	Dark brocade
moth	*Brachylomia viminalis*	Minor shoulder-knot
moth	*Caradrina morpheus*	Mottled rustic
moth	*Celaena haworthii*	Haworth's minor

Classification level	Taxon name	Common name
moth	*Celaena leucostigma*	The crescent
moth	*Chesias legatella*	The streak
moth	*Chiasmia clathrata*	Latticed heath
moth	*Chortodes extrema*	The concolorous
moth	*Cymatophorima diluta*	Oak lutestring
moth	*Diarsia rubi*	Small square-spot
moth	*Diloba caeruleocephala*	Figure of eight
moth	*Ecliptopera silaceata*	Small phoenix
moth	*Ennomos erosaria*	September thorn
moth	*Ennomos fuscantaria*	Dusky thorn
moth	*Ennomos quercinaria*	August thorn
moth	*Epirrhoe galiata*	Galium carpet
moth	*Eugnorisma glareosa*	Autumnal rustic
moth	*Eulithis mellinata*	The spinach
moth	*Eupithecia extensaria occidua*	Scarce pug
moth	*Euxoa nigricans*	Garden dart
moth	*Graphiphora augur*	Double dart
moth	*Hemistola chrysoprasaria*	Small emerald
moth	*Hepialus humuli*	Ghost moth
moth	*Hoplodrina blanda*	The rustic
moth	*Hydraecia micacea*	Rosy rustic
moth	*Lycia hirtaria*	Brindled beauty
moth	*Malacosoma neustria*	The lackey
moth	*Melanchra persicariae*	Dot moth
moth	*Melanchra pisi*	Broom moth
moth	*Melanthia procellata*	Pretty chalk carpet
moth	*Mesoligia literosa*	Rosy minor
moth	*Mythimna comma*	Shoulder-striped wainscot
moth	*Orgyia recens*	Scarce vapourer
moth	*Orthonama vittata*	Oblique carpet
moth	*Pareulype berberata*	Barberry carpet
moth	*Pelurga comitata*	Dark spinach
moth	*Perizoma albulata albulata*	Grass rivulet
moth	*Polia bombycina*	Pale shining brown
moth	*Scotopteryx bipunctaria*	Chalk carpet
moth	*Scotopteryx chenopodiata*	Shaded broad-bar
moth	*Spilosoma lubricipeda*	White ermine
moth	*Spilosoma luteum*	Buff ermine
moth	*Tholera cespitis*	Hedge rustic
moth	*Tholera decimalis*	Feathered gothic
moth	*Timandra comae*	Blood-vein
moth	*Trichiura crataegi*	Pale eggar
moth	*Tyria jacobaeae*	The cinnabar
moth	*Tyta luctuosa*	Four-spotted moth
moth	*Watsonalla binaria*	Oak hook-tip
moth	*Xanthia gilvago*	Dusky-lemon sallow
moth	*Xanthia icteritia*	The sallow
moth	*Xanthorhoe ferrugata*	Dark-barred twin-spot carpet
fly	*Lipsothrix errans*	Northern yellow splinter
fly	*Phaonia jaroschewskii*	Hairy canary fly
ant	*Formicoxenus nitidulus*	Shining guest ant

Classification level	Taxon name	Common name
bee	*Bombus muscorum*	Moss carder-bee
bee	*Bombus ruderatus*	Large garden bumblebee
bee	*Colletes halophilus*	a mining bee
wasp	*Chrysis fulgida*	Ruby-tailed wasp
crustacean	*Austropotamobius pallipes*	White-clawed crayfish
crustacean	*Gammarus insensibilis*	Lagoon sand-shrimp
spider	*Saaristoa firma*	a money spider
jawless fish	*Lampetra fluviatilis*	River lamprey
jawless fish	*Petromyzon marinus*	Sea lamprey
shark/skate/ray	*Dipturus batis*	Common skate
shark/skate/ray	*Galeorhinus galeus*	Tope shark
shark/skate/ray	*Raja clavata*	Thornback ray
bony fish	*Anguilla anguilla*	European eel
bony fish	*Clupea harengus*	Herring
bony fish	*Cobitis taenia*	Spined loach
bony fish	*Gadus morhua*	Cod
bony fish	*Hippoglossus hippoglossus*	Halibut
bony fish	*Merlangius merlangus*	Whiting
bony fish	*Osmerus eperlanus*	Smelt
bony fish	*Pleuronectes platessa*	Plaice
bony fish	*Salmo salar*	Atlantic salmon
bony fish	*Salmo trutta*	Brown/sea trout
bony fish	*Scomber scombrus*	Mackerel
bony fish	*Solea solea*	Sole
amphibian	*Bufo bufo*	Common toad
amphibian	*Epidalea calamita*	Natterjack toad
amphibian	*Triturus cristatus*	Great crested newt
reptile	*Anguis fragilis*	Slow worm
reptile	*Natrix natrix*	Grass snake
reptile	*Vipera berus*	Adder
reptile	*Zootoca vivipara*	Common lizard
bird	*Alauda arvensis arvensis/scotica*	Skylark
bird	*Anthus trivialis*	Tree pipit
bird	*Aythya marila*	Scaup
bird	*Botaurus stellaris*	Bittern
bird	*Branta bernicla bernicla*	Dark-bellied brent goose
bird	*Caprimulgus europaeus*	Nightjar
bird	*Carduelis cabaret*	Lesser redpoll
bird	*Carduelis cannabina autochthona/cannabina*	Linnet
bird	*Carduelis flavirostris bensonorum/pipilans*	Twite
bird	*Coccothraustes coccothraustes*	Hawfinch
bird	*Cuculus canorus*	Common cuckoo
bird	*Cygnus columbianus bewickii*	Bewick's swan
bird	*Dendrocopos minor comminutus*	Lesser spotted woodpecker
bird	*Emberiza calandra calandra/clanceyi*	Corn bunting
bird	*Emberiza citrinella*	Yellowhammer
bird	*Emberiza schoeniclus*	Reed bunting
bird	*Larus argentatus argenteus*	Herring gull

Classification level	Taxon name	Common name
bird	*Limosa limosa limosa*	Black-tailed godwit
bird	*Locustella naevia*	Grasshopper warbler
bird	*Lullula arborea*	Woodlark
bird	*Motacilla flava flavissima*	Yellow wagtail
bird	*Muscicapa striata*	Spotted flycatcher
bird	*Numenius arquata*	Curlew
bird	*Passer domesticus*	House sparrow
bird	*Passer montanus*	Tree sparrow
bird	*Perdix perdix*	Grey partridge
bird	*Phylloscopus sibilatrix*	Wood warbler
bird	*Poecile montanus Kleinschimdti*	Willow tit
bird	*Poecile palustris palustris/dresseri*	Marsh tit
bird	*Prunella modularis occidentalis*	Dunnock
bird	*Pyrrhula pyrrhula pileata*	Common bullfinch
bird	*Stercorarius parasiticus*	Arctic skua
bird	*Streptopelia turtur*	Turtle dove
bird	*Sturnus vulgaris vulgaris*	Starling
bird	*Turdus philomelos clarkei*	Song thrush
bird	*Turdus torquatus*	Ring ouzel
bird	*Vanellus vanellus*	Lapwing
terrestrial mammal	*Arvicola amphibius*	Water vole
terrestrial mammal	*Barbastella barbastellus*	Barbastelle
marine mammal	*Delphinus delphis*	Common dolphin
terrestrial mammal	*Erinaceus europaeus*	Hedgehog
marine mammal	*Lagenorhynchus acutus*	Atlantic white-sided dolphin
marine mammal	*Lagenorhynchus albirostris*	White-beaked dolphin
terrestrial mammal	*Lepus europaeus*	Brown hare
terrestrial mammal	*Lutra lutra*	Otter
terrestrial mammal	*Micromys minutus*	Harvest mouse
terrestrial mammal	*Muscardinus avellanarius*	Dormouse
terrestrial mammal	*Mustela putorius*	Polecat
terrestrial mammal	*Nyctalus noctula*	Noctule
marine mammal	*Phoca vitulina*	Common seal
marine mammal	*Phocoena phocoena*	Harbour porpoise
terrestrial mammal	*Pipistrellus pygmaeus*	Soprano pipistrelle
terrestrial mammal	*Plecotus auritus*	Brown long-eared bat

Appendix 6: Public consultation

A six week public consultation on the draft 3rd edition of the Lincolnshire Biodiversity Action Plan took place between 20 June and 29 July 2011. Members of the public filled in questionnaires at the Lincolnshire Show, or online, and others sent feedback by email. The consultation was publicised via two press releases, which resulted in a number of articles in local and county-wide newspapers as well as three radio interviews. There was also publicity in various online newsletters and on Partners' websites.

121 people filled in questionnaires at the Lincolnshire Show; 156 were filled in online; and a further 17 feedback emails were received: bringing the total number of responses to 294. These responses were used to inform the content of the final document.

The results demonstrate the overwhelming support for the ongoing work of the BAP to protect and enhance the species and habitats of Lincolnshire. People clearly value the county's wildlife and countryside – with 76% of respondents saying that it is very important to them in deciding where they live; and 77% saying that they visit local green spaces more than once a week.

- 84% of respondents support the aims of the BAP.
- 91% think more funding should be made available to support the work of the BAP.
- 95% think that local authorities and other organisations should do more to support action for wildlife.
- 99% think that restoration of ancient woodland is quite or very important.
- 95% would like to see more restoration or creation of wetland habitats for the benefit of people and wildlife.
- 88% think that more money should be made available through agri-environment schemes to further encourage management of farmland to benefit biodiversity.
- 98% would like to see coastal habitats protected for wildlife and enjoyment by future generations.
- 89 pledges were made at the Lincolnshire Show to use peat-free compost; feed the birds in the garden all year round; and/or plant a native wildflower meadow or hedgerow.