REPORT OF ECOLOGICAL NETWORK MAPPING PROJECT FOR NORFOLK

PRESENTATION OF METHODOLOGY AND DRAFT MAPS FOR CONSULTATION

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NORFOLK BIODIVERSITY PARTNERSHIP

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This report was prepared by Reg Land, Norfolk Wildlife Trust, on behalf of the Norfolk Biodiversity Partnership and its Ecological Networks Topic Group.

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Making Space for Wildlife and People – An Indicative Ecological Network Map for Norfolk

1 Summary of report

This report is produced for the Norfolk Biodiversity Partnership. The Partnership has as a core aim the establishment of an ecological network in Norfolk.

In order to secure the long term future of wildlife, it will be necessary to protect the existing wildlife resource. In addition, it is increasingly apparent that the area of wildlife habitat needs to be greatly increased and re-connected if it is to survive in a human dominated landscape and be given a chance to adapt to climate change. The creation of an ecological network is, therefore, a necessity.

A series of maps showing an indicative ecological network for Norfolk are presented and the methodology used to derive them is set out. The maps identify core areas for a wide range of habitats which need to be protected. They also identify where new habitats can be created and where these can be connected.

These indicative maps are based on two approaches. Firstly, expert opinion has been sought on where the core areas for each BAP habitat are found and also where habitat creation opportunities and corridors could be located at the county level.

A second approach took the methodology adopted by the Regional Biodiversity Mapping Project and applied this to Norfolk to identify core areas, enhancement areas and strategic corridors. This approach related various spatial features of SSSI, County Wildlife Site (CWS) and BAP habitat distribution to Landscape Description Units.

The two approaches have their strengths and weaknesses and it is essential the full range of maps is referred when interpreting the ecological network needs. A map unifying the two approaches is presented which it is believed best illustrates the spatial priorities for creating an ecological network.

It is recommended that all local authorities in Norfolk adopt the ecological network concept along with the indicative maps and integrate them as appropriate into their Local Development Frameworks. The ecological network can help with priority setting and targeting of a wide range of actions. Examples are landscape characterisation studies and targeting of grant aid schemes such as the DEFRA Higher Level Scheme. Most importantly, though, local authorities should adapt the map to their areas and add more local sites to the network so that it covers the county comprehensively. In order to achieve this, additional resources may be required.

Improved data on the location of wildlife habitats is essential. The level of detail presented on the indicative maps is reliant on our incomplete knowledge of the distribution of wildlife habitats in the county. Much of the available information is out of date and inadequate for the planning of wildlife conservation. In addition, for some habitats, our knowledge of where they can be created is still fragmentary. It is recommended that the state of knowledge of habitat location and creation opportunities is assessed and a programme of work agreed to bring this up to date. It will also be desirable to place the ecological network in the public domain and it is recommended that the Oxfordshire Wildlife and Landscape System is considered to see if it is a suitable means for developing an agreed Norfolk approach.

A number of potential projects are also presented which if implemented could help develop various aspects of the network. It is recommended that these are further developed and opportunities identified for taking them forward.

2 Introduction

Much of Norfolk is now a landscape dominated by intensive agriculture. Once extensive areas of habitat such as heathland, grassland and woodland now comprise small remnants isolated from each other and surrounded by relatively inhospitable land-use. As a result, there are significant consequences for the long-term survival of biodiversity. This process of habitat fragmentation has a number of consequences that affect the ability of wildlife to survive into the longer term:

Firstly, small and isolated sites may become too small to support viable populations of a particular species or may be adversely impacted by surrounding land uses;

Secondly, many ecological processes are now largely human controlled with the result that small, fragmented habitats are often unable to function naturally;

Thirdly, there is increasing concern as to how our wildlife and habitats will respond to climate change.

In order to safeguard wildlife in the long-term there are a number of measures that need to be taken. Firstly, key wildlife sites must be protected from damage and destruction. Secondly, they should be properly managed and this includes the restoration of degraded sites. Thirdly, there is the need to expand and re-connect the existing areas and restore habitats where they have been destroyed. The large-scale restoration and linking up of habitats – a 'landscape scale' approach – is increasingly seen as necessary to safeguard our wildlife and to ensure sustainable development. One approach that provides the conceptual basis for achieving this outcome is that of the Ecological Network.

An Ecological Network in Norfolk would comprise the following elements:

- Clusters of high value wildlife sites forming core areas;
- Enhancement or habitat creation areas;
- Corridors and stepping stones designed to promote connectivity between the sites and through the wider landscape;
- Buffer areas surrounding these sites to reduce the adverse impacts from adjacent land-uses

An Ecological Network can operate at any scale from the local to the international. An example of an international network is the system of protected wetlands established to safeguard migrating waterfowl between the Arctic and Africa. On a local scale for example, a network could be developed to protect and enhance a population of great crested newts on a farm by creating ponds and grass margins to fields.

The report has been produced by the Ecological Network Topic Group[1] under the auspices of the Norfolk Biodiversity Partnership[2]. The report has been produced following consultation with a range of organisations and individuals in Norfolk. In addition a document setting out the principles behind the ecological network idea has been produced[3].

The report is presented in three parts:

Part 1 sets out the approach taken to produce the indicative ecological network maps for Norfolk. It records the methodology adopted for the two approaches taken to derive the maps.

Part 2 sets out a number of suggestions and recommendations for taking forward the ecological network idea to the implementation phase.

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[1] The members of the Ecological Network Topic Group represented the following organisations as of March 2006 – Norfolk County Council, Norfolk Wildlife Trust, English Nature, RSPB.

[2] Norfolk Biodiversity Partnership. The Norfolk Biodiversity Partnership is dedicated to the conservation and enhancement of the county's biological diversity, through the development and implementation of the Norfolk Biodiversity Action Plan. The Partnership's Steering Group consists of local authorities, statutory agencies and voluntary groups

[3] *Making Space for Wildlife and People*. 2005 Norfolk Biodiversity Partnership and Norfolk Wildlife Trust. Downloadable from www.norfolkbiodiversity.org.uk

Part 3 presents the indicative maps that collectively identify an ecological network for Norfolk

The report is aimed primarily at planning practitioners and conservation bodies but also those with some knowledge of nature conservation and involvement in the planning system. It is hoped that organisations that can help put in place the ecological network will adopt the recommendations set out in this report and play their part in establishing the ecological network.

3 Acknowledgements

The content of this report was the result of the collective thoughts, efforts and constructive criticism from numerous individuals from a great many organisations who participate in the Norfolk Biodiversity Partnership and its various habitat based Topic Groups. There are too many to mention by name apart from Scott Perkin, Norfolk Biodiversity Coordinator, whose help and encouragement has been crucial.

PART ONE –METHODOLOGY FOR PRODUCING THE INDICATIVE ECOLOGICAL NETWORK MAPS

4 Approaches adopted in producing the indicative maps

The indicative maps for Norfolk were developed based on the general principles as set out in the Pan European Ecological Network[4]. This involved the identification of core biodiversity areas, areas for the restoration/creation of habitats, identification of buffer areas and connectivity between areas.

The indicative maps for Norfolk are based on two approaches. The first approach analysed spatial data using GIS and was based on the methodology adopted in the East of England Biodiversity Mapping Project (the regional methodology is briefly described below) but with some criteria changed to reflect County circumstances[5]. The basic approach was to map the areas of designated sites (SSSIs and CWSs) and BAP habitats[6] and related these to the Level 2 (1:50 000) Landscape Description Units[7] for Norfolk.

The second approach was more qualitative with the indicative maps being based on a set of conservation priorities for a number of BAP habitats, agreed by practitioners in Norfolk, and then related to landscape or designated site boundaries. No attempt was made to harmonise the two approaches, however, a map was produced that drew upon both approaches to summarise the general findings of each.

Three general points need to be made regarding the overall approach adopted. Firstly, the intention of producing the indicative maps is primarily to provide sufficient information to enable local authorities to support the ecological network approach and integrate it into their Local Development Frameworks. Because of the timescales, this precluded detailed and time-consuming research and data gathering.

Secondly, an ecological network is only effective if it enables a species to survive and move through the landscape. The design of the network should therefore be based on the requirements of the species we wish to conserve. This is generally not feasible because of the lack of knowledge on species requirements. An alternative is to develop a network for selected 'key' species but even this approach may result in an ineffective network for a wide variety of other species whilst still requiring a high level of knowledge of species needs. There are a number of computer models that can be used to generate ecological networks based on various land use and species variables which attempt to get around the considerable data needs. This exercise did not attempt to develop the network based on a species approach or on computer models. The presumption adopted was that protecting, enhancing and expanding the extant core habitats and creating and connecting habitats would go a long way to satisfying the objectives of an ecological network given current levels of knowledge and resources. It does not preclude a more analytical and species-based approach being adopted at some future date, as data becomes available.

Thirdly, it is important to work at the appropriate scale. Too detailed and the indicative maps would become highly prescriptive and potentially stifle local participation in their further development and

[4] For details see http://www.ecnc.nl/EuropeanEcologicalNe/Index_6.html

[5] *East of England Biodiversity Mapping Project*. 2005 Prepared for the East of England Biodiversity Forum. This report was funded by English Nature, Forestry Commission, the East of England Wildlife Trusts, Environment Agency and East of England Regional Assembly. Downloadable from http://www.eastspace.net/biodiversity/DisplayArticle.asp?ID=4511

[6] See www.ukbap.org.uk and www.norfolkbiodiversity.org.uk for an explanation of the BAP process generally and how it is implemented in Norfolk. The BAP process identifies Broad Habitat Types and Priority Habitats. In addition, the Countryside and Rights of Way Act 2000 lists a number of habitats of principal importance. The choice of habitats in this study is drawn from these lists.

[7] Landscape Description Units are a spatial framework that integrates the natural and cultural aspects of the countryside at the landscape scale. It identifies relatively homogenous units of land that are distinct from one another. The units are defined at a number of scales eg regional and county

implementation. Too generalised and they will provide little more guidance on priorities for nature conservation than exist now. Central to the development of the ecological network will be its continuing refinement at the local level.

4.1 The regional mapping project

The East of England Biodiversity Mapping Project (referred to as regional mapping project below) established a methodology for producing a regional ecological network map.

The principles established in the regional mapping project were as follows:

Core areas for wildlife were identified based on the distribution of BAP habitats and the presence of land designated as of importance for wildlife (SSSIs and CWS). These were mapped in relation to Level 1 (1:250 000) Landscape Description Units. From this analysis, the project identified a number of core areas for biodiversity in Norfolk: Breckland; the Greensand[8]; the north Norfolk coast; Cromer ridge; the Horsford area; and Broadland.

All land outside core areas (and many areas within the core areas as well) was identified for enhancement including habitat creation. The project recognised that all land is capable of being enhanced for biodiversity through, for example, habitat creation and more sympathetic management of existing land use. The overall sustainability of the ecological network will be dependent on the management of the land surrounding core areas. The region was divided into three spatially defined enhancement areas. For each area, the scale of habitat enhancement (more specifically habitat creation) varies from small through medium to large scale.

Urban and urban fringe areas are potential areas for conflict with nature conservation because of development pressures; they are also areas where the need for greenspace for expanding populations is most acute. The provision of this greenspace and the planning of an ecological network go hand-in-hand. Urban areas that failed to meet a number of socio-economic criteria were identified as needing enhancement in terms of more greenspace and access to it. Three urban areas were identified – Norwich, Great Yarmouth and King's Lynn.

On account of their rich wildlife, rivers and valleys act as important corridors for a wide range of species compared with more intensively farmed areas. The regional mapping project identified the main rivers as strategic corridors.

4.2 Transposing the regional mapping project approach to the Norfolk context

This transposition replicated the regional mapping project methodology but used the Norfolk Level 2 LDU classification. As such the boundaries of the component areas differed slightly. An additional refinement was to differentiate the percentage cover for each LDU into 10% bands thus giving a better definition of how much of a particular LDU is covered in BAP habitat or designated sites. It should be noted that the BAP habitat data used were from publicly available sources and as such the quality of this data has not been verified as part of this exercise.

The biodiversity enhancement areas used in the regional mapping project were applied directly to the Norfolk context. It was not possible to adapt the regional methodology to the county context because of the methodology used in the regional mapping project.
Urban enhancement areas were identified using the regional methodology but the threshold level for a qualifying urban area was reduced from a population of >35000 to one of >5000.

The regional methodology used main rivers, chalk rivers and a 100 m buffer around these to identify strategic river corridors. This was extended through the inclusion of wetland LDUs as indicators of strategic river corridors at a county level.

[8] The Greensand is a region of West Norfolk characterised by sandy soils and contains extensive areas of heathland and other habitats.

As a result of the adaptation of the regional methodology to the county context it was not possible to present a single map of core, enhancement and urban deprivation areas and strategic river corridors because of the overlap of the different components.

The results of this approach are set out in section 12 as Maps 1-5

4.3 The practitioners'-based approach to producing the indicative maps

This approach produced an indicative map for each BAP habitat based on a set of conservation priorities (see appendix 1).The priorities were identified in consultation with conservation practitioners from a number of statutory and voluntary bodies[9]. It identified core areas, enhancement areas (habitat creation areas), corridors and buffering requirements. In addition, a number of published documents were reviewed to identify conservation objectives relevant to an ecological network[10]. For a number of habitats the core areas and corridors, in particular, were additional to those identified in the regional mapping project described above. This outcome was expected and actively sought. As the analysis focuses on smaller geographical areas, it should identify additional areas of importance at the local level.

The results of this approach are presented in section 13 as Maps E1-E11 and are discussed below.

4.3.1 Identifying the component parts of the ecological network

Core areas

Core areas represent significant concentrations of high quality extant habitat. Core areas were identified for each BAP habitat and invariably included European protected sites[11], SSSIs and concentrations of BAP habitats. The depiction of core areas varied according to the particular BAP habitat. Core area boundaries were simplified by encompassing groups of dispersed sites and, therefore, often included extensive areas of land of relatively lower conservation value. Core areas would also be priority areas for habitat creation and linking of sites.

Enhancement (habitat creation) areas

It is important to increase the area of habitat to make existing sites larger and to re-create the spatial distribution of habitats across Norfolk. Enhancement areas were identified on the basis of various factors such as potentially suitable soil type, water supply or the presence of a relatively high concentration of similar habitats in an area. Where possible the boundaries of enhancement areas were related to LDUs.

For some habitats, such as heathland, there is data available on potential areas for habitat creation; for many others, however, this is currently not available and only broad areas-of-search could be identified. If information exists, reference is made to relevant studies that identify in more detail where the specific habitat can be created.

Corridors

Corridors are important in order to link sites so as to facilitate species movement. Two types of corridor were identified. The first type consists of specific identifiable tracts of land (normally river valleys) that may already have high biodiversity value but which could also act as corridors through the intensively farmed landscape. The second type consists of indicative corridors between core areas, where our knowledge of the exact nature of the corridor is limited. These require further investigation as to how

[9] The individual conservation practitioners consulted were from the following organisations: Broads Authority, English Nature, Environment Agency, Forestry Commission, FWAG, Norfolk County Council, Norfolk Wildlife Trust, Norfolk Flora Group and RSPB. It should be noted that the views expressed by those consulted might not have represented the official views of the respective organisations. In addition, all eight of the Norfolk Biodiversity Partnership Topic Groups were consulted. These Topic Groups have representatives from a range of organisations in addition to those listed here. .

[10] The published documents included English Nature Natural Area Profiles and all relevant Norfolk Biodiversity Action Plans.

[11] Central to the objectives of the ecological network is to ensure the favourable condition of European protected sites such as Special Areas of Conservation and Special Protection Areas. See http://www.jncc.gov.uk/ for a full description.

they can be created. They could be continuous zones of a particular habitat or stepping stones and mosaics of habitat or other interventions that allow species to move through the landscape more easily.

Buffering
Buffering sites from adverse impacts is an important objective of the ecological network. In many cases these impacts are pervasive in the environment eg diffuse pollutants, whilst others may be more specific eg a road running alongside an important wildlife site. Further work is needed on how sites should be buffered from adverse impacts of surrounding land use. The buffering needs identified were mainly generic and covered the key adverse impacts that affect a habitat. The approach adopted is that the buffering requirements of habitats will require further refinement and, as a result they, are not shown on the maps.

In defining each of these components of the ecological network, there may be circumstances where they overlap in function. Corridors may be identified for some habitats but which act as core areas for others. An example would be a river valley that could include core areas for wet woodland but be a corridor for species associated with reedbed. Another example would be core areas which may often include extensive areas for enhancement ie habitat creation areas.

4.3.2 Identification of core areas, enhancement areas and corridors for each BAP habitat

A set of conservation priorities was drawn up for a range of BAP habitats and a number of broad BAP habitat types. See appendix 1.

One of the major problems faced during the exercise was the variation in quality of habitat data and especially our knowledge of where habitats can be created. As a result, some individual habitat maps are more specific than others. These issues are discussed in Part 2.

A number of BAP habitats were not covered. Cereal field margins and ancient and/or species rich hedgerows are so clearly part of the agricultural landscape and are of such extent that the indicative map could not adequately cover them. At a more local level (eg farm scale), hedgerows and field margins will have an important part to play in developing the ecological network.

No marine BAP habitats were included. These habitats are confined to the North Norfolk and Wash Marine European protected areas[12]. There are also no opportunities for habitat creation. Current proposals by government to legislate to enhance protection of the marine environment may require the offshore area to be considered in the future.

Eutrophic waters were not covered due to the lack of a Norfolk BAP action plan and the consequent identification of sites.

Coastal habitats
The BAP coastal habitats are mudflats, vegetated shingle, sand dunes and maritime cliff and slopes, saltmarsh and saline lagoons. Only the first four are mapped in this exercise. They occur in the European protected sites covering the Wash, north Norfolk coast, Great Yarmouth and Winterton Dunes and Breydon Water. Additional areas of coastal habitat, designated as CWSs, comprise mainly of sand dune and maritime cliff and slope in east Norfolk. Many of these habitats are threatened by sea level rise, coastal squeeze[13] and flood and coastal erosion protection. Habitat creation and restoration will be required to offset losses that will occur as a result of these processes. Fundamentally, however, these habitats require the continuation of natural coastal processes such as erosion and deposition.

The core areas are the coastal European protected sites, SSSIs and CWSs.

[12] The North Norfolk Marine Special Area of Conservation extends 12 km offshore.
[13] Coastal squeeze is the process whereby rising sea levels encroach on coastal habitats but because of physical barriers such as flood defences or natural rises in the land, the habitats cannot move and adjust to this change. Consequently the intertidal habitats become constricted. Sea level rise is occurring due to two factors: firstly, the readjustment of the land surface following the retreat of glaciers after the Ice Age resulting in East Anglia sinking slowly into the sea; and secondly, global warming.

The restoration of degraded habitats eg vegetated shingle beaches should be the priority. The priority areas for enhancement and habitat creation are the north Norfolk coastal plain and especially the Wash hinterland. There may be opportunities in the long term in the lower valleys of Broadland but these are not mapped. The creation of grassland on the cliff tops and behind sand dune in east Norfolk to facilitate more natural functioning is also identified as a priority but these are not mapped. The coast acts as a natural corridor for the movement of species and an indicative corridor is shown linking to the adjacent coasts of Lincolnshire and Suffolk.

Calcareous grassland
This habitat has been dramatically reduced in extent, primarily as a result of agricultural intensification. Chalk grassland occurs over a wide area of west Norfolk but the surviving areas are generally small, isolated sites including roadside verges. Many of the remaining areas are SSSIs or CWSs. The largest expanses are the calcareous grass-heaths of Breckland, where they often form an intimate mosaic with acid grassland and heather.

The core areas include all the Breckland grass-heath SSSIs and the chalk grassland SSSIs in west Norfolk[14] are also identified, despite their small size, as core areas because of their rarity.

An extensive area of west Norfolk, denoted by LDUs with calcareous soils, is shown as an zone where the creation of a chalk flora could occur. The priority would be habitat creation in and around the core areas as described above. In west Norfolk, calcareous grassland is likely to be created on steep slopes, worked out chalk pits and other similar features. Thetford Forest is also a priority area for creation on account of its considerable area of calcareous grassland in forest rides. An indicative corridor for calcareous grassland is shown linking the Norfolk Breckland and Suffolk.

Lowland meadows
This habitat was taken to include a wide range of grassland plant communities, both wet/moist and dry, that were non acidic or calcareous and which occur in a wide range of locations, not necessarily as 'meadows'. There has been a catastrophic loss of this habitat in Norfolk with only a scattering of small, isolated sites often occurring only on roadside verges, churchyards, greens and meadows in the upper river valleys. Many sites are CWSs and some are SSSIs.

It is difficult to identify core areas for dry grassland. The core area historically was likely to have been strongly associated with the area of 'ancient countryside'[15]. This is identified as a core area despite the highly fragmented distribution of lowland grassland within it. Core areas for wet/moist grassland (not coastal and floodplain grazing marsh, which is covered elsewhere) are contained within river valleys within the area of ancient countryside but this habitat also exists alongside rivers and streams elsewhere in the county.

For the purposes of this assessment, 'ancient countryside' is taken as being represented by the LDUs falling largely within the South Norfolk Claylands, Mid Norfolk and Central North Norfolk Joint Character Areas[16]. A notable region within this core area is the boulder clay of south and mid Norfolk, where the Beccles series soils have a highly characteristic flora.

Lowland meadow is likely to be created in a wide range of situations within the core area. Any site where an ecologically valuable flora can develop would be appropriate with priority given to expanding extant sites. The distribution of lowland meadows is inadequately known but further analysis of this may enable the core area to be more closely defined and to identify more targeted areas for habitat creation.

Acidic grassland
Breckland contains a large expanse of acid grassland as well as neutral and calcareous grassland that together are classed as grass-heath. For the purposes of this exercise, these grass-heaths are mapped with heathland.

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[14] SSSIs are Cockthorpe Common, Warham Camp, Ringstead Downs, Narborough railway Line
[15] Ancient countryside is explained and mapped in *The History of the Countryside*. O Rackham 1986 Dent.
[16] Joint Character Areas. English Nature and Countryside Agency have developed an approach to identifying and mapping the countryside so as to produce a single joint map of landscape, wildlife and natural feature characteristics.

Heathland
Norfolk's heaths are differentiated into heather dominated heaths and the so-called grass-heaths of Breckland, which are ecologically very distinctive. There has been a dramatic decline in the extent of heathland. Currently, the Breck grass-heaths represent the largest expanse with the remaining, often heather dominated heath, spread widely across the county. Many sites are SSSIs and CWSs. Many of the heaths on sands and gravels are associated with important wetlands such as fen and bog whilst the Breckland heaths are associated with meres and pingoes (see Aquifer-fed naturally fluctuating water bodies).

The core areas of heathland are the European protected sites and SSSIs of the Greensand region of west Norfolk, Syderstone, Cromer ridge, North Walsham, Horsford[17] and the European protected sites in Breckland.

Enhancement areas for habitat creation occur within or adjacent to the core areas as mentioned above. They are generally based on LDUs containing impoverished sandy soils but the North Norfolk Heaths Re-creation Strategy and the FC/RSPB Heathland Opportunity Mapping Project[18] present a more detailed picture of the opportunities in these and other areas. There are two additional creation areas that have been identified on the margins of the Broads: firstly, the Lothingland area and the valley sides of the Ant valley and Upper Thurne.

Corridors would ideally be created within the core areas to link sites. Indicative corridors are shown linking the core areas and connecting the Norfolk Breck-heaths to their counterparts in Suffolk. In many cases isolated areas of heathland or potential heathland (eg as part of the restoration of gravel extraction sites) occur between core areas and could be developed as stepping stones for heathland species through the farmed landscape.

A particular feature identified as part of the assessment of this habitat was the association of heathland with wood-pasture in various parts of the County. As a result two zones of wood-pasture and heathland have been identified.

Fen (including Purple moor grass and rush pasture)
The largest expanse of this habitat is in Broadland and at least in its extent it has not declined in area as much as many other habitats in the county in recent years. In the rest of the county, fen sites are small, isolated and widely scattered with a marked lack of sites only in Fenland itself. Many fens are associated with wet woodland, heath and open water and are at risk from a variety of impacts including water abstraction and deep drainage. The habitat contains some of the scarcest plant communities in the country and Norfolk therefore is a key area for their conservation with a large number designated as European protected sites.

Core areas are all European protected sites. They include the Broadland fens – the main areas are the Upper Thurne, Ant, Bure and Yare valleys – and a number of other small fens[19] associated with the Breckland margins or generally scattered throughout the county. Although these sites are small they are of such importance that it is considered they should be shown as core areas. It is likely that other areas could also be shown as core areas but this is dependent on further survey work.

Fens require highly specific water regimes and soils (peat). Opportunities for creation may be limited and should be undertaken wherever possible due to the limited extent of the habitat. Priority would be to enlarge and link existing sites but the restoration of degraded fens will be the priority. In general the largest expanse of peat soils is in Fenland and opportunities may be available for creating some kind of fen habitat on a large scale.

Also in Broadland the creation of fen habitats upstream of their current location should be considered to enable them to adjust to rising water levels in the Broads caused by sea level rise. Fen creation would also be a component of any plans to create more naturally functioning river systems in the Broads. Corridors for fens are likely to be within core areas and especially between Broadland fens

[17] These core areas are taken from the *North Norfolk Heaths Re-creation Strategy*. English Nature 2002
[18] *East of England Heathland Opportunity Mapping Project* RSPB/FC 2004 http://www.eastspace.net/heathland/home.asp?r=15659
[19] Sites falling within Norfolk Valley fens, Dersingham Bog & Roydon Common and Waveney-Little Ouse European protected sites

River valley corridors would have some functional value for fens because of the mosaics of wetland habitats and associated species they support. In many cases the priority may be to buffer the fens from adjacent land use by other semi natural habitat such as grassland.

Coastal and floodplain grazing marsh
The largest expanse of grazing marsh is in Broadland especially in the valleys of the Bure, Thurne, Yare and Waveney. In many cases the habitat often does not reach its full ecological potential because of deep drainage and inappropriate management.

Other areas of grazing marsh occur along the north coast, at one site on the Wash and in the larger river valleys (especially Wensum and Waveney). The Ouse Washes are the largest expanse of grazing marsh in Fenland. Often grasslands in the upper river valleys are mixed with marshy habitat and wet woodland and often do not have the characteristics of 'classic' grazing marsh - open, expansive grassland, often treeless and with an intricate network of drainage dykes. These upper valley grasslands are, therefore, covered in the lowland meadow indicative map. Grazing marsh especially on the coast but increasingly in Broadland is at risk from sea level rise.

The core areas are identified as: Broadland (a larger area than is covered by SSSI designations is included on the basis of its scale and inclusion within the Broads National Park); north Norfolk coast; Ouse washes; Wensum valley.

Areas for enhancement and habitat creation are generally within the major wetland LDUs and surrounding core areas, in particular, upriver from existing grazing marsh areas in Broadland to enable them to adjust to rising water levels caused by sea level rise. The most extensive area for creation is in Fenland and the Wash margins

Corridors are shown as the major river valleys (eg Wensum, Wissey and Waveney) which would also act as a link between the Broadland and Fenland sites. For the purposes of the map these are shown as habitat creation areas. In some areas existing grazing marsh may be lost through the creation of other BAP habitats and especially the restoration of naturally functioning rivers in parts of the Broads.

Reedbed
A number of wetland habitats contain reed including grazing marsh, fens and the upper parts of salt marshes. For the purposes of this assessment, reedbeds were taken as extensive areas where the reedbed has some surface water. It is a relatively scarce habitat and many freshwater reedbeds are at long term risk from sea level rise.

The core areas are: Broadland, especially in the Upper Thurne, Ant, Bure and Yare valleys (all in European protected site); river ronds along the lower Yare, Bure and Waveney rivers; and parts of the north Norfolk coast European protected site.

Enhancement and habitat creation areas are in the above core areas, although the longer term impacts of sea level rise need to take account of coastal flood defence strategies. The creation of reedbed in the middle reaches of Broadland rivers to enable them to adjust to rising water levels caused by sea level rise would be desirable. The greatest opportunity for reedbed creation is in Fenland and some of the lower valleys of Broadland eg associated with the development of more naturally functioning rivers.

Corridors are shown as the major river valleys (eg Wensum, Wissey and Waveney) which would also act as a link between the Broadland and Fenland sites.

Aquifer-fed naturally fluctuating water bodies
This habitat includes the Breckland meres, which are all associated with grass-heath. They are Ringmere, Langmere, Holme Mere, Fowlmere and Devil's Punchbowl and all are located within a European protected site. The major threat to these sites is water abstraction. As they cannot be created, greatest effort should go into buffering them from external impacts and in particular ensuring their water regime functions naturally.

A second type of wetland habitat is included on account of its very high nature conservation interest and the presence of some of the best examples within Norfolk. Pingoes are peri-glacial features and essentially occur as a high density of relatively small ponds in discrete areas. Core areas are identified

as individual concentrations of pingoes that are SSSIs (Thompson, Foulden, East Walton and East Harling Commons) and a number of other areas such as Frost's Common (in Thetford Forest SSSI), Hills and Holes (in Thetford Forest) and Gayton Common (County Wildlife Site). Because this habitat cannot be created, efforts should be concentrated on restoring the pingo sites that have been afforested or still survive in arable areas and buffering them from external impacts. The location of these relict pingo sites needs to be assessed.

Mesotrophic lakes

The Broadland lakes (broads) are the main areas of this habitat although other areas may occur. The core areas are taken as all the broads identified as European protected sites[20] and intimately associated with Broadland fen habitats. The habitat is highly susceptible to eutrophication[21] and the natural process of hydroseral succession[22].

Creation of this habitat is likely to be on a relatively small scale perhaps by digging turf ponds[23] in adjacent areas of fen. In many cases, the creation of large bodies of water, often called broads, does not create mesotrophic standing waters and these are better called eutrophic standing water. The priority should be the restoration of degraded broads and buffering from impacts of land use in their catchments.

Rivers and streams

The only riverine priority BAP habitat is chalk rivers. The remaining rivers and their floodplains, however, are critical areas for biodiversity containing a relatively high proportion of BAP habitats and designated sites. The rivers and floodplains form important corridors across the relatively more intensively farmed landscape. As many of the major rivers and their tributaries, including the Fenland Drains, have been shown as corridors for other habitats their importance is recognised within the ecological network as strategic river corridors. The significant length of river channels in Fenland including the Cut-off Channel is also covered, as these represent a significant biodiversity resource and should be assessed.

Chalk rivers

Chalk rivers have their headwaters rising on the chalk even though they may eventually flow through other soil types in their lower reaches. A number the rivers are relatively short and have been highly modified. Water abstraction and diffuse pollution pose a significant threat to their long-term survival.

Because of their high national conservation value, all chalk rivers as identified by the Environment Agency[24] are shown. This list, however, is not considered comprehensive and other streams rising on the chalk between Grimston and Narborough in particular are likely to qualify but require further study. Chalk rivers cannot be created and so efforts should go into buffering them from external threats and restoration of the rivers themselves.

Lowland mixed deciduous woodland

The two priority BAP habitats in Norfolk are wet woodland and wood-pasture and parkland, which are discussed below. Other broadleaved woodland types have high biodiversity value and, therefore, are included in the ecological network[25]. However, it was decided that only ancient broadleaved woodland would be included at this stage ie plantation and secondary woodland could be covered at a local level.

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[20] Hickling Broad complex, Martham Broads, Horsey Mere, Trinity Broads, Upton Broad, Ranworth and Cockshoot Broads, Hoveton Great and Little Broads, Rockland Broad. There are a number of minor broads not specifically listed.

[21] Eutrophication is the process whereby there is an increase in the amount of nutrients such as nitrogen and phosphorus entering a water body usually from anthropomorphic sources. This can eventually lead to an increase in algal dominance in waters and a decline in biodiversity.

[22] Hydroseral succession is the process whereby open water naturally and gradually infills through the succession of plant communities and can become dry land with woodland

[23] Turf ponds are shallow cuttings that mimic the practice of peat cutting. Because of the high water table, they fill with water and then begin the process of hydroseral succession. During this process, they form an important habitat for many scarce species.

[24] See *The State of England's Chalk Rivers*. EA and EN 2004

[25] Lowland mixed deciduous woodland is listed under s74 Countryside and Rights of Way Act 2000 as a habitat of principal importance in England but currently is not a BAP priority habitat.

Ancient woodland is spread throughout much of the county with east and north-west Norfolk and the Fenland having the least. Most sites are small and highly isolated but may be associated with secondary woodland and plantations.

Due to the widespread occurrence of ancient woodland, the core areas are often based on clusters of woodland surrounding significant SSSI ancient woodland and are demarcated by a line encompassing all the woodlands in a cluster. Core areas are therefore likely to contain extensive areas of farmland and other BAP habitat. They are 1) Swanton Novers-Foxley Wood, 2) Hockering-Easton, 3) Horse Wood-Wayland Wood, 4) Ashwellthorpe, 5) Saxlingham-Wheatacre, 6) Gawdy Hall Wood-Brockdish, 7) Cromer ridge

Although ancient woodland cannot be created the establishment of new woodland will have value for biodiversity and help buffer and link ancient woodlands. Priority areas for woodland creation lie within the woodland cluster core areas. These clusters can form the focal area for increasing connectivity to adjacent blocks of woodland through the development of corridors. Further refinement of the network at a local level will identify additional clusters of woodland comprising of both ancient and secondary woodland.

Wood-pasture and parkland

Wood-pasture survives in scattered locations but there is evidence that it was once more widespread in the county and intimately associated with other more open habitats such as heathland. The best surviving example in Norfolk is at Felbrigg on the Cromer ridge. A critical component of wood-pasture and parkland is the presence of 'veteran' trees. These, by their nature, are difficult to replace in the short term and the existing resource, whilst not mapped in this exercise, is a priority for action.

Priority will be the restoration of degraded sites. The core area for wood pasture is identified as a zone from 1) Norwich to the Cromer ridge and 2) King's Lynn to Hunstanton[26.] This will also be the priority area for creation of new wood pasture associated with other BAP habitats such as heathland and grassland.

Parkland is not mapped but is referred to in the Norfolk Parks and Garden Survey[27]. Because of the association of this habitat with veteran trees and ancient grassland it is likely that the priority will be the restoration of degraded sites.

Wet woodland

Knowledge of the distribution of wet woodland in Norfolk is poor. Wet woodland is widely scattered with most occurring in upper river valleys and the largest areas associated with the undrained fens and drained marshes of Broadland. A particular type of wet woodland associated with clay soils on the boulder clay plateau is not covered under this heading, as the core areas are likely to be included in ancient woodland.

Core areas are identified as the SSSI wet woodlands of Broadland.

The existing wet woodland in Broadland is at risk from sea level rise. It is a priority to allow the development of wet woodland upriver from these core areas and on the margins of lower river valleys in the Broads, which could be associated with the development of more naturally functioning wetlands. Due to its size and length there is significant potential for creating large expanses of woodland in the Waveney-Ouse valley and also Fenland primarily, but not exclusively, on areas of peat soils. A number of river valleys, which act as corridors for wet woodland, are identified where there is potential for habitat creation.

[26] These areas are based on *Heaths and Wood-pastures: aspects of the landscape history of Norfolk heathland*. Tom Williamson. School of History, UEA. Feb 2006

[27] Unpublished report, Norfolk Parks and Gardens Survey, Landscape Group, School of History, UEA

5 Combining the two approaches to produce a unified map

It was not the intention that the two approaches should necessarily be combined to produce a 'unified' map because of the methodological differences between the two. An attempt, however, has been made to draw out the similarities so as to produce a map that expresses the major conclusions of the two approaches. Inevitably this unified map loses information that is present in the other maps and it is important to note that the supporting maps are essential to its interpretation.

In summary, the unified map took Map 1 (see section 12) and expanded the core areas by adding those additionally identified by the practitioners' approach which were linked to LDUs. This was called a 'zone for creation and enhancement (for wet grassland, reedbed, fen, aquifer-fed waterbodies, mesotrophic lakes, chalk rivers and calcareous grassland)'. This expanded core area, however, did not wholly cover those for woodland/wood pasture, lowland grassland and heathland. In order to incorporate these habitats, an additional area was identified as a 'zone of woodland, heathland and grassland creation and enhancement'. The Fens were identified as a 'zone of large scale wetland enhancement and creation' based on its identification on a number of wetland maps (eg grazing marsh). Lastly, a number of areas of the county fell outside the above as they were not identified as core or enhancement areas in the practitioners approach. They were identified, however, as a zone of general habitat enhancement' in line with the regional methodological approach.

The Map is presented in section 14.

6 Further considerations

6.1 Non BAP habitats

The descriptions above are based primarily on recognised BAP habitats, albeit some have been expanded to encompass a wider range of plant communities than the definitions contained in the relevant national BAP. It is important to recognise that many sites will contain mosaics of habitats. Often the biodiversity interest of a site lies in the juxtaposition of different habitats creating a diverse site for wildlife. In some cases it may be difficult to assign a particular site to a priority BAP habitat.

In many cases it may be more feasible or even desirable to create 'non BAP habitats' such as scrub and rough grassland. This type of habitat is often associated with commons and, where ponds occur, it can be one of the most important habitats locally. Historically it is likely to have been a very extensive habitat that was closely associated with the local community as part of local commons and greens. These habitats are often robust and could have a significant role to play in buffering sites and providing habitats that can be used by a wide range of species. Habitats such as rough grassland, ponds[28] and scrub can be created in many areas and whilst not BAP habitats they will support BAP species such as great-crested newt and bats. The creation of these habitats should be considered at the local level.

6.2 Environmental change

Many of the BAP habitats above imply or assume a static environment. In reality the natural environment is in a constant state of flux and one of the drivers behind developing an ecological network is the recognition that change will occur as a result of climate change. Broadland and the coast are areas where environmental change is likely in the future. For example, the long-term policy of the Broads Authority is to develop a more naturally functioning wetland. This will influence the types of habitats that will or can be created. The traditional landscape of grazing marsh may change to open water and reedbed all connected to the river system. The potential for these changes needs to be considered when establishing the priorities for the ecological network. In the lower Broadland rivers it may be more appropriate to identify them as areas for wetland creation and not to be prescriptive about particular BAP habitats.

[28] The review of BAP habitats currently underway may incorporate some ponds as BAP habitat

6.3 The farmed landscape outside the ecological network

The regional mapping project was based on the assertion that all land had potential for biodiversity enhancement. The ecological network maps presented here identify core areas, creation areas etc at a county level. As the development of the ecological network considers smaller geographical areas, such as districts and even parishes, habitats of more local importance will be identified as components of the ecological network. This would include woods, commons, streams, roadside verges, hedgerows and parks that will link the component parts shown in the county indicative maps to more local features.

Over much of Norfolk agriculture will remain the dominant activity within the countryside. This land use supports a number of BAP habitats such as cereal field margins and ancient hedgerows. The farmed landscape, however, is recognised as having a major impact on wildlife habitats through, for example, diffuse pollution. The sympathetic management of all farmland will be essential to the success of the ecological network in the long term. It is important to recognise that habitat creation and enhancement can occur throughout the County especially through the progressive implementation of agri-environment schemes.

6.4 Urban areas

The regional mapping project identified the importance of linking the ecological network to the development of greenspace in and around urban areas. At the regional level it identified King's Lynn, Norwich and Great Yarmouth as the priority areas based on an analysis of the current provision of greenspace, a number of socio-economic criteria and future needs given anticipated levels of development.

Access to greenspace is increasingly seen as having multiple benefits for people in terms of health and well-being. Access to greenspace is not only required in large urban areas but also in many rural parts where there is often little provision. The provision of greenspace and the development of the ecological network should be seen as mutually beneficial and should be seen as part of a continuum. Some areas of the ecological network may have as a prime focus the protection of scarce and sensitive species. Parts of the greenspace network in urban areas would be primarily managed for people (eg formal parks and playgrounds) and over much of the network, people and nature should find a balance.

The indicative map identifies urban enhancement areas but extends the regional methodology by including market towns where more accessible greenspace may be required. This aspect of the ecological network undoubtedly needs more consideration.

6.5 Buffering of habitats and sites

Buffering of sites is an important part of the ecological network. A number of initiatives are underway that will help to buffer sites from external impacts. An important policy driver will increasingly be the Water Framework Directive[29] and also the need to achieve favourable condition[30] for European protected sites and SSSIs. Currently, much of the effort is being targeted at water quantity (eg review of abstraction consents affecting European protected sites) and water quality (eg catchment sensitive farming projects).

Relatively little attention, however, is paid to the physical buffering of sites from adjacent land use. A very large proportion of designated sites such as SSSIs as well as CWSs are bounded by intensively managed farmland with the threats from adjacent land use being insidious and often unrecognised. In these cases, buffering can take the form of 'no spray zones' for agricultural pesticides lower input farming or other, more sympathetic, land use.

More attention needs to be paid to the adverse impact from these external threats and the requirements of habitat buffering need to be more widely applied. Currently, this requirement is not explicitly mentioned in BAP habitat targets, although BAP actions may seek to address some at least of these

29 The Water Framework Directive requires all inland and coastal waters to reach "good status" by 2015. It will do this by establishing a river basin district structure within which demanding environmental objectives will be set, including ecological targets for surface waters.
30 Favourable condition means that SSSI land is being adequately conserved and is meeting its 'conservation objectives'; however, there is still scope for the enhancement of these sites.

threats. The indicative maps do not address buffering needs. It is recommended that more discussion is required in order to determine the specific needs of habitats for buffering.

PART TWO - ESTABLISHING THE ECOLOGICAL NETWORK

7 Initiatives that can help establish the ecological network

7.1 How can Local Authorities help establish the ecological network?

Implementation of the Norfolk ecological network will require local authorities to play an active role. Planning Policy Statement 9[31] states that local authorities should aim to maintain networks by avoiding or repairing the fragmentation and isolation of natural habitats through policies in plans.

It is recommended that local authorities incorporate the development of an ecological network in their Local Development Frameworks (LDFs) and seek to refine the concept. The incorporation of concept into the LDF and its further refinement would provide local authorities and developers with a clear vision of conservation priorities and encourage both to actively seek ways of establishing the network. It will be important for local authorities to integrate the ecological network into other policy areas especially landscape and archaeological assessments but also social and economic development as the identification of core areas, habitat creation areas and corridors could be a key contributor to sustainable development. Appendix 2 illustrates how an existing landscape characterisation for a district council can incorporate ecological network objectives. This integration helps identify mutual objectives and possible areas of conflict.

Local authorities will need to further refine the county ecological network to incorporate district and ultimately sub-district (eg parish) level priorities. The development of the ecological network at district and parish levels provides an opportunity for local communities to participate in local decision making and the identification of local priorities. Local authorities through their community strategies have an opportunity to stimulate participation in defining a long-term vision.

7.2 Existing initiatives that can help deliver an ecological network

There are a number of initiatives that are currently contributing toward the creation of an ecological network, although this may not necessarily be one of their stated objectives.

7.2.1 Agri-environment and other grant schemes

Environmental Stewardship (ES)[32] and cross-compliance[33] have a central role to play in establishing the ecological network. The creation of an ecological network is not an explicit objective of these initiatives but habitat creation, buffering and connectivity are amongst the objectives of ES. Cross-compliance measures are likely to be important in buffering habitats and developing the finer detail of the network at the local (eg farm) level. Targeting priorities for the Higher Level Scheme are based on Joint Character Areas (JCA) and the indicative maps can help identify priorities within these. Appendix 5 identifies the ecological network priorities for a one JCA to illustrate how these can be incorporated. It is recommended that the ecological network priorities within each JCA are incorporated in future targeting reviews of HLS.

Other grant schemes will also have a key role to play in developing the ecological network. Amongst these are the English Woodland Grant Scheme and locally delivered schemes such as those of Norfolk

[31] Planning Policy Document 9. *Biodiversity and Geological Conservation*. August 2005 ODPM.
[32] Environmental Stewardship is an agri-environment scheme of the government. See http://www.defra.gov.uk/erdp/schemes/es/default.htm comprising an Entry Level Scheme open to all farmers who can choose from a menu of basic management options to enhance the environmental value of the landholding. A Higher Level Scheme is more targeted and seeks to fund high quality schemes having significant environmental benefits.
[33] Cross-compliance is the process whereby farmers receive a payment and in return have to demonstrate they are keeping their land in good agricultural and environmental condition.

County Council and other local authorities. All such schemes should be assessed to see how they can best contribute toward the creation of an ecological network.

7.2.2 Biodiversity Action Plan targets.

Many BAPs set habitat creation targets but these are currently short-term, normally less than 10 years, and not always spatially explicit. The ecological network approach can help establish more explicit targets in two ways. Firstly, it will provide a long-term target by defining minimum habitat creation requirements. This long-term target can then be broken down into short-term milestones. Secondly, it will provide district level and even sub-district targets, which currently are not set. The spatial distribution of habitat creation can therefore be more explicitly defined which should help focus attention on specific areas of land. It is recommended that Norfolk BAPs incorporate ecological network objectives when they are next reviewed.

7.2.3 Habitat creation projects

There are a number of habitat creation initiatives underway. A wide range of organisations are involved, from community groups undertaking schemes at the local level to statutory bodies undertaking habitat creation to comply with legal obligations. Many projects by their nature are opportunistic and their prime purpose may not be explicitly to contribute toward creating an ecological network

The ecological network provides an overarching framework within which habitat creation projects can be targeted and assessed. A step change in habitat creation in terms of both number and size is required. The ecological network should provide a stimulus to projects in particular geographical areas or focus attention on certain habitats that are often neglected. The importance of viewing projects within a strategic framework is increasingly seen as an important consideration for funding bodies and to ensure that the maximum benefit is derived.

7.2.4 Practical projects to establish the ecological network

It is important to demonstrate that the ecological network can be delivered and that it will bring benefits to wildlife and people. Much work contributing toward the establishment of an ecological network is being implemented already by various statutory and non-statutory bodies. Appendix 4 identifies a range of projects and initiatives that are already helping to put the ecological network in place. There will, however, need to be a step change in the efforts being made to restore, expand and create habitats, in buffering and in seeking ways to connect them together.

In addition to those initiatives already in place a number of others are presented that have been suggested by the practitioners consulted .The list is not comprehensive but presents a range of projects that if implemented will help establish the ecological network. They range from specific habitat-focussed projects to area-based ones at varying geographical scales. They are presented as a stimulus to project development.

8 Priority setting

8.1 Priorities for establishing the ecological network

In creating an ecological network, priorities will need to be set by a whole range of organisations from funding bodies to those actively carrying out projects on the ground. It is therefore impractical to establish a common set of priorities applicable to all organisations. The following, however, presents some potential priorities for discussion. It is recognised, however, that local circumstances and opportunities should be grasped wherever possible to establish the network on the ground.

One approach is to focus efforts on European protected sites, followed by those of national importance (SSSIs), then of county (County Wildlife Sites) and finally those of local importance. Priority should be given to the maintenance of the existing extent of habitat, management of that habitat, followed by restoration of existing sites and those that are in a degraded state. This last becomes more important where the habitat cannot be created. Securing the better management of CWSs is of paramount importance as the 1300 sites represent a critical nature conservation resource.

The enlargement (including linking of sites close to each other) and buffering of sites should be undertaken. The enlargement of existing habitats is generally a priority where it can be achieved, before creating small, isolated sites. The creation of large, new areas of habitat is a priority as they will generally be more sustainable; however it should be recognised that many such schemes may start as small habitat creation projects. Buffering of habitats from damaging external impacts should be a priority. This can be from diffuse pollution or unsympathetic land use on adjacent land.

Natural functioning is a central concept of the ecological network. In general this should be actively sought in all habitat management and creation projects. This is a complex area of debate and policy but it is generally recognised that in areas such as floodplains and the coast that allowing natural processes greater freedom will enhance biodiversity.

The following list identifies those habitats for which Norfolk has an important role to play in their long-term protection and which therefore should receive attention. It is based on the habitats that are identified as of importance on a European scale and included within European protected sites. The locations where these habitats can be created will be relatively restricted (by for example soil type).

- All marine and coastal habitats
- Fens
- Breckland grass-heaths
- Coastal and floodplain grazing marsh
- Reedbed
- Mesotrophic lakes
- Wet woodland
- Aquifer-fed naturally fluctuating waterbodies
- Heathland
- Chalk rivers

There are a number of habitats that cannot be recreated easily, if at all, and which are high priorities for action in terms of restoration of existing sites or buffering from external impacts or linking habitats. They include:

- Ancient and native woodland
- Wood pasture
- Veteran trees associated with the above habitats
- Chalk rivers
- Aquifer-fed naturally fluctuating waterbodies
- Hedgerows

The identification and development of corridors is a lower priority at least in the short term except where they are currently of high value (eg river corridors). Increasingly, however, there will be a need to develop large-scale habitat corridors or to enhance the suitability of the countryside to enable more species to move through the landscape and find suitable habitats.

Wherever possible, habitats should be created on sites of low current value for wildlife, such as arable land or intensively managed grassland. Habitat creation on existing low quality BAP habitat may be acceptable if for example there is little potential for significant enhancement of that habitat. For example, an area of ‘grazing marsh’ may have a very poor water supply with no likelihood of improving this situation so it may be acceptable to convert it into another habitat.

8.2 Monitoring establishment of the ecological network

There is a need to develop a monitoring approach for the establishment of the ecological network. In particular local authorities and statutory bodies increasingly need to establish targets and milestones for measuring success. Many actions that contribute toward the ecological network would be monitored as part of other policies eg favourable condition of SSSIs, reducing diffuse pollution.

Two actions that could be monitored are the adoption of policies by local authorities that explicitly recognise the ecological network in their LDF. Secondly, the area of BAP habitat created which contributes to the development of the ecological network (as defined by the ecological network map for each district) could be used. It is likely that as the ecological network is developed at more local levels

that other features could be monitored eg percentage of core sites that are buffered from adjacent land use. Monitoring of implementation will need further consideration.

9 Presentation of the indicative ecological network maps

There is a need to present the ecological network map(s) and supporting information in an easily accessible form for users and the general public to consult. Placing the indicative map on the web would ensure that it remains in the public domain, although there is the problem of keeping it up to date that would need to be addressed.

A possible model for presenting the ecological network**,** and other biodiversity data, is the Oxfordshire Wildlife and Landscape Study (OWLS) web-based system[34]. It has the following features:

- It is a map-based system which brings together biodiversity and landscape descriptions and objectives for different landscape character types;
- The system can be interrogated to show details by district, parish and landscape type;
- It provides an explanation of the conservation and landscape issues and objectives for an area.

Such a system could be used for a number of purposes:

- The ecological network and other strategies could be made accessible. It could act as a single point of reference for biodiversity information and objectives/targets for agri-environment advisers, planners, developers and statutory agencies;
- It could be updated as new studies become available;
- It would enable local communities to interact with the process of landscape and biodiversity planning
- If all local authorities adopted a unified approach to developing the ecological network at the local scale it would ensure consistency of approach across the county.

It is recommended that consideration is given to how the ecological network can be presented, updated and integrated with other spatial data and made accessible to the public.

10 Knowledge gaps in developing an ecological network

Planning Policy Statement 9[35] states that development plans should be based on up to date environmental information about the environmental characteristics of an area. It is crucial to the establishment of an ecological network that there is up to date information on the distribution of habitats, the conservation priorities for each habitat – a conservation assessment – and where they can be created – opportunity mapping. The Association of Local Government Ecologists has produced a report[36] setting out the biodiversity data needs for local and national park authorities. The discussion below seeks to expand the recommendations in the report to specific types of data that were found to be limiting in the current study.

10.1 Habitat distribution data

The production of the indicative maps highlighted a number of gaps in the data available on habitat distribution. It is important that there is up to date information on the location, at least, of priority BAP habitats. There is also no comprehensive inventory of other important non BAP habitats such as ponds. Digital datasets on the distribution of BAP habitats in the county should be more readily accessible. It is to be hoped that this aspect will be addressed as part of the review currently underway into the Norfolk Biological Record Centre. This will not address, however, the necessary funding of countywide assessments of habitat distribution so as to provide up to date information. This is an issue of the highest priority for addressing within the county.

[34] The OWLS system can be viewed at http://owls.oxfordshire.gov.uk/wps/wcm/connect/OWLS/Home/
[35] Planning Policy Document 9 . *Biodiversity and Geological Conservation*. August 2005 ODPM
[36] *Biodiversity data needs for Local Authorities and national park Authorities.* D. Lott. ALGE 2006

Appendix 5 is an assessment of the current situation regarding our knowledge of the distribution of BAP habitats and provides some pointers as to those that need further assessment.

The general conclusion is that most datasets are incomplete, some are not fully digitised and a number are over 10 years old. Some habitats are so restricted that individual named locations can be relatively easily identified such as for aquifer-fed naturally fluctuating waterbodies (eg the Breckland meres) and mesotrophic lakes (eg Norfolk Broads). In other cases the habitats occur primarily within protected areas such as SSSIs eg mudflats, saltmarsh, saline lagoons and to some extent maritime cliff and slope.

The objective should be, firstly, to ensure all current data is digitised and readily accessible, secondly, an assessment is made of the habitats to identify priorities for updating, thirdly, funding is secured to update the relevant data. Obvious gaps in our knowledge are lowland meadow, calcareous grassland, wood pasture, wet woodland and some open water habitats.

10.2 Conservation assessments

There is a need to identify conservation priorities for each BAP habitat. This is particularly the case for habitats that are relatively scarce or may be in a highly degraded state such as calcareous grassland, wood pasture and lowland grassland. There is a need to assess the condition of sites and the threats as well as identify remedial measures to include restoration of degraded sites, buffering and linking and expanding them. Currently conservation assessments have been undertaken for fens[37] in Norfolk, which should help identify priorities for action but others are required especially for calcareous grassland, lowland meadows, wood-pasture, (aquifer-fed water bodies) and chalk rivers,.

10.3 Habitat creation – opportunity mapping

Central to the establishment of an ecological network is habitat creation. Many habitats are so limited in extent that without extensive new areas being created the long-term survival of species associated with them has to be in doubt.

Some habitats, however, cannot be created (eg aquifer-fed naturally fluctuating water bodies, mesotrophic lakes, vegetated shingle, some types of fen, ancient woodland) because they rely on specific environmental factors that we cannot readily replicate. In these cases, the emphasis will remain on managing, restoring and buffering existing sites.

For many habitats, however, there is considerable knowledge on where to create them given suitable soil types or water regimes. Identifying where specific habitats can be created is a high priority for action. This can be carried out at various spatial scales; for example, broad soil types can be used to identify areas of search or alternatively, specific parcels of land can be investigated to see if they match the exact requirements of a particular habitat. It is important that we determine where habitats can be created. There is good information on where to create heathland (eg in the North Norfolk Heaths re-creation Strategy or East of England Heathland Opportunity Mapping Project) and increasingly on wetlands (through EAs Regional Habitat Creation Project) but little on calcareous grassland, lowland meadows and wood pasture.

Appendix 6 assesses the current state of knowledge on where each BAP habitat can be created in Norfolk and identifies gaps that need filling.

[37] *An assessment of Norfolk fens*. Norfolk Wildlife Trust 2006 for Norfolk Biodiversity Partnership, Breckland District Council and Environment Agency. Available from NWT

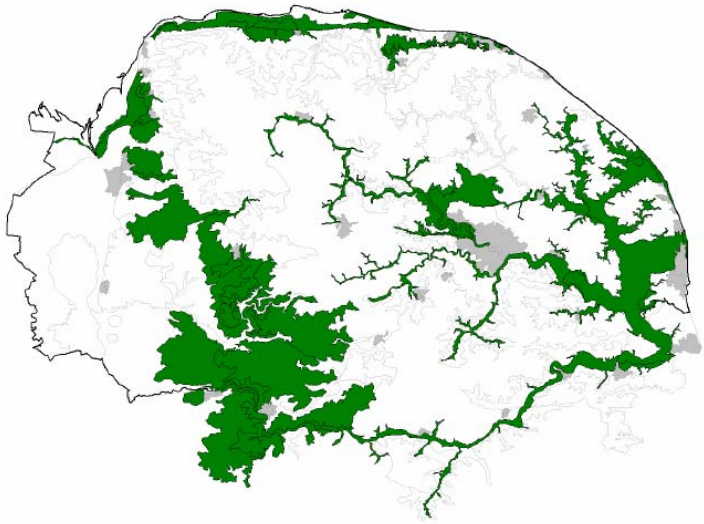
11 Recommendations – priorities for action

	Recommendation	Progressed by	Action by	Priority
1	Include the ecological network approach in all Norfolk LDFs	Norfolk Biodiversity Partnership (NBP) and all partners/Econet Topic Group	All Norfolk Local authorities	1
2	Ensure the continued development at the district level of the ecological network. Consider resource requirements eg it may require a staff resource to help local authorities undertake the work	NBP/Econet Topic Group	All Norfolk local authorities	1
3	Develop projects including from the list of projects in appendix 4, that can be taken forward to establish the ecological network	NBP/BAP Topic Groups	All partner organisations	1
4	Ensure that the Norfolk Biological Records Centre holds and manages all current and future BAP habitat data and that this is freely and easily accessible to partners for planning work	Norfolk County Council	Norfolk County Council	1
5	Take forward agreed priorities for updating habitat distribution data and a process for achieving this. Consider resource requirements	NBP/BAP Topic Groups	Appropriate partner organisation(s)	1
6	Agree and implement priorities for opportunity mapping and conservation assessments and a process for achieving this. Consider resource requirements	NBP	Appropriate partner organisation(s)	1
7	Develop the ecological network monitoring criteria for inclusion in the Local Area Agreement	Econet Topic Group	Norfolk County Council	1
8	Produce a regular assessment of the progress made in achieving the above recommendations and report to relevant organisations	Econet Topic Group		1
9	Integrate ecological network priorities into policies and plans eg landscape characterisation	NBP/Econet Topic Group	Appropriate partner organisation(s)	2
10	Carry out an assessment of ecological networks and ‘urban’ greenspace provision and link to local development frameworks	Econet Topic Group/ Communities Topic Group		2
11	Establish ecological network priorities for all JCAs to inform HLS priorities	Econet Topic Group	RDS/Natural England	2
12	Identify and promote an approach (eg based on OWLS) to presenting the ecological network (and landscape characterisation and archaeological assessments?) on the web for use by practitioners and general public. This would involve agreement from all local authorities	NBP	All Norfolk local authorities	2
13	Produce information on Norfolk biodiversity website and produce information for general public.	Econet Topic Group		2
14	Consider how to disseminate information on ecological network establishment to practitioners including the provision of case studies and good practice including public participatory approaches	Econet Topic Group?		3
15	Review all BAPs as appropriate and incorporate actions or complete priority BAPs (eutrophic standing waters) or write new local BAPs (ponds and Fenland drains) to further ecological networks	Econet Topic Group/all Topic Groups		3
16	Identify buffering requirements for habitats. This may require further study	Econet Topic Group		3

PART 3 ECOLOGICAL NETWORK MAPS

12 Indicative ecological network maps based on regional approach

Map 1 Core Biodiversity Areas

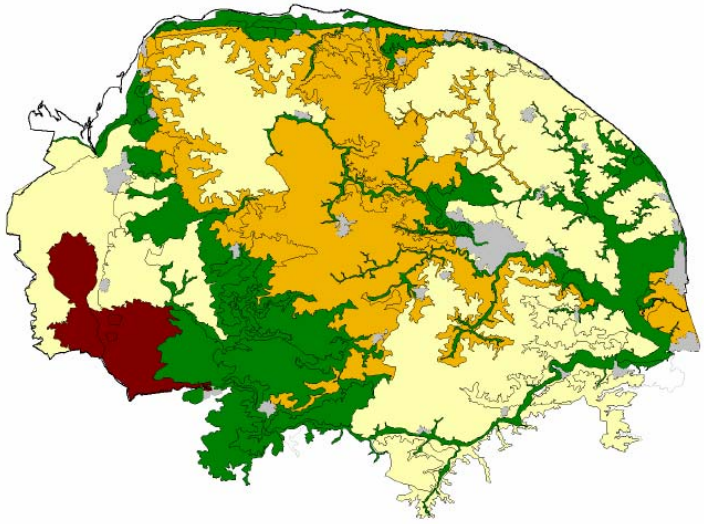


LEGEND

County Boundary
LDU Boundary
Urban LDU

Core area

Map 2 : Biodiversity enhancement areas



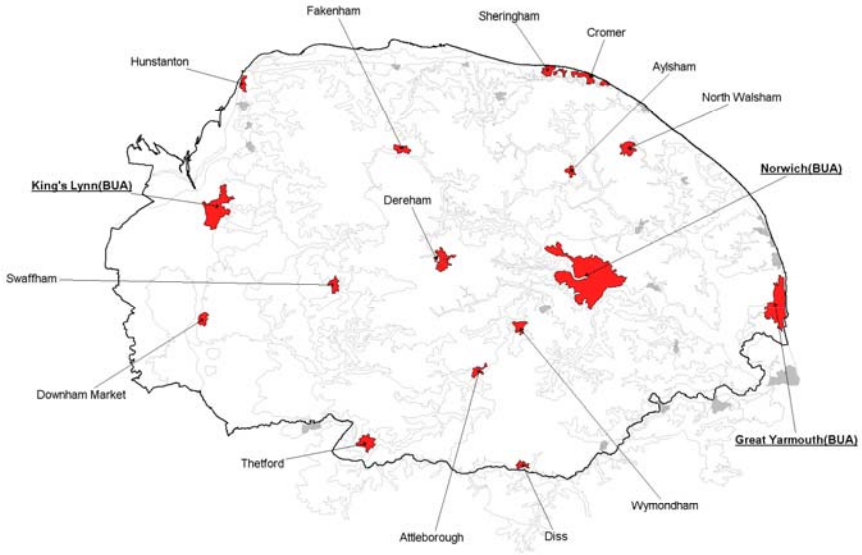
LEGEND

County Boundary
LDU Boundary
Urban LDU

Core area

Buffer fragmented habitats
Extend and link fragmented habitats
Large scale habitat restoration and enhancement

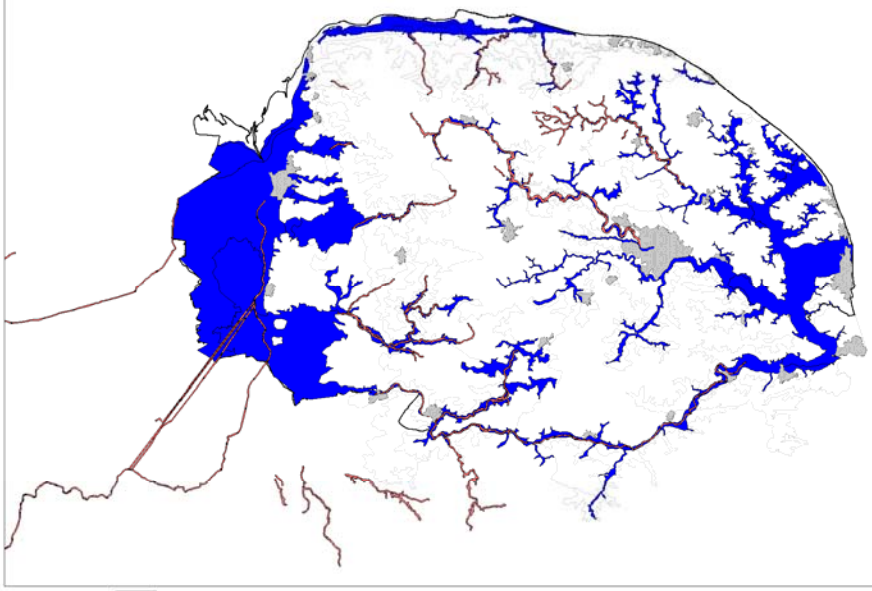
Map 3 Urban Deprivation Areas



LEGEND
County Boundary
LDU Boundary
Urban Biodiversity Deprivation Area

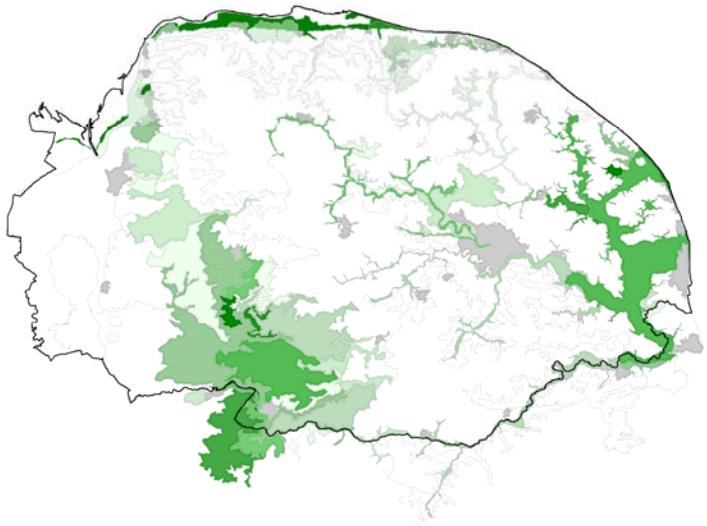
Towns with population greater than 30 000 are underlined and in bold
Towns with populations between 5000 and 30 000 are in normal text
BUA is built urban area and does not correspond to legal boundaries.

Map 4 Strategic River Corridors



LEGEND
County Boundary
LDU Boundary
Urban LDU
Strategic corridors from regional methodology
Strategic river corridors from County Methodology

Map 5 : Core Biodiversity Areas - stepped approach



LEGEND

County Boundary
LDU Boundary
Urban LDU

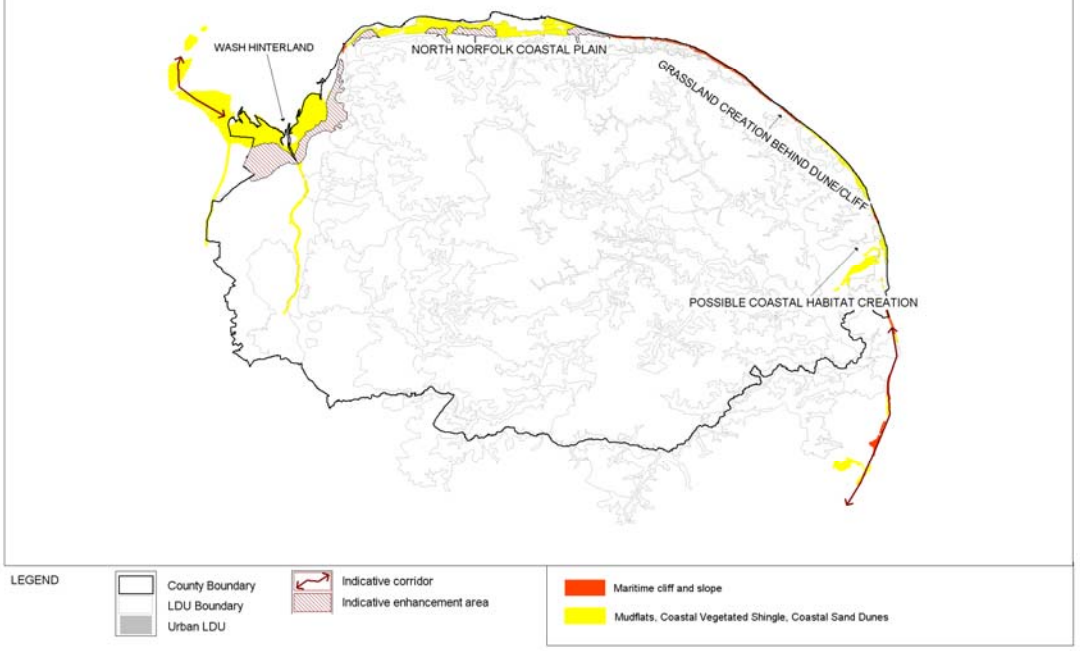
Percentage CWS, SSSI and BAP habitat cover

90 to 100
80 to 90
70 to 80
60 to 70
50 to 60
40 to 50
30 to 40
20 to 30
10 to 20
< 10

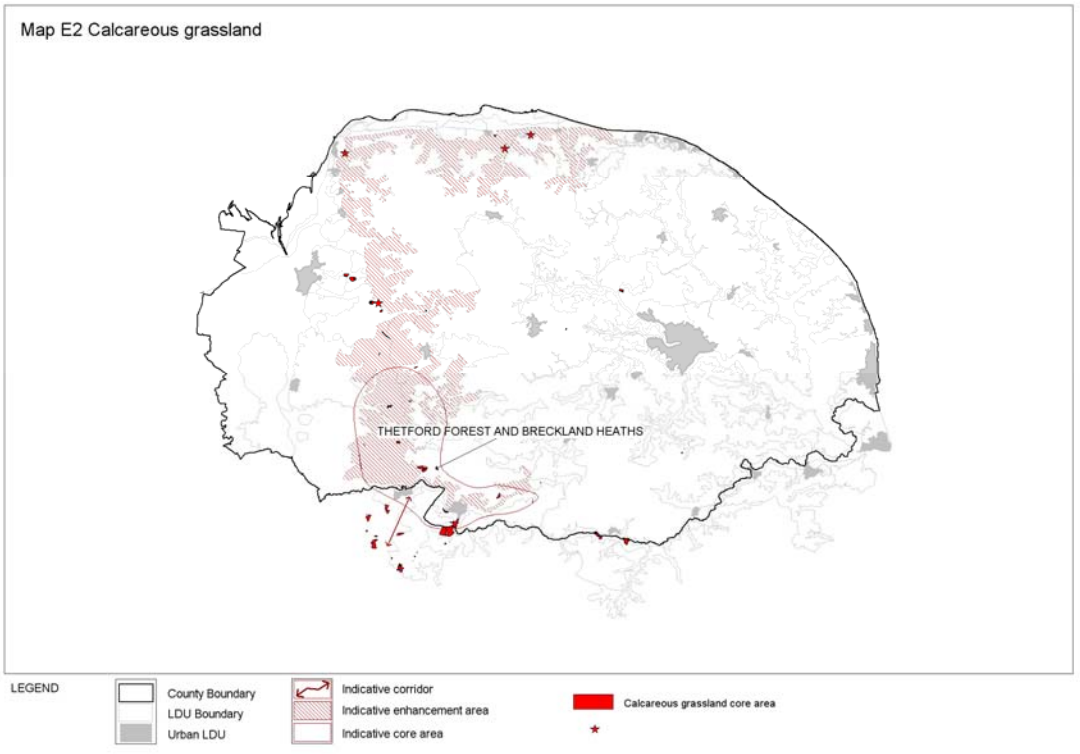
13 Indicative ecological network maps based on practitioners' approach

Map E1	Coastal habitats
Map E2	Calcareous grassland
Map E3	Lowland meadows
Map E4	Heathland & Acid grassland
Map E5	Fens
Map E6	Floodplain ands grazing marsh
Map E7	Reedbed
Map E8	Aquifer-fed and naturally fluctuating waterbodies & Mesotrophic lakes
Map E9	Chalk rivers
Map E10	Woodland and wood-pasture
Map E11	Wet woodland

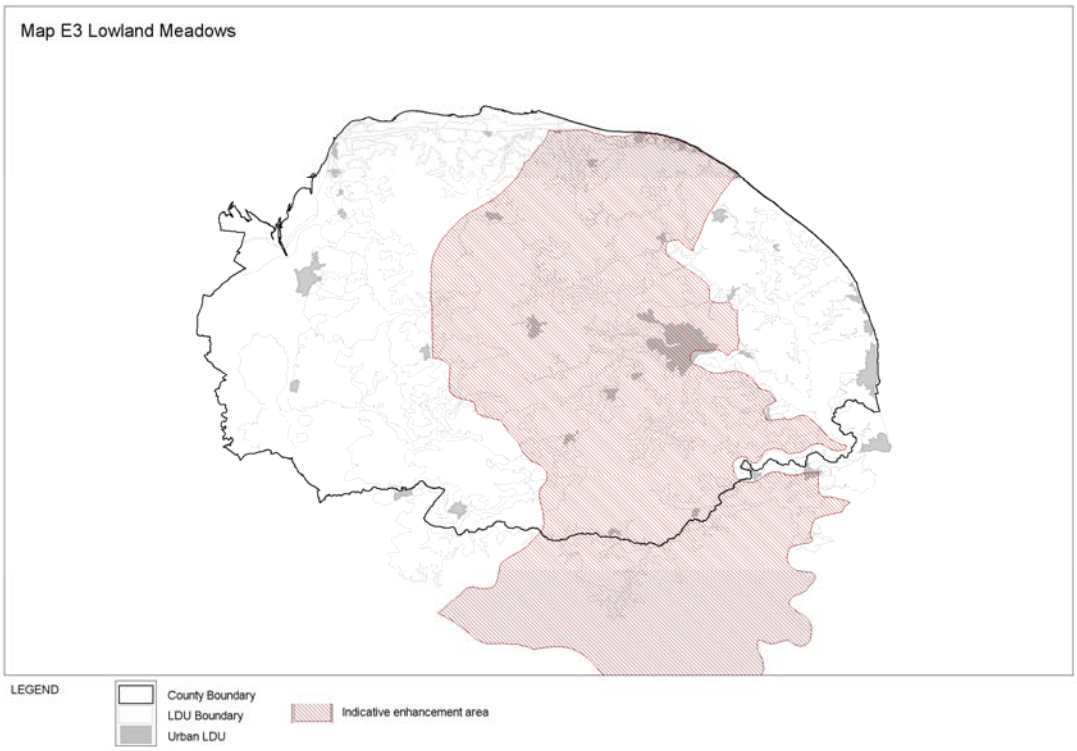
Map E1 Coastal habitats



Map E2 Calcareous grassland



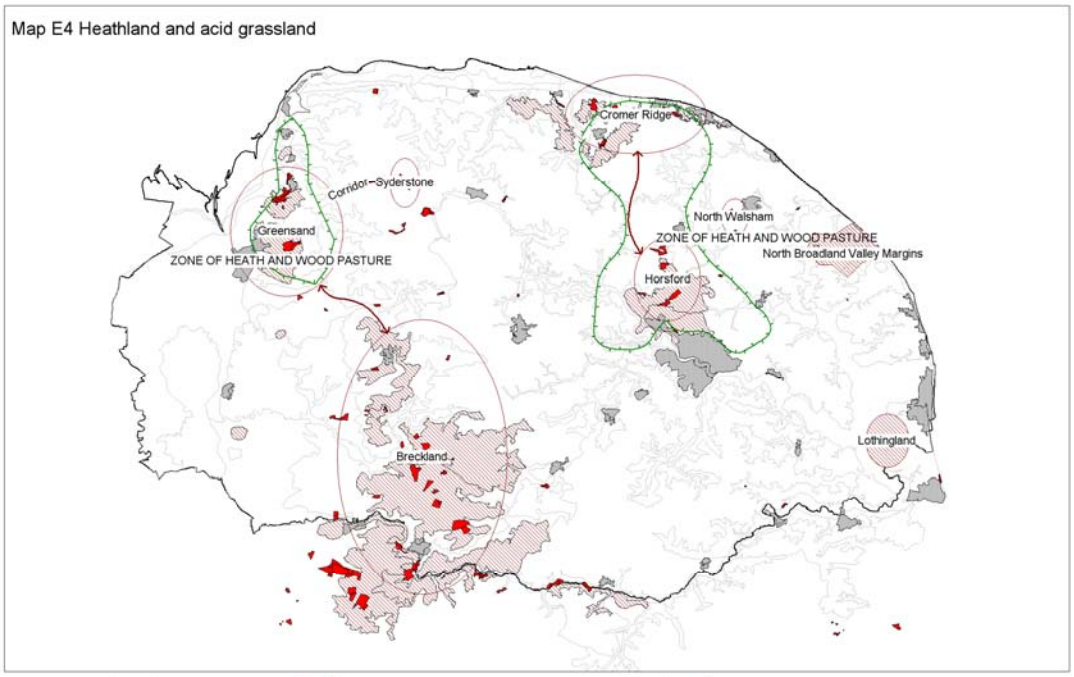
Map E3 Lowland Meadows



LEGEND

County Boundary
LDU Boundary
Urban LDU
Indicative enhancement area

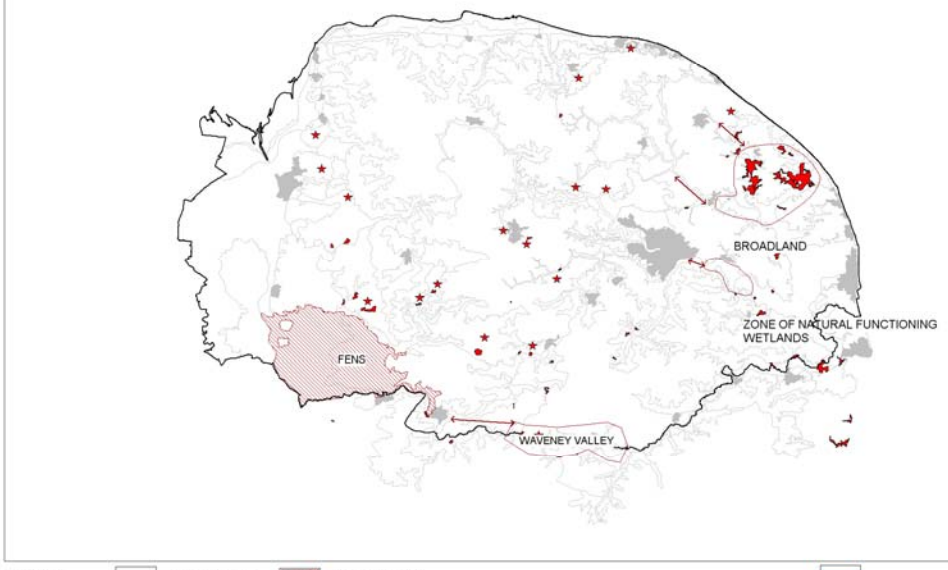
Map E4 Heathland and acid grassland



LEGEND

County Boundary
LDU Boundary
Urban LDU
Indicative corridor
Indicative enhancement area
Indicative core area
Zone of heath and woodpasture
Heathland Core Area (from EN dataset)

Map E5 Fens



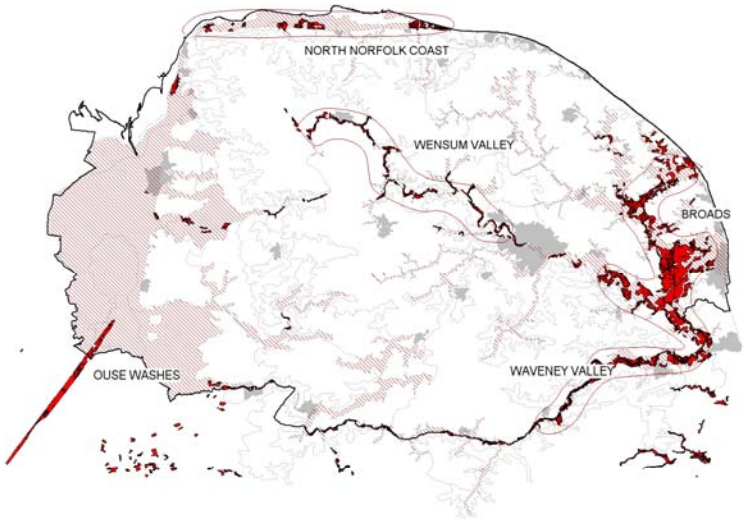
LEGEND

County Boundary
LDU Boundary
Urban LDU

Indicative corridor
Indicative enhancement area
Indicative core area

Fen Core Areas

Map E6 Floodplain and grazing marsh

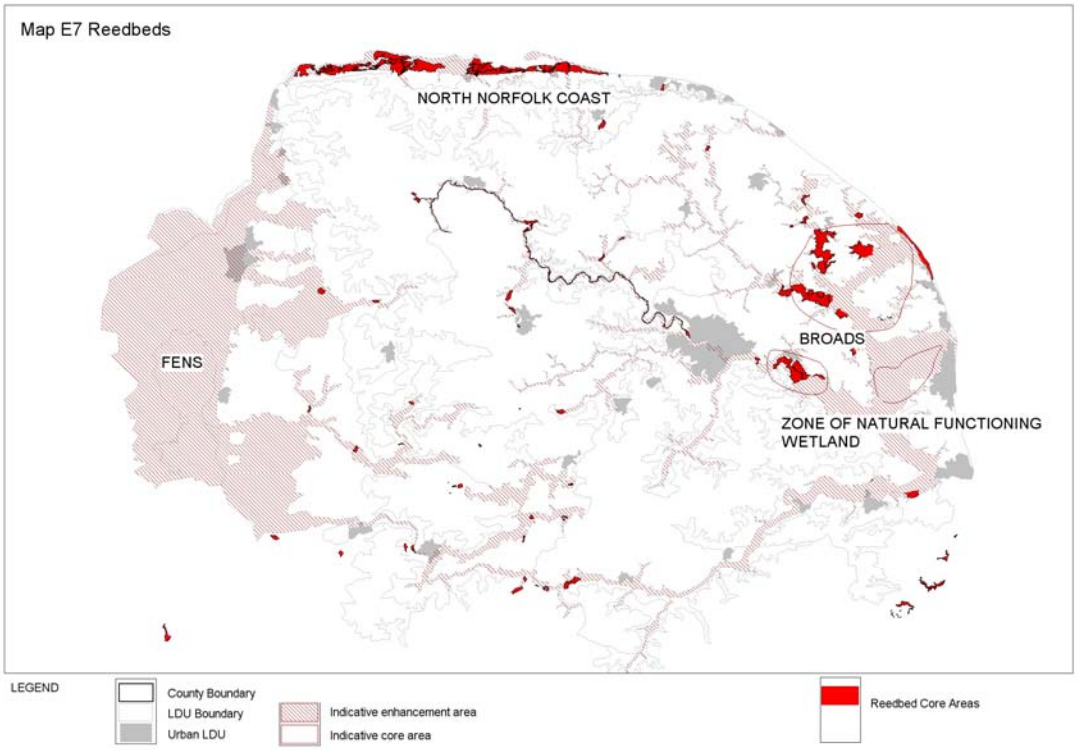


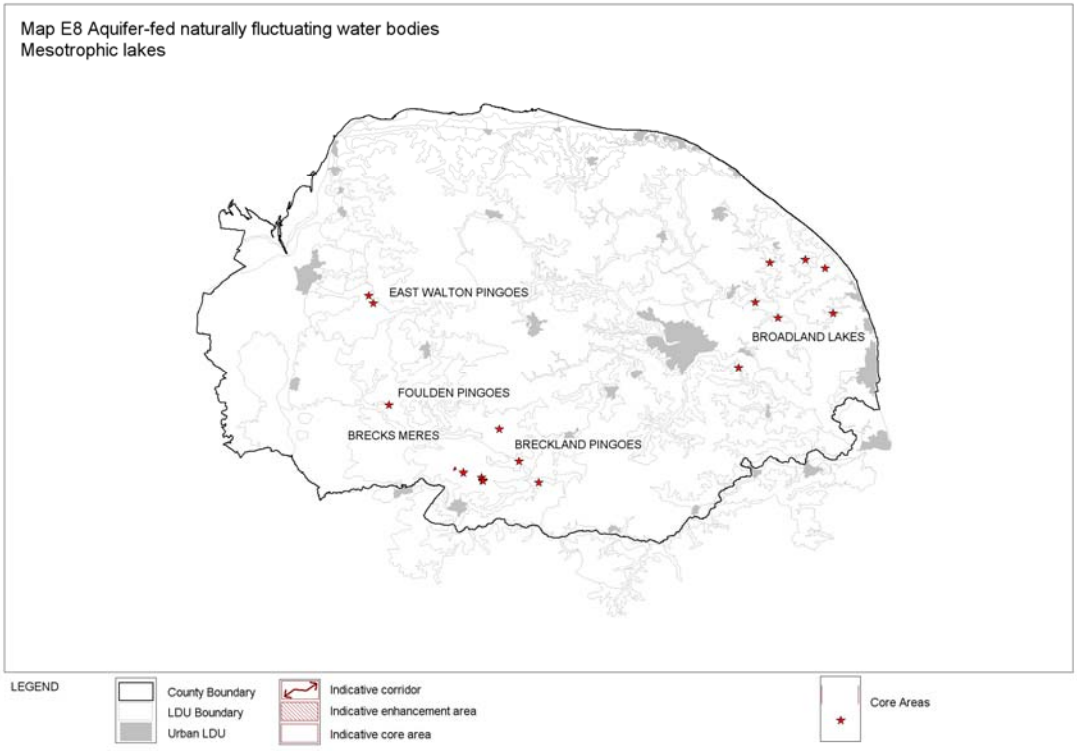
LEGEND

County Boundary
LDU Boundary
Urban LDU

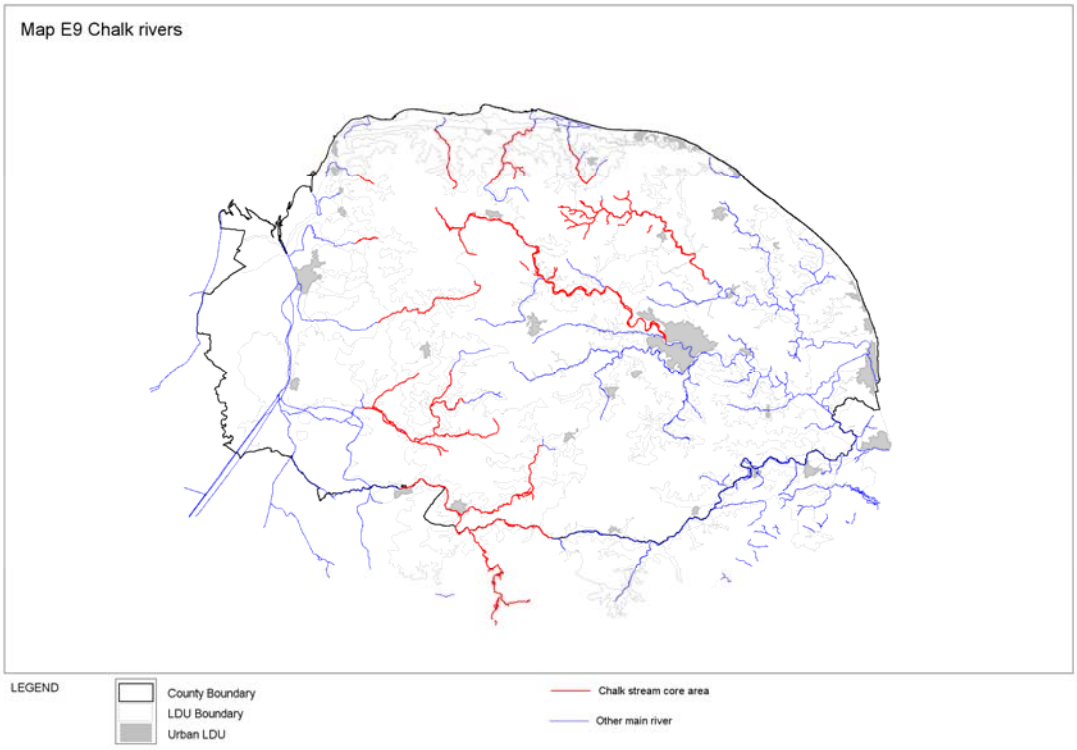
Indicative corridor
Indicative enhancement area
Indicative core area

Floodplain and grazing marsh core Areas


Map E7 Reedbeds
NORTH NORFOLK COAST
BROADS
FENS
ZONE OF NATURAL FUNCTIONING WETLAND
LEGEND
County Boundary
LDU Boundary
Urban LDU
Indicative enhancement area
Indicative core area
Reedbed Core Areas


Map E8 Aquifer-fed naturally fluctuating water bodies
Mesotrophic lakes
EAST WALTON PINGOES
BROADLAND LAKES
FOULDEN PINGOES
BRECKS MERES
BRECKLAND PINGOES
LEGEND
County Boundary
LDU Boundary
Urban LDU
Indicative corridor
Indicative enhancement area
Indicative core area
Core Areas

Map E9 Chalk rivers

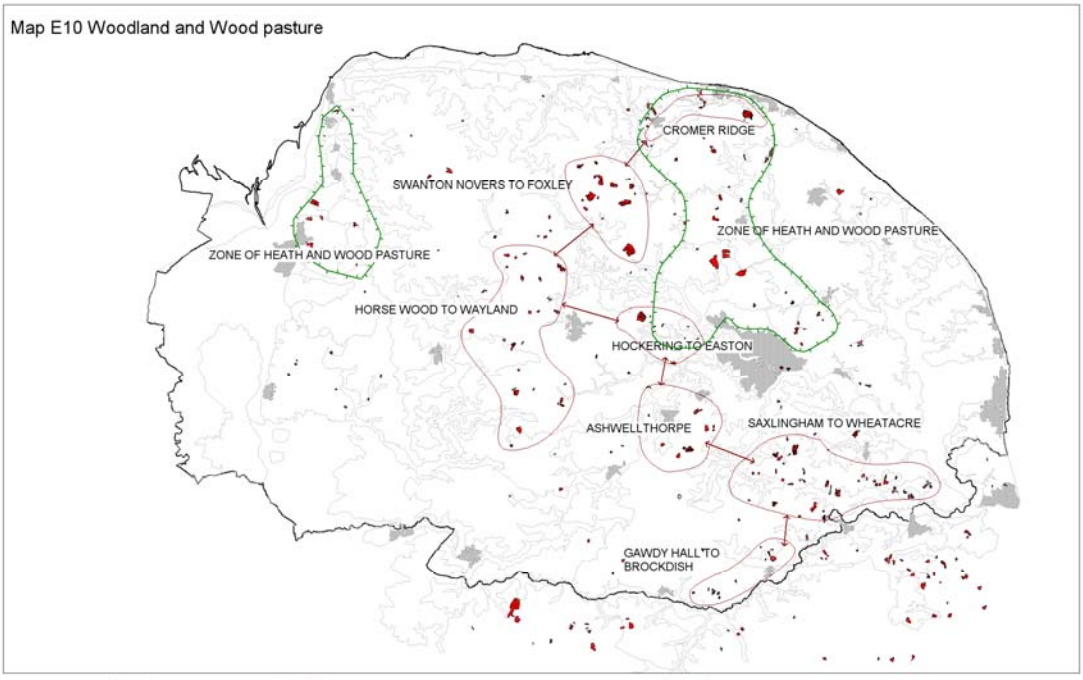


LEGEND

County Boundary
LDU Boundary
Urban LDU

Chalk stream core area
Other main river

Map E10 Woodland and Wood pasture

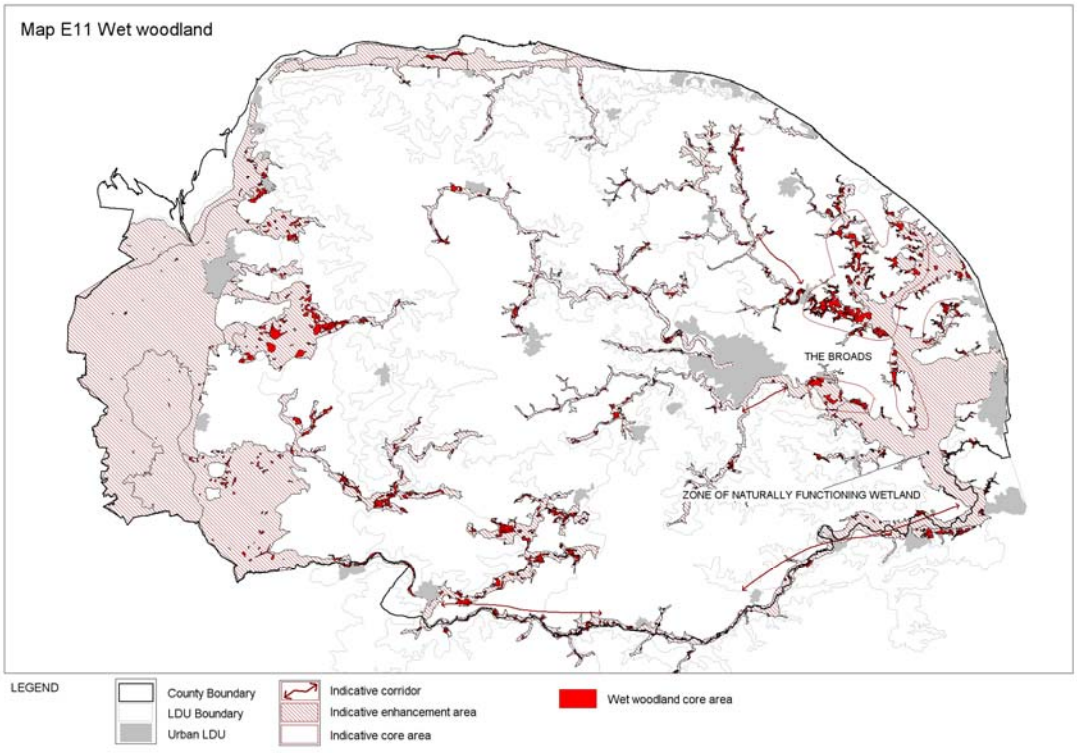


LEGEND

County Boundary
LDU Boundary
Urban LDU

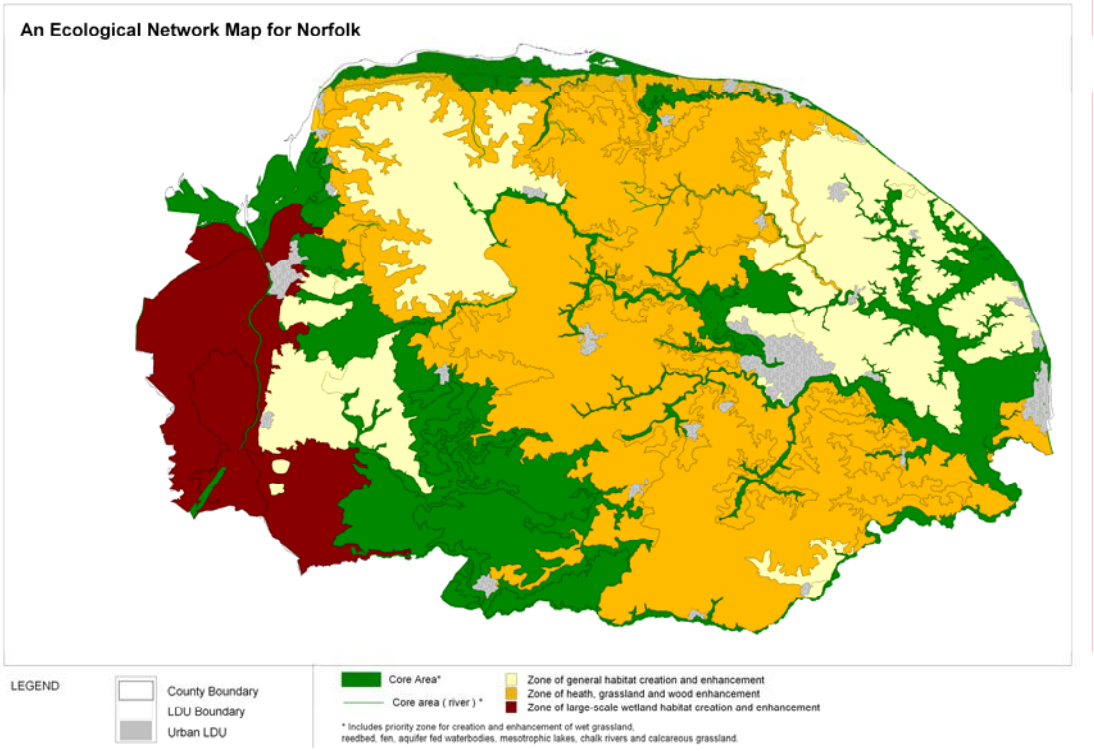
Indicative corridor
Indicative enhancement area
Indicative core area

Zone of heath and woodpasture
Ancient Woodland Core Area


Map E11 Wet woodland
THE BROADS
ZONE OF NATURALLY FUNCTIONING WETLAND
LEGEND
County Boundary
LDU Boundary
Urban LDU
Indicative corridor
Indicative enhancement area
Indicative core area
Wet woodland core area

14 Indicative ecological network map unifying the regional and practitioners' approaches

Map 6 An ecological network map for Norfolk



15 Appendices

15.1 Appendix 1 Conservation priorities identified by practitioners used in defining the indicative ecological network map

Broad BAP habitat	**BAP habitat**	**Core areas**	**Expand/create (minimum requirements have not been set)**	**Corridors/linkage/barriers**
Dwarf shrub heath	Lowland Heathland Lowland acid grassland	1. Cromer Ridge* 2. Horsford* 3. Sandringham Sands* 4. Syderstone 5. North Walsham 6. Breckland*	1. In core areas 2. Lothingland 3. Broads margins 4. As part of minerals restoration strategy in other parts of the county	1. Between individual Breck heaths and outliers 2. Brecks to Sandringham Sands via stepping stone sites 3. To Suffolk Brecks sites 4. Between isolated sites in remainder of county 5. Heath to wetland/woodland/wood pasture ecotones where possible
Calcareous grassland	Lowland calcareous grassland	• Brecks* • Thetford Forest* • N&W Norfolk (SSSIs/CWSs)	1. Core areas 2. Adjacent isolated sites especially SSSI/ CWS 3. As part of minerals restoration strategy	1. Sites within core area 2. To Suffolk Breck & chalk ridge to Cambs 3. To Brecks to N&W Norfolk 4. Between isolated sites in remainder of county
Fen, marsh and swamp	Fens Purple moor grass and rush pastures	1. Broads fen* and ronds 2. Brecks* 3. Widely scattered and small sites (valley fen sites*) 4. Roydon-Dersingham* 5. Waveney Valley Fen	1. Core areas 2. Fenland (peat) 3. Adjacent isolated sites especially SSSI/ CWS	1. Sites within core areas 2. Between isolated sites in remainder of county 3. River valley corridor links across county 4. Heath to wetland ecotones where possible
	Reedbeds (NVC S4)	1. North Norfolk coast inc saline reedbed* 2. Broads* (Upper Thurne, Bure, Ant, Yare & Lower river ronds)	1. Core areas 2. Fenland (peat) 3. Upstream of broads rivers in larger river valleys eg Waveney	1. To Suffolk coast 2. River valley corridor links across county especially Waveney 3. Wash margins to Lincs and Fenland 4. Mosaics with other wetland habitats
Improved grassland	Coastal and floodplain grazing marsh	1. Broads (drained levels)* 2. North coast (drained levels)* 3. Wash margins (drained levels) 4. Ouse Washes* 5. River valleys especially Waveney, lower Wensum	1. Core areas 2. Upstream of Broads rivers in larger river valleys eg Waveney 3. Fenland and Wash drained levels	1. River valley corridor links across county 2. Wash margins to Lincs and Fenland 3. Mosaics with other wetland habitats
Neutral grassland	Lowland meadows	1. Widely scattered and small sites (SSSI/CWSs) mainly in ancient countryside 2. South Norfolk chalky boulder clay	1. Core areas 2. Any area with suitable soil	1. Existing and created sites to be linked wherever possible due to small size 2. River valley corridor links across county
Broadleaved, mixed and yew woodland	Lowland mixed deciduous woodland (ancient woodland)	1. Ancient woodland clusters centred on SSSIs and clusters of ancient woodland	1. Core areas 2. Adjacent other ancient woodland sites 3. Restore degraded sites	1. Woodlands clusters linked 2. Isolated ancient woodland sites 3. Mosaics with other habitats

Broad BAP habitat	BAP habitat	Core areas	Expand/create (minimum requirements have not been set)	Corridors/linkage/barriers
	Wet woodland	1. Broads (inc European protected sites) 2. Brecks* 3. SSSIs	1. Core areas 2. Fenland 3. Upper river valleys 4. Upstream of Broads rivers in larger river valleys	1. Wet woodland to fen/wetland ecotones
	Lowland wood pasture and parkland	Wood pasture - North Norfolk, Cromer ridge, Central north Norfolk Parkland - scattered	1. Core areas 2. Restore degraded sites	1. Existing and created sites to be linked wherever possible 2. Ecotones to heathland and other semi natural habitats
Rivers and streams	This will be taken as all classified rivers and streams by EA	Eg Waveney, Thet, Tud, Yare, Tiffey, Ant, Lower Bure, Dilham Canal; Ouse, Cut off Channel		1. Rivers and floodplains are critical corridors across county 2. Linking rivers across watershed with semi natural habitat
	Chalk rivers	Gladder, Heacham River, Babingley, Bure, Burn, Glaven, Nar, Stiffkey, Tat, Thet, Wensum*, Wissey, Gaywood, streams at East Walton and Gayton	1. Restore degraded sites	1. Remove internal barriers to movement of key species 2. Functional linkage to floodplain 3. Restore marginal semi natural habitats or low input grassland in floodplain and to spring lines
Standing open water and canals				
	Aquifer-fed naturally fluctuating waterbodies	1. Breck meres – Ringmere, Langmere, Holme Mere, Fowlmere, Devil's Punchbowl 2. Pingoes at East Walton, Brecks	1. Restoration of degraded sites	1. Transitions to heathland/ grassland
	Eutrophic standing waters	None identified. Await preparation of Norfolk LBAP 1. Ponds?? 2. Gravel Pits etc?? 3. Fenland drains??		1. Functional linkages to other semi natural habitats including scrub and woodland
	Mesotrophic lakes	3. Broads* 4. Broads grazing marsh dykes?? 5. Westwick lakes??	1. Restoration of degraded areas	1. Functional linkages to open fen and semi natural marginal habitats
Supralittoral rock	Maritime cliffs and slopes	1. Hunstanton 2. Weybourne to Happisburgh (inc Overstrand*)	1. Grassland creation on cliff top	1. Enable natural functioning of core area
Inshore sublittoral sediment	Saline lagoons	1. North Norfolk* 2. Snettisham		1. Enable natural functioning of core areas
Supralittoral sediments	Coastal sand dunes	1. North Norfolk* 2. Sea Palling-Gt Yarmouth (inc Winterton and Gt Yarmouth*)		1. Enable natural functioning of core areas including inland transitions
	Coastal vegetated shingle	1. Weybourne-Blakeney*	1. Restoration of degraded areas	1. Enable natural functioning of core area
Littoral sediments		1. Wash and North Norfolk * 2. Breydon water *	1. Core areas on adjacent drained levels	1. Enable natural functioning of core areas

* includes European Protected Sites

15.2 Appendix 2 - How ecological network objectives can be integrated with landscape characterisation

The analysis is based on an assessment of the North Norfolk landscape characterisation produced by North Norfolk District Council[38]. It aims to show in broad terms how the ecological network priorities for the district can complement the characterisation process and define priorities.

The characterisation process identified 14 landscape character types associated with a common suite of features. The character types have some ecological basis in that they take account of soil type and landform as well as vegetation, such as grassland and tree cover. By itself though it does not help identify ecological priorities and in particular what needs to be done to create an ecological network.

For each landscape character type the county ecological network priorities were identified based on the indicative ecological network map. In addition, however, (possible) District priorities were also identified. It should be noted that this assessment is meant to be illustrative of the approach and benefits and is not presented as a definitive statement of the priorities.

Parliamentary enclosed rolling farmland
There are no SSSIs and a relative lack of CWSs and BAP habitats. Faden shows a small number of heaths and commons. The county core area for calcareous grassland covers part of this area as does heathland near Syderstone. The district core area is the grassland at Sculthorpe (and Raynham?), which probably represents the largest area of semi natural habitat in the area.

The priorities for creation would be all types of grassland according to soils (calcareous is the priority north of the Wensum valley) and heathland adjacent to Syderstone and West Rudham Common. The latter could act as a stepping stone between Syderstone and potential heath creation sites in west Norfolk. Habitat creation could be achieved through the creation of mixed habitats of grassland, heath and scrub: an analogue of the sites shown in Faden. In addition buffering the Wensum, Stiffkey and tributary valleys through catchment sensitive farming and low input grassland will help protect this chalk stream from diffuse pollution inputs.

<u>BAP Species</u>
This is a key area for restoration of stone curlew which will require the maintenance of a relatively open landscape north of the Wensum. Any woodland planting is likely to be on a small scale and dispersed.

Randomly enclosed rolling farmland
There are a number of woodland CWSs. Faden shows a small number of extensive commons and heath especially near Guist, Briston, Sharrington and Roughton. The county core area for lowland meadow covers this area. The district core area is the extensive ancient/secondary woodland cluster between Aylsham-Briston-Holt.

Priorities for habitat creation are grassland throughout the area and woodland within the district core area and especially linkages to woodlands of the 'Wooded with parkland' landscape character type. The creation of mixed habitats of grassland, heath and scrub: an analogue of the sites shown in Faden would be beneficial. In addition buffering of river valleys through catchment sensitive farming and low input grassland will help protect important areas such as the chalk rivers of the Stiffkey, Glaven and Wensum as well as downstream areas of the Broads from diffuse pollution inputs.

<u>BAP species</u>
This area is a key one for great-crested newt, therefore the creation of habitat mosaics, as mentioned above, adjacent to and linking existing populations of great-crested newt would be beneficial.

Randomly enclosed low plain farmland
There are relatively few CWSs in this area and there are no county core areas identified. Faden shows a number of commons and heaths often associated with valley sides.

Priorities are buffering of river valleys through catchment sensitive farming, low input grassland and creation of mixed habitats of grassland, heath and scrub: an analogue of the sites shown in Faden to protect rivers and especially the Broads from diffuse pollution.

[38] *Landscape Character Assessment for North Norfolk District Council Local Development Framework.* NNDC. Draft undated

Broads
The Broads form a county core area as they contain European protected sites and many other non-designated areas are of national importance for biodiversity. Priorities for habitat creation are fen, reedbed, floodplain grazing marsh and wet woodland as well as mosaics of these habitats. Adaptation to environmental change through climate change is a priority requiring the creation of habitats in middle reaches of the Ant valley. It would be desirable to develop more naturally functioning river systems and wetlands. Restoration of the Upper Thurne catchment to remove ochre and salinity inputs into the Broads is a priority.

Broads fringe
There are relatively few CWSs in this area. The county priority for heath creation covers the Broadland valley sides in the Upper Thurne and Ant valleys to create a zonation of habitats from wetland to dry ground. A notable feature in Faden is Hickling Common linking the Upper Thurne and Any valley wetlands. Priorities are also the buffering of the Broads to reduce diffuse pollution inputs through catchment sensitive farming.

Coastal fen
Much of the coast is either SSSI (European protected sites)or CWS. The county core area comprising of sand dunes and associated grassland covers most of the coast. Priorities for habitat creation include allowing coastal dunes to 'roll-back', wetland creation such as coastal and floodplain grazing marsh, fen and reedbed. Buffering of these dunes through the development of grassland and scrub habitats on their landward side is a District priority. In addition buffering of the margins to the Broads (Upper Thurne) with semi natural habitats to reduce diffuse pollution inputs from ochre and salinity is a priority. This is an area potentially subjected to major environmental change in the future. The creation of habitats will need a flexible response to allow adaptation.

Coastal plain
There are relatively few designated sites away from the coast. The county core area is the SSSI and CWS maritime cliff and slope. The core area requires natural processes to operate to ensure its continued development. In addition, a county priority would be grassland creation on the cliff top.

Coastal towns and villages
There are a number of coastal as well as heath/fen SSSIs and CWSs in this area. The county core area is the European protected site, SSSIs and CWSs associated with the maritime cliff and slope. This core area requires natural processes to operate to ensure its continued development and grassland creation on the cliff top. A characteristic local habitat that is a priority for creation is grassland with scrub and especially gorse eg associated with golf courses. The county core area for heathland/fen is covered in the Wooded with parkland character area covering the Cromer ridge but elements of this heathland occur in this character area (eg Beeston Common).

Rolling coast heath and arable
There area number of SSSIs and CWS heathlands. The county core area is made up of SSSI heathland and CWSs forming part of the Cromer ridge heathland. The priority for habitat creation is heathland and in particular expansion and linking of existing sites by heathland or other 'open' habitats. A characteristic local habitat that is a priority for creation is grassland with scrub and especially gorse. In addition buffering of the Glaven river through catchment sensitive farming and low input grassland is a priority.

Wooded and parkland
There are a number of SSSI and CWS woodlands and heathlands. Faden shows an almost uninterrupted chain of heath, common and warren from Cromer to Hunworth as well as around Westwick and Swanton Novers. This is in addition to areas of woodland and the formal parks.

The county core areas for a number of habitats occur in this character area: Heathland associated with European protected sites, SSSIs and CWSs of the Cromer ridge (Holt-Cromer) and south of North Walsham (Felmingham-Westwick); woodland (ancient) associated with the SSSI and ancient woodlands around Melton Constable; the Glaven, a chalk river, has its headwaters on the Cromer ridge; and Wood pasture and parkland especially at Felbrigg. District priorities are the ancient woodland and plantations in all these areas.

Priorities for habitat creation are heathland, especially at Holt, Cromer ridge and North Walsham. The priority should be to expand and link existing sites that are often small and surrounded by farmland or woodland. The woodland in these areas is a relatively connected habitat within the component parts of this character area but linkages through the intervening Rolling Open Farmland to link these wooded areas is a priority. There is an obvious conflict between heath creation and woodland coverage. The creation of wood

pasture should be investigated. In many cases the historic association of woodland, heathland and wood pasture may represent a desirable target for habitat creation.

Drained marsh & Undrained marsh
The entire landscape type is a core area as it incorporates the north Norfolk coast European protected site. Priorities would be the establishment or maintenance of natural processes to ensure the continued development of coastal habitats. Habitat creation priorities include all coastal habitats in appropriate locations. Where there is no conflict with the long-term objectives of shoreline management plans then the maintenance and creation of freshwater habitats would be a priority.

Small valleys & Large valleys
There are a large number of CWS and a number of SSSIs (including the European protected site of the Wensum) associated with the river valleys. The valleys also act as corridors often through a largely arable landscape. As such they contain a large proportion of the District's biodiversity. The Wensum, Bure and Ant rivers are identified as corridors at a county level and at the District level all large and small valleys are important corridors. A number of river valleys also contain chalk rivers and are therefore County core area priorities. Priorities for habitat creation are all types of wetland habitat such as grazing marsh, lowland meadow, fen, reedbed and wet woodland. In the river valleys upriver from the Broads the priority is to create habitats that may be lost due to se level rise in Broadland. In some cases this may mean restoration of sites that have changed into woodland or scrub. In addition the restoration of chalk rivers (Glaven, Stiffkey and Wensum) is a priority and buffering of these by creating low input grassland or semi-natural habitats such as woodland and heath.

Based on this analysis, the following priorities can be identified that help establish the County ecological network:

- Heathland expansion in two core areas Cromer ridge and Felmingham area
- Grassland creation wherever there are suitable soils and including cliff top grassland. In many cases this can be associated with other habitats such as scrub and woodland to 'mimic' some of the features in Faden's map such as commons
- River valley wetland habitats and river restoration (chalk rivers priority). More detailed analysis could prioritise these;
- Buffering rivers and Broads to protect wetlands;
- Woodland/wood-pasture in one core areas;
- Coastal habitats including linking the Broads and coastal areas through extensive wetland creation

The following District priorities are identified that help to reinforce the county priorities

- In a number of areas the 'recreation' of features such as commons and greens would introduce a wide range of habitats such as grassland, scrub and ponds into the landscape
- Woodland core area (Briston to Aylsham and Cromer ridge) and linkages between clusters of woodland throughout the northern part of the District
- All river valleys are important corridors
- Grassland and other habitat creation behind dune systems

The following potential areas of conflict are identified with other (landscape) objectives

- Woodland and heathland creation in Cromer ridge and Felmingham areas
- Large scale wetland creation in Coastal fen and Broads involving changes to arable land use and potential loss of woodland although woodland creation would be an objective as well
- Woodland loss in large and small river valleys associated with restoration of habitats such as fen

The farmed landscape will contain many features of high value but often of small scale that are not picked up in the above analysis of landscape and ecological needs at the district level. Habitats such as species rich hedgerows, small copses, ponds will need to be linked, expanded and buffered just as the larger areas are. Throughout the area and without exception it will be important that the farmed landscape be continually enhanced, generally through measures promoted by cross-compliance for farmers and Entry Level Stewardship. These measures will be undertaken independently by individual landowners and will not generally take account of the needs of the ecological network. It would, however, be highly desirable if landowners and managers were made aware of how their farm fits into and can help make the ecological network as effective as possible.

15.3 Appendix 3 – How can ecological network objectives be integrated into Higher Level Stewardship priorities?

Targeting of Higher Level Stewardship (HLS) is based on features considered of importance within a Joint Character Area (JCA). Below, the HLS key targets for the South Norfolk Claylands JCA are assessed to see how they can implement the priorities as set out in the county indicative map and potential district priorities.This example is illustrative only but highlights the point that the HLS targeting generally covers the actions required to establish the ecological network and with appropriate targeting would be an important means toward achieving the objective. .

Key target in JCA		**Ecological network priorities**
SSSI management		A priority is to ensure that important sites are well managed so this target is critically important. In general, SSSIs will be identified as core areas unless particularly small and isolated. The target also recognises the management of adjacent land (buffering) which may be important.
Maintain, restore or create locally important or BAP habitats.		It is important to maintain BAP habitats outside of SSSIs, many of which will be County Wildlife Sites. All the habitats listed are identified in the ecological network as priorities in this JCA apart from ancient hedgerows (these would be important at a local level).
	Wet woodland	County core areas are identified based on the Yare, Tas and Waveney (NB This JCA does not include the Broads). District priority areas would be the Tiffey, Tud, Chet and Broome and Hellington Becks.
	Lowland woodland	County core areas identified based on SSSIs and associated ancient woodland clusters and occur in three blocks. Priority is for buffering, expanding and linking sites within these blocks. Priority for buffering, expanding and linking in District would include other woodland clusters.
	Fen & Purple moor grass and rush pasture	County core areas identified as SSSI fens. Priority for managing and buffering sites but creation should be attempted wherever possible due to small amount of resource. District core areas would be Fen CWSs which would require buffering, expanding and linking where possible.
	Coastal and floodplain grazing marsh+	County core area identified in Waveney valley. Priority for habitat creation and restoration in Waveney valley. District priority is for creation and restoration in all other river valleys if scale appropriate.
	Lowland grassland	County core area covers much of district. Priority for creation wherever possible due to small amount of resource. High priority for boulder clay grassland.
	Heathland & acid grassland	No county priorities. District priority for creation adjacent Waveney on suitable terrace soils and possibly Poringland.
	Wood pasture and parkland	Not identified as a priority for creation in this area. (NB: There is limited data on distribution and potential, so this may change)
	Ponds	Not considered in ecological network so far but a high priority for great crested newt in association with other habitats such as scrub and grassland.
	Ancient and/or species rich hedges	Not considered in ecological network at County level but a priority at the District level but areas not specifically identified. .
Maintain or enhance populations of BAP species		The following BAP species (from those listed in the targeting statement) are considered to be most likely to benefit significantly from the ecological network if implemented.
	Lapwing, redshank,	Maintenance and creation of wet grassland, grazing marsh and fen in all river valleys is a county or district priority. Priority likely to be

	snipe	Waveney.
	Farmland birds	Associated with the farmed landscape measures but creation of grassland, scrub and presence of valley corridors through arable landscape are important.
	Great crested newt	This species will require a finer level of detail in terms of creating ecological networks for local populations based on hedgerows, ponds, grassland and other habitats.
	Otter	Creation of semi-natural wetland habitats in all river valleys is a county or district priority. Linking of river headwaters with semi-natural habitats would be desirable to aid movement from river to river.
	Water vole	Maintenance and creation of semi-natural wetland habitats in all river valleys is a county or district priority.
	Dormouse	Not present but woodland expansion and linking may aid colonisation from Suffolk
	Bat species	This group will require a finer level of detail in terms of creating ecological networks for local populations. Priority to create habitat mosaics in valleys and woodland, grassland and semi natural habitats would benefit bats
	BAP invertebrates and arable weeds	Associated with the farmed landscape measures but invertebrates would benefit from semi natural habitats in landscape
Restore traditional field boundaries		These are not considered in the ecological network at the county or district level but are essential at a local scale in providing connectivity for species through the farmed landscape.
Maintain, restore or create historic landscape features		This key target is essential in creating connectivity at a local scale and with the BAP habitat creation above. The District formerly had extensive areas of semi natural habitat associated with commons and greens which could be replicated.
Semi improved river valley grassland		A key landscape component with a wide range of priority habitats. Important for connectivity across the intensively farmed landscape.
	Floodplain grazing marsh	A County priority in the Waveney valley. May be a District priority in other valleys but more likely to be lowland grassland due to generally small scale of valleys but see below.
	Lowland meadows, greens, tyes and commons, green lanes	Priority for creation as they can be a means to creating lowland species rich grassland on boulder clay in particular as well as wet grassland and other non BAP habitats of importance to a wide range of species.
	Parkland	Not a County priority (but additional information may change this). Likely to be a District priority.
Minimise diffuse water pollution on priority sites		Priority action to buffer all river valleys, Broads and individual wetlands.
Creation of recreational opportunities		A County priority in terms of the integration of greenspace and ecological network close to large urban areas (Norwich). A District priority near to market towns (eg Wymondham)
Flood management		Additional opportunities for the creation of wetland habitat and development of more naturally functioning floodplains

15.4 Appendix 4 – Projects that could help establish an ecological network

The project list below has been put together to cover a range of approaches for establishing the ecological network. There are many other potential approaches. They cover a variety of geographical areas and BAP habitats. The projects are in no order of priority or feasibility.

Project name	**Norfolk Fens Project**
Project goal	To ensure appropriate management and restoration of Fens outside Broads
Project description	Norfolk is one of the most important areas in England for fens. The initial phase of this project is underway undertaking a conservation assessment of at all non-SSSI fens (outside of Broads). It will come up with recommendations for protection, enhancement, expansion and buffering. In the second phase, these recommendations need to be implemented. It is likely that actions will include remedial works eg to alter water levels, advice to landowners on habitat management and trying to link sites together or buffer them from adjacent land uses. It will also help inform priorities for targeting agri-environment actions via Environmental Stewardship and the policies of drainage authorities. Such a project will help to protect a priority BAP habitat and help put in place the Fen ecological network.
Project activities	• Assess the conservation status of Norfolk fens (underway); • Undertake actions to achieve favourable management, buffering and linking; • Provide advice to landowners; • Promote actions to be implemented by Rural Development Service, other advisory/statutory bodies and Internal Drainage Boards; • Initiate projects to develop specific conservation actions.
Duration	3 years
Funding	£10000+ for follow up works
Lead body and partners	NWT, Landowners, FWAG, EN, EA, IDBs

Project name	**Lowland Meadow Project**
Project goal	The goal is to encourage the better management and restoration of extant of meadows and where possible to expand these
Project description	Lowland meadows have declined to such an extent that the remaining sites are small, highly isolated and often at risk from unsympathetic management through the creation of new areas using hay from existing flower rich sites.
Project activities	• Undertake actions to achieve favourable management, buffering and linking of existing sites • Provide advice to landowners; • Promote actions to be implemented by Rural Development Service and other advisory/statutory bodies • Initiate projects to develop specific conservation actions
Duration	3 year
Funding	£10000+
Lead body and partners	Statutory and voluntary bodies – Local authorities, EN, NWT, FWAG, landowners, RDS

Project name	**Claylands Project**
Project goal	The project's goal is to encourage the creation and linking of commons and greens and the development of habitats such as woodland for the benefit of local communities and wildlife.
Project description	The Claylands Project is already in existence and covers an area of South Norfolk. The area formerly contained an extensive area of interconnected commons and greens that formed part of the rural economy. These have been largely lost but many remnants remain and are important for wildlife and people.
Project activities	• Undertake actions to achieve favourable management, buffering and linking of existing sites • Provide advice to landowners; • Promote actions to be implemented by Rural Development Service and other advisory/statutory bodies • Initiate projects to develop specific conservation actions
Duration	3yr
Funding	£10000+
Lead body and partners	South Norfolk Council, EN, NWT, landowners, RDS, FWAG

Project name	**North Norfolk Heath Re-creation Strategy**
Project goal	Stimulate the re-creation of heathland in the five core areas of heath to meet the revised Norfolk BAP target
Project description	This strategy has identified heath re-creation opportunities. Specific parcels of land have been identified and there is a need for a plan of action to identify a prioritised programme of heath creation incorporating ecological network concepts
Project activities	• Identify priorities for creating heath taking account of ecological network concepts; • Provide site specific information to RDS and other conservation bodies on where to create heathland and buffering needs of sites; • Provide a basis for prioritised action to target landowners (BAP action).
Duration	3 months desk study
Funding	£5000 for study then follow up actions
Lead body and partners	Heath Topic Group

Project name	**Application of econet concept to Breckland**
Project goal	Vision plan for the Breckland region to inform European site management, Forestry Commission and landowner management
Project description	The Breckland region is identified as a core area for a wide range of priority BAP habitats and a large part is a European protected sites. The need for increased connectivity (corridors) between many of the habitats is identified along with the opportunity for large scale habitat creation. There is a need to produce a plan, an ecological network for the Brecks, which major landowners and statutory bodies can use in their long term planning.
Project activities	• Identify biodiversity resource in the Breckland region • Apply ecological network principles using computer modelling to identify corridors • Integrate an agreed ecological network with other objectives of forest management
Duration	6 months
Funding	£10000 for study then follow up actions
Lead body and partners	EN, FC, landowners, other statutory and voluntary bodies

Project name	**Wet woodland**
Project goal	To identify wet woodland areas with potential for enhancement and expansion, and to create mosaic links with other wetland habitats.
Project description	Wet woodland is scattered through the county and is thought to be declining in area due to the restoration of some areas to fenland. There is a need to target areas where wet woodland can be created and to
Project activities	• Undertake actions to achieve favourable management, buffering and linking of existing sites • Provide advice to landowners; • Promote actions to be implemented by Rural Development Service and other advisory/statutory bodies • Initiate projects to develop specific conservation actions
Duration	2.5 years
Funding	£19000 for study then follow up actions
Lead body and partners	NCC, FC, EA

Project name	**King's Lynn and Area Green Infrastructure Study**
Project goal	To relate the benefits of habitat restoration and creation to socio-economic goals in and around a major urban area
Project description	The study would look at an urban area such as Kings Lynn with high potential for creating a significant amount of habitat and applying the principles of the ecological network. The study would scope the potential for habitat creation opportunities based on conservation priorities and importantly also greenspace creation to enhance access to the countryside from the urban area and how it can contribute toward economic renewal. The provision of a vision for the immediate surroundings of a large town would provide a blueprint for others to follow. It would provide an opportunity to engage with local communities and other agencies not normally part of the nature conservation agenda eg economic regeneration, health and welfare sectors.
Project activities	• Carry out a land use study of the area • Identify nature conservation resource and conservation needs, habitat creation opportunities • Identify green infrastructure – public open space, greenspace – and landscape objectives • Identify how the above can be integrated and developed to provide economic benefits, aid regeneration and diversification and deliver biodiversity
Duration	£10000+ depending on level of detail
Funding	6 months-1 year
Lead body and partners	Local authorities, local communities, Parish Councils, local businesses, conservation organisations, health and social services sectors

Project name	**Gaywood River Catchment restoration project**
Project goal	To restore a degraded chalk river and associated habitats within the entire catchment
Project description	The Gaywood river is 10 km long and runs into Kings Lynn. It is heavily modified through its length. Associated with the catchment are a number of SSSI fens and heathland of international importance for wildlife. There is potential to restore the river (a small scale restoration has already taken place) and to expand and link the heathland and fenland habitats. There is also scope for the creation of other BAP habitats such as wet woodland and reedbed. The project being on the edge of Kings Lynn links to the urban fringe project mentioned elsewhere and could provide a template for what the overall study could aim for. There is potential to enhance access opportunities as well as wildlife and link restoration to development of the Leziate Country park and restoration of mineral working.
Project activities	• Produce a vision for the valley based on the creation of wildlife habitats, landscape enhancement and public enjoyment; • Develop a delivery partnership; • Engage with local communities; • Identify policy and practical approaches to implementation.
Duration	1 year preparation of visioning study and stakeholder dialogue
Funding	£10000+ for scoping and then business plan for undertaking works
Lead body and partners	Local authority, landowners, local business, EA, IDB, conservation bodies,

Project name	**River Naturalisation in Broadland**
Project goal	To create more naturally functioning rivers in Broadland.
Project description	The creation of a more naturally functioning river and floodplain is a long term goal of the Broads Authority. A number of drained levels within the Broads have been identified as potential areas for managed set back of the floodwalls to create more naturally functioning sections of the Broadland rivers. The impact of this on the flood risk to other sections of the river has been tested against the Broadland Flood Alleviation Project hydrological model and the results show there would be no additional risk of flooding. For each of the sections identified there needs to be an agreement with the landowners and then a detailed study of the feasibility. Developing these projects is likely to be a long term process. One scheme on the Chet river however is considered to be a candidate in the short term as the technical studies undertaken as part of the BFAS show that the compartment cannot be protected in the long term and so set back is the only option.
Project activities	• Liaison with landowners; • Produce a design for the wetland incorporating adjacent land and agree management requirements to integrate access and wildlife; • Identify technical works to ensure a safe and sustainable set back plan; • Put together the funding package required.
Duration	6 months for studies and consultation
Funding	£5000+
Lead body and partners	Landowners, EA, EN, BA, RDS, NWT, BESL, RSPB

Project name	**Application of econet principles to Norfolk Coast AoNB**
Project goal	Vision plan for the AoNB to inform management
Project description	The AoNB is identified as a core area for a wide range of priority BAP habitats including many European protected sites. The need for increased connectivity (corridors and linkages) between the habitats is identified along with the opportunity for large scale habitat creation. There is a need to produce a plan, an ecological network for the AoNB, which major landowners and statutory bodies can use in their long term planning. The Vision for Nature Conservation in the Norfolk Coast AoNB 1997-2022 provides a basis for this project.
Project activities	• Identify biodiversity resource in the AoNB; • Apply ecological network principles to identify corridors; • Integrate an agreed ecological network with other objectives for the coast
Duration	6 months
Funding	£5000+ for study then follow up actions
Lead body and partners	Norfolk Coast Project, local authorities, EN, landowners, other statutory and voluntary bodies

Project name	**Fen wetland creation**
Project goal	Creation of a large wetland in the Norfolk fens
Project description	The ecological network identifies the Fenland as a key area for the creation of a wide range of wetland habitats and potentially on a large scale. Adjacent counties are developing large wetland creation projects and there is ample scope to identify a suitable area(s) within Norfolk. This would complement the wetlands being created elsewhere in Fenland. Wetland creation can be linked to rural diversification and economic development in particular through tourism. Wetlands could be linked to linear features such as navigable waterways thus adding to their attraction.
Project activities	• Identify a suitable area(s) for developing a wetland creation project; • Produce promotional material; • .
Duration	6 months
Funding	£5000+ for study then follow up actions
Lead body and partners	Statutory and voluntary bodies,

Project name	**Major development and green infrastructure**
Project goal	To work with planners and developers to develop a functioning ecological network as part of a large development
Project description	Linking the development of the ecological network to a major development offers the opportunity to put in place green infrastructure that has multiple benefits. The ecological network will benefit by reducing the impact of major development on presenting barriers to wildlife movement. The provision of natural greenspace on a large scale will be of benefit to the new community. With the anticipated levels of growth it is important that the development is made as sustainable as possible. Working with developers from an early stage is not a feature of many developments in Norfolk to date. There are multiple benefits and the possibility of developers delivering on greenspace provision.
Project activities	• Identify mechanisms for engagement with planners and developers to implement principles; • Identify examples of good practice from elsewhere.
Duration	6 months
Funding	£10000+ for study
Lead body and partners	Local authorities, statutory and voluntary conservation bodies

Project name	**Linear Corridors Project**
Project goal	To create wildlife habitat and other greenspace along linear routes to increase connectivity with the landscape and integrate this with other socio-economic benefits such as access thus complementing the role played by river corridors for wetland habitats.
Project description	There are a number of linear routes through the County. Some may be historical features and/or long distance footpaths such as the Peddar's Way, others may be development corridors such as the A11 or proposed transport routes such as the NDR. There are doubtless many other examples. The principle is to take a linear route and build onto it the requirements of an ecological network either retrospectively or proactively. These corridors would be linked to economic development eg house building in the growth corridor or enhanced landscape and visitor enjoyment by creating a corridor of habitat alongside a long distance footpath. The NDR is proposed to follow a route around north Norwich in an area with low greenspace provision and high development pressure.
Project activities	• Produce a vision of the proposal(s) identifying potential areas • Promote the vision.
Duration	6 months feasibility study
Funding	£5000+
Lead body and partners	Local authorities

Project name	**Broads Hinterland Restoration Project**
Project goal	To develop wildlife habitat and greenspace alongside the Broads National Park boundary
Project description	The Broads National Park is restricted to the floodplain of the major rivers to a large extent. An important ecological network priority is the buffering of the Broads and the creation of terrestrial habitats on the valley margins. In addition there is an increasing recognition that land based recreation is not catered for sufficiently and that very often the best views of the Broads are from the valley sides. The vision is to create a corridor of habitats to integrate the valley floor and valley side landscapes and to develop public access. This would have a major benefit for buffering the Broads as well as aiding the direct management of the Broads by for example providing grazing land during high water. This project could integrate with the River Naturalisation Project mentioned elsewhere.
Project activities	• Identify the valley side zone and undertake a land use survey linked to landscape characterisation; • Assess habitat creation potential and public access opportunities; • Adopt any plan after public consultation.
Duration	6 months feasibility study
Funding	£10000+
Lead body and partners	Broads Authority, local authorities, statutory and voluntary bodies

Project name	**Great crested newt Ecological Network**
Project goal	To develop a best practice example of creating a network for a population of newts to promote measures to agri-environment advisers
Project description	Great crested newts are a species of high conservation importance. There is a relatively large and widespread population in Norfolk. The species is largely restricted to the farmed landscape, with few occurring in the major core areas in the county apart from Breckland. Inappropriate pond management, farming practises and small-scale developments adversely impact them. They can act as a flagship species over much of the countryside whereby measures to ensure their survival will also benefit other species.
Project activities	• Identify a typical area of countryside with a population of newts that has the potential to be enhanced • Assess the status and distribution of the newts; • Produce a conservation plan for the newts incorporating ecological network requirements such as pond restoration, buffering, habitat creation and corridors based on known ecology of the species; • Carry out follow up monitoring. • Promote the findings
Duration	6 months for the study plus monitoring of impacts
Funding	£5000+ for study
Lead body and partners	Landowner, RDS, NWT, statutory and voluntary bodies, FWAG

Project name	**Bat Ecological Network**
Project goal	To develop a best practice example of creating a network for a population of bats centred on a known bat roost to promote measures to agri-environment advisers
Project description	Bats are a species of high conservation importance. Inappropriate grassland management and farming practises have an adverse impact. They can act as a flagship species over much of the countryside whereby measures to ensure their survival will also benefit other species
Project activities	• To identify a typical area of countryside with a population of bats that has the potential to be enhanced; • Assess the status and distribution of the bats; • Produce a conservation plan for the bats incorporating ecological network requirements such as pond restoration, buffering, habitat creation and corridors based on known ecology of the species; • Carry out follow up monitoring; • Promote the findings.
Duration	6 months for the study plus monitoring of impacts
Funding	£5000+ for study
Lead body and partners	Landowners, Norfolk Bat Group, RDS, NWT, statutory and voluntary bodies, FWAG

Project name	**Norfolk Community Woodland Scheme**
Project goal	To establish new woodland
Project description	The scheme encourages the planting of new woodland on appropriate sites, often linking existing habitats.
Project activities	• Establish new woods for access and biodiversity. • Open existing woods for access where appropriate. • Provide advice to landowners. • Encourage the formation of community groups.
Duration	Ongoing
Funding	£10000+
Lead body and partners	NCC. Greenlight Trust

Project name	**Anglian Woodland Project (AWP)**
Project goal	To bring into management neglected farm woodlands
Project description	The AWP was established in 1990 with the primary aim of encouraging the management of neglected farm woodlands.
Project activities	• Advice and co-ordination of management • Encourage development of markets • Hold training days • Co-ordinate bids for external funding • Produce In-Leaf, 6 monthly newsletter.
Duration	Ongoing
Funding	£10000
Lead body and partners	NCC, FC, Suffolk CC, Essex CC and Beds CC

Project name	**Orchard Planting and Conservation**
Project goal	Conserve and establish Norfolk variety fruit trees and orchards
Project description	The Project aims to conserve old orchards and orchard trees. It propagates about 1500 Norfolk varieties per year, surveys and records extant orchards, runs training days and up to twelve apple days per year. It also grant aids the establishment of new traditional orchards across the County.
Project activities	• Propagate local varieties of fruit trees • Plant new orchards • Run training days for orchard owners • Locate and identify orchards and lost varieties of fruit trees. • Provide advice.
Duration	Ongoing
Funding	£25000
Lead body and partners	East of England Apple and Orchard Project, NCC

15.5 Appendix 5 - Assessment of datasets on distribution of priority BAP habitats in Norfolk.

To be completed

Habitat data	Availability	Date of survey	Digitally mapped	Comment
Generic datasets				
English Nature SAC/SSSI habitat data	EN	**?**	yes	Some of these datasheets may allow identification of specific habitats
Heathland				
English Nature Heath inventory	publicly available	1994	yes	Shows heathland – considered to be out of date and many anomalies
North Norfolk Heaths re-creation strategy M. Harding. EN	EN	2002	yes	Shows existing heaths (based on x dataset) outside Brecks
East of England Heathland Opportunity Mapping Project S. Eglington & M. Horlock FC/RSPB	From Forestry Commission & Suffolk Biological Records Centre,	2004	yes	Shows existing heaths (based on x dataset)
FE heath inventory for Forest sites	From FE	?	yes?	
Acid grassland				
Assumed covered in above heathland mapping				No specific dataset
Lowland meadow				
Norfolk grassland survey N. Roberts & W. Smyth Nature Conservancy Council	yes	1990	yes	Incomplete coverage
Calcareous grassland				
Botanical survey of East Anglian calcareous grassland L. Moore. EN	yes	1993	yes	Incomplete coverage
Fens				
Norfolk Fens Assessment NWT 2006	?	2006	yes	Covers non Broads sites
EN/BA Fen audit	From BA	?	yes	Covers fen in Broads Authority Executive Area
Purple moor grass and rush pastures				No specific dataset
Coastal and freshwater grazing marsh				
Reedbed				
Eutrophic standing waters				No specific dataset
Mesotrophic lakes				No specific dataset
Aquifer fed naturally fluctuating water bodies				No specific dataset
Chalk rivers				
The State of England's Chalk Rivers EA/EN	From EA?	2004	yes	Lists rivers (probably incomplete coverage for Norfolk)
Broadleaved woodland				
Ancient Woodland Inventory	yes	?	yes	
Wet woodland				No county-wide dataset
Bure, Ant NWT report	From EN Norfolk	199?	yes?	Data only for wet woodland in Broadland SAC?
Wood-pasture and parkland				
Norfolk Parkland Inventory		1995		No specific dataset for wood pasture
Coastal habitats* – Sand dunes				No specific dataset

* only sand dunes are covered in this assessment as all other coastal habitats occur largely within SSSIs, however, there are still areas outside designated sites that should be mapped

15.6 Appendix 6 Assessment of habitat creation opportunity mapping in Norfolk

To be completed

Habitat	Study	Coverage	Strengths/Limitations	Further requirements
Heathland, acid grassland and including Breckland grass-heath	A Heathland Re-creation Plan for Breckland English nature 1995	Looks at heath creation in Brecks ESA area based on history of heath cover and proximity to existing heath. Linking sites is mentioned as an objective	Constrained by relatively limited search criteria eg known areas of heather not identified as potential heath re-creation sites	Study needs to be revisited. Breck-heath creation potential in Thetford Forest is inadequately known. **High Priority**
	North Norfolk Heaths Re-creation Strategy English Nature 2002	Strategy identifies specific land parcels based on an assessment of environmental variables in 5 core areas, which are suitable for heathland re-creation. The study does not cover Breckland.	Specific land parcels identified according to potential for heath creation based on a large number of factors. A number of heathland areas outside these core areas have not been assessed. Also weak on identification of landscape scale corridors.	Extend study to look at other potential heathland areas. To some extent the FC/RSPB study covers these areas but uses a different methodology (see below).
	East of England Heathland Opportunity Mapping Project FC/RSPB 2004	Exercise identifies specific land parcels and their suitability for heath creation across the whole of Norfolk based on a range of socio economic and environmental attributes.	Data can be used to refine attributes to identify heath creation opportunities for specific purposes. Data set not publicly accessible but Suffolk Biological Records centre are contracted to provide help in making assessments of the data.	There is confusion over which heath creation approach to adopt and no agreement on a county-wide plan. The results from these three studies need to be collated to provide a county plan. This will be required to implement the specific BAP action - to prioritise a programme of heath restoration and recreation **High Priority**
Calcareous grassland	North Norfolk AoNB Vision for Nature Conservation1997-2022. A. Millar, English Nature 1998	Identifies a large area of NW Norfolk within the AoNB based on soil type. Not intended to identify specific parcels of land. Calcareous grassland in Breckland would be covered in heathland assessments above.	Limited geographical range. Single environmental factor does not provide sufficient information for targeting specific parcels of land	There is no suitable study available for this habitat. A targeted study looking at potential sites such as steep slopes, chalk pits, archaeological features or more recent earthworks and roadside verges may highlight suitable areas. **Medium Priority**
Lowland meadows	No opportunity mapping undertaken			Opportunity mapping is required for this habitat **High priority**
Maritime cliff and slope & Sand dune (grassland buffering only)	Identifying Biodiversity Opportunities in the Sheringham-Lowestoft Natural Area 104[39] Restoration assessment	Identifies broad habitat restoration and creation opportunities but not specific parcels of land		Cliff top grassland likely to be of value at any location along coast.
Fens	Broads fen audit[40]	Only covers Broads Authority Executive Area		Identification of suitable areas for fen re-creation is required in remainder of the county. There is a BAP action to agree a list of fens requiring remedial treatment that may make some recommendations. This study is currently underway but will not achieve 100% coverage of County. **High Priority**
Wet woodland	Broads fen audit	Ditto		Identification of suitable areas for wet woodland re-creation is required in remainder of county. There is a BAP action to investigate the creation of wet woodland with black poplar and to identity and map priority areas, create new woodlands and restore hydrological connection **High Priority**
Lowland broadleaved woodland	Ancient woodland clusters in the east of England. Norfolk Wildlife Services. Report to Forestry Commission Apr 2004	Identifies a number of areas where targeting of woodland grants could encourage woodland planting	Does not specifically look at parcels of land. This is unlikely to be a constraint as woodland planting is generally not limited by environmental conditions in Norfolk	Opportunity mapping required to identify best locations for woodland creation within the zones identified. High Priority

[39] *Identifying Biodiversity Opportunities in the Sheringham-Lowestoft Natural Area 104* Available from English Nature. www.english-nature.org.uk

[40] Details from Broads Authority

Habitat	Study	Coverage	Strengths/Limitations	Further requirements
Wood-pasture and parkland	No opportunity mapping undertaken or assessment of restoration opportunities for wood pasture			
Aquifer fed naturally fluctuating waterbodies,	No assessment of restoration opportunities for pingoes			
Chalk rivers	No assessment of restoration opportunities for chalk rivers			
Reedbeds & Coastal and floodplain grazing marsh	EA Regional Habitat Creation Project in progress	GIS based appraisal of wetland creation opportunities looking at physical and ecological criteria specifically to identify suitable sites for EA to create compensatory habitat as part of the Agency's compliance with the Habitats Directive		EA project should provide information relevant to these habitats but the search criteria are those relevant to EA specific requirements and other suitable areas may not be identified. There is a BAP action to map areas with potential for reedbed creation and areas for creation of wet grassland and to prioritise sites.
	RSPB/EN/EA Wetland Creation Project			Unlikely to provide detailed opportunity mapping at County scale
Mudflats/saltmarsh	EA Regional Habitat Creation Project in progress	Ditto for reedbed		EA project should provide adequate information for these habitats

15.7 Appendix 7 Summary of approach used in transposing regional mapping project methodology to county context

To follow