

# **North Norfolk**

*'Once in his life a man ought to concentrate his mind upon the remembered earth. He ought to give himself up to a particular landscape in his experience; to look at it from as many angles as he can, to wonder upon it, to dwell upon it.*

*He ought to imagine that he touches it with his hands at every season and listens to the sounds that are made upon it.*

*He ought to imagine the creatures there and all the faintest motions of the wind. He ought to recollect the glare of the moon and the colours of the dawn and dusk.'*

N. Scott Momaday.

*'All England may be carved out of Norfolk, for here are fens and heaths, light and deep, sandy and clay grounds, meadow lands and pastures, arable and woodlands.'*

Dr Fuller (quoted by Bacon in the Report of the Agriculture of Norfolk, London, 1844)

*'Do different.'*

Norfolk motto

## Foreword

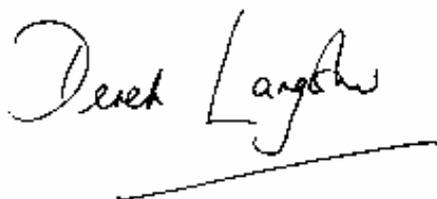
One of the key components of English Nature's *Strategy for the 1990s* has been the Natural Areas approach. We examined the local distinctiveness of each part of England, to identify their characteristic wildlife and natural features, and used this to define a comprehensive series of Natural Areas. Their boundaries are based on the distribution of wildlife and natural features, and on the land use pattern and human history of each area, and thus offer a more effective framework for the planning and achievement of nature conservation objectives than do administrative boundaries. They are **not** designations.

Wildlife is not restricted to designated and protected sites such as nature reserves or SSSIs; it occurs throughout the countryside, coast and built up areas of England. No part of the country is without some wildlife interest. The Natural Areas approach gives us a way of determining priorities for nature conservation areas with ecological and landscape integrity, and to set objectives which reflect these priorities. Together, all Natural Areas provide a powerful vision for nature conservation right across England.

The achievement of the objectives described for each Natural Area will be a key part of our new strategy *Beyond 2000*. The objectives will guide our work over the coming years, and we hope Natural Areas will allow us to help others in achieving what is best for nature conservation locally.

This Natural Area profile is one of a series of 120, one for each Natural Area. In it we describe the wildlife and natural features of the area, and what makes it special and distinctive. Each Natural Area profile is different, since it describes and reflects the local distinctiveness of the area, and therefore includes nature conservation objectives which are particular to that area. The profiles have been written after a wide range of local consultations, both on the boundaries of the Natural Areas themselves and on these profiles.

We hope you will find this document useful, and look forward to working with you to maintain and enhance the wildlife and natural features of England.

A handwritten signature in black ink that reads "Derek Langslow". The signature is written in a cursive style. Below the signature is a horizontal line that starts under the first letter and extends to the right, ending under the last letter.

Dr Derek Langslow  
Chief Executive

## **Preface**

North Norfolk has a character which sets it apart. It is much loved by both residents and visitors alike and is held in special affection by the many professionals and amateurs who are interested in aspects of its geology and wildlife.

The survival of so many important sites owes much to the efforts of local people, past and present. It was on the North Norfolk Coast that the Wildlife Trust movement began through the efforts of Sidney Long and other members of the Norfolk and Norwich Naturalists Society. The first meeting which led to the formation of the Norfolk Naturalists Trust (recently renamed the Norfolk Wildlife Trust) took place in the George Inn at Cley in 1926. The importance of the coast had already been recognised by Professor Oliver (of London University) who had led the appeal which resulted in the purchase by the National Trust of Blakeney Point back in 1912. This tradition of caring carries on today through a variety of individuals and organisations as diverse as the Brancaster Common Right Holders, the Poor's Trustees, sympathetic landowners and members of the Norfolk and Norwich Naturalists Society. The voluntary sector (Norfolk Wildlife Trust, the National Trust, FWAG and the RSPB) are prominent through their nature reserves and in the wider countryside. English Nature manages four National Nature Reserves and has major responsibilities for the statutory designations. Increasingly the Environment Agency and local government are also playing an active part in conserving this wealth of wildlife.

The purpose of this natural area profile is to try and document the interest of the area and to continue the vision of the likes of Sidney Long and others into the next century. Despite all these efforts there have still been considerable losses of both habitats and species in the last fifty or more years, a continuation of a process which accelerated with the enclosures of the late 18th century. Species and habitats have always been subject to change, but the next 25 and more years are likely to see even greater threats, particularly through global warming with its impact both on land and sea. Past experience also suggests that inevitably there will also be threats and issues about which we cannot even guess. It is hoped that this document will at least provide guidance on the way ahead into an uncertain future.

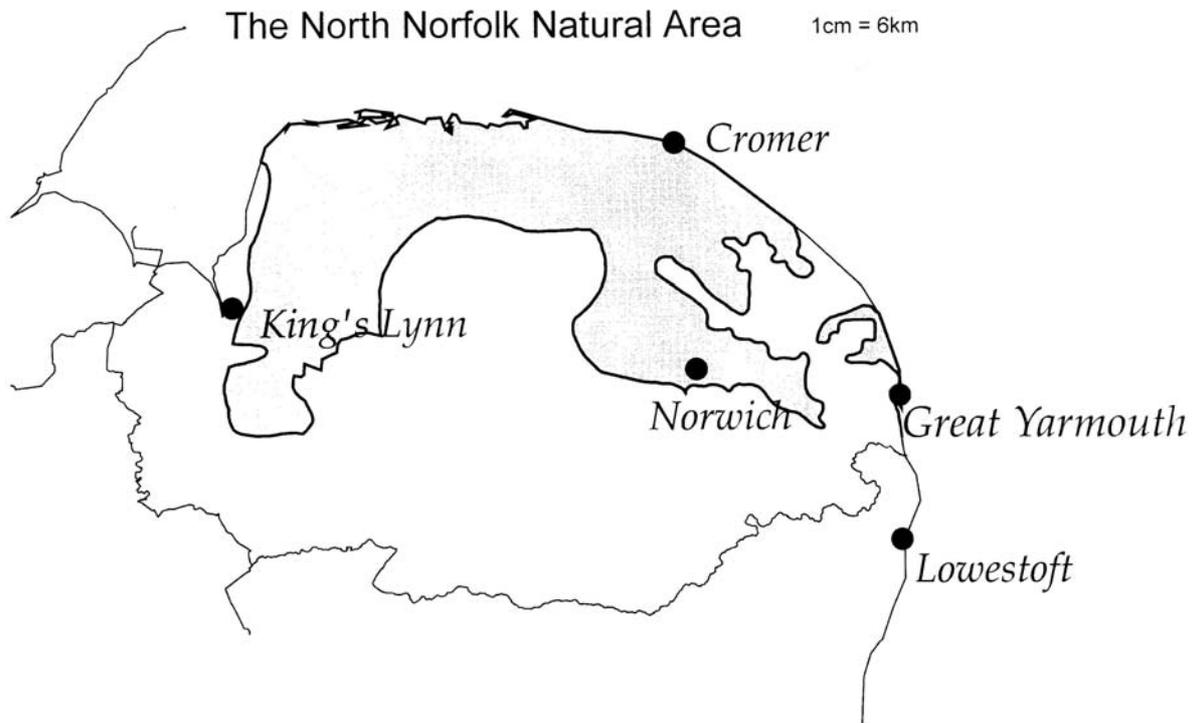
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June 1997

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# 1. Description of the area

## 1.1 Introduction

The character of North Norfolk has been moulded by the sea, the ice age and man creating an area which is of high importance for its' wildlife and geology and distinct from the neighbouring natural areas.

The area forms the northern part of the bulge of East Anglia which is entirely unprotected to the north as far as the North Pole and in fact beyond, it is therefore not surprising that the sea has been and still is a major influence. It ameliorates the climate, making it generally slightly milder and a little moister than other parts of East Anglia, a feature reflected in the ferns growing on roadside banks especially in the north-east of the area. The sea also gnaws at the high cliffs and moulds the low-lying marshland coast incessantly changing the pattern of sand banks, dunes, shingle and salt marsh and sometimes raging through the seawalls taking back the reclaimed grazing marshes. Inland the influence of the sea gradually diminishes. The attractive nature of the countryside is recognised in the designation of the coastal strip as an Area of Outstanding Natural Beauty.

The legacy of the glaciers which covered the area in the Anglian glaciation 350,000 years ago and again reached the north coast some 30,000 to 10,000 years ago still dominates the landscape throughout the area. The gravels, sands, chalk erratics and boulder clays left behind by the retreating ice still determine the natural vegetation patterns. This is evident in the distribution of heathlands which are developed on a sweep of gravels which extend from the Blakeney area down to the Ringland Hills and Norwich. The land has a greater relief than adjacent areas but with no where more than 100 metres altitude.

The area is very diverse, more so than its neighbouring areas and as a consequence has been divided into four character areas (see below) by English Nature and the Countryside Commission after consultation with other interested parties. It is distinguished from its neighbouring natural areas by the following: Broadland with its wetlands, the East Anglian plain which has heavier soils, Breckland by its climate, soils and land use history and from the fens by their topography and history. The two maritime natural areas, Old Hunstanton to Sheringham and that part of the Sheringham to Lowestoft area between Sheringham to Happisburgh overlap and are in many ways best considered as part of the North Norfolk natural area.

The predominant land use is arable farming with some livestock mostly in the river valleys and coastal plain. Other major landuses include forestry, mineral working for gravel and sand, nature reserves on the coastal plain and tourism. The main urban centres are Norwich (on the south-eastern boundary) and King's Lynn (on the western boundary ) with the smaller towns of North Walsham, Cromer, Sheringham, Fakenham, Aylsham, Holt, Hunstanton and Wells. The area is drained by the Rivers Wensum and Bure which flow south-eastwards into Broadland and by a number of smaller rivers flowing northwards - the Hun, Glaven, Stiffkey, Burn and Mun. There are also a number of small rivers flowing westwards into the Wash including the Babingley, Gaywood and Heacham. The Nar also flows westward, forming part of the southern boundary before entering the Fens.

## 1.2 The character areas

### Sub-divisions of the Natural Area

Following consultations with interested parties English Nature and the Countryside Commission have divided the area into four Landscape character units which are as follows: North-west Norfolk, North Norfolk Coast, Central North Norfolk and North-east Norfolk and Flegg. These broadly correspond with divisions used by Dymond (1985), though he had some further divisions which are useful as sub-divisions in some of the character areas. The key and characteristic species listed in this section are not comprehensive and reference should also be made to other sections of the profile.

#### 1.2.1 North-west Norfolk character area

This comprises of two ecologically distinct areas:

##### i) The Western escarpment

Historically this is an area of heathland developed on the Lower Greensand. This escarpment forms a distinct terrace along the eastern edge of the Fens and Wash. It is higher at its northern end than southern and is broken by a number of westward flowing rivers including the Babingley, Gaywood and Nar. Although drift deposits are less extensive than elsewhere in the area they can be significant locally. The main land use is agriculture, though there are extensive plantations growing on former heathland particularly on large estates such as Sandringham. Never-the-less a number of internationally important heathlands with mire systems remain, notably at Dersingham and Roydon Common.

##### Key habitats and features

Heathland and valley mires.

##### Key and characteristic species

**Plants:** bog orchid, bog Asphodel, cranberry, white-beaked sedge, heather, cross-leaved heath, lichen *Cetraria islandica*, *Sphagnum* moss.

**Birds:** hen harrier, nightjar and woodlark.

**Invertebrates:** black darter dragonfly and bog raft-spider.

##### ii) The Goodsands (Open chalk landscape)

This is a large area of dry rolling upland with chalk near the surface (especially on the valley sides) or covered by light glacial soils of a sandy or loamy texture. The main landuse is arable and field sizes are generally large. The area was largely enclosed from sheepwalk in the 18th century, but consequently lost fewer hedges in the post-war rationalisation of fields. Large estates like Holkham are an important influence on land use. There are only a few remnants of ancient woodlands or sites of ancient woodland in the area. Whilst wetlands of any kind are rare away from the river valleys. Ancient earthworks and steep valley sides support a chalk flora in places, as do some wide roadside verges.

## **Key habitats and features**

Chalk grassland, field margins.

## **Key and characteristic species**

**Plants:** pyramidal orchid, horse-shoe vetch, common rockrose and salad burnet.

**Birds:** grey partridge, pink-footed goose, corn bunting, barn owl and stone curlew.

### **1.2.2 Central North Norfolk**

This area is more wooded and with a more varied topography than other parts of the natural area. The soils are predominately light or gravelly and generally acid or neutral. This character area may be subdivided more by topography than for ecological reasons.

#### **i) The Holt-Cromer Ridge**

This is a relatively high ridge formed of sands and gravels which reaches 100 metres at Roman Camp near Sheringham. The age of the feature is uncertain but may be Anglian i.e. c. 350,000 years old. It has steep north facing slope overlooking the sea in an impressive indented escarpment with outlying spurs and hills. Features of the semi-natural vegetation are the heathlands, some of which have developed secondary woodland and pasture woodlands mostly with oak but also two small areas with beech. A number of valley mire systems are associated with small streams and springs issuing from the ridge. Sunken lanes are more of a feature than elsewhere in the county.

The ridge ends in the impressive eroding cliffs between Weybourne and Mundesley which are of international importance for their geology. Those between Weybourne and Cromer are generally fairly low and vertical but between Cromer and Mundesley the cliffs are higher and exhibit massive cliff slides. Wet flushes are a feature and add diversity to the habitats present. The semi-natural vegetation is grassland and in places scrub.

#### **ii) Wensum-Bure region**

An area defined more by topography than geology, this includes gravel deposits to the north-west of Norwich and also areas of boulder clay and glacial loams. It is relatively low-lying below 30 metres but the valley sides of the Bure and Wensum are often relatively steep-sided. Chalk only rarely occurs near the surface, then only in the valley sides and in large erratics as at Alderford. The area is predominantly arable with grassland on the valley floors. Heathland was formerly much more extensive but has been either reclaimed for arable or afforested. However, important heaths and mires do survive in the area north-west of Norwich, and within the city's boundary at Mousehold Heath.

## **Key Habitats and Features for both sub-divisions**

Heathland, valley mires, woodpasture, coastal cliffs, pleistocene geology and land forms.

## **Key and characteristic species**

**Plants:** common butterwort, marsh gentian, western gorse, heather, cross-leaved heath, sessile oak, bird cherry, great sundew, marsh helleborine, may lily, small-leaved lime, purple broomrape (cliffs), Norfolk flapwort (liverwort), lichen *Enterographa sorediata*.

**Birds:** nightjar, woodlark, nightingale, honey buzzard.

**Mammals:** otter.

**Invertebrates:** silver-studded blue, bog bush cricket.

### **1.2.3 North-east Norfolk and Flegg**

A disparate area of very fertile loam soils which is predominantly arable. It includes the area around North Walsham, the finger of upland between the Bure and the Yare around Brundall and Flegg Island. It is primarily the upland margin flanking Broadland and the nature conservation issues reflect this proximity. The chalk is at or below sealevel and is overlain by iron-rich Pleistocene crag deposits which are again overlain by drift deposits of the Anglian glaciation (North Sea drift). The landscape tends to be bleak, with hedgebanks rather than hedges, and boundary windblown oaks. There is little in the way of woodland, though Bacton Wood, now planted with conifers was probably once a pasture woodland with some heath. Nature conservation interest tends to be limited and focused on disused railways and other derelict land.. The coast is generally fringed with cliffs, though those at Mundesley and Happisburgh are lower but more vertical than those further west. These are eroding rapidly at Happisburgh where the natural area boundary ends in the dune systems of Sea Palling.

#### **Key habitats and features**

Pleistocene exposures on the coast.

### **1.2.4 North Norfolk Coast**

This area largely coincides with the Heritage coast. It is one of the finest natural coastlines in the British Isles and is one of the few examples of a barrier coast in Europe. The whole is a complex of saltmarshes, generally (but not always) developing behind sand dunes and shingle structures with extensive areas of intertidal sand and mudflats. Scolt Head Island and Blakeney Point are particularly notable features. About 50% of the saltmarsh was reclaimed in the eighteenth and nineteenth centuries and is now mostly grazing marsh, with some arable and also areas of reed bed. The area extends for a distance of about 35km and in a belt often 2km wide. The total extent of saltmarsh exceeds 2000 hectares. In addition there are approximately 4000 hectares of intertidal mud and sand flats and more than 1500 hectares of reclaimed grazing marsh. Approximately 50% of this area is owned or leased by nature conservation bodies.

#### **Key habitats and features**

Intertidal sand and mud flats, saltmarsh, sand dunes, shingle, freshwater grazing marsh reedbed and lagoons.

## Key and characteristic species

**Plants:** matted sea- lavender, sea-heath, sea-kale, shrubby seablite, sea spurge, yellow-horned poppy, sea holly, Jersey cudweed, grey-hair grass and the lichens *Usnea articulata*, *Cyphelium notarisii* & *Cliostomum corrugatum*.

**Birds:** bittern, marsh harrier, bearded tit, avocet, garganey, wintering wildfowl, waders, sandwich tern, little tern, ringed plover, twite, shore lark, snow bunting.

**Amphibians and mammals:** natterjack toad, common seal.

**Invertebrates:** dark-green fritillary, malachite beetle, starlet sea-anemone

**Table 1 - SSSIs in the North Norfolk Natural Area**

### Non-Coastal sites

Name	Area (Ha)	Habitat / Interest
Alderford Common	20.6	Chalk grassland, species
Bawsey	1.3	Geological
Bilsey Hill	2.5	Geological
Blackborough End Pit	13.5	Geological
Briton's Lane Gravel Pit	20.9	Geological
Bryant's Heath, Felmingham	17.6	Heath, valley mire
Buxton Heath	67	Heath, valley mire
Castle Acre Common	17.7	Flood-plain grassland
Catton Grove Chalk Pit	0.1	Geological
Cawston & Marsham Heath	125.7	Heath
Cockthorpe Common	6.9	Chalk grassland
Dersingham Bog	159.1	Heath, valley mire
East Walton Common and Adcock's Common	62.9	Chalk grassland, fen, geological
East Winch Common	25.6	Heath
Eaton Chalk Pit	0.2	Species
Edgefield Little Wood	5.5	Woodland
Felbrigg Woods	162.5	Woodland, parkland
Glandford, Hurdle Lane Pit	7.9	Geological
Glandford, Letheringsett Road Pit	1.0	Geological
Gunton Park Lake	18.4	Species
Heacham Brick Pit	0.9	Geological
Holkham Brickpits	0.5	Geological
Holt Lowes	49.3	Heath, valley mire
Kelling Heath	88.2	Heath, geological
Leziat, Sugar and Derby Fens	86.3	Heath, grassland, mire
Ringstead Downs	7.0	Chalk grassland

Name	Area (Ha)	Habitat / Interest
River Nar	233.8	Chalk river
Roydon Common	194.1	Heathland, mire
Sheringham and Beeston Regis Common	24.0	Heathland, mire
Snettisham Carstone Quarry	10.7	Species
Southrepps Common	5.3	Valley mire
St James Pit, Norwich	3.28	Geological
Swannington Upgate Common	20.0	Heath, valley mire
Swanton Novers Wood	83.4	Woodland
Sweetbriar Road Meadows	9.5	Floodplain grassland
Syderstone Common	43.6	Heathland, species
Warham Camp	5.0	Chalk grassland
Wells Chalk Pit	5.7	Chalk grassland, geological
Westwick Lakes	9.6	Standing water
Weybourne Town Pit	0.6	Geological
Wiveton Downs	29.6	Geological

### Coastal sites

Name	Area (Ha)	Habitats / Interest
*Beeston Cliffs	11.0	Geological, grassland
*East Runton Cliffs	19.7	Geological
*Happisburgh Cliffs	5.9	Geological
**Hunstanton Cliffs	17.1	Geological
**Morston Cliff	0.9	Geological
*Mundesley Cliffs	28.7	Geological
**North Norfolk Coast	7701	Saltmarsh, sand dune, sandflats, lagoon, shingle, reedbed, grazing marsh, species, geological
*Overstrand Cliffs	57.4	Geological, soft-cliff habitat
*Sidestrand and Trimingham Cliffs	68	Geological, soft-cliff habitat
*West Runton Cliffs	17.6	Geological
**Weybourne Cliffs	39.8	Geological

### Key

- \* = also in Sheringham to Lowestoft Maritime Natural Area
- \*\* = also in Hunstanton to Sheringham Maritime Natural Area

## 2. Geology and Landforms

### 2.1 General geological character

North Norfolk is considered to be outstanding in a national context for both its geology and its landforms. It has one of the most complete sequences of late Jurassic to late Cretaceous

marine strata in Britain. These are capped by an extremely important series of Pleistocene pre-glacial, inter-glacial and glacial deposits. The low-lying coast, the coastal cliff sections and the inland landforms are some of the finest of their kind in the British Isles.

The sequence of the uppermost Jurassic and Cretaceous rocks dips gently eastwards with the oldest rocks outcropping along the Fen edge where the Lower Greensand forms a low escarpment. These Lower Cretaceous sediments are in turn overlain by Upper Cretaceous chalk which again dips gently eastwards, this is followed by Pleistocene Crags to the east of a north-south line through Norwich. The whole area is covered by glacial drift and post-glacial deposits of varying depths.

The Lower Cretaceous rocks are composed mostly of sands, including the Sandringham sands formation and iron-rich sandstones (carstone), together with some clay horizons (including the Snettisham clay) of varying thickness which were laid down in shallow waters. They have been exploited both in the past and the present for carstone which is used in building and also for road construction, whilst the silica sands (Sandringham Sands) are quarried extensively around Bawsey for the manufacture of glass. The Snettisham Clay was formerly used in brickmaking. The transition to the overlying Chalk is well demonstrated at Hunstanton where brown Carstone lies at the base of the cliffs which are overlain in turn by the characteristic Hunstanton Red Rock (or Red Chalk) and then the white Lower Chalk of Upper Cretaceous age. Further south in the area the red chalk changes laterally to a contemporaneous deposit, the Gault Clay. The Cretaceous rocks are of particular note as they yield marine fossils with Arctic affinities similar to species known from Greenland and Arctic Russia.

The rest of the area away from the western margin is underlain by an almost complete sequence of chalk from the lower chalk to the youngest chalk in Britain. However it is rarely exposed except in the limited stretches of coastal cliffs and the relatively few inland working pits and disused quarries. From Cromer eastwards the top of the chalk dips below sea level, exposures which occur further east are in the form of glacial erratics as at Little Marl Point near Mundesley where chalk of Maastrichtian age (c. 70 million years old), the youngest in Britain, is present as a raft in the cliffs.

East of a line drawn south from about Cromer to Norwich the chalk is overlain with Pleistocene crags together with a series of deposits which were formed before the first glacial advance (Anglian) over the British Isles. The Pleistocene deposits in north-east Norfolk are of international importance. They include the type-locality for the Cromerian interglacial which occurred about 450,000 years ago. These deposits have yielded a very rich vertebrate fauna including recently the almost complete skeleton of the steppe elephant. The coastal cliffs and few inland quarries are also important in understanding the complex sequence of events which took place before and during the Pleistocene glaciations in East Anglia.

The Holt - Cromer Ridge and associated landforms such as Wiveton Downs are also important features providing further evidence of glacial advances and retreats. In north-west Norfolk deposits at Morston, Holkham and the Hunstanton esker are evidence of the last time that the glaciers extended south coming to a halt along the North Norfolk coast about 30,000 to 10,000 years ago (the Devensian). Late glacial features also include the well developed series of ground ice depressions (pingos) at East Walton and Adcock's Commons.

The continuation of geological processes into the present is well demonstrated along the coast. The whole stretch from Hunstanton to Happisburgh is a largely unspoiled zone of internationally important glacial and post-glacial landforms and contemporary coastal processes. It divides into a depositional coast - between Hunstanton and Weybourne and an eroding coast between Weybourne and Happisburgh. The north Norfolk coast is a zone of saltmarshes and tidal flats with associated barrier islands, gravel ridges, spits and dunes. This zone is up to 4km wide in places. It is undergoing gradual submergence but landward migration of the coastal sedimentary units is constrained by relatively high ground to the south. There is evidence that sedimentation began 8,000 years ago and has largely been continuous since then. It is a classic area for the study of the topography, physiography, vegetational and historical evolution of such areas. It has also been the target of special studies of modern sedimentation processes. The soft cliffs especially in the vicinity of Overstrand and Sidestrand to Trimingham demonstrate some of the finest examples of mass movement in the British Isles. Although protected by sea defences for long stretches, the cliffs between Sheringham and Happisburgh are still an important source of sediment for beaches along the coast towards Great Yarmouth.

## 2.2 Key geological features

- Lower and Upper Cretaceous stratigraphy.
- Pleistocene stratigraphy, palaeontology and palaeoenvironments.
- Modern coastal geomorphology (including saltmarsh development and landslips).

## 2.3 Site protection

There are 28 SSSIs in the Natural Area containing 35 Geological Conservation Review (GCR) Special Interest Localities (SILs) representing nine different GCR networks. At least two of the sites are considered to be of international importance: West Runton Cliffs and Sidestrand to Trimingham Cliffs. The SSSIs can be broadly divided into a number of groups:

**Lower Cretaceous** - Inland (man-made sections) including the type locality for the Dersingham Formation (Dersingham Bog), sand pits such as Blackborough End Pit (Carstone and Sandringham Formations), Grimston Warren Pit and brick pits such as Heacham (Sandringham and Dersingham Formations).

**Upper Cretaceous** - Hunstanton Cliffs provides the best exposure of Hunstanton Red Chalk while the Sidestrand to Trimingham cliffs and foreshore provides the youngest exposure of chalk (Maastrichtian) in the British Isles. Inland disused chalk pits include Catton Grove Pit (Catton Sponge Bed) and St James Pit (fossil marine reptiles).

**Pleistocene** - There are a number of type-localities including Beeston Cliffs (Beestonian), West Runton Cliffs (Cromerian stratotype), Weybourne Cliffs (Weybourne Crag) and Bawsey (Bawsey Calcareous Till). West Runton is the richest Pleistocene vertebrate locality in the British Isles as exemplified by the recent discovery of West Runton elephant. Inland localities include Bilsey Hill, Holkham Brick Pit, Glandford Hurdle Lane Pit and Glandford Letheringsett Road Pit. Glacial deformation structures are well shown a Trimingham to Sidestrand Cliffs and East Runton. Glacial landforms are present at Morston Cliff (raised beach), Wiveton Downs (Blakeney Esker) and Hunstanton Esker. Periglacial features (pingos) are well shown at East Walton and Adcock's Commons.

**Coastal Geomorphology** - The North Norfolk Coast has the British Isles' finest salt marsh development, ( the best documented in the world) and important coastal features including barrier islands (e.g. Scolt Head Island) and spits (Blakeney Point). Rotational landslips at Overstrand and from Sidestrand to Trimmingham are also internationally important.

**Table 2 - Geological SSSIs**

<b>Name</b>	<b>Horizon</b>	<b>Interest</b>
Bawsey	Pleistocene	Pleistocene stratigraphy
*Beeston Cliffs	Pleistocene	Pleistocene stratigraphy
Bilsey Hill	Pleistocene	Pleistocene stratigraphy
Blackborough End Pit	Lower Cretaceous	Cretaceous stratigraphy
Briton's Lane Gravel Pit	Pleistocene	Pleistocene stratigraphy
Catton Grove Chalk Pit	Upper Cretaceous	Cretaceous stratigraphy
Dersingham Bog	Lower Cretaceous	Cretaceous stratigraphy
*East Runton Cliffs	Pleistocene	Pleistocene stratigraphy
East Walton & Adcock's Commons	Pleistocene	Pleistocene landforms
Glandford Hurdle Lane Pit	Pleistocene	Pleistocene stratigraphy
Glandford Letheringsett Road Pit	Pleistocene	Pleistocene stratigraphy
Grimston Warren Pit	Lower Cretaceous	Cretaceous stratigraphy
*Happisburgh Cliffs	Pleistocene	Pleistocene stratigraphy
Heacham Brick Pit	Lower Cretaceous	Cretaceous stratigraphy
Holkham Brick Pits	Pleistocene	Pleistocene stratigraphy
**Hunstanton Cliffs	Lower/Upper Cretaceous	Cretaceous stratigraphy
Hunstanton Esker	Pleistocene	Pleistocene landform
Kelling Heath	Pleistocene	Pleistocene landform
**Morston Cliff	Pleistocene	Pleistocene stratigraphy
Mundesley Cliffs	Pleistocene	Pleistocene stratigraphy
**North Norfolk Coast	Quaternary	Coastal geomorphology
*Overstrand Cliffs	Pleistocene	Pleistocene stratigraphy
*Sidestrand & Trimmingham Cliffs	Pleistocene	Pleistocene stratigraphy, fossil vertebrates and coastal geomorphology
St James' Pit	Upper Cretaceous	Fossil reptiles
Wells Chalk Pit	Pleistocene	Pleistocene stratigraphy
*West Runton Cliffs	Pleistocene	Pleistocene stratigraphy & fossil vertebrates
**Weybourne Cliffs	Pleistocene	Pleistocene stratigraphy
Weybourne Town Pit	Pleistocene	Pleistocene stratigraphy
Wiveton Downs	Pleistocene	Pleistocene landforms

**Key**

- \*\* = also in Sheringham to Lowestoft Maritime Natural Area
- \* = also in Hunstanton to Sheringham Maritime Natural Area

## **2.4 Geological management threats and issues**

### **Working quarries**

- Need to monitor working for new interest features, especially important in some Pleistocene sites where there are major lateral as well as vertical changes.
- Agree conservation sections to protect in working quarries, ensure input into restoration plans.
- Assess new sites (temporary or permanent).
- Promote the research value of these sites.

### **Disused quarries or other exposures**

- Need to maintain access and face, relatively easy with hard rock sites e.g. Carstone pits, but much more difficult with softer sediments especially gravels and sands.
- Promote the research and educational value of these sites when appropriate.

### **Inland landforms**

- Promote the educational and research value of the geological resource.
- Maintain the landform/landscape character.

### **Sea cliffs**

- Maintain or encourage the development of natural processes.
- Promote the education and research value of the geological resource.

### **Coastal landforms (low lying )**

- Maintain or encourage the development of natural coastal processes.
- Promote the educational and research value of the resource.

## **2.5 Vision**

*Earth science sites have either good exposures of their special interest features or demonstrate their landforms intact. Inland, landuse on the landforms is sympathetic to their interest and where quarries are no longer worked the exposures are cleared at intervals. Restoration plans on working quarries take into account the geological interest. On the coast, sea defences have been removed allowing exposures to be maintained by natural processes. Features like landslips are not constrained by sea defence or other works. At suitable sites interpretation boards explain the interest and there is a bicycle trail linking those in north Norfolk. University and school parties regularly visit the area but are careful to follow the fossil collecting code.*

## **2.6 Key geological objectives**

### **Maintenance and enhancement of the geological resource through:**

- Continued maintenance of natural coastal processes (Shoreline Management Plans).
- Development of local conservation strategies that include geology.

- Continued assessment of educational/research value of new sites (in particular, inland quarries and cuttings temporary and permanent).

#### **Promotion of geological resource through:**

- Assessment of and promotion of site educational and general interest value (e.g. West Runton Cliffs, Wiveton Downs).
- On-site interpretation, ( eg sign boarding as at Hunstanton Cliffs), trail guides, leaflets.
- Promotion of the understanding of the influence of geology on local habitats and scenery e.g. eskers.

## **2.7 Mechanisms**

Grants for interpretation from English Nature, Geologists Association and Norfolk Coast Project.

Recording sites Norfolk Geological Society and academic geologists.

Coastal sites Environment Agency and District Councils.

Regional Important Geological Sites (RIGS).

## **2.8 Key partners**

Landowners including quarry operators

Norfolk Geological Society

Academic geologists from UK and foreign universities and institutions

Norfolk Coast Project

Norfolk County Council Department of Planning and Transportation (especially Minerals and Countryside Sections)

North Norfolk District Council - Technical Services and Planning Departments

Environment Agency

Norfolk Museums Service

English Nature local team, Environmental Impacts Team and Maritime Team

MAFF (funding of sea defences)

# **3. Heathlands and valley mires**

## **3.1 Location and status**

Heathlands and their associated mires within the natural area are of outstanding importance both nationally and internationally. This is recognised in the designations set out elsewhere. They are, however, only a remnant of those which occurred in this part of Norfolk before the enclosures (Heath Topic Paper 1996, Lambley 1995), having suffered from fragmentation, isolation, and reduction in size in the last two centuries. Those which survive are mostly commons or fuel allotments held in trust for the poor of a parish. These are, with one or two exceptions, concentrated in three major clusters which are determined either by the lower greensand outcrop or where deposits of glacially derived gravels and sands occur.

- The Lower Greensand (Carstone) scarp slope, running north to south between Ken Hill and Roydon.

- The glacial sands and gravels of the Holt-Cromer ridge and associated outwash plains.
- The glacial sands and gravels extending north-westwards from Norwich towards Aylsham.

The valley mires are generally developed within these heathlands where ground-water issues from springs or seepages on valley floors and sides or near the base of an escarpment. Those on the Lower Greensand at Roydon Common and Dersingham are generally rather acidic in nature, whilst those on the drift deposits at Buxton Heath, Holt Lowes, Sheringham and Beeston Regis Common, Bryants Heath and Southrepps Common are often best described as mixed mires. This is because the water can be derived from a number of drift sources as well as the underlying chalk, giving rise to mixed calcareous and acidic mires.

On the Lower Greensand, there are four remaining large blocks of heathland. These are at Ken Hill, Dersingham National Nature Reserve, Roydon Common National Nature Reserve and at Ling Common east of North Wootton, although large areas of Ling Common have succeeded to secondary woodland. Other smaller areas of heathland habitat and relict heath are concentrated in the Sandringham area. Formerly heathland also occurred to the south of the main block at Shouldham Warren. Sugar Fen, Leziat and East Winch Commons to the east of this main block are isolated sites developed on glacial sands over greensand or chalk.

On the Holt - Cromer ridge several large and extensive blocks of heathland remain. The largest and most significant are at Holt Lowes, Sheringham and Beeston Regis Commons, Salthouse Heath and Kelling Heath with smaller areas at Spout Hills and West Runton Roman Camp. The area also contains numerous other small pockets of heathland within the extensive areas of conifer plantation and secondary deciduous woodland. Other heathland habitat is present along the sinuous ridge of Wiveton Down with an isolated site away from the ridge at Barrow Common, south of Brancaster Staithe.

There are some important heathlands north-west of Norwich, which are a remnant of a once far more extensive area. The largest and most significant are Buxton Heath, Cawston Heath, Marsham Heath and Swannington Ugate Common. Significant areas of heathland survive in the Horsford Woods - Felthorpe Woods complex associated with rides, clearings and remnant pastures.

In the rest of the natural area there are isolated but important heaths at Syderstone Common west of Fakenham with its non-permanent pools and at Bryants Heath, Felmingham (west of North Walsham).

They are of special interest for the internationally and nationally important plant communities which they support. These include the oceanic heather-western gorse community which is present as an outlier in north Norfolk. The mire communities on the Greensand which have affinities with those in the New Forest and also sites further north and the mixed mire communities which are largely restricted to Norfolk. The latter, especially, are rare in the rest of north-west Europe. This importance is also reflected in their invertebrate fauna, which includes some species more characteristic of northern England.

### **3.2 Characteristic habitats and species**

The drier parts of the heaths are dominated by heather or ling with some bell-heather together with areas of bracken, common gorse and birch. A feature of the heaths on the glacial gravels

is the western gorse which, unlike the common gorse, flowers in August and September at the same time as the heather and bell heather, giving rise to very colourful displays.

In the damper parts of the heath the pink flowers of the cross-leaved heath are conspicuous often growing with purple moor-grass, sphagnum mosses and the insectivorous common sundew. This community grades into the valley mires which have stands of purple moor-grass, cotton grass, black bog rush, various sedges, bog pimpernel, southern marsh orchid, marsh fragrant orchid, marsh helleborine and other attractive species such as grass of parnassus.

### 3.3 Special wildlife

The most notable feature of the flora of the dry heaths is the abundance of western gorse which is isolated from its main centre of distribution in western Britain. The regionally rare stag's horn clubmoss occurs at Beeston Regis Common where it was recently refound after last being recorded at the beginning of the century. A number of regionally rare lichens occur including the normally montane Iceland moss (*Cetraria islandica*) at Ling Heath, one of its only two lowland England localities. The northern *Cladonia sulphurina* occurs at Marsham Heath and *Pycnothelia papillaria* is at Cawston on damp peat.

Four populations of the nationally scarce marsh gentian occur on the wet heaths in the area. However several other species which formerly occurred in this habitat e.g. marsh clubmoss, have probably become extinct in the last 50 years.

The mixed mires have a range of plants which require calcareous or more acid conditions. Whilst most of these species are not Red Data Book (RDB) or Nationally Scarce they are often the only localities for these species in East Anglia. Species associated with calcareous water include black bog rush, common butterwort, marsh helleborine, Pugsley's marsh orchid and common yellow sedge. Whilst the more acid mires have crested fern (RDB), marsh gentian and great sundew. Wood horsetail and lesser skullcap are also restricted in East Anglia to this habitat. The west Norfolk mires have a number of species absent from the others including bog asphodel, cranberry and bog orchid, the latter a RDB species and threatened in Europe. Rare mosses and liverworts are known or have been recorded in the past from these mires including Norfolk flapwort (*Lophozia rutheana*), which was known at least until the 1970s from Buxton Heath and *Hookeria lucens*, a moss more characteristic of high rainfall areas, which occurs at one of three East Anglian sites at Holt Lowes.

The invertebrate fauna of the heaths and valley mires is exceptionally rich. Prominent species include the silver-studded blue, a declining species now confined to two sites, the black darter dragonfly, keeled skimmer and bog bush cricket. It is also the main habitat for glow worms in Norfolk. The Invertebrate Site Register records 10 RDB species and 33 notable species from Dersingham Bog Nature Reserve. Four RDB species have been recorded from Sandringham Warren adjacent to Dersingham Bog: the beetles *Agathidium confusum*, *Odinia ornata*, *Homoneura interstincta* and a plume moth *Buckleria paladum*. Three RDB species have been recorded from Sheringham Common SSSI: the flies, *Psacadina vittigera*, *Anagnota collini* and *Vidilia cornuta* together with the local snail *Ashfordia granulata*. Two RDB species (the flies *Odontomyia argentata* and *Psacadina vittigera*) and nine notables have been recorded from Buxton Heath. East Winch has seven notable species together with *Hydrochus carinatus* and *Enochrus isotae* (both water beetles) from a small pond on the heath. Holt Lowes has 16 notables and one recent RDB, (a fungus gnat, *Rymosia britteni*). Horsford Woods seven

notables including the bog bush cricket. Twenty four notables have been recorded from Roydon Common and the following RDB species: the fungus gnats *Macrocera fascipennis* and *Allodia embla*; the robber fly *Eutolomus rufibarbis* and the plume moth *Buckleria paludum*. The locally rare bog-raft spider has also been discovered recently, living in pools on the Common. Whilst there are also records of the moth, the light knot grass, from Roydon Common; this is a species with a north-western distribution in the British Isles.

Shallow pools at Syderstone Common support a population of the internationally important natterjack toad, (listed under Annexe 2 of the EU Habitats Directive). This is one of the last inland heath colonies left in the British Isles. Heaths are the main habitat for adders, common lizards and slowworms; all species which have declined in recent years (Buckley, 1987, 1988).

The heathlands of the North Norfolk Natural Area support a nationally important population of nightjar, an RDB species, (listed within Annexe 1 of the EU Birds Directive). The breeding population in 1994 was 47-48 pairs, representing 1.5% of the UK breeding population. The main concentration of pairs is at Dersingham Bog SSSI where 15 pairs bred in 1995 with a further 6 at Sandringham. Other main breeding sites are Kelling Heath SSSI, Salthouse Heath and a few other heathland sites. Some are also known to breed in commercial forestry plantations where sympathetic rotational felling regimes produce suitable habitat.

Other priority heathland birds present include woodlarks, which have recently begun to colonise heaths in north Norfolk and tree pipits which regularly breed, though in diminishing numbers in recent years. Redpoll, siskin and crossbills are also associated with areas of scrub and woodland. Blackthorn and other scrub on heaths is important for nightingale. Roosts of hen harriers are a feature of some sites in winter.

### 3.4 Extinctions

The drainage of some sites and the cessation of management on most heaths is the probable cause of the recent extinctions of the following species which are characteristic of damp heaths and probably required grazing and or turf cutting to keep open habitats (site and date of last record in brackets): marsh clubmoss (Bryants Heath 1971), bog hair-grass (East Winch 1957) and pillwort (Horsford 1951). There have also been local extinctions of marsh gentian (Litcham common) and bog orchid (Bryant's Heath). The rare moss *Homalothecium nitens* was last recorded at Roydon Common in 1962. The Norfolk flapwort (*Lophozia rutheana*), a liverwort, may also have become extinct at Buxton Heath (1973) though it is possible that it may be refound. Drainage works on the Gaywood in the 1950s severely damaged a number of fens notably Derby Fen, this is evident from a comparison of species lists compiled by Petch in the 1940s compared with the present situation.

The following invertebrates also appear to be now extinct: the tortricid moth, *Archips betulana* last recorded from the bogs of north west Norfolk c.1900, the Dersingham bog moth (*Chloristoneura lafauryana*) (Dersingham 1962) and the large marsh grasshopper (Wolferton marshes 1968).

Natterjack toads have become extinct at the following two heathland sites in the area in the last 60 years: Bryants Heath (1938) and Roydon Common (1973).

Stonechat was regarded as common on heaths at the beginning of this century, but is now absent from heaths in the area. The red-backed shrike is now extinct as a breeding bird in Britain but its last stronghold was the heaths of East Anglia including this area. Stone curlews also bred in some numbers around Holt in the 1920s.

### 3.5 Site protection

Most heathland and mire sites have been included within the SSSI series and most of the remainder are designated as County Wildlife Sites other than those in Forestry Enterprise holdings. The major sites are tabled below:

**Table 3 - Site protection on heaths**

Name	Designations			Habitats			
	SSSI	cSAC	R	D	WH	M	A
Bryants Heath	•			•	•		•
Buxton Heath	•	•		•	•	•	
Cawston & Marsham	•			•			
Dersingham Bog	•	•	•	•	•		•
East Winch Common	•			•	•		
Holt Lowes	•	•		•	•	•	
Kelling Heath	•			•			
Leziate, Sugar & Derby Fens	•				•		
Roydon Common	•	•	•	•	•	•	•
Salthouse Heath				•			
Sheringham and Beeston Regis Commons	•	•		•	•	•	
Southrepps Common	•	•				•	
Swannington Ugate	•			•	•	•	
Syderstone Common	•			•			

#### Key

R = Ramsar D = Dry Heath WH = Wet Heath M = Mixed Mire A = Acid Mire

Wiveton Down is notified as an SSSI for its geological interest, and partly as a Local Nature Reserve for reasons which include its heathland interest. Spout Hills and Barrow Common are notified as County Wildlife Sites. Mousehold Heath in Norwich and Southrepps Common have Local Nature Reserve Status. There are, however, areas of heathland within the Forestry Enterprise areas of the Horsford Woods, which are without any designations at present.

### **3.6 Threats and issues**

The heathland resource within the North Norfolk Natural Area has markedly declined in both area and character over the last 100 years. Evidence from old maps and aerial photography, shows that not only have whole heathland sites been lost, but the quality of those that remain has also declined. Old maps such as those produced by Faden in 1797, (Barringer, 1989), show that heathland was a major land use in North Norfolk at this time, and revealed many unbroken swathes of heathland which linked the small fragments that remain today. This loss and decline has occurred as a result of the combined effect of a number of factors, some of which continue today. These are well documented in the recently published Heath Topic Paper Consultation Draft (1996). The principle issues are as follows:

#### **Reclamation**

Intensification of agriculture, particularly during and after the Second World War, has been one of the main contributors of heathland loss eg. Roughton Heath in 1945 and about 30% of Cawston Heath in 1969. In addition, some heathland sites have been lost due to increase demand for land for leisure and recreation; A significant part of Ling Common near King's Lynn was converted into a golf course in the 1970s. Recent changes in agricultural attitudes and policy, together with strengthened nature conservation legislation, mean that further wholesale reclamation of heathland sites is less likely for the foreseeable future.

#### **Lack of management and the decline of heathlands as a local resource**

Until the 1st World War heathlands played a vital role in sustaining the economy of local communities and people. They were used as a source of grazing for stock, sand for building and wood and peat for fuel, and it is these practices which over the centuries inadvertently helped to create the rich mosaic of habitats which our present-day heaths still possess. The ecology of the heathlands has therefore developed in response to human intervention. Lack of management allows successional processes to occur, leading in time to the eventual reversion of open heathland habitat to secondary woodland. Most of the activities which were so vital to local people at the time have now ceased, so that the development of sustainable management on those heathlands which remain is vital if their nature conservation interest is to be maintained. This is already being carried out to some extent by nature conservation bodies within the Area; but neglect is still a major issue to be addressed, even on some SSSIs, and particularly County Wildlife Sites.

#### **Fencing and grazing**

Fencing is necessary in order to return heathland to sustainable management through grazing. However in the case of commons, the Secretary of State's approval has to be given before it can take place. This is not the case on poor's land which is not a common, but even then there are issues of access, cost and obtaining and managing stock.

#### **Terrestrialisation**

In the past peat cutting created a mosaic of shallow water filled cuttings and various stages of peat and vegetation recovery. The cessation of this may be a reason for the loss of the wet heath and bog pool species in particular. More information is needed on the advisability of re-instating these practices.

## **Water abstraction**

This is a major issue, as there have been considerable increases in groundwater abstraction for public water supply and agricultural irrigation in recent years which may be affecting springs and seepages feeding the valley mires. Strong anecdotal evidence suggests that many sites were formerly much wetter. The NRA and now the Environment Agency have installed a series of boreholes, piezometers and dipwells on most of the sensitive sites in the last two years which should provide baseline information for future studies.

## **Drainage**

Drainage schemes particularly in the 1950s and early 1960s resulted in the loss of some wetlands notably on Leziate, Sugar and Derby Fens. Though less of a problem in recent years there have been a few instances when routine dredging outside an SSSI has had an impact on a site.

## **Water quality**

Recent practices such as intensive outdoor pig units and the injection of sewage into the soil are the latest manifestations of a general intensification of nutrient inputs into the ground. There is a concern that in the future water feeding from springs and seepages may have high levels of nitrates and phosphates as a result of this input. There is a suggestion that this is already happening on Buxton Heath.

## **Commercial forestry and amenity tree planting**

Afforestation of many heaths took place after the formation of the Forestry Commission in the 1920s; besides the direct loss of heaths there may be indirect affects through associated drainage schemes and uptake of water by the trees.

## **Roads, Minerals and aggregate extraction and other land take**

In 1990 the A149 Dersingham bypass was completed across the northern part of Dersingham Bog, isolating the northern part from the larger southern area. Loss of habitat has also occurred where quarries have been excavated on to former heathland sites, such as at Leziate and Briton's Lane gravel pit, Beeston Regis. However, old workings do provide opportunities for heathland re-creation.

## **Human disturbance**

Pressure from increased population growth, together with greater mobility and recreation time have all contributed to increased human disturbance on nearly all heathland sites. Adverse effects include: garden and domestic waste tipping, motorbikes, mountain bikes, uncontrolled fires, path erosion and unnecessary disturbance to wildlife and fouling by dogs. However, public access can also promote the management of heaths.

## **Public understanding of heathland management**

Necessary conservation work such as tree and shrub clearance is often seen as being destructive by local residents and there is a need for the reasons to be better explained. The introduction of grazing also involves fencing and there is an issue of public access which has to be addressed.

### **3.7 A vision of the North Norfolk heathlands**

*There are extensive areas of open heathland on the Lower Greensand, the Holt-Cromer ridge and in the area between Norwich and Aylsham, with smaller blocks elsewhere. These include the long-established heaths, but also land in various stages of reversion from arable and coniferous plantation to heath. The main areas of heathland including the mires are managed by light summer grazing with a range of stock including cattle, sheep, ponies and by rabbits. Some of the mires may also be mown or topped in late summer.*

*The open heath typically occupies the high plateau and valley sides, and grades down into the wet mires and bogs of the river valleys. The typical heathland scene is a sea of colour in summer provided by yellow flowers of two gorse species and the pink and purple of heathers and heaths. This vegetation stretches away in unbroken stands, but is varied in age, height and structure. Elsewhere the heather and gorse may be interspersed with patches of bare sand, bracken, dense tall gorse, isolated individual pine and birch trees, clumps of dense scrub and close swards of acid grassland with anthills. Some stands of gorse and secondary woodland are allowed to remain in places around the perimeter and on the open heath. At night the churring of nightjaras is a familiar sound and points of greenish-light on paths mark the presence of glowworms. In the day-time silver-studded blues are now a common sight fluttering low over the heather whilst adders, lizards and slowworms are also frequent. Global warming has allowed dartford warblers to colonise some of the heaths together with several insect species once rare or absent.*

*The mires are open with generally few trees or shrubs and there are often small pools. Their vegetation has a structure with small paths and runnels created by light grazing, purple moor grass is present but rarely dominates the vegetation and there are areas with carpets of sphagnum and other mosses. Springs and small streams feeding the mires normally have water except in severe droughts. Marsh helleborine, marsh fragrant orchid, butterwort, grass of parnassus and many other flowers provide colourful displays in the summer. Whilst dragonflies (e.g. black darters) hover over small pools and on some sites there are thriving populations of natterjack toads which have been re-introduced.*

### **3.8 Nature conservation objectives**

1. Maintain, as an absolute minimum baseline the current extent of open heathland and mire habitats within existing SSSIs and County Wildlife Sites.
2. Impliment a sustained programme of positive management on all heaths and mires.
3. Secure sustainable management of all heathland SSSI's and County Wildlife Sites through reintroduction of grazing wherever possible.
4. Within existing SSSIs and County Wildlife Sites, expand heathland and mire habitat into selected former heath and mire which have developed into scrub and secondary woodland.
5. Re-create heathland habitat on selected known former heathland sites which have since been reclaimed for agriculture or forestry.

6. Use restoration plans for mineral workings to promote heathland re-creation where appropriate.
7. Target initial heathland re-creation efforts at those clusters of former sites, which will provide a links between existing sites which are currently isolated and fragmented.
8. Develop an understanding of the hydrology of these sites and protect their groundwater catchments.
9. Develop a better understanding of the precise ecological requirements of priority species.
10. Consider reintroductions of extinct species where appropriate
11. Support the Norfolk Heathland Forum, Norfolk County Council's Heathland Strategy and seek funding for a project to take a central role in the revival of Norfolk Heathland
12. Promote awarenessof the value of heathlands and an understanding of the principles of conservation.

### **3.9 Mechanisms and targeting of resources**

Norfolk Wildlife Trust currently manages many heathland SSSIs including Roydon Common, National Nature Reserve using Countryside Stewardship funding. English Nature has management agreements currently on a number of others and manages most of Dersingham Bog SSSI. Where positive management agreements can be achieved this remains the best available mechanism for maintaining heathland SSSIs. Site Management Statements are being produced for all owners and occupiers outside nature reserves, as a mechanism for achieving positive management of all SSSIs by 2000. Norfolk County Council's Heathland Strategy provides an excellent overview and provides a firm basis for arguing for additional resources. Norfolk Wildlife Trust are experimenting with grazing as a management tool with a flock of Hebridean Sheep. The National Trust is active in site management and land acquisition. FWAG is currently involved in advising heathland re-creation and management on private land. at Ken Hill. There are opportunities to influence Forestry Enterprise operations exist through Forest Design Plans. Agri-environmental schemes are a future targeting mechanism. Norfolk County Council landscape conservation grants can assist heathland conservation.

### **3.10 Key partners**

Norfolk County Council  
 Norfolk Wildlife Trust  
 National Trust  
 Forestry Enterprise  
 Forestry Authority  
 FWAG  
 Private landowners (including Trustees)  
 Environment Agency

## 4. Pingo systems

### 4.1 Location and status

East Walton Common and Adcock's Common, which lie east of King's Lynn, are the only pingo systems within the area, though the few other UK examples are found close by in the Norfolk part of the Breckland. This habitat is similar in many respects to that of the valley mires but is treated separately because the fens are surrounded by chalk grassland rather than heath.

These sites are considered to be of outstanding importance in a national context, both for their geological and biological interest. The Commons are important for the ground ice depressions or pingos which formed in periglacial conditions during the last ice advance. This created a series of depressions which partly overlap but are separated in part from each other by raised chalky banks. The hydrology is not fully understood but at least some of the basins are still spring fed and have developed a fen vegetation with chalk grassland on the banks.

### 4.2 Characteristic habitats and species

The chalk vegetation of the banks is characteristic of the vegetation described in the chalk grassland section, though a feature in spring is the abundance of cowslips. The fen vegetation is generally calcareous with a similar vegetation to the more calcareous valley fens. Characteristic species in the fens include blunt-flowered rush, black bog rush, fibrous tussock sedge, lesser tussock sedge, marsh helleborine, fen fragrant orchid, southern marsh orchid, grass of parnassus, butterwort and fen lousewort. In addition, unlike most of the valley mires in the area, saw sedge is frequent. A feature of the two commons are the areas of scrub which have grown up particularly on East Walton Common in the last fifty years. It is important for nightingales and probably also for invertebrates.

### 4.3 Special wildlife

Pugsley's marsh orchid an uncommon calcareous fen species is present, but the fen orchid recorded here until 1958 and again in 1964 has not been seen recently.

The invertebrate fauna is outstanding with 30 RDB species recorded. This is probably a reflection of the relative stability of the habitats over time and the range and mosaic of habitats present. The site is particularly important for its assemblage of water beetles which may include glacial relict species. These include *Haliphus furcatus*, *Hydrporus glabriusculus*, *H. scaesianus*, *Laccornis oblongus*, *Hydrochus brevis*, *H. carinatus*, *H. ignicollis*, *Enochrus isotae* and *Hydraena palustris*. Rare crane flies include *Prionocera subserricornis*, *Nephrotoma crocata* and *Limonia masoni*. Rare soldier flies recorded include *Oxycera analis*, *O. leonina*, *Odontomyia angulata* and *O. argentata*. Snail killing flies include *Colobaea pectoralis*, *Antichaeta analis*, *Psacadina vittigera*, and *P. zernyi*. The rare fly, *Rhamphomyia physoprocta* has also been recorded. *Vertigo moulinsiana*, a snail protected under the Habitats Directive also has a strong population on the site. The scarce emerald damselfly, another RDB species, has also been recently discovered on this site.

#### **4.4 Site protection**

East Walton Common and Adcock's Common are an SSSI and also one of the component sites of the Norfolk Valley Fens candidate SAC.

#### **4.5 Threats and issues**

##### **Scrub invasion on chalk grassland and in the pingos**

In the last fifty years scrub has extended into many of the pingos and on to the chalk grassland mainly on East Walton Common, probably because of a relaxation of grazing.

##### **Grazing**

Grazing has not ceased on either site but is probably insufficient on parts of East Walton Common at present. Fencing and stock availability needs to be addressed. In some other parts there has been poaching and overgrazing by rabbits leading to invasion by ragwort and creeping thistle. This also needs to be addressed.

##### **Water abstraction**

The interest of the site is dependent on the hydrological integrity of the site being maintained.

#### **4.6 Nature conservation objectives**

1. Reach a satisfactory level of grazing which is sustainable and allows the mozaic of vegetation types to be maintained.
2. Continue a policy of scrub removal from the pingos and chalk grassland leaving about 15 - 20% cover.
3. Develop a better understanding of the hydrology and protect the catchment of the site.
4. Maintain the pingo landform.

#### **4.7 Key mechanisms and targetting of resources**

Aim to improve management agreement especially regarding stock numbers.

#### **4.8 Key partners**

The landowner  
Environment Agency  
English Nature

## 5. Chalk grassland

### 5.1 Location and status

Despite the fact that chalk underlies much of the natural area chalk grassland is very restricted in distribution. The sites are either man-made and may be ancient as at Warham Camp, recent as at Wells Chalk Pit, or in natural situations at East Walton and Adcock's Commons, Ringstead and Cockthorpe. The main concentration is in the Goodsands area of north-west Norfolk where the Ringstead, Wells, Cockthorpe and Warham sites are situated, but there are two outliers at East Walton Common where the grassland is developed on a pingo system and Alderford Common where it is within an old marl working. At Leziate Fen tufa deposits occur and support some calcicole species and there is also some calcareous influence nearby at Sugar Fen. In addition small areas of chalk grassland also occur on roadside verges, mainly in north west Norfolk within the Goodsands area. Some plants characteristic of calcareous communities also occur on the north Norfolk coast, but are dealt with in the coastal dune section.

The drift cover and gentle topography of much of the goodsands area has probably meant that chalk grassland was always uncommon. Certainly, there is little evidence from old flora records that historically chalk grassland was much more widespread than now, though it is known that there were other sites on the sides of the Stiffkey valley fifty years ago and also on the former Massingham Heath. The presence of some chalky roadside verges on the higher parts of the ridge inland from Heacham and Dersingham may also indicate that chalk grassland was once developed in this area.

The chalk grasslands of the area are only considered to be of 'some' significance in a national context; however they do contribute considerably to the biodiversity of the area.

### 5.2 Characteristic habitats and wildlife

The total area occupied by chalk grassland is small and is estimated at about 20 hectares (Moore 1993). There are two main vegetation types which characterise the Area's chalk grasslands; a sheep's fescue - hairy oat-grass community occurs at Ringstead Downs with variants at Cockthorpe Common, Warham Camp, and at East Walton and Adcocks Commons; whilst a sheep's fescue- mouse-eared hawkweed-thyme community occurs at Wells Chalkpit. The grasslands which occur at Alderford Common, Leziate and Sugar Fens are more mesotrophic, but still have many chalk-loving species.

There are no nationally rare plants associated with these communities, but they hold the only populations of many typical chalk grassland plants in the area including the stemless thistle, squinancywort, horseshoe vetch, common rockrose, autumn gentian and dropwort. Other characteristic species also occur on the coastal dunes such as pyramidal orchid, bee orchid and the carline thistle. Field gentian appears now to be confined to East Walton Common.

An RDB fly, *Platyalpus infectus*, is recorded from Ringstead Downs. The chalk grassland at East Walton and Adcocks Common is also important in contributing to the overall richness of the invertebrate fauna of this site.

### 5.3 Extinctions

The advent of myxomatosis in the 1950s was probably the cause of a number of species becoming extinct including the autumn lady's-tresses orchid and chalkhill blue butterfly both on Ringstead Downs. Man orchid, formerly on a railway cutting near Holt also became extinct at about this time probably because of lack of management. Autumn lady's-tresses still survives in the area, though on a lawn and not on typical chalk grassland.

### 5.4 Site protection

All of the main chalk grassland sites (Wells Chalk pit, Warham Camp, Ringstead Downs, Cockthorpe Common, Alderford and East Walton and Adcocks Commons) are designated as SSSIs. In addition, Ringstead Downs is a Norfolk Wildlife Trust reserve. There are also a number of verges on the chalk which are roadside nature reserves.

### 5.5 Threats and issues

#### Grazing

The onset of myxomatosis in the 1950s affected many sites and resulted in the extinctions mentioned elsewhere. Stock grazing is still an issue on some sites e.g. Ringstead Downs and Alderford Common where there are practical difficulties at reinstating the practice. Elsewhere high rabbit populations have resulted in temporary overgrazing and at East Walton Common has created difficulties in attempts to re-establishing a suitable grazing regime with cattle.

#### Fragmentation and isolation

The small size of the remaining sites must threaten the viability of some plant and animal populations.

### 5.6 Vision

*There are discrete pockets of chalk grassland throughout the goodsands area where the chalk is close to the surface, especially on the steeper slopes. This is mainly around Ringstead, eastward to Burnham Market, and between Wells and Morston.*

*The chalk grassland is grazed, unimproved pasture, rich in chalk-loving plants. A typical chalk grassland site contains mainly open terrain with ancient turf, closely grazed in places but untouched in others and with ant hills and rabbit burrows. There may also be pockets of hawthorn or blackthorn scrub, as well as clumps of wild roses and brambles.*

*The sward is a sea of colour in summer, with patches of yellow and purple produced by carpets of thyme, vetches and trefoils, together with salad burnet, squinancywort and dropwort. Orchids may be locally abundant, with bee, pyramidal and common spotted orchids adding to the colour. The chalk grassland sites are a haven for butterflies, and in summer the sward is alive with many species, particularly the common blue. North-west Norfolk also supports a small but recovering population of chalk-hill blue.*

*Outside the core of sites identified in 1996, there are blocks of former arable land in reversion to chalk grassland, serving as corridors linking sites, or as buffers around existing sites. These are confined to the Stiffkey valley, and on high ground and valley sides between Ringstead, Burnham Market and south to the Babingley.*

*All 1990s and some newly created sites are managed by grazing with cattle, sheep or by rabbits.*

## **5.7 Nature conservation objectives**

1. To maintain the existing area of grassland.
2. To maintain or where necessary improve the quality of that grassland through grazing.
3. Extend the area of existing grassland on sites by removal of invasive scrub as appropriate.
4. Seek opportunities for chalk grassland reversion from arable or improved grassland especially in areas where topography is suitable.
5. Influence chalk quarry restoration schemes to include an element for chalk grassland.
6. Consider and if possible reintroduce populations of Chalkhill Blue and Autumn Lady's tresses to Ringstead when conditions are suitable.

## **5.8 Mechanisms and future targeting of resources**

EN management agreements.  
Countryside Stewardship.  
Local Authorities in relation to mineral restoration.  
Verge management.  
Agri-environmental schemes.

## **5.9 Key partners**

MAFF  
FaRCA - Countryside Stewardship  
FWAG  
Norfolk Wildlife Trust  
Local landowners  
Norfolk County Council

# **6. Woodlands**

## **6.1 Location and status**

Within the natural area woodland is concentrated on the Greensand and in north-central Norfolk (Cromer-Holt Ridge and the Wensum - Bure area). The Goodsands, north-east Norfolk and the coastal plain have very little woodland. However, even in the better wooded

areas semi-natural ancient woodland is scarce and largely confined to the Cromer-Holt ridge and immediate area. Ancient semi-natural woods are generally the most important and are defined as those areas of woodland which have had a continuous cover of native trees and other plants since at least 1600AD, having not been cleared or extensively replanted since then. In the past many ancient woodlands such as Haveringland Great Wood and Bacton have been replanted with conifers.

Ancient woodland which is managed as coppice with standards is largely restricted to the vicinity of Swanton Novers, though there are also some former coppiced oak woodlands close to Holt. Pasture woodland appears to be concentrated along the Cromer- Holt ridge usually on comparatively hilly terrain and poor sandy gravelly soils. There is also a second group centred on Thursford which is a remnant of the former Stock Heath.

However, these ancient woodlands have been supplemented by plantations of broadleaved and conifers and secondary woodland, particularly in the nineteenth and twentieth centuries. These are a feature of estates at Sandringham, Holkham and elsewhere. The cessation of grazing and the abandonment of other practices on many heathlands has also allowed considerable growth of secondary woodlands, such as those behind Cromer and Sheringham and on Marsham and Buxton Heaths.

The ancient woodlands of the Natural Area, though relatively small in extent, are considered to be of considerable importance nationally.

## **6.2 Characteristic habitats and wildlife**

A feature of some of the North Norfolk woods is the wide range of woodland stand types in a small area reflecting differences in the underlying drift deposits. This is exemplified at Swanton Novers Great Wood where small-leaved lime grows on the more neutral soils with areas of plateau alder woodland (a rare stand type nationally), calcareous flushes dominated by bird cherry and sessile oak coppice on the poorest soils. Elsewhere sessile oak coppice occurs at Edgefield Little Wood and around Holt Hall, though there is often hybridisation with pedunculate oak. It is always associated with the poorest soils in this area.

There is some documentary evidence which supports the presence of beech at Felbrigg in the Middle Ages and this may indicate that this stand is at the natural limit of the tree after its spread into England at the end of the Ice Age. It is perhaps significant that a similar but smaller stand occurs in a sheltered valley at the Fox Hills near Northrepps.

The other pasture woodlands are dominated by the pedunculate oak, though sometimes with the sessile oak as well. They are often developed on hilly terrain which is covered with a sheets of bluebells in spring, followed later by bracken. Those woodlands at Hull Wood include some magnificent veteran oaks, the largest in the county. A number of other woods show a stand type which also has holly and rowan, as at the Pond Hills where exceptionally large specimens of both occur.

A feature of most of these woodlands is the abundance of bluebells and the occurrence of lily-of-the-valley. The butterflies white admiral, purple hairstreak and speckled wood butterflies are relatively common.

The badger population has been low in Norfolk and until recently largely confined to the area around Dereham. It is now beginning to expand with sites in woodland on the Holt-Cromer ridge, in the Ringstead area and around Cawston. Roe deer have also spread into the area from their stronghold in the Brecks and there is a small population of red deer.

### 6.3 Special plants and animals

The most important flowering plant is the may lily (a RDB species) which occurs in one area of Swanton Novers Great Wood. Other species which are locally rare include the wild service tree and herb paris. Creeping lady's tresses, a northern orchid characteristic of pine plantations occurs at Holt Country Park and Horsford, as well as in pines on the dunes at Holkham.

The large pollards support a lichen flora which is best represented in Hull Wood and which includes species characteristic of ancient trees such as *Lecanactis premnea* and *L. lyncea*. The endemic *Enterographa sorediata* occurs on an isolated pollard at Cottage Wood, Northrepps and is known elsewhere only from the New Forest.

A number of RDB fungi are also known including *Plectania melastoma* (Felthorpe Woods & Swanton Novers), *Clavariadelphus truncatus* (Holt Country Park), *Creolophus cirrhata* (Lion Wood, Norwich), *Hydnellum spongiosipes* (Felthorpe Woods), *Collybia acervata* (Swanton Novers & Felthorpe Woods), *Leucoagaricus georginae* (Ringland Hills), *Pluteus pellitus* (Felbrigg) and *Russula solaris* (Swanton Novers).

The Swanton Novers woodlands have supported at least one pair of honey buzzards for a number of years and historically they have nested at at least one other site. Redstart and nightingale also breed in these woods. Some nightjars are also known to breed in commercial forestry plantations where sympathetic rotational felling regimes produce suitable habitat. Goshawk and hobby have also bred in woodlands in the area.

The Invertebrate Site Register records three RDB species from Felbrigg including the only British site for a fungus gnat, *Mycetophila lubomirskii* and one RDB fungus gnat, *Mycomya clavigera*, from Swanton Novers. In addition Britain's largest slug *Limax cinereoniger*, a rare species in East Anglia, has recently been found in Swanton Novers Great Wood, an indication of the incomplete knowledge we still have for invertebrates in these woods. This is even more true for the pasture woodlands which have yet to be studied for their invertebrates.

### 6.4 Site protection

Swanton Novers Great Wood, Little Wood, Barney and Guybons woods are the largest and most significant blocks of ancient semi-natural woodland. They are designated as SSSIs and form Swanton Novers NNR. Other woods notified as SSSIs are Edgefield Little Wood and Felbrigg Woods, the latter owned and managed by the National Trust. Whilst coppice with standards is well represented in the SSSI series, pasture woodland is represented only by the beech woods at Felbrigg. The remainder at Hull Wood, Thursford Woods, Pond Hills and the Fox Hills are County Wildlife Sites.

## **6.5 Threats and issues**

### **Neglect**

The most significant ancient woodland sites with semi-natural vegetation which have been managed in the past as coppice with standards are mostly within the Swanton Novers NNR. These woodlands are now being managed again at least in part on a coppice rotation. The most significant issue is the need to continue to find a market for the product so that the management is at least economically sustainable. The oak coppice woodlands around Holt Hall and Edgefield Little Wood have not been coppiced for many years except for a small scale experiment at Edgefield Little Wood and in part of Swanton Novers Great Wood. There is a need to consider how far this experimental work should be extended.

### **Protection of veteran trees**

In the long term there is an issue of repollarding and allowing regeneration (preferably) or planting if necessary to improve age structure. Seed from veteran trees may be important because of its genotype and should be collected and grown on.

### **Designation**

At present there is less statutory protection for the wood pasture sites though the beechwoodlands at Felbrigg are notified as an SSSI. However a smaller but similar site at the Fox Hills has no protection. The oak pasture woodlands of Hull Wood at Glandford and those around Thursford are not notified, though Thursford Wood is a Norfolk Wildlife Trust Reserve and several are in Woodland Grant Schemes.

### **Isolation**

Historically many north Norfolk ancient woods were adjacent to heathland and form part of land management units. Many species such as nightjars would benefit from a return to this pattern of land use.

### **Deer**

Deer numbers are increasing in the Area and are having some effect on coppice regrowth, at present this does not appear to be a serious problem but may become one in the future.

### **Invasive plants**

Rhododendron is a problem in some woodlands most notably on acid soils as at Westwick. It does not appear to be a serious threat except in some conifer plantations.

### **Lack of data on invertebrates associated with oak pasture woodland**

Veteran trees are known to be very important for some invertebrates. There is no data on these woods at present.

## **6.6 A vision of the North Norfolk woodlands**

*All the ancient semi-natural woodland present in 1997 survives. Coppicing continues in woods which have been traditionally managed and the produce is used for example in the production of charcoal, in power stations and river protection works. Some small scale planting and coppicing takes place on an occasional but regular basis in the oak coppice woodlands, and regeneration takes place in some small fenced off areas. There are also areas non-intervention. in this overall strategy.*

*In the pasture woodlands some small scale pollarding has taken place and light grazing is taking place on some sites. Some pasture woodland with extensive areas of secondary growth have been restored by removal of some of the young growth and re-pollarding the older trees.*

*Ancient woodland sites which have been planted up in the past with conifers are now being replanted with native broadleaves once they have been cropped. New woodland either planted or re-generating naturally is growing on former arable land adjacent to some semi-natural ancient woodlands, whilst in some places newly created heathland provides the link between woods.*

## **6.7 Nature conservation objectives**

1. Protect and manage where necessary the existing ancient semi-natural woodlands.
2. Encourage the removal of conifers and replanting with native broadleaves on ancient woodland sites especially where the native flora survives. Where possible consider allowing natural regeneration on these sites.
3. Encourage new woodland adjacent or close to ancient woodlands where this land is not of nature conservation value.
4. Where land was historically heathland adjacent to ancient woodland encourage heathland restoration.
5. Improve knowledge of invertebrate fauna of pasture woodlands.
6. Maintain populations of veteran trees by encouraging pollarding where appropriate and by the selection of seed for replacement trees

## **6.8 Mechanisms and targeting of resources**

Woodland Grant Scheme.

Farm Woodland Premium Scheme.

Woodland Improvement Grants.

EN management agreements.

Norfolk County Council landscape conservation grants.

## **6.9 Key partners**

Norfolk County Council

Forestry Authority  
Forestry Enterprise  
Anglian Woodland Project  
Private Landowners  
National Trust  
Norfolk Wildlife Trust  
FWAG

## **7. Rivers, streams and associated river valley habitat and standing waters**

### **7.1 Rivers, streams and associated river valley habitat**

#### **7.1.1 Location and status**

The catchments of some of the rivers lie entirely and others partly in the Area. The former include the northward flowing rivers: the Hun, Burn (13km), Stiffkey (30km), Glaven (18km) and Mun (6km), together with the westward flowing rivers: the Heacham, Ingol and Babingley (18km). The westward flowing Nar (38km) rises in the East Anglian Plain with the middle reaches in the North Norfolk Natural Area and its lower reaches in the Fenland Natural Area. For the purposes of this document the whole of the Nar downstream to Narborough is considered to be within the Area. The eastward draining rivers form part of the Yare catchment and flow into the Broadland Natural area; of these the Bure (81km) is within the natural area as far as Aylsham, whereas the Ant rises at Antingham and flows out of the area near North Walsham. The Tat (5km), a tributary of the Wensum, rises in the North Norfolk Natural Area at Syderstone and joins the main river at Tatterford and is considered in this document. The Wensum itself flows through two natural areas; upstream of Fakenham and downstream of Lenwade it is within North Norfolk, whilst the intermediate stretch is in the East Anglian Plain. However, as a mixed catchment river it is more characteristic of the latter and is thus considered in that natural area profile.

The general pattern is that the uppermost reaches of the rivers have little or no influence on the surrounding landuse and are within very shallow valleys. Further downstream the valleys become more defined in their middle and lower reaches and it is here that most wetlands associated with the river are located.

#### **7.1.2 Characteristic habitats and species**

##### **General features**

The general geology of gravels and other drift deposits overlying chalk results in the rivers deriving their water from both calcareous and more acid sources, however; generally the water is calcium-rich. The rivers have mostly slow to moderate flows because of the low lying topography. However all of the rivers have been modified by man to a greater or lesser extent with the uppermost reaches often over-deepened and canalised, whilst mills are a feature of the middle and lower reaches with their weirs and side channels to take excess water. This creates a sequence of repeated habitats along their lengths with the water sluggish and pond-like up-stream, whilst below it is fast flowing creating a series of pools and riffles. The beds of the rivers are usually flint gravel with fine muds and silt on the slower stretches.

Most rivers are fed by a mix of run-off and groundwater seepage, but very active springs are a feature of the Nar. The Burn is unusual in behaving as an intermittent bourne, disappearing underground for part of its length during periods of severe drought. The North Norfolk rivers drain largely rural catchments with little industrial activity, but are heavily influenced by farming practices.

The upper reaches of the valleys have a variety of landuses up to the banks including arable, improved grassland and woodland of various types. Valley mires as previously mentioned are associated with some headwater streams. The middle and lower reaches have generally improved or semi-improved grassland with some wet woods and parkland. Semi-natural habitats are relatively rare but occur on the Nar with a number of tall fen communities and to a lesser extent on the Burn and Glaven. The remains of a former water-meadow system are found adjacent to the Nar at Castle Acre.

### **Rivers of greatest nature conservation importance**

The **River Nar** originates as a spring-fed stream and is moderately flowing over a gravel bed for much of its upper and middle length. It has a wide range of natural physical features including riffles and pools, together with many active springs either in or adjacent to the river along its upper and middle course. In addition there are a wide diversity of habitats associated with the river including old water meadow systems, unmanaged rough grassland and scrub, seasonally flooded grassland, wet woodlands and reedbeds. There are a few water-control structures mostly associated with mills. The fish population is dominated by a breeding brown trout population and eels. The associated wetland habitats support good numbers of wintering snipe. Grey wagtails breed around some of the mills.

The **Babingley** starts its main course west of Hillington, as a gravel bed stream with riffle-pool sequences, flowing through and adjacent to woodland. The middle reach is tightly meandering through predominately arable land and then becoming a straight sided drain in its lower reaches, where a riffle pool sequence dominates this chalk stream. The river supports flower-rich wet meadows along the upper reaches. There are also stands of common reed and extensive emergent fringes along the river with adjacent ponds. It supports a breeding brown trout population in its upper reaches. There is some recent evidence of use by otters.

The **River Burn** is unusual in that its source is drift, but stretches are over chalk which may be above the water-table in which case the river disappears underground for stretches. It flows through arable and dry grassland in its upper and middle length, but there are some wet meadows with greater conservation interest in its lower reaches. It supports a population of brown trout and is important for wintering bittern.

The **River Stiffkey** originates near Swanton Novers on gravels and in its upper reaches flows through a mix of woodland, grassland and arable. In its middle and lower lengths it flows through generally drained grassland including some parkland. In its lower reaches it is prone to seasonal flooding on to adjacent wet grassland and this area is now being positively managed for higher water levels. The river supports a breeding population of brown trout.

The **Glaven** is mostly drained from gravels but with some calcareous input from the chalk and calcareous drift deposits. It flows through a variety of habitats including parkland and wet grasslands in its lower reaches. In Bayfield Park it has been partly diverted through a long brick culvert which has potential as a bat hibernaculum. The headstreams have a

vegetation with watercress, water forget-me-not and celery-leaved crowfoot. Fast flowing stretches in the upper reaches have starwort, water forget-me-not and brooklime. The mill at Hunworth creates conditions for horned pondweed, starwort and Canadian pondweed. Downstream, horned pondweed, starwort and canadian pondweed are also common. In the lower reaches these and species such as unbranched bur-reed, spiked watermilfoil, river crowfoot and slender pondweed occur. The river is known to have significant populations of brook lamprey and supports a breeding brown trout population. Otters are present.

The upper reaches of the **Bure** drain mostly from gravels, but with some input from the chalk and calcareous drift. There are some interesting poorly drained meadows and a small valley mire in the vicinity of Briston. Native brown trout are found in the upper reaches and tributaries and these may also be important for otters and crayfish.

The source of the **Tat** is Syderstone Common which is situated on gravels but there is a calcareous groundwater input. The seasonally fluctuating pools on Syderstone Common are the breeding site for an inland population of Natterjack toads. The stream has a population of native crayfish.

### Rivers of less nature conservation significance

The **Gaywood** originates from springs in the chalk. Long stretches were over-deepened in the 1950s and 1960s. **The Ingol** originates from springs in the chalk. It has a short riffle pool sequence then becomes ditch-like. There are some wet meadows along its course. The fish population is not considered significant. The **Heacham** river originates from springs in the chalk and flows through stretches of woodland with riffle-pool sequences. Habitats present include fringes of common reed together with areas of botanically-rich wet grassland. It supports a small breeding population of brown trout. Much of **the Hun**, a short river, has been canalised and deepened through coastal grazing marsh. There is little information on the **Mun**.

### 7.1.3 Special species

**Table 4 - Special species (rivers)**

Species	Status
Black poplar	A few trees, not always in river valleys.
Otters	Population recovering following crash in the 1970s, some re-introductions.
Water vole	Needs clarifying.
Bittern	Riverine habitats may be important for small north coast breeding population and wintering continental birds.
Snipe	The wetter meadows used by breeding and wintering birds.
Brown trout	Strong populations on the Nar and Glaven, also on some other rivers.
Sea trout (plus other migratory fish)	Move into the rivers from the sea.
River lamprey	Glaven.
Brook lamprey	Strong population on the Glaven.

Species	Status
Crayfish	River Tat, Glaven. Bure tributaries e.g. the Mermaid.
Desmoulin's whorl snail	On at least two sites in fen adjacent to the Nar.

#### 7.1.4 Site protection

The Nar (along with the Wensum including the Tat) has been selected as an SSSI, one of about 30 rivers in a national series. The Nar, as it is the best example in East Anglia of a southern chalk river though also with the characteristics of a Fenland river in its lower reaches. Adjacent habitats have been included in places and the riverside meadows of Castle Acre Common are an SSSI in their own right. There is local recognition of the importance of other rivers notably the Babingley, Burn, Stiffkey, Glaven, Bure and their associated wetlands in the designation of County Wildlife status on many stretches and areas within the valleys.

There are also a series of valley mires and other spring-fed sites associated with the rivers in their headwaters which are notified as SSSIs. These are dealt with more fully in the Valley Mire and Heath section, but include: Holt Lowes (Glaven), Leziate, Sugar and Derby Fens and Roydon Common (Gaywood and tributaries), East Walton Common (Nar tributary) and Syderstone Common (Tat). In addition Litcham Common (Nar) and Spout Common (Glaven) are designated as Local Nature Reserves.

#### 7.1.5 Threats and issues

##### Low flows

Low flows resulting from abstraction for public water supply and irrigation have been identified as a cause for concern on some of the rivers, particularly the Nar but also others such as the Burn, Hun and Bure. Over the last twenty years there have been increasing demands for water abstraction for public water supply and agriculture to improve profit margins and to increase diversification away from traditional crops such as sugar beet, barley or potatoes into carrots and salad crops. The groundwater resources in the Bure, Glaven and Mun catchments are considered to be fully committed whilst that of the north-west Norfolk is not. The maintenance of in-channel features is closely linked with peak winter flows. It is unclear how much the increasing number of winter storage reservoirs might affect these processes by reducing these peak flows.

##### Siltation

Siltation as a result of low flows and the change to winter cultivation and better drainage of land appears also to have become significant on a number of rivers including the Nar.

##### Water quality

A number of the rivers are suffering from water quality problems including:

- a). High phosphate levels.
- b). Levels of BOD (Biological Oxygen Demand) and dissolved ammonia are high particularly in the upper reaches of the Nar.

These are linked to low summer flows caused by groundwater depletion through abstraction. Eutrophication through run-off from arable land (including out-door pig units) and the increased demands on small sewerage plants as a result of village estate developments are also a cause of concern on some rivers including the Nar and Burn.

### **Lack of habitat diversity both within the rivers and their floodplains**

Most streams and rivers in the area have been modified to a greater or lesser extent by man. In some instances this has led to increased habitat diversity such as that resulting from mills and their structures, some of which are referred to in the Domesday Book. However, particularly since the War, there have been considerable efforts to improve land drainage through canalising and deepening watercourses; this is particularly evident on some of the west Norfolk rivers such as the Gaywood.

### **Recreational activities**

There has been increased pressure for water recreation activities including canoeing and fishing. There have been some demands to alter the rivers to improve trout fishing in particular.

### **Alien species**

Mink are an increasing problem and may have had an impact on water vole populations. Rainbow trout have escaped from several fish-farms on the Nar and perhaps elsewhere. Information on the status of signal crayfish is needed. A number of alien plants are now quite widespread, including himalayan balsam and monkey flower.

### **Species information**

Whilst there is much information on some groups notably fish and to a lesser extent plants, many groups are more or less under-recorded. There is a need to pull together all available data.

### **Long-term impact of sealevel rise**

Sealevel rise may affect the lower parts of the rivers in a number of ways: by increasing the nature conservation importance of their adjacent wetlands as possible replacement habitat, through physical loss and possibly causing increased impounding.

## **7.1.6 Nature conservation vision**

*All the Areas' rivers sustain reliable flows of clean, clear, fresh running water, and support their full range of aquatic habitats and species.*

*Throughout their lengths, rivers display a great variety of conditions and between source and mouth, flow through a diverse and ever changing mosaic of surrounding valley habitats. The river may be bordered by a jungle of tall herbs and reeds, or may flow through woodland where it is overhung by alder and willow trees. In other areas, the course may cross cattle-grazed pasture, where stock drink from the stream and the banksides are poached by their trampling feet.*

*In the upper reaches the river may be a fast flowing chalk stream flowing over a stony substrate. In the middle reaches, the river becomes wider and more sluggish, winding its way through the narrow flood plain, sometimes fast flowing, sometimes slow, often where it ponds up behind a mill weir. Towards the sea, the river opens up into a wide coastal plain as it nears its mouth, spilling out through the grazing marshes into the tidal creeks.*

*Within natural seasonal variations the rivers contain strong reliable flows throughout the year. The one exception is the Burn which will naturally dry up in extreme drought years.*

*All river flows are unpolluted and unaffected by groundwater or surface water abstractions.*

*The rivers support thriving populations of fish, including trout, brook lamprey and river lamprey. There are abundant aquatic and emergent plants, dragonflies, moorhen, kingfisher, otter and water vole.*

*The adjacent valley habitats are a mosaic of high hedges, old poplar or willow trees, small pasture fields divided by ditches, ponds and small wet alder woods. The flood plain wet grasslands support species-rich fen meadow vegetation, with a colourful sward containing meadowsweet, water mint, marsh marigolds, bog bean, cuckoo flower and southern marsh orchid. The meadows and marsh dykes provide food for herons and support populations of snipe and some redshank.*

### **7.1.7 Nature conservation objectives**

#### **1. Water quality**

- a) To improve or maintain water quality to ensure sustainable conservation of biodiversity within the area.
- b). To prevent groundwater from deteriorating and adversely affecting wetlands.

#### **2. Water quantity**

- a) To protect aquifers and surface water to ensure that abstractions do not undermine sustainable conservation of wetland and river species and communities.
- b) To identify and promote the flows necessary to sustain the geomorphological and ecological interest of the river systems.

#### **3. Flood defence and physical features**

- a) To identify, maintain, enhance and restore both natural and man-made riverine features which provide ecological and conservation interest.
- b) To ensure protection, enhancement and restoration of habitat features during the design and implementation of flood-defence schemes.

#### **4. River valley habitats**

- a) To restore arable land adjacent to rivers back to pasture to reduce silt loading and improve habitats.
- b) To encourage optimal grazing regimes for wildlife.

- c) Manage associated dyke systems on a regular but not intensive regime.
- d) Keep water-levels in grazing marshes high where practicable.

### **7.1.8 Mechanisms**

Local Environment Agency Plans (LEAPs).  
 Countryside Stewardship.  
 Agri-environmental proposals.  
 Legal requirements re discharges.  
 Abstraction licence applications.  
 River management plan for the Nar.

### **7.1.9 Key partners**

Environment Agency  
 Anglian Water  
 Internal Drainage Boards  
 Landowners  
 Fishing clubs and consortia.  
 FWAG  
 MAFF  
 FaRCA (Countryside Stewardship)

## **7.2 Standing waters**

### **7.2.1 Location and status**

There are no natural large open waters within the Area. However, Westwick Lakes and Gunton Park Lake, though artificial, are of some importance for their nature conservation interest. Other water bodies include Holkham Park lake formerly an inlet from the sea. Otherwise standing water is restricted to a few lakes in parkland, millponds and farm ponds.

### **7.2.2 Special habitats and species**

Westwick lakes are an example of a mesotrophic standing water. They have a number of diatoms new to Britain and support a population of the regionally scarce shoreweed. Gunton Park Lake supports a nationally important post-breeding flock of gadwall.

### **7.2.3 Site protection**

Gunton Park Lake and Westwick Lakes are designated as SSSIs for their bird and aquatic interest respectively, whilst a number of ponds, ornamental lakes and other standing waters are designated as County Wildlife Sites.

### **7.2.4 Threats and issues**

#### **Water quality**

There has been a serious decline in the coarse fishery of Saw Mill Pond, Gunton, which is connected to Great Water. A likely cause is discharge from a sewerage works linked with high silt loads entering the lakes.

### **Water abstraction**

There is strong circumstantial evidence that Westwick Lakes have been affected by water abstraction in the last few years.

### **Alien plants**

There is a serious problem with invading rhododendron overhanging and therefore shading marginal and aquatic vegetation at Westwick. Cape-pondweed is also present in Captains Pond but does not seem to be seriously invasive at present. Of more concern are several aquatics which are increasing in small ponds, such as New Zealand Pigmy Weed (*Crassula helmsii*) and Parrot's-feather (*Myriophyllum aquaticum*).

### **Neglect**

Ponds no longer functioning as watering places for stock become surrounded and then overgrown by shrubs and trees and serve as dumps for farm chemicals, rubbish etc. (See also wider countryside section.)

## **7.2.5 Nature conservation Objectives**

1. Maintain or restore water quality in the larger lakes.
2. Protect catchment areas from abstractions which might affect sites.
3. Control alien invasive species.

## **7.2.6 Mechanisms**

Abstraction licences.  
Discharge consents.  
Countryside stewardship (Waterside).  
Norfolk County Council grants for ponds.

## **7.2.7 Key partners**

Land owners  
Environment Agency  
Anglian Water  
Norfolk County Council  
FaRCA  
FWAG

# **8. The wider countryside including farmland**

## **8.1 Description**

This covers by far the largest part of the natural area and is therefore important both in size and in the influence it has on other habitats. It is in effect the fabric of the countryside in

which the more biologically rich habitats are set. Throughout the natural area landuse is primarily arable with permanent grasslands largely confined to river valleys, commons and the coastal plain. Small, but sometimes significant units may also occur where land ownership is fragmented for various reasons as in the vicinity of villages and small towns. River valley habitats and coastal farmland are dealt with elsewhere.

The main crops are cereals in particular winter wheat and barley (especially malting barley); root crops notably sugar beet, potatoes and carrots; industrial crops such as linseed and oil seed rape. A notable change in recent years has been the increase in vegetable growing on the light soils made possible because of increased investment in irrigation.

The factors influencing farming practice and the wider countryside over the last 50 years are probably far more complex than the other habitats in the natural area and reflect the consequences of national and European policies and economics together with local conditions and landowner preferences. During this time there has been a general decline in nature conservation interest in the wider countryside as result of a steady attrition of habitats due to the intensification of agriculture (Bull, 1995).

## 8.2 Characteristic wildlife

The intensively arable land is generally low in wildlife interest. However, a number of species have been able to adapt and in some instances thrive in this landscape. These include barn owl and grey partridge which still have nationally important populations in the area, whilst in the winter large flocks of pink-footed geese descend on the large fields of north-west Norfolk and feed on the sugar-beet tops. Brent geese also feed on winter wheat and barley near the coast.

## 8.3 Special species

**Table 5 - Special species (wider countryside)**

Species	Status
Badger	Slowly increasing.
Pipistrelle bat	Severe national decline in the 1970s.
Barbastelle bat	Only known UK breeding colony.
Barn owl	Relatively strong population in otherwise declining species.
Grey partridge	Relatively strong population in otherwise declining species.
Skylark	Severe national decline.
Stone curlew	Small breeding population of a nationally rare species.
Pink-footed goose	North Norfolk holds 7% of the world population in winter.
Turtle dove	National decline, regionally important population.
Lesser spotted woodpecker	Moderate population.
Yellowhammer	Regionally important population.
Corn bunting	Severe national decline, regionally important population.
Tree sparrow	Severe national decline, only a few pairs remaining in N. Norfolk.
White-letter hairstreak	Now very scarce, due to loss of mature elm trees.
Corn marigold	Formerly frequent as a weed in light acid soils but now very scarce.

Species	Status
Rough poppy	Scarce in chalky arable fields.
Venus' looking-glass	Uncommon as an arable weed.
Mousetail	Rare on poached ground in wet pasture.
Hoary mullein	In UK largely confined to Norfolk and Suffolk on waste ground, quarries and roadside verges.
Small-flowered catchfly	Disused railways.
Moss ( <i>Bryum knowltonii</i> )	Disused sand and carrstone quarries.
Liverwort ( <i>Lophozia capitata</i> )	Disused sand and carrstone quarries.
Orange-fruited elm lichen ( <i>Caloplaca luteoalba</i> )	Probably now extinct in North Norfolk due to Dutch Elm disease.
Churchyard lichens	East Anglian churches including those in North Norfolk are important for a suite of species which grow on limestone, mortar and sandstone stonework.
Fungus <i>Battarraea phalloides</i>	On a roadside verge, one of only four UK sites for this species.

## 8.4 Special habitats

There are a number of special habitats in the wider countryside which are of particular importance for wildlife, including the following:

### Churchyards

Often the only semi-natural grassland in a parish therefore important for species such as meadow saxifrage, burnet-saxifrage, pignut and cowslip. Also extremely important for lichens and ferns growing on stonework, with most churchyards having 40 or more lichen species. They are also one of the few habitats in the county for mosses such as *Grimmia pulvinata* and *Tortula muralis* which grow on stonework. They are also important for bats and slow worms.

### Roadside verges

Important, particularly for chalk grassland in north west Norfolk. The more sheltered sunken lanes in the Cromer-Holt ridge area have populations of ferns.

### Cereal crop margins

The area is important for wildflowers of arable land on both chalky and sandy soils. The area still has a thriving population of grey partridge and there are also important populations of seed-eating birds. The brown earth soils of North Norfolk are also important for a group of mosses and liverworts e.g. *Sphaerocarpus tenax* (RDB species) which colonise autumn stubble fields.

### Ponds

Those that remain may be important for great-crested newts also some uncommon aquatic insects such as the long-bodied water scorpion.

## Old quarries and marl pits

Old marl pits are often have a dense growth of elders which support epiphytic mosses and liverworts. Old gravel, carstone, sand and chalk pits are also important for mosses, liverworts and other groups.

## Ancient hedgerows

A relatively scarce habitat, and then mostly in the north-central character area but important where they occur. All hedgerows if managed sympathetically can increase bird diversity by acting as a source of food.

## Old unrestored farm buildings, lime kilns, ice houses

These are important for bats, barn owls and some less glamorous invertebrates such as some false scorpions. The area has the only known British breeding colony of barbastelle bat, a species specially protected under the Habitats Directive.

## 8.5 Site protection

The County Wildlife Site system provides a second tier non-statutory set of identified sites throughout the Natural Area and the County in general. These provide the minimum necessary together with SSSIs to protect the biodiversity of the county. They include a range of habitats which are discussed elsewhere but as they are integral to the wider countryside they are also important in this context.

## 8.6 Factors causing change in the last 50 years

- Estimated c.45% loss of hedgerows for Norfolk as a whole between 1945 and 1970 (Baird & Tarrant 1973). Likely to be of this order for the Natural Area. Continued loss since then though at a slower rate with some new planting in recent years. Hedgerow removal uneven with smallest loss in north-west Norfolk where the late enclosure fields were already large.  
**Impact:** Loss of breeding birds. Studies by Bull (1988) at Cranworth outside this natural area found considerable decreases following a period of hedgerow removal.
- Loss and change of small ponds and marl pits.  
**Impact:** No longer needed for watering stock or used to extract marl, many are now willow carr with no open water or filled in. Others suffer from dumping of rubbish, eutrophication due to run-off. Others are isolated as they are no longer linked to hedgerows, ditches nor set in wet grassland.
- Effectiveness of herbicides resulting in clean fields, even stubble after harvest, with few if any weed species.  
**Impact:** Local extinction of some species. Reduction in food for seed-eating birds. Loss of foodplants for insects with consequent effects on insectivorous and the young of seed-eating birds.

- Use of insecticides resulting in reduction in insect biomass in the wider countryside. Also the use of chemicals such as ivermectin which have an effect on soil invertebrates.  
**Impact** on a wide range of insect eating animals including bats and many birds; also non-target and beneficial insects adjacent to crops.
- The use of herbicides, pesticides and fertilisers right up to roadside verges and hedgebanks.  
**Impact** leads to tall rank vegetation and consequent loss of species diversity.
- Changes in cultivation practice notably the sowing of winter or the early sowing of spring cereals and consequent loss of standing stubble.  
**Impact:** Decline in the population of many seed eating birds. Loss of habitat for winter ephemeral mosses and liverworts.
- Increased sugar beet cultivation and practice of leaving tops, though in recent years there has been a general trend towards harvesting, then rapid cultivations into spring cereals.  
**Impact:** Likely cause of increased numbers of wintering pink-footed geese.
- Marginal land no longer needed for keeping horses on the farm. The general reduction in livestock husbandry may also be significant.  
**Impact:** Either improved or no longer managed. Fewer livestock resulting in a reduction in insect and other invertebrate biomass in the wider countryside.
- Tree health including Dutch elm disease.  
**Impact:** Dutch elm disease: Loss of a substrate for a group of lichens largely restricted to mature elm trees e.g. *Bacidia incompta* and *Caloplaca luteoalba*. Also decline in populations of some insects eg white-letter hairstreak. May have had a significant effect on the populations of some birds e.g. lesser-spotted woodpecker. Recent concern over the health of hedgerow oaks.
- Changes in rabbit populations due to myxomatosis.  
**Impact:** increased rankness on grasslands in the 1950s and 60s resulting in some losses.
- Improved maintenance, conversion and demolition of old barns and other farm buildings.  
**Impact:** loss of habitats for barn owls, bats and some invertebrates.
- Effect of pesticides on birds and mammals.  
**Impact:** declines of species such as sparrowhawks and otters in the 1960s and 70s with some subsequent population recovery, but continued use of molluscides with possible impact on birds and mammals.
- Reduction in gamekeeping.  
Less predator control and probable cause for increased fox and magpie populations.

## 8.7 Issues and threats to be addressed

The following issues need to be addressed:

- Recent changes in farming enterprises and cropping patterns, particularly the shift away from mixed farming which included livestock.
- the insidious damage to wildlife from pesticides, herbicides and fertilisers.
- The loss of and damage to features such as hedges, ponds and hedgerow trees.
- Pollution of water by fertilisers, animal manures and excessive sediment
- The shortage of integrated and comprehensive farmland conservation advice. This is related to decline in knowledge of traditional skills in the farm work force, less slack in the farming year and a smaller labour force.

## 8.8 Vision

*The farmed countryside is rich in species and semi-natural features appropriate to their landscape character area, including hedgerows, trees, ponds, small woods, pasture and arable field margins. The overall picture is of a diverse and varied countryside, with a mosaic of different habitats no longer marginalised but managed as an integral part of the overall land management system. Farmland habitats and crops are managed sensitively by landowners to maintain their wildlife value, for itself, or as a result of game management.*

*CAP reform and changes in policy have secured significant redirections of agricultural funding away from arable price-support into wildlife and environmental benefits. There is stringent cross compliance between arable area and price support mechanisms and nature conservation benefits. Contributions to Biodiversity targets and nature conservation gain are conditional requirements of set aside and arable-support payments. There are incentives available to farmers and landowners within the agri-environment schemes, aimed at encouraging conservation of farmland habitats via a range of flexible mechanisms. This is backed by an advisory service and payments levels which are a sufficient incentive to ensure take-up.*

*The crop cycle includes a greater proportion of true spring sown cereal. Later harvests and retention of large areas of stubble and fallow ground in autumn and winter, provide a winter food source for seed eating birds. Winter stubbles are alive with finches, while in summer the fields support barn owl, grey partridge, and the soaring song of the skylark, whose numbers have increased with the later harvests. Stone curlew have expanded their range northwards from Breckland, and now have a viable population in north Norfolk. Hares are frequently seen. There is a network of tall, thick-bottomed hedgerows made up of native species, forming a more or less continuous matrix of linear habitats, serving as corridors to link existing wildlife sites and river valleys throughout north Norfolk. There are hedgerow trees of different ages ranging from young saplings to old stag-headed specimens. Hedges on the farm are managed to various prescriptions to create diversity and to maximise wildlife benefits, including nesting sites and crops of fruits and berries as food for birds and mammals. Ponds and ditches are clear and unpolluted.*

*Arable fields support conservation headlands and margins, forming buffer zones between hedgerows and crop, providing an invertebrate rich food source for insect eating birds, and*

*viable populations of wildflowers such as corn marigold, venus' looking-glass and field poppy.*

*There is no prophylactic application of pesticides, and those used are increasingly targeted and specific. There is growth in organic agriculture, increasing use of genetically-engineered insect pest resistant crops and integrated crop management and its successors.*

## **8.9 Nature conservation objectives**

1. Reverse the declines in farmland birds and other wildlife by encouraging a greater diversity of cropping, including livestock, and increased use of genuine spring-sown crops and over-winter stubbles. Encourage management of crop residues to resolve conflicts caused by geese.
2. Restore biological diversity to cropped areas by ensuring that pesticide-use and herbicide use is as specific and targeted as specifically as possible and by promoting the use of conservation headlands, beetle banks, game and wild bird cover strips and unfarmed habitats throughout the Area. Explore mechanisms for promoting farming with reduced inputs and organic systems.
3. Reverse the loss and decline in quality of farmland habitats and features by seeking to, expand grant schemes, sufficiently to secure widespread take-up in the Area. Encourage moves to link agricultural support-payments to the conservation of the whole farm.
4. Seek to assess the scale and impact on wildlife of surface water eutrophication and excessive sediment loads, and promote best practice and buffer strips as a precautionary approach.
5. To seek the provision of a comprehensive and integrated farm conservation advisory service for the Area, sufficiently resourced to be able to take a pro-active role and ensure implementation.
6. Maintain the current number and encourage positive management for optimal nature conservation of County Wildlife Sites.
7. Extend positive conservation and advice to all village churchyards.

## **8.10 Mechanisms and targeting**

Countryside Stewardship.

Agri-environmental schemes including Set-aside.

Norfolk County Council and District Councils through their landscape and conservation grants.

The County Wildlife site system managed by Norfolk Wildlife Trust in partnership with Norfolk County Council and English Nature, now to be the focus of positive management initiatives.

Need to improve conservation advice and training to farmers.

Roadside Nature Reserves.

Churchyard conservation scheme.

## 8.11 Key partners

Local landowners individually and through the NFU and CLA  
 FWAG  
 Norfolk County Council  
 MAFF  
 FaRCA - Countryside Stewardship  
 Norfolk Wildlife Trust  
 Norfolk Coast Project  
 Naturalists including local bat groups  
 Parochial Church Council

## 9. Key non-coastal species

The following species have been selected as they fullfill one of the following criteria:

1. They are RDB species.
2. They are very rare in East Anglia.
3. They are uncommon species characteristic of uncommon habitats.
4. They are species included in the national Biodiversity plan and/or the local biodiversity long list, these are marked with an \*.

The lists are of necessity subjective to some extent and should be reviewed at intervals.

**Table 6 - Key non-coastal species**

Common name	Latin name	Reasons for selection	Habitat
Great sundew	<i>Drosera anglica</i>	Rare in England	valley mire
Marsh gentian	<i>Gentiana pneumonanthe</i>	Only East Anglian populations in Area	valley mire
Creeping lady's tresses	<i>Goodyera repens</i>	Only populations south of Lake District	pinewoods
* Heath cudweed	<i>Gnaphalium sylvaticum</i>	Declining but not scarce	heaths and forestry rides
* Bog orchid	<i>Hammarbya paludosa</i>	RDB Declining through out Europe. Only East Anglian population	valley mire
Marsh helleborine	<i>Epipactis palustris</i>	Attractive orchid	valley mire
May lily	<i>Maianthemum bifolium</i>	RDB confined to a few localities in Eastern England	ancient deciduous woodland
* Small- flowered catchfly	<i>Silene gallica</i>	Rare arable weed, at least two N.Norfolk sites	in N. Norfolk on disused railways
Hoary mullein	<i>Verbascum pulverulentum</i>	Most UK populations in East Anglia	roadside verges, quarries, waste ground

Common name	Latin name	Reasons for selection	Habitat
Corn marigold	<i>Chrysanthemum segetum</i>	Rapidly becoming scarce	arable on acid soils
Long- headed poppy	<i>Papaver dubium</i>	Rapidly becoming scarce	arable on chalky soils
Cranberry	<i>Vaccinium oxycoccus</i>	In East Anglia restricted to four sites	wet heath
*Crested fern	<i>Dryopteris cristata</i>	RDB largely confined to East Anglia in UK	mires
* Slender green feather-moss	<i>Hamatocaulis (=Drepanocladus) vernicosus</i>	Known from 70 sites nationally, one in area, though possibly extinct	calcareous fen
* Norfolk flapwort (liverwort)	<i>Lophozia rutheana</i>	Recorded from c. six UK sites, ? only at two recently, ? extinct recently in Area	calcareous fen
* Lichen	<i>Enterographa sorediata</i>	Endemic to the UK; only population outside New Forest	ancient oak
Iceland moss (lichen)	<i>Cetraria islandica</i>	One of two populations in lowland England	secondary birch woodland on heath
* Fungus	<i>Battarraea phalloides</i>	Known from four British localities, one in area.	sandy roadside verge
* Club fungus	<i>Clavariadelphus truncatus</i>	Known from one site in North Norfolk	? woodland
*Barbastelle bat	<i>Barbastella barbastellus</i>	RDB; only known UK breeding colony	farm buildings
Honey buzzard	<i>Pernis apivorus</i>	RDB; c. 3% UK population	woodland
*Gadwall	<i>Anas strepera</i>	RDB; c. 1-2% UK population	lakes
*Pink-footed goose	<i>Anser brachyrhynchus</i>	RDB; c.18% UK population	farmland
*Stone-curlew	<i>Burhinus oedicnemus</i>	RDB; 2-3 breeding pairs	farmland
*Nightjar	<i>Caprimulgus europaeus</i>	RDB; 1.5% UK population	heaths
*Woodlark	<i>Lullula arborea</i>	RDB; recent colonist a few pairs	heaths
*Corn bunting	<i>Miliaria calandra</i>	RDB; <1% UK population	farmland
*Tree sparrow	<i>Passer montanus</i>	RDB; <1% UK population	farmland
*Grey partridge	<i>Perdix perdix</i>	RDB; % of UK population unknown	farmland
*Barn owl	<i>Tyto alba</i>	RDB; <1% UK population	farmland

Common name	Latin name	Reasons for selection	Habitat
Brook lamprey	<i>Lampetra planeri</i>	EU protected species	ivers
* Natterjack toad	<i>Bufo calamita</i>	RDB; one inland locality	heathland with temporary pools
*Great crested newt	<i>Triturus cristatus</i>	Schedule 5 species. Threatened in Europe	ponds
*Soldier fly	<i>Odontomyia argentata</i>	RDB	mires
Fungus gnat	<i>Allodia angulata</i>	RDB	? mires
Pipunculid fly	<i>Eudorylas terminalis</i>	RDB	
Crane fly	<i>Erioptera meigeni</i>	RDB	
*Crane fly	<i>Prionocera subserricornis</i>	RDB threatened internationally	breeds in peat by pools in alder carr
Crane fly	<i>Nephrotoma crocata</i>	RDB	
Crane fly	<i>Limonia masoni</i>	RDB	
Soldier fly	<i>Oxycera analis</i>	RDB	
Soldier fly	<i>Oxycera leonina</i>	RDB	
*Soldier fly	<i>Odontomyia angulata</i>	RDB	mires & pools
Horse fly	<i>Hybomitra muhlfeldi</i>	RDB	
*Robber fly	<i>Eutolmus rufibarbis</i>	RDB	heathland
Empid fly	<i>Rhamphomyia physoprocta</i>	RDB	
Snail-killing fly	<i>Dichetophora finlandica</i>	RDB	? mires
Snail-killing fly	<i>Colobaea pectoralis</i>	RDB	
Snail-killing fly	<i>Antichaeta analis</i>	RDB	
*Snail-killing fly	<i>Psacadina vittigera</i>	RDB	fens
Snail-killing fly	<i>Psacadina zernyi.</i>	RDB	
Snail-killing fly	<i>Cordilura aemula</i>	RDB	
Fungus gnat	<i>Mycetophila lubomirskii</i>	RDB; only UK locality	woodland
Phorid fly	<i>Triphleba excisa</i>	RDB	woodland
Fungus gnat	<i>Rymosia britteni</i>	RDB	? mire
Empid fly	<i>Platypalpus infectus</i>	RDB	
Fungus gnat	<i>Macrocera fascipennis</i>	RDB	
Fungus gnat	<i>Allodia embla</i>	RDB	
Tephritid fly	<i>Vidalia cornuta</i>	RDB one of four UK records from this Area	fens/mires
Anthomyzid fly	<i>Anagnota collina</i>	RDB	
Fungus gnat	<i>Mycomya clavigera</i>	RDB	
Oдиниid fly	<i>Odina ornata</i>	RDB	
Lauxaniid fly	<i>Homoneura interstincta</i>	RDB	
*Tortricid moth	<i>Archips betulana</i>	Only UK site	valley mire; feeds on bog myrtle

Common name	Latin name	Reasons for selection	Habitat
* Hoary mullein moth	<i>Nothris verbascella</i>	Only UK site, possibly extinct	feeds on hoary mullein
* Silver-studded blue	<i>Plebejus argus</i>	Declining nationally; two populations in the area	heathland
Micro-moth	<i>Yponomeuta rorella</i>	RDB	
*Tortricid moth (Dersingham bog moth)	<i>Choristoneura lafauryana</i>	RDB, not recorded since 1962 ?extinct	mires
Plume moth	<i>Buckleria paludum</i>	RDB	heaths/mires
Leiodid beetle	<i>Leiodes lucens</i>	RDB	
Leiodid beetle	<i>Agathidium confusum</i>	RDB	
Water beetle	<i>Enochrus isotae</i>	RDB	pools
Water beetle	<i>Haliplus furcatus</i>	RDB	pools
Water beetle	<i>Hydroporus glabriusculus</i>	RDB	pools
*Water beetle	<i>Hydroporus scalesianus</i>	RDB; glacial relict species	pools
Water beetle	<i>Laccornis oblongus</i>	RDB	pools
Water beetle	<i>Hydrochus brevis</i>	RDB	pools
Water beetle	<i>Hydrochus carinatus</i>	RDB	pools
Water beetle	<i>Hydrochus ignicollis</i>	RDB	pools
Bog bush-cricket	<i>Merioptera brachyptera</i>	local	Wet heaths
Black darter dragonfly	<i>Sympetrum danae</i>	Only one or two East Anglian localities	boggy pools on heathland
Downy emerald	<i>Cordulia aenea</i>	Local	standing water
*Scarce emerald damselfly	<i>Lestes dryas</i>	RDB	standing water
Keeled skimmer	<i>Orthetrum coerulescens</i>	Local	boggy pools in heathland
Bog raft-spider	<i>Dolomedes fimbriatus</i>	Rare in East Anglia, commoner in the west	boggy pools in heathland
* White-clawed crayfish	<i>Austropotamobius pallipes</i>	EU protected	rivers
* Desmoulin's whorl snail	<i>Vertigo moulinsiana</i>	Protected under EU Habitats Directive; one good population	calcareous fen
*Ashford's hairy snail	<i>Ashfordiana granulata</i>	Local; UK has large proportion of world population	heath/mire

## **10. Coastal habitats**

### **10.1 Introduction**

**This section provides an overall view of the coast as many of the issues and the vision relating to habitats are interrelated. Detailed accounts of issues and objectives relating to individual habitats are covered in sections 11 - 14.**

North Norfolk has one of the finest natural coastlines in the British Isles and is of exceptional importance both for its biological, geological and geomorphological interest. Internationally it is recognised through its large number of designations. The coast from Old Hunstanton to Sheringham has also been considered as a separate Maritime Natural Area and that from Sheringham to Happisburgh forms part of the Sheringham to Lowestoft Area. This is based on the process cell which is said to divide at Sheringham, however, Pethick (pers. comm). is sceptical that this division exists. There is no clear physical boundary and as it is also difficult to separate the terrestrial influences from the marine, it is felt that the whole section from Hunstanton to Happisburgh is better seen as an integral part of the north Norfolk natural area.

It divides into an accreting marshland coast and an eroding line of soft cliffs with one small area of harder rock. The low lying coast extends for a distance of about 35km from Old Hunstanton to Weybourne in a belt up to 4km wide and is one of the few examples of a barrier system in Europe. The whole of this is a complex of saltmarshes of over 2000 hectares in extent, generally but not always developing behind sand dunes and shingle structures, together with extensive areas of intertidal sand and mudflats. Scolt Head Island and Blakeney Point are particularly notable features with recurving shingle and dune ridges which have been extensively studied by geomorphologists. About 50% of the saltmarsh had been reclaimed between the seventeenth and the end of the nineteenth centuries and is now mostly grazing marsh, with some arable and also areas of reed bed.

The spectacular soft slumping cliffs begin at Weybourne and then extend in a largely unbroken line for a further 29km. ending at Happisburgh. These soft cliffs have internationally important geological exposures and also a range of important soft cliff habitats.

### **10.2 Habitats**

For a detailed account see sections 11-15 and Table 8.

### **10.3 Site protection**

Much of the coast of the Natural Area lies either within the North Norfolk Coast SSSI or in a series of SSSIs along the cliffed sections (see Table 1).

In addition the North Norfolk Coast SSSI is covered by a series of international designations as follows:

**Table 7 - Site protection : coastal habitats**

<b>Designation</b>	<b>Stat. (1)</b>	<b>Geographical Area</b>	<b>Interest Feature</b>
Biosphere Reserves	-	Blakeney Point, Cley, Salthouse, Holkham, Scolt.	
Ramsar	-	All of SSSI	Wetlands
Special Protection Area (SPA)	+	All of SSSI	Birds
Candidate SAC (North Norfolk Coast and Gibraltar Point)	+	North Norfolk coast SSSI above HWM and excluding the grazing marshes ( also Gibraltar Point (Lincs))	<ol style="list-style-type: none"> <li>1. Dune grassland (priority).</li> <li>2. Lagoons (priority).</li> <li>3. Mediterranean saltmarsh scrubs.</li> <li>4. Shifting dunes.</li> <li>5. Shifting dunes with marram grass.</li> <li>6. Humid dune slacks.</li> <li>7. Coastal shingle vegetation outside the reach of waves.</li> </ol>
Candidate Marine SAC (Wash and North Norfolk Coast)	+	North Norfolk Coast SSSI below HWM and also adjacent marine area including the Wash	<ol style="list-style-type: none"> <li>1. Subtidal sandbanks.</li> <li>2. Glasswort &amp; other annuals colonising mud &amp; sand.</li> <li>3. Atlantic salt meadows.</li> <li>4. Mediterranean salt meadows.</li> <li>5. Mediterranean saltmarsh scrubs.</li> <li>6. Intertidal mudflats &amp; sandflats.</li> <li>7. Shallow inlets &amp; bays.</li> <li>8. Common seal.</li> </ol>

(1) Stat. = Statutory designation

## **10.4 Issues: Affecting all habitats**

(when in bold they are considered to be the most significant)

### **Those related to coastal processes:**

- **climate change - sea level rise and increased storminess;**
- **potential loss of habitats particularly of freshwater;**
- **changes in erosion patterns.**

The key issue which has to be addressed on the coast is the impact of conditions resulting from climatic change. Though as (Funnell,1992) states'Environmental (geological, geomorphological, sea-level and climatic) change is the essence of this coastline, and has

been for thousands of years - since the return of the sea to this location following the melting of the ice caps of the last glaciation. To try and fossilize it in its present state is absurd - and ultimately impossible'. However the consequences of this course of action are likely to be loss and change of habitats especially the reclaimed freshwater marshes, although as Spencer and French (1992) state 'despite several ongoing multi-disciplinary research programmes, it remains difficult to forecast accurately the change in habitat configuration and extent that would occur in north Norfolk'.

The species and communities associated with the suite of habitats resulting from natural processes and comprising saltmarshes, sand dunes, sand and mud flats and shingle are essentially those of mobile systems and will therefore be expected to adjust as long as the change is not too rapid. In contrast those associated with the freshwater systems are dependent on the maintenance of sea defences and are thus vulnerable. The consequences of sea level rise, changes in wave patterns and/or increased storminess would be to alter the balance between them. This could happen in several ways: realignment would result in the loss of some or all of the freshwater habitats, as unlike some other coastal zones the room for general retreat is limited by the old Pleistocene coastline, except in the rather confined Stiffkey and Glaven valleys. Holding the line would result in increased stress on the system with consequent loss of habitats outside the sea defences. There is a need to identify the potential losses and gains which would result from these scenarios and to look for ways to mitigate these losses. There will also be a need to develop compensatory mechanisms for land purchase as part of any flood defence strategy. The implications for the Habitats Directive also need to be clarified.

**Those related to visitor pressure:**

- **disturbance of nesting and feeding birds;**
- **managing visitors;**
- erosion of dunes and saltmarshes;
- bait digging;
- interpretation.

**Other management issues:**

- **waterlevel management on grazing marshes;**
- **predation by foxes and other predators;**
- **water quantity and quality;**
- **land availability for habitat creation;**
- wildfowling;
- birdwatching;
- ringing.

## **10.5 Vision for the coast**

*The marshland coast from Holme to Weybourne is managed with nature conservation as a priority by the statutory organisations, voluntary conservation bodies and local landowners. Financial incentives through agri-environmental funding and capital sums for habitat creation and possible land purchase are available.*

*Along most of this coast natural processes are operating creating a suite of marine habitats which are responding to changing conditions. Freshwater habitats remain where sustainable, (that is whilst other coastal habitats are not being damaged by holding the line) and continue to be managed in a way which provides optimal habitat for wildlife. All of the grazing marsh which was arable in 1997 is now under grass. At the same time, provision is on-going for the creation of replacement freshwater habitats close by in the river valleys and on any remaining arable land. Further afield freshwater habitats are being created in the fenland basin, particularly as part of a washland strategy, and around the Wash itself.*

*Most, if not all of species present in 1997 still occur often in greater numbers than at that time. For instance the area's reed beds support eight pairs of bitterns and a flourishing population of bearded tits. All of the grazing marshes are managed optimally for both for breeding waders and wildfowl, whilst large flocks of geese and other wild fowl descend on the marshes in winter.*

*There is a sustainable strategy for visitor management so that disturbance by visitors is at a level where breeding populations of key species are not compromised. This provides an environment for public enjoyment and understanding of the wildlife, landscape and over-all beauty of the coast*

*The cliffed part of the coast is undeveloped and largely unprotected by sea defences again allowing natural processes to operate and sediment thus to move uninterrupted down the coast towards Great Yarmouth. The cliffs are fringed by cliff-top grassland which provides additional habitat.*

## **10.6 Objectives**

### **Coastal processes**

- Maximum free functioning of coastal sediment processes.
- Maximum free functioning of sub-aerial processes on dunes.
- Use of soft engineering for the protection of capital assets.

### **Habitats and species**

- No net loss of coastal habitat to coastal squeeze.
- Compensation for habitat loss by re-creation.
- Restoration and maintenance of habitat diversity by appropriate management e.g. water level manipulation.
- Core feeding, roosting and breeding areas for birds and seals free from disturbance.
- Encourage the restoration of arable to grazing marsh or reed bed.

### **Exploitation of resources**

- Protection of groundwater resources to allow continued input of freshwater onto grazing and saltmarshes.
- Environmentally and economically sustainable exploitation of marine wildlife resources e.g.. fish, shellfish, livebait and samphire.
- Manage commercial reedbeds in a manner compatible with breeding bird interest.

## **Pollution**

- Restoration of water quality where it is sub-standard.

## **Infrastructure and development**

- Relocation of fixed assets to promote free functioning of coastal systems.

## **People**

- Acceptance by planners, nature conservationists, landowners and general public of the essential mobility of soft coasts.
- Avoidance of conflict between recreation and wildlife e.g. by zoning and educational means.

## **Planning and regulation**

- Continue to develop the Shoreline Management Process to take account of environmental consequences.

## **Policy**

- In relation to the Habitats Directive and the need for compensatory habitats influence land-use policy through MAFF.

## **Resources**

- Obtain resources to create additional habitat.

## **Table 8 - Coastal habitats**

### **Summary of areas**

#### **Dune systems**

Total area 697ha. 6% of England resource (Radley 1994). Comprising the following:

<b>Hunstanton to Holme Dunes</b>	<b>134ha</b>
<b>Thornham to Brancaster</b>	<b>108ha</b>
<b>Scolt Head Island</b>	<b>80ha</b>
<b>Holkham</b>	<b>266ha</b>
<b>Blakeney to Cley</b>	<b>109ha</b>

#### **Shingle**

Total area of **vegetated shingle** 85ha., 1.9% of England resource (Randall 1995). Comprising the following:

<b>Scolt Head Island</b>	<b>4ha</b>
<b>Blakeney Point</b>	<b>81ha</b>

Total area of **non vegetated shingle** estimate 120ha. (Lambley unpublished). Comprising the following:

**Cley Coastguard to Weybourne 120ha**

(based on the estimated length being 6km and average width 200 metres)

No attempt has been made to estimate areas elsewhere but these are probably not significant except just west of Cley coastguards.

### **Coastal lagoons**

Total area 15.5 ha., 1.2% of GB total. When noteworthy lagoons only are included the area is 14ha, which is 3% of the GB total and 22% if the Fleet, the largest lagoon is excluded.

(Bamber & Barnes, 1995). Comprising the following:

**Broad Water, Holme 4.5ha**

**Holkham Salts Hole 0.5ha**

**Abraham's Bosom 1.5ha**

**Blakeney Spit Pools 9.0ha**

### **Saltmarshes**

Total area 2127ha. (Burd 1989) 6.7% of the England resource. Comprising the following:

**Holme to Gun Hill 687ha**

**Scolt Head Island 225ha**

**Wells to Blakeney 1052ha**

**Blakeney Point 163ha**

### **Intertidal sandflats**

Figures by Davison (1995) give the following: total area 6292ha., intertidal 5874ha., and saltmarsh 2217ha.

### **Freshwater marsh**

Total area of 867ha. There is no information on the extent of the total England or GB resource. Comprising the following:

**Holme 84ha**

**Thornham 22ha**

**Brancaster 32ha**

**Burnham Norton 121ha**

**Holkham 114ha**

**Holkham 181ha**

**Blakeney Freshers 142ha**

**Cley 58ha**

**Salthouse 113ha**

### **Reed bed**

The total area of 142 ha. is 9% of the total for Norfolk. Approximately 23ha. is tidal and fringes the upper saltmarshes and the remainder freshwater.

**Blakeney Freshers 3.0ha Freshwater**

**Borthwicks Marsh near Brancaster 5.0ha Freshwater**

**Brancaster Golf Course 4.5ha ? Freshwater**

**Brancaster Staithe 9.0ha Tidal**

**Burnham Deepdale 6.2ha Freshwater**

<b>Burnham Norton (North)</b>	<b>2.6ha</b>	<b>Freshwater</b>
<b>Burnham Norton</b>	<b>8.5ha</b>	<b>Freshwater</b>
<b>Burnham Overy</b>	<b>2.0ha</b>	<b>Freshwater</b>
<b>Cley marshes</b>	<b>43.0ha</b>	<b>Freshwater</b>
<b>Holkham</b>	<b>3.6ha</b>	<b>Feshwater</b>
<b>Holkham (Wells)</b>	<b>5.3ha</b>	<b>Freshwater</b>
<b>Holme (inner)</b>	<b>0.3ha</b>	<b>Freshwater</b>
<b>Holme</b>	<b>8.6ha</b>	<b>Freshwater</b>
<b>Salthouse</b>	<b>12.0ha.</b>	<b>Freshwater</b>
<b>Stiffkey</b>	<b>1.3ha</b>	<b>? Freshwater</b>
<b>Thornham East</b>	<b>5.4ha</b>	<b>Tidal</b>
<b>Thornham West</b>	<b>8.9ha</b>	<b>Tidal</b>
<b>Titchwell</b>	<b>25.2ha</b>	<b>Freshwater</b>
<b>Wells</b>	<b>1.6ha</b>	<b>Freshwater</b>
<b>Weybourne</b>	<b>2.3ha</b>	<b>Freshwater</b>

## **Cliffs**

The total length is 29km (Lambley estimate) of which 13km is described as soft cliffs (Dargie 1995). This latter total is 5% of the England resource. Maritime grassland is estimated by Dargie (1995) at 24ha, just over 1% of the total England resource, however this figure is probably an underestimate as totals for the most significant sites using SSSI data are estimated at 129ha.

# **11. Freshwater reed beds and grazing marsh**

## **11.1 Location and status**

The low-lying coast between Hunstanton and Weybourne includes areas of freshwater and brackish grazing marsh which were reclaimed from saltmarshes mostly between the 17th century and the end of the 19th century. This habitat is nationally important for the brackish and freshwater dyke systems, reed beds and as an integral part of the suite of fresh and marine habitats along this coast.

They cover an area of about 867 hectares in a series of discrete blocks which are at Holme, Brancaster, Burnham Norton, Burnham Overy, Holkham, Blakeney Freshes and the Cley to Kelling Quag stretch. These grazing marshes are generally semi-improved and drained by systems of ditches which contain fresh and sometimes brackish water. They are generally fed by a springline which runs at the foot of the rising ground or from a number of streams or rivers e.g. the Kelling Beck and the River Glaven. They are usually grazed by cattle and sometimes horses during the summer months.

In addition there are 142 hectares of reed bed which are largely freshwater, approximately 9% of the total for Norfolk. The main reed beds in size are at Titchwell, Cley and Salthouse; however there are many others, though smaller which are as biologically significant. The importance of those reed beds on the uppermost part of the saltmarsh relative to those in freshwater is not clear; whilst the former appear to be much less significant for birds, their invertebrate interest may be considerable.

The coastal plain also has areas of arable which have been converted from grassland; these have the potential to be returned to wet grassland or reed bed.

## 11.2 Characteristic habitats and species

The characteristic habitats of the grazing marshes are the grasslands grazed by stock which are either semi-improved or unimproved. Their value is considerably enhanced by high water levels during winter and early spring which gradually drop during the summer. They are dissected by systems of drainage ditches which are either fresh or brackish. There are also reed beds which may be extensive or largely confined to ditch sides.

During the summer months the small pools of water on the marsh are frequented by redshank, lapwing, avocet, teal and a few pairs of snipe. The less improved grazing marshes are coloured with the sulphur-yellow flowers of hairy buttercup, other plants of note include strawberry clover and marsh club-rush. The presence of sea purslane and sea aster along some of the ditches indicates increasing saline influence and is especially noticeable at Cley-Salthouse. In winter the marshes are frequented by large flocks of geese including brent, pinkfoot and white-fronts. The flooded marshes also provide winter feeding grounds for very large numbers of duck, notably wigeon.

The reed beds hold populations of characteristic species such as ree bunting, reed warbler and sedge warbler together with a number of rarities discussed below.

## 11.3 Special species

The ditch flora includes the following nationally scarce species which are characteristic of the freshwater-brackish transition; soft hornwort, brackish water-crowfoot and spiral tasselweed. Sea barley and divided sedge are also present on some of the grasslands whilst the spectacular tussocks of sharp rush are also sometimes a feature in a transition at the back of dunes.

The invertebrate fauna again includes some scarce species which are characteristic of reed beds, including the following moths; flame wainscot (RDB), reed dagger, obscure wainscot, crescent striped, twin-spotted wainscot, brown-veined wainscot, silky wainscot and the pyralid moth *Nascia ciliaris*; the bugs; *Paralimnus phragmitis*, *Chloriona dorsata* and *C. vasconica*, the latter known in Britain only from Brancaster; the fly *Cryptonevra nigratarsis* and the nationally scarce spider *Donacochara speciosa*.

The Ramshorn snail *Anisus vorticulosus* has been recorded from a ditch at Cley. Other notable species associated with the ditches and grazing marsh include the Crane fly *Erioptera bivittata* (RDB) and the water beetles *Haliphus apicalis*, *Anacaena bipustulata*, *Enochrus bicolor* and *Ochthebius nanus*.

The reed beds are nationally important for breeding bittern with c. four pairs breeding most years ie. 20% of UK population. Other important breeding reed bed birds are marsh harrier (33% of UK population, though some of this in crops) and bearded tit (11% of UK population).

Notable breeding birds of the grazing marshes include avocet (31% of UK population), gadwall, pochard, garganey and shoveler. They are also of international importance for

wintering wildfowl and waders with dark-bellied brent goose (15% of UK population), pink-footed goose (18% of UK population), white-fronted goose (c.6% of UK population), wigeon (6.5% of UK population) and pintail (6% of UK population).

## 11.4 Site protection

Significant areas of this habitat are managed as nature reserves by English Nature, the National Trust, Norfolk Wildlife Trust and the RSPB. Other areas are subject to English Nature and Countryside Stewardship agreements. Almost all of the grazing marshes and reed beds lie within the North Norfolk Coast SSSI and are further protected under the Habitats Directive as an SPA and under the Ramsar Convention. The Weybourne reed bed lies outside but is a County Wildlife Site. New reed beds being developed at Stiffkey also lie outside these designated sites and there is an issue of the probable need to extend designations to cover such newly created areas.

## 11.5 Threats and issues

- **Coastal erosion**  
Loss of protection leading to increased flooding by the sea, most notably at Brancaster, Cley and Salthouse but Holme, Titchwell and Blakeney Freshes are also vulnerable.
- **Predicted increased storminess and sealevel rise**
- **Abstraction**  
Potentially causing a reduction in freshwater spring flows.
- **Increased predation by foxes and other predators**
- **Waterlevel management**  
High water levels in winter and spring, slowly dropping in summer creating optimal conditions for many wintering and breeding birds.
- **Wildfowl damage**  
The manipulation of water levels on nature reserves has resulted in higher wildfowl numbers, especially wigeon this can conflict with the cultivation of cereals and other crops on former grazing marsh.
- **Land availability for freshwater habitat creation**

## 11.6 Nature conservation objectives

1. Anticipate loss in the medium and long term of some of the existing freshwater marsh and reed bed through coastal change, by pressing for the planning, acquiring and managing new areas either close to existing areas or outside the natural area in suitable localities as in the Fens, targeting arable land.
2. Continue to manage freshwater habitats until replacements are developed elsewhere, as long as this is sustainable and not damaging to other priority habitats.

3. Ensure the continuation of an adequate freshwater input into these systems along the coast.
4. Aim to manage livestock and waterlevels on all grazing marshes for optimum benefit for breeding and wintering wildfowl and waders.
5. Aim to provide through management optimum breeding conditions for bittern and other priority reedbed birds.
6. Develop more sustainable methods of predator control than generally practised at present.

## **11.7 Mechanisms**

Countryside stewardship.  
 English Nature grants.  
 Biodiversity funding.  
 Agri-environment schemes.

## **11.8 Key partners**

Landowners  
 Norfolk Wildlife Trust  
 National Trust  
 RSPB  
 English Nature  
 FWAG  
 Environment Agency  
 Internal Drainage Boards  
 FaRCA

# **12. Sand dunes, shingle and foreshore**

## **12.1 Location and status**

The sand dunes and shingle form part of the complex of habitats that constitute the barrier system which is developed on the north Norfolk coast. Although these dunes only form c.7% of the total England resource and the vegetated shingle 2%, the distinctive and widespread barrier dune systems, closely allied with saltmarsh, extensive tidal sand flats and coastal grazing marsh comprise a dune set of international importance (Dargie, 1995).

The total area of dunes has been estimated at 697 ha. (Radley, 1994). This is made in the following blocks: Hunstanton to Holme (134ha.), Thornham to Brancaster Golf Course (108ha.), Scolt Head Island (80ha.) , Holkham Dunes and East Hills (266ha) and Blakeney Point to Cley (109ha.). Small fore-dunes also occur in places at the base of the cliffs east of Cromer.

Shingle is the predominant material forming the long ridge between Blakeney Point and Weybourne. However, elsewhere these two habitats are often closely associated as shingle often underlies the dunes and is exposed in lows on the landward side and on the saltmarsh

margins. The area of vegetated shingle is estimated at 85ha (c. 2% of the total England resource) and comprises of 4ha. at Scolt Head Island and 81ha at Blakeney Point (Randall 1995). In addition the 6km. length from Cley Coastguards to Weybourne is largely unvegetated and covers an estimated 120ha.

## 12.2 Characteristic habitats and species

The major dune habitats are: strand and embryo dune, acidic fixed dune grassland, neutral and calcareous fixed dune grassland, dune slack, dune scrub and woodland and transition to salt marsh. The coast has good examples of transitional habitats from sand dune-shingle to saltmarsh, strand and embryo dune and a large area of dune scrub and woodland. Slacks are much less developed than in the west coast dunes, however they do hold important populations of certain species. Shingle habitats range from that which is bare and often bulldozed to vegetated shingle above the high watermark and transitional shingle-sand-silt habitats often on the upper edge of the salt marsh.

Common plants which grow on the foredunes include sea couch, sand couch, sea rocket, prickly saltwort, sea sandwort and frosted orache. Marram grass generally dominates the larger yellow dunes often growing with the prickly bluish-leaved sea holly; whilst on the more stable grey dunes, so called because they are often grey with lichens, sea bindweed, lady's bedstraw, sand sedge and small spring annuals like spring whitlow-grass and early forget-me-not occur. Other less common species which grow in this habitat include pyramid orchid, bee orchid and sea spurge. Shrubs such as privet and sea buckthorn are a feature, whilst at Scolt Head Island an alien rose, *Rosa rugosa*, appears to be spreading. The dunes at Holkham were planted with corsican pine and Holme oak in the last century and both species are now naturalised. Dune slacks have populations of orchids including a dark red form of the early marsh orchid and southern marsh orchids. Where the dunes are backed by saltmarsh these is often a gravel band which is colonised by the dark green bushes of shrubby sea-blite.

The song of the skylark is a feature of the dunes in spring, whilst meadow pipits are frequent.

The characteristic plant of the more disturbed shingle is the colourful yellow-horned poppy often growing with sea campion. Red fescue, crisped dock, sea couch grass and biting stonecrop are also common species of the shingle. In lows where the shingle is sometimes covered by the tides the pebbles are often covered in lichens of which the yellow rosettes of *Xanthoria parietina* are the most conspicuous.

Ringed plover, oystercatcher and little tern are the most characteristic breeding birds on the shingle. In winter small flocks of shorelark, snow buntings, linnets and other finches frequent this habitat.

## 12.3 Special species

The shingle-sand-silt transition bordering the saltmarshes supports good populations of several flowering plants which are rare or absent from the rest of the British Isles including shrubby sea-blite and sea heath both nationally scarce, and the matted sea-lavender (RDB). The sharp rush (nationally scarce) also grows on the sand dune-saltmarsh transition.

The dune slacks, though not as well developed as those in western Britain, are important for a number of vascular plants including Jersey cudweed (RDB), known in the British Isles only

from Holkham. Crested fern (RDB) has also been discovered in a slack at Holkham in the last few years and even more recently moonwort, a strange looking fern, has been found in the same area. Other notable species in this habitat include the bright red form of the early marsh orchid, man orchid and the marsh fern.

A feature of the drier grey dunes are the abundant lichens notably *Cladonia* species but including *Usnea articulata* and *Bryoria fuscescens* both species otherwise not known in East Anglia. These communities are best developed on shingle covered with a thin layer of sand. The nationally scarce grey hair-grass, which has a restricted distribution centred on the North Sea basin, is abundant at Blakeney Point and present at a number of other sites on the dunes. Several RDB fungi are known, including *Geaster minimus* at Holkham.

The Corsican pine woodlands and Holm oaks at Holkham provide a different habitat which was favoured until the 1970s by red squirrels, sadly now extinct. They are still, however, important for fungi, (including earthstars) and for populations of the creeping lady's-tresses orchid and the saprophytic plant, yellow bird's-nest.

Shingle supports small colonies of the nationally scarce sea-kale and sea-pea - the latter introduced at Cley.

The invertebrate fauna of the dunes and shingle is rich with many species rare or restricted to this coast in Britain. This is a reflection of the the extensive and wide range of habitats present and its geographical position. Holkham National Nature Reserve alone has three RDB beetles (Sage 1996), including *Hypocaccus metallicus*, *Trichohydnobius suturalis* and the malachite beetle *Malachius barnevillei* known in Britain only from the North Norfolk coast where the larvae are predatory and the adults are found on flowers. Other rare beetles include the dune tiger beetle which has recently been found on the coast where it has a preference for sand flats adjacent to dunes and the very local ground beetle *Harpalus vernalis* known from open sandy gravelly areas in southern England. Uncommon butterflies and moths include the dark-green fritillary butterfly, scarce vapourer (RDB), the micro-moth *Gelethia hippophaella* (food plant, sea buckthorn) and the pyralid moth *Platytes alpinella*. There are a number of rare flies including the very rare coastal fly *Neolimnophora maritima* which in Britain is only recorded from Blakeney Point and Dawlish Warren in Devon, the snail killing fly *Salicella fasciata* and also from Blakeney Point, *Tomosvaryella minima* with only three post 1960 British records. Plant bugs include the leaf hopper *Doratura impudica* known so far only from the North Norfolk coast. Sandy areas are often favoured by wasps and bees and several uncommon species occur including the mud wasp *Podalonia affinis*, a large black and red solitary species which nests in sandy soil and is nowhere common. Rare spiders include *Clubiona similis* which occurs in dunes in south east England and is usually found in marram tussocks and *Euophrys browningi* on shingle. In general the shingle invertebrate fauna is not as well known as that of Snettisham in the Wash and may repay a more intensive study.

There are two colonies of natterjack toads on the North Norfolk dunes breeding in pools at Holkham and Holme.

The tern colonies at Scolt and Blakeney are nationally important with 3000 pairs of sandwich terns comprising 22% of the British population and 5% of the international population. Little tern numbers are about 200 pairs which is 10% of the British population. Sand dune and beach nesting ringed plover numbers were estimated at 237 pairs in 1993, (Rooney & Eve, 1993), 3% of the British population. The dunes and shingle are also of some importance for

wintering shorelark and snow bunting. In spring and autumn scrub and woodland on dunes provides cover for many passerine migrants including some extreme rarities.

The sandflats at the entrance to Blakeney Point hold a colony of about 200 common seals, a species protected under the EU Habitats Directive.

## 12.4 Extinctions

Until the 1930s there was also a small colony of oysterplant, a specialised northern shingle plant at Blakeney. A number of RDB mosses (*Bryum mamillatum* and *Petalophyllum ralfsii*) also appear to have become extinct

## 12.5 Site protection

These habitats lie entirely within the North Norfolk Coast SSSI.

They are also recognised internationally under the EU Habitats Directive, lying within the North Norfolk Coast SPA and as a candidate SAC ( Gibraltar Point and North Norfolk Coast). Under the c.SAC they are recognised as having the following dune and shingle communities:

1. Dune grassland (priority)
2. Shifting dunes
3. Shifting dunes with marram grass
4. Humid dune slacks
5. Mediterranean saltmarsh scrubs
6. Coastal shingle vegetation outside the reach of waves

Additional international recognition is afforded by their inclusion within the North Norfolk Coast Ramsar site and Biosphere Reserve.

In addition Holkham and Scolt Head Island are NNRs managed by English Nature, whilst Holme and Blakeney are S35 NNRs owned and managed by Norfolk Wildlife Trust and the National Trust respectively.

## 12.6 Threats and issues

### Coastal processes causing erosion and deposition

Dunes and shingle structures are essentially mobile systems and the plants and animals associated with them are generally adapted to cope with changing conditions. Therefore for their maintenance they require sources of sediment and unconstrained coastal processes. Because of the nature of landholdings this ideal can conflict with other interests which may or may not be in accordance with nature conservation. Instances on this coast include the Royal West Norfolk Golf Club at Brancaster, where a prime recreational asset is threatened by localised erosion and Holme Dunes, where important grazing marshes are threatened by the same process. In both instances deposition is taking place in the vicinity. The issue is essentially one of fixed assets on a mobile coast.

### **Sea defence work**

Sea defence work can interfere with these processes on a local or coastal cell level. Thus the works protecting the Royal West Norfolk Club House appear to be increased erosion close by and coast protection works protecting cliffs east of Weybourne may be reducing sediment supply to this stretch of coast. The annual reprofiling of the shingle bank between Cley and Weybourne is a serious concern as it in effect sterilises it as a habitat preventing a natural profile and vegetated shingle ridge developing. The beach is also made unusable by nesting terns and ringed plovers.

### **Sea level rise**

The impact of sea level rise is not known in detail but current studies should shed light on how the coast has responded in the past. It is assumed that there would be a general landward migration of dunes as with the other habitats on this low lying coast.

### **Disturbance**

Visitor management is an issue particularly in relation to disturbance either directly or through uncontrolled dogs. Nesting birds are particularly vulnerable and disturbance is the probable reason for the decline in ringed plovers between 1984 and 1993 as documented (Rooney 1993). Policies and actions have been developed in the Visitor Management Strategy published by the Norfolk Coast Project.

### **Erosion by people**

The very large numbers of visitors (estimates of 500,000 for Holkham alone) on the coast can have a direct impact through erosion of the dunes.

### **Grazing by rabbits and stock**

Grazing due to high rabbit numbers is perceived in some places to be too severe but they do help to provide the open habitats associated with dunes. Although these dunes were probably grazed in the past there does not seem to be a need to reintroduce stock, at least whilst rabbit numbers are reasonably high.

### **Low productivity of ground nesting birds**

Predation by foxes, and to a lesser extent stoats and kestrels, is now a significant factor in the success or otherwise of many ground nesting birds on the coast particularly terns and avocets.

## **12.7 Nature conservation objectives**

1. Maintain the existing dynamic resource, though not necessarily in the same place.
2. Allow natural processes to operate as far as possible whilst accepting that provision will have to be made for habitat loss and change.
3. Implement visitor management provision, so that disturbance by visitors is at a level where breeding populations of key species are not compromised.

4. Develop a strategy which reduces predation to a level where breeding populations of key species are not compromised.

## **12.8 Mechanisms**

Norfolk coast project visitor management strategy.

Influencing the Shoreline Management Plan.

Working with landowners including through Blakeney Area Advisory Committee, Brancaster Commons and Scolt Head Island Committee.

## **12.9 Key partners**

Norfolk Coast Project

National Trust

Norfolk Wildlife Trust

RSPB

Environment Agency

English Nature

Royal West Norfolk Golf Club

Common right holders

FaRCA (Countryside Stewardship)

## **13. Coastal lagoons**

### **13.1 Location and status**

Small coastal lagoons occur at a number of places along the North Norfolk coast; at Holme (Broadwater), Holkham (Salt Hole), Wells (Abraham's Bosom) and five small pools between Cley Coastguards and Salthouse Beach road, (Smith & Laffoley 1992). In addition some of the grazing marsh dykes are brackish especially at Salthouse and support species tolerant of these conditions. They have generally originated as a result of reclamation over the centuries cutting off creeks or similar to direct tidal influence. They are fed by percolation or by saltwater springs. The degree of interest reflects the continuing saline influence which persists more in some than others. It is possible to see new lagoons forming in natural systems as at Lodge Marsh near Wells.

Lagoons are a nationally rare habitat and a 'priority habitat type' under Annex 1 of the EU Habitats Directive. The north Norfolk lagoons are particularly important as examples of lagoons which have developed where formerly there were salt marshes behind dune-capped barrier islands. (Bamber & Barnes 1995). In North Norfolk all of the lagoons are within the North Norfolk coast SSSI. They are also within the candidate SAC, SPA, Ramsar, Biosphere reserve, Heritage coast and AONB. It is estimated that the North Norfolk lagoons are 1.2% of the Great Britain total; but that figure nearly doubles when the largest lagoon, the Fleet in Dorset, is excluded. More significantly when noteworthy lagoons only are included, Norfolk then has 14 ha, which is 3% of the GB total and 22% if the Fleet is excluded (Bamber and Barnes 1995).

## 13.2 Special species

Key species are the starlet anemone, lagoonal cockle and possibly the shrimp (*Paramysis noveli*), though its status is unclear (Hamond in litt.). Eel grass (*Zostera angustifolia*) formerly occurred in Abraham's Bosom and may still do. The flora in brackish dykes includes the spiral tasselweed and brackish water crowfoot. The starlet anemone is considered to be an endangered species in the IUCN Invertebrate Red Data Book and is one of the species with a costed action plan in the Biodiversity Action Plan. On the north Norfolk coast it is known from Abraham's Bosom (where it was rediscovered in 1986) and formerly Half Moon Pond near Cley where it probably became extinct soon after the pond dried up in 1975 during a drought. (Williams 1987).

## 13.3 Extinctions

The gammarid shrimp *Gammarus insensibilis* has also been recorded but was probably lost when the brackish lagoon at Titchwell was made freshwater in the early 1970s. It is on schedule 5 of the Wildlife and Countryside Act and an RDB species.

## 13.4 Threats and issues

### Pollution

There has been some evidence of pollution affecting Abraham's Bosom which is adjacent to a caravan site. Pollution does not seem to be an issue on other sites.

### Sealevel rise and coastal retreat

Most if not all of the lagoons are at sealevel and are therefore vulnerable to sealevel rise and storm events. All of the sites were flooded in 1953 and the Cley-Salthouse lagoons in 1978, 1991 and 1996. In addition the slow inland movement of the Cley - Weybourne shingle ridge of about one metre a year on average has resulted in shingle slowly overwhelming these features. The reduction in size of Half Moon Pond so that it dries upon occasions is a consequence of this process. In making provision for this habitat there is a need to accommodate the essential often temporary nature of these features.

### Recreation pressure

Abraham's Bosom is adjacent to a caravan site and is used as a boating lake in summer.

## 13.5 Nature conservation objectives

1. The current number, area and distribution should be maintained and enhanced.
2. Create sufficient lagoon habitat to offset losses over the last 50 years and anticipated losses as a result of sea level rise.

## 13.6 Mechanisms

English Nature grants through Biodiversity programme.

## 13.7 Key partners

English Nature  
Norfolk Wildlife Trust  
National Trust  
RSPB  
Universities  
Planning Departments

## 14. Saltmarshes

### 14.1 Locality and status

In North Norfolk, saltmarshes stretch almost continuously from Holme in the west to Blakeney Harbour in the east, a length of over 35 km and in places with a width of up to 2km. They have formed behind barrier islands or spits as at Scolt and Blakeney or have extended out on to sandflats where the wave climate is favourable, as at Stiffkey and Warham. These saltmarshes are 6000 years old in places, having developed on a chalk platform overlain by alluvial deposits which may explain this relative stability. The marshes are still accreting at an average rate over the whole marsh of 2.5mm per annum. Detailed studies which should improve our understanding of the evolution of this coast are underway at present as part of the LOIS (Land-Ocean Interaction Study).

These marshes are considered to be of outstanding importance nationally and to be important in an international context. The area of saltmarsh is estimated at 2127ha. (Burd 1989), that is 6.7% of the England resource. This is probably an underestimate, as recently developed marshes at Holkham Bay were not recorded nor were saltmarsh communities behind the shingle bank between Cley and Weybourne.

### 14.2 Characteristic habitats and species

A key feature of the north Norfolk coast marshes are their extent and also range of habitats. They are some of the most botanically rich in Britain and contrast markedly with the grass-dominated marshes of the Wash. The slow rate of vertical accretion and lack of successional changes in North Norfolk mean that the plant communities have a high degree of stability. Most of the marshes have been ungrazed at least since the war.

A typical zonation starts at the lowest levels, indeed below the true salt marsh with eel-grass, a flowering plant which can grow on sand and mud flats which are partly or entirely submerged by the sea. This species is now much rarer than formerly, probably as a result of a fungal disease. The first pioneering communities on the sand and mud flats are dominated by annual plants, particularly samphire and annual sea-blite. Cord-grass can also be an early coloniser especially where the mud is particularly sloppy.

This is followed by a low-mid marsh community with abundant sea aster and then the mixed mid-marsh communities often dominated by common sea-lavender and thrift, together with sea aster, sea plantain, sea arrowgrass, saltmarsh grass (*Puccinellia* sp.) and red fescue. In late summer these marshes are coloured purple by the flowers of sea lavender. The small grey-leaved shrub, sea purslane grows on the edges of creeks and also forms a band at the top of the marsh, usually just in front of the taller dark-green shrubby sea-blite. This latter plant

dominates the shingle saltmarsh interface and is associated with other nationally and locally rare species such as matted sea-lavender, rock sea-lavender and sea heath, forming a community which has affinities with those in the Mediterranean. The sharp rush is also a species with its distribution centred on the Mediterranean and occurs in places especially where blown sand is adjacent to saltmarsh. Sea rush and saltmarsh rush are also characteristic of these upper marshes. The diversity of the marsh is enhanced in places by lenses of shingle which give rise to slight ridges which are often dominated by grasses such as sea couch or shrubby sea-blite, whilst saltpans provide habitats for samphire and other annuals. Other variations result from freshwater springs issuing from the top of the salt marsh, most notably at Brancaster where reedbeds and other freshwater/brackish communities grade into the salt marsh.

Marine invertebrates living in the unvegetated and samphire zone include huge numbers of the mud snail, *Hydrobia ulvae* (up to 16000/sq. metre), whilst within the sediment the fauna is dominated numerically by worms, predominantly oligochaetes, nematodes and polychaetes. Small shorecrabs known locally as gillies actively roam over the marsh surface. The salt marsh pans and pools are used by small plaice, flounders and juvenile mullet as nursery grounds. In summer prawns (mainly *Palaemon elegans*) and small gobiid fish such as the sand goby move onshore in spring and spend the summer and autumn on the marsh before migrating off-shore in the winter. Lugworms are also present in the pools but absent from the surrounding marsh. Local patches of gravels support periwinkle and chiton species.

The terrestrial invertebrate fauna is particularly rich in upper saltmarsh zones, where pools, seepages, driftline debris and tall vegetation are found.

Characteristic birds of the saltmarsh include waders such as redshank and oyster catcher both of which breed. Other breeding birds include colonies of black-headed, herring and lesser black-backed gulls, a few shelduck, reed bunting on the margins and in some years short-eared owls. In winter flocks of brent geese are a feature of the marshes whilst overhead skeins of pink-footed geese fly out to their roosting grounds on the sandflats. The larger creeks are a feeding ground in spring, autumn and winter for bar-tailed godwit, curlew, knot, dunlin and grey plover. Passerines often feeding among the shrubby sea-blite and along the drift line include linnets, reed buntings, lapland buntings and twite. These marshes are also important in winter for skylark and rock pipit.

### 14.3 Special species

Most of the uncommon plants are associated with the upper saltmarsh and transitions. Sea heath, shrubby sea-blite, rock sea-lavender (all nationally scarce) and matted sea-lavender (RDB) reach or are close to their northern limits on this coast, and as an assemblage only occur on this coast. The other nationally scarce plants on these saltmarshes are perennial glasswort and sharp rush.

An RDB lichen, *Cliostomum corrugatum*, which is only known from three modern sites in Britain occurs on fence posts in saltmarsh at Burnham Overy.

The beetle fauna has been well studied at Holkham by Sage (1996) who found 115 species associated with salt marshes though a detailed analysis shows that of these only 32 can be described as saltmarsh specialists. However, of these *Bledius diota* is an RDB species and 11 are nationally notable. Other RDB species associated with these saltmarshes include the

ground beetle *Pogonus luridipennis*, the horsefly *Atylotus latistriatus*, the craneflies *Limonia complicata*, *L. bezzii* and *L. bivittata*, the scarce pug moth and the wolf spider *Arctosa fulvolineata*. Other rare and notable insects recorded include the ground beetles *Pogonus littoralis*, *Bembidion laterale* and *Tachys scutellatus*; the rove beetles *Bledius tricornis* and *Diglossa submarina*, the brown flea beetle *Crepidodera impressa*, the leaf beetles *Phaedon concinnus* and *Longitarsus plantagomaritimus*; and the weevils *Apion limonii*, *Phyllobius vespertinus* and *Polydrusus pulchellus*. Scarce moths recorded include Mathew's wainscot, *Monochroa tetragonella*, *Bactyra robustana* and the crescent striped.

Key bird species which breed on the saltmarsh are redshank, oystercatcher and shelduck. In winter it is significant for dark-bellied brent geese (15% of UK population), other wildfowl and waders, short-eared owl and lapland bunting and twite (1% of UK population).

#### **14.4 Site protection**

All of the saltmarshes fall within the North Norfolk Coast SSSI.

They are also recognised internationally under the EU Habitats Directive, lying within the North Norfolk Coast SPA and as a candidate SAC (Wash and North Norfolk Coast and/or Gibraltar Point and North Norfolk Coast). Under the c.SAC they are recognised as having the following non-priority saltmarsh communities:

1. Glasswort and other annuals colonising mud and sand.
2. Atlantic saltmeadows.
3. Mediterranean saltmarsh meadows.
4. Mediterranean saltmarsh scrubs.

Additional international recognition is afforded by their inclusion within the North Norfolk Coast Ramsar site and Biosphere Reserve.

In addition Holkham and Scolt Head Island are National Nature Reserves (NNRs) managed by English Nature, whilst Holme and Blakeney are NNRs owned and managed by Norfolk Wildlife Trust and the National Trust respectively.

#### **14.5 Threats and issues**

Most of the issues are common to the other coastal habitats and are identified in the introduction to the coastal section.

##### **Coastal processes causing erosion and deposition**

The saltmarshes are dependent on a continuous supply of sediment.

##### **Sea level rise**

Predicted sealevel rise and observed accretion rates appear to be close and there is therefore some uncertainty over future change. At present there is no observed loss of salt marsh or indications of cliffing. New saltmarsh is forming in places as at Holkham Bay.

### **Disturbance and erosion of paths**

Wide paths have been created in places as at Stiffkey, but access is often determined by the presence or absence of bridges crossing creeks and is probably not a significant issue at present.

### **Samphire collecting**

Some is collected for commercial purposes or individual use. This is strictly illegal under the Wildlife and Countryside Act as the plants are usually uprooted and without the owners permission. However this is not perceived as a problem on the present scale of collecting.

### **Bait digging**

At present practiced only on a limited scale and self-regulated in that bait diggers get other jobs when it becomes unprofitable.

### **Wildfowling**

The consensus of conservation opinion at the present time is that wildfowling is not seen as a problem on this coast.

### **Water abstraction**

A potential threat to springs issuing from the top of the saltmarsh at Brancaster.

### **Grazing**

Traditionally these marshes were probably grazed but there has been little if any since the war. Unlike the Wash there appear to be no benefits from re-introducing it and possible disadvantages in reducing the diversity of the flora.

## **14.6 Nature conservation objectives**

1. Allow natural processes to operate as far as possible, accepting that provision will have to be made for habitat loss and change.
2. Maintain the existing resource, though not necessarily in the same place.
3. Implement visitor management provision, so that disturbance by visitors is at a level where breeding populations of key species is not compromised.
4. Monitor changes.

## **14.7 Mechanisms**

The Habitat Scheme saltmarsh option.

## **14.8 Key partners**

Landowners

MAFF  
English Nature  
National Trust  
Norfolk Wildlife Trust  
RSPB

## 15. Cliffs and rocky shore

### 15.1 Rocky shore

#### 15.1.1 Location and status

In the natural area restricted to West Runton and Robin's Friend immediately west of Sheringham.

The chalk platforms and associated flints represent one of the few areas of intertidal rock in East Anglia and as such have considerable local importance from the biological and public amenity aspects. They are an oasis for rock dwelling organisms, similar to those on the rocky shores in south-east England and Flamborough Head, in a region that is otherwise characterised by sediment dwellers.

#### 15.1.2 Characteristic habitats and species

The chalk rock foreshore at West Runton is unusual in that it is not backed by chalk cliffs, unlike sites elsewhere in Yorkshire and the south-east. The presence of irregularly shaped flints (paramoudras) on the chalk platform considerably enhances the number of macro-invertebrates that the shore is able to sustain, these are much fewer at Robin's Friend but this does have some blocks of conglomerate towards the upper shore with a fauna that is more usually subtidal. The number of invertebrate species recorded is similar to the most intensively studied chalk sites in the south-east.

In a survey (George and others 1988) 153 species of invertebrates were recorded from four sites between Robin's Friend and East Runton. Common species include three species of periwinkle, small mussels, sea slaters, two species of sea-anemone and two species of barnacle. Dog-whelks are abundant in places whilst the breadcrumb sponge occurs lower down the shore. The chalk platform is bored extensively by a species of bristle worm and two species of piddock. However, by far the largest concentrations of animals live under the boulders and cobbles lying on the chalk. These include shore, edible and small hermit crabs, scale worms, common starfish, various amphipods and isopods.. Tubes of the sand masonworm are also common under these boulders. At the lowest tides brittlestars are frequent together with a greater variety of sponges and bryozoa. The seaweed flora includes common brown bladder and spiral wracks, a variety of red species including frequent coralline weed and the green *Enteromorpha*. The larger wracks such as *Laminaria* are absent because there is no substrate on to which they can attach themselves.

#### 15.1.3 Special species

Some of the species present are at the northern limits of their range e.g. the small red algae *Gastroclonium reflexum* whilst others such as the polychaete worm *Axionice flexuosa* (recorded once) are at their southern limit.

#### **15.1.4 Site protection**

Robin's Friend lies within Weybourne Cliffs SSSI notified for its geology and West Runton lies within West Runton Cliffs SSSI notified primarily for its geology but also for its biological interest.

#### **15.1.5 Threats and issues**

- Intensive use by education parties.
- Formerly contaminated by inshore sewerage pipe, now discharging 2.5km out to sea.
- Coastal protection works affecting sediment distribution over the platform.
- Interpretation.

#### **15.1.6 Nature conservation objectives**

1. To maintain this as an exposed rocky shore.
2. Ensure water quality standards are sufficiently high that there is no effect on the ecological interest.
3. Develop sustainable management of the resource for education including an interpretation element.

#### **15.1.7 Mechanisms**

Liase with Environment Agency and Anglian Water over water quality monitoring following installation of new outfall.

Identify the importance of the site in the shoreline management plan.

Encourage the removal of the existing sea defences and object to any future sea defence protection works which might damage the interest.

Work with Norfolk Coast Project and others to develop a more sustainable use of the educational resource.

#### **15.1.8 Key partners**

Anglian Water

Environment Agency

North Norfolk District Council Technical Services Department

Marine Biologists e.g. both locally and from the Natural History Museum

Norfolk Coast Project

## 15.2 Cliffs

### 15.2.1 Distribution and status

In the north-west there is a small length of distinctively coloured cliffs at Hunstanton which are composed of outcrops of lower Cretaceous sandstone (carstone) overlain with red chalk and the lower chalk.

In the north-east, soft cliffs extend from Weybourne eastwards to Happisburgh in an almost unbroken line except at Walcott. In the west between Weybourne and Sheringham they are largely vertical and are composed of glacial tills overlying Pleistocene crags which in turn overlie chalk. At Weybourne the chalk is exposed near the base of the cliffs, but by about Sheringham (Robin's Friend) it is at beach level and extends on to the foreshore as a chalk platform. Between Sheringham and Cromer there are further foreshore exposures, especially at West Runton where the presence of large paramoudra flints in the chalk provide the only chalk rocky shore between Flamborough Head and the north Kent coast. Further west, the chalk is overlain by Pleistocene crags but with the Cromerian interglacial deposits and glacial till. East of Cromer the cliffs become higher and more unstable. They are composed of glacial till which varies from sand to chalk marl and this is often contorted into sand basins and ridges. The Overstrand cliffs are generally well vegetated but are subject to major landslides. Flushes caused by springs issuing from the cliffs are a feature. The six km stretch between Overstrand and Mundesley is the highest, reaching 60 metres in places. It is composed largely of glacial tills but with some large rafts of chalk and pre-glacial pleistocene deposits. They are very unstable and subject to frequent landslides through water draining through the cliffs and erosion by the sea from the toe of the cliffs. Beyond Mundesley the cliffs are generally more stable, sandier and with less seepage. The situation at Happisburgh is similar though the cliffs are lower and more prone to erosion. Just south-east of Happisburgh the cliffs merge with the dune coast fronting Broadland.

The total length of cliffs is 29km (PWL estimate) c.f. 36km (Dargie, 1995). Maritime cliff grassland is estimated as occupying 24 hectares, just over 1% of the total resource in England.(Dargie 1995). However, this figure is probably an underestimate, as totals for the most significant sites (Beeston Cliffs, Overstrand, Sidestrand and Trimingham and Mundesley) are estimated at 129 hectares using SSSI data.

### 15.2.2 Characteristic and special features

#### Geology

At Hunstanton there is a remarkable section of mid-Cretaceous Carstone, Red Chalk and Lower Chalk which is nationally important for stratigraphy.

Further east the cliffs between Weybourne and Happisburgh are of national and in many instances international importance for their geological interest. The cliffs between Cromer and Mundesley are also nationally important for their geomorphological interest demonstrating landslides and other aspects of mass movement.

At Weybourne Cliffs glacial deposits overlie Pleistocene marine deposits and Cretaceous Upper Chalk; Beeston Cliffs (Pre-glacial Pleistocene deposits overlying Cretaceous Upper Chalk); West Runton Cliffs (classic Pleistocene interglacial and glacial deposits with very

important fossil mammal, reptile, amphibian, freshwater shell, pollen and plant remains); East Runton Cliffs (Pre-glacial Pleistocene deposits with an associated vertebrate fauna and glacial deposits); Overstrand Cliffs (glacial deposits with glacial rafts of upper chalk); Sidestrand and Trimingham Cliffs (Pleistocene deposits including pre-glacial marine and estuarine and glacial, with fossil vertebrates, demonstrating tectonics, mass movement and with rafts of Maastrichtian Chalk - the youngest Upper Chalk in the United Kingdom); Mundesley Cliffs (thick sequence of Pleistocene glacial and some pre-glacial deposits) and Happisburgh (Pleistocene glacial and pre-glacial deposits). (See also Table 2).

### **Fauna and flora**

The cliffs between Cromer and Mundesley are also notable for their biological interest as their mobile nature is important in that it creates an extensive mosaic of habitats ranging from uncolonised mud flows through to relatively mature unimproved grassland and scrub communities. The grasslands have some affinities with sand dune communities. A particular feature of these cliffs are the colourful displays of the kidney vetch in the grassland. Associated with the seepages are perched reed beds and bryophyte and rush dominated flushes. The very attractive red form of the early marsh orchid is a feature of these situations.

The Red Data Book species, purple broomrape probably has its main centre of distribution in the British Isles in cliff-top grassland on this coast notably on Beeston Cliffs, Sidestrand and Mundesley. Other nationally scarce species include sand catchfly at Beeston and bulbous meadow-grass at Overstrand.

The cliffs are a haven for many common grassland butterflies and moths with large populations of Common Blue and Five-spot Burnet moth. The flushes are of particular importance for breeding Diptera and a number of rare or notable species of soldier-flies have been recorded including *Oxycera morrissii*, *Vanoyia tenuicornis* and *Stratiomys potamida*. Other Diptera recorded include *Hydrophorus viridis* (RDB). Rare beetles are also associated with these cliff habitats including the following RDB species: the rove beetle *Bledius filipes*, the ground beetle *Dyschirius obscurus*, and *Leiodes lunicollis*.

Fulmars nest at Hunstanton (123 pairs 1994) and on some of the high sandy cliffs at Sidestrand, Overstrand and elsewhere. The sandy cliffs also support small nesting colonies of sand martins.

### **15.2.3 Site protection**

Most of these cliffs have been notified as SSSIs for their geological importance. These include Hunstanton Cliffs, Weybourne Cliffs, Beeston Hill, West Runton, East Runton, Overstrand, Sidestrand and Trimingham, Mundesley and Happisburgh. In addition much of Overstrand Cliffs has also been notified just for its biological interest, whilst there is additional biological interest on many other stretches but notably Beeston Cliffs and the Overstrand to Mundesley stretch.

## **15.2.4 Threats and issues**

### **The erosion of the cliffs and their management**

At present much of this coast is protected by timber revetments with seawalls on short stretches. In a few places additional protection has included cliff drainage and stabilisation schemes. Such coastal protection works lead to a degradation or loss of exposure in the cliff section. They also lead to the loss of a major sediment source for areas down drift in the sediment cell. They thus interfere in a number of ways with the natural coastal processes.

#### **Stablising the cliffs**

Coastal protection works stabilise the cliffs and therefore reduce habitat diversity significantly.

#### **Dumping and spreading materials**

Tipping material over the cliffs so as to prevent access to their base has been a problem on occasions.

#### **Construction of sewerage outfalls**

The outfall at West Runton was tunneled at an angle and then into the foreshore reducing the need for sea defence works to protect the pipeline.

#### **Construction of pipelines from off-shore to Bacton Gas Terminal**

Bacton is the destination of a series of pipelines from the North Sea gas fields and is also now to be linked via the interconnector with Belgium. There is an issue in ensuring that there is no damage to the geological interest at Mundesley.

#### **Collecting of fossils**

Collecting fossils, particularly from the Cromer Forest Bed, is not a serious problem as long as the finds are well documented and brought to the attention of professional geologists. There is an issue of education and a need to promote English Nature's position statement on fossil collecting.

## **15.2.5 Nature conservation objectives**

The overall objective is to allow the natural processes of erosion, sediment transport and cliff mobility to operate. This would enable the following to be achieved:

1. To maintain or restore good exposures of the geological deposits.
2. To allow the movement of sediment along the coast to take place without interference.
3. To allow those cliffs which are unstable to continue to remain mobile.
4. Retain habitat and species diversity.

To attain these objectives it would be necessary to:

1. Resist the addition of new coastal defences, particularly in relation to SSSIs.
2. Resist attempts to stabilise cliffs.

3. Encourage the removal of existing defences.

In addition there would be benefits for the biological interest in encouraging a conversion from arable to grassland on the clifftops.

### 15.2.6 Mechanisms

Seeking to influence the Shore Line Management Plans 3a for Hunstanton to Sheringham and 3b for the rest.

Consider and comment on individual schemes as they arise.

Make representations through the planning process to ensure that no developments take place which require new defences.

Comment on planning applications to ensure that work involving pipeline construction and related schemes do not damage the geological interest.

Encourage the take up of coastal habitat option in Stewardship in relation to the conversion of cliff top arable to grassland.

Liase with others to encourage a better understanding of the geological value of this coast.

### 15.2.7 Key partners

North Norfolk District Council, especially the Planning and Technical Services Departments  
MAFF

University Academics and Museum staff

Norfolk Geological Society

## 16. Key species

The following species have been selected as they fullfill one of the following criteria:

1. They are RDB species
2. They are very rare in East Anglia
3. They are uncommon species characteristic of uncommon habitats
4. They are species included in the national Biodiversity plan and/or the local biodiversity long list, these are marked with an \*

The lists are of necessity subjective to some extent and should be reviewed at intervals.

**Table 9 - Key coastal species**

b= breeding w= wintering

Common name	Latin name	Reasons for selection	Habitat
Eel grass	<i>Zostera</i> species	Biodiversity target species	sand and mud flats
Purple broomrape	<i>Orobanche purpurea</i>	RDB most UK population is centred in North Norfolk	cliff-top grassland
Rock sea-lavender	<i>Limonium binervosum</i> ssp. <i>anglicum</i>	Endemic	saltmarsh

Common name	Latin name	Reasons for selection	Habitat
*Matted sea-lavender	<i>Limonium bellidifolium</i>	RDB; almost confined to the North Norfolk Coast in UK	saltmarsh-shingle interface
Sea heath	<i>Frankenia laevis</i>	Scarce; restricted to SE England generally rare	saltmarsh-shingle interface
*Jersey cudweed	<i>Gnaphalium luteoalbum</i>	RDB; only UK locality	dune slacks
*Crested fern	<i>Dryopteris cristata</i>	RDB; largely confined to East Anglia in the UK	dune slacks
Sea kale	<i>Crambe maritima</i>	Rare on the east coast north of Suffolk	shingle
Sea pea	<i>Lathyrus japonicus</i>	Scarce	shingle
Grey hair-grass	<i>Corynephorus canescens</i>	Rare nationally, but frequent at several sites in North Norfolk	sand dunes
Rush-leaved fescue	<i>Festuca arenaria</i>	Scarce nationally	sand dunes
Sharp rush	<i>Juncus acutus</i>	Scarce nationally	grazing marsh and dune slack
Curved hard-grass	<i>Parapholis incurva</i>	Scarce nationally	sand-shingle interface
Bulbous meadow grass	<i>Poa bulbosa</i>	Scarce nationally	sand dunes and shingle
Spiral tasselweed	<i>Ruppia cirrhosa</i>	Scarce nationally	brackish dykes and lagoons
Dune fescue	<i>Vulpia fasciculata</i>	Scarce nationally	sand dunes
Bearded fescue	<i>Vulpia ciliata</i> sub sp. <i>ambigua</i>	Scarce nationally	sand dunes
Sea holly	<i>Eryngium maritimum</i>	Attractive, susceptible to trampling and collection	sand dunes and shingle
Shrubby sea-blite	<i>Suaeda vera</i>	Scarce nationally, but abundant in north Norfolk	shingle/saltmarsh interface, sea walls
Lichen	<i>Usnea articulata</i>	Only eastern site, very sensitive to air pollution	sand dunes
*Lichen	<i>Cliostomum corrugatum</i>	RDB; only two modern UK sites	wooden posts in saltmarsh
Earth star	<i>Geastrum minimum</i>	Scarce	sand dunes
*Common seal	<i>Phoca vitulina</i>	Priority species in Habitats Directive	sandflats / marine
*Bittern	<i>Botaurus stellaris</i>	RDB; b. 26% of UK population	breeding: reedbeds
*Pink-footed goose	<i>Anser brachyrhynchus</i>	RDB; w. 18% of UK and 7% of world population	grazing marsh and arable

<b>Common name</b>	<b>Latin name</b>	<b>Reasons for selection</b>	<b>Habitat</b>
European white-fronted goose	<i>Anser albifrons</i>	RDB; w.6% of UK population	grazing marsh
*Dark-bellied brent goose	<i>Branta bernicla bernicla</i>	RDB; w.15% of UK population and 6% of world population	grazing marsh intertidal, salt marsh
*Shelduck	<i>Tadorna tadorna</i>	RDB; b. w. 1% of UK population	b:sand dunes, heaths, w: intertidal flats etc
*Wigeon	<i>Anas penelope</i>	RDB; w. 6.5% of UK population	grazing marsh
*Teal	<i>Anas crecca</i>	RDB; w. 3% of UK population	grazing marsh, coastal lagoons
*Pintail	<i>Anas acuta</i>	RDB; w. 6% of UK population	grazing marsh, coastal lagoons
*Garganey	<i>Anas querquedula</i>	RDB; b. a few breeding pairs	grazing marsh, coastal lagoons
*Shoveler	<i>Anas clypeata</i>	RDB; b.>1% of UK population w.1% of UK population,	grazing marsh, coastal lagoons
*Pochard	<i>Aythya ferina</i>	RDB; b. 2% of UK population	grazing marsh
Common scoter	<i>Melanitta nigra</i>	RDB; w. 10% of UK population	marine
Velvet scoter	<i>Melanitta fusca</i>	RDB; w. c.1% of UK population	marine
*Marsh Harrier	<i>Circus aeruginosus</i>	RDB; b. 33% of UK population	reedbed, arable
*Oystercatcher	<i>Haematopus ostralegus</i>	RDB; b. >1% of UK population, w. >1% of UK population	b: shingle, grazing marsh w: intertidal
*Avocet	<i>Avosetta recurvirostra</i>	RDB; b.31% of UK population	coastal lagoons
*Ringed plover	<i>Charadrius hiaticula</i>	RDB; b. 4% of UK population w. 1% of UK population	sand & shingle
Golden plover	<i>Pluvialis apricaria</i>	RDB; w. 1% of UK population	grazing marsh
Grey plover	<i>Pluvialis squatarola</i>	RDB; w. 5% of UK population	intertidal
*Knot	<i>Calidris canutus</i>	RDB; w. 3% of UK population	intertidal
*Sanderling	<i>Calidris alpina</i>	RDB; w.3% of UK population	intertidal

Common name	Latin name	Reasons for selection	Habitat
*Dunlin	<i>Calidris alba</i>	RDB; w. 1% of UK population	intertidal
*Bar-tailed godwit	<i>Limosa lapponica</i>	RDB; w. 2% of UK population	intertidal
Curlew	<i>Numenius arquatus</i>	RDB; w. 1% of UK population	intertidal
*Redshank	<i>Tringa totanus</i>	RDB; b.>1% of UK population, w. 1% of UK population	saltmarsh & grazing marsh, also intertidal
Turnstone	<i>Arenaria interpres</i>	RDB; w. <1% of UK population	intertidal
*Sandwich tern	<i>Sterna sandvicensis</i>	RDB; b. 22% of UK population	sand & shingle
*Little tern	<i>Sterna albifrons</i>	RDB; b. 10% of UK population	sand & shingle
Shore lark	<i>Eremophila alpestris</i>	RDB; w.10% of UK population	sand & shingle
*Bearded tit	<i>Panurus biarmicus</i>	RDB; b. c.11% of UK population	reedbeds
*Twite	<i>Acanthis flavirostris</i>	RDB; w. c.1% of UK population	saltmarsh
Lapland bunting	<i>Calcarius lapponicus</i>	RDB; w. 10%? of UK population	saltmarsh
Snow bunting	<i>Plectrophenax nivalis</i>	RDB; w. 2%? of UK population	shingle & foreshore
Lapwing	<i>Vanellus vanellus</i>	candidate RDB; b. >1% of UK population	grazing marshes
Snipe	<i>Gallinago gallinago</i>	candidate RDB; b. >1% of UK population	grazing marshes
Ruff	<i>Philomachus pugnax</i>	nationally significant wintering population	grazing marshes
Natterjack toad	<i>Bufo calamita</i>	RDB; two colonies	dunes
Pipunculid fly	<i>Tomosvaryella minima</i>	RDB; mostly recorded from E. Anglia	dry sandy areas including dunes
Flesh fly	<i>Sarcophaga exuberans</i>	RDB; only one confirmed locality in UK	coastal
House fly	<i>Neolimnophora maritima</i>	RDB; only two UK sites, one in N. Norfolk	coastal
House fly	<i>Neolimnophora virgo</i>	RDB; recorded from Dorset, Essex, Norfolk & Sutherland	?
Fungus gnat	<i>Anatella dampfi</i>	RDB	? fungi
Fungus gnat	<i>Trichonta icenica</i>	RDB	?

Common name	Latin name	Reasons for selection	Habitat
Fungus gnat	<i>Mycetophila confusa</i>	RDB	Wet woodland
*Crane fly	<i>Limonia bezzii</i>	RDB	coastal lagoons & intertidal gravel
Silver fly	<i>Parochthiphila coronata</i>	RDB; only recorded from Essex & Norfolk	dunes
Dolichopid Fly	<i>Hydrophorus viridis</i>	RDB	
Crane fly	<i>Erioptera bivittata</i>	RDB; known from Kent, Essex, Suffolk & Norfolk	grazing marshes with some saline influence
Snail-killing fly	<i>Salticella fasciata</i>	RDB; southern species	foredunes
Grass fly	<i>Conioscinella zetterstedti</i>	RDB	? sand dunes
Horse fly	<i>Atylotus latistriatus</i>	RDB; confined to southern England	saltmarsh
Micro-moth	<i>Platytes alpinella</i>	RDB; south & east coasts	sandy coasts
Moth	<i>Scythris inspersella</i>	RDB	? larvae feed on <i>Epilobium</i>
*Scarce pug moth	<i>Eupithecia extensaria</i>	RDB; confined to N.Norfolk, the Wash & Spurn point	saltmarshes
*Micro-moth	<i>Pima boisduvaliella</i>	RDB; known from Kent to Norfolk also Lancs.	sand dunes & shingle
*Scarce vapourer moth	<i>Orgyia recens</i>	RDB; now only recorded from Norfolk, Lincs & Yorkshire	? dunes in Norfolk
Flame wainscot moth	<i>Senta flammea</i>	RDB; Cambs, Norfolk & Suffolk, also recent records from southern England	Inland & coastal reedbeds
Beetle	<i>Corticarina truncatella</i>	RDB	feeds on decaying matter on sand dunes & saltmarsh
*Rove beetle	<i>Bledius filipes</i>	RDB	soft cliffs
Beetle	<i>Dyschirius obscurus</i>	RDB	soft cliffs
* Dune tiger beetle	<i>Cicindela maritima</i>	Notable	sandflats & dunes
Beetle	<i>Hypocaccus metallicus</i>	RDB; restricted to S.E. England	sand dunes
*Malachite beetle	<i>Malachius barnevillei</i>	RDB confined to the North Norfolk coast	sand dunes
Ground beetle	<i>Pogonus luridipennis</i>	RDB	saltmarshes
Rove beetle	<i>Atheta mortuorum</i>	RDB	?

Common name	Latin name	Reasons for selection	Habitat
Ground beetle	<i>Tachys scutellaris</i>	RDB; south & east coast north to Norfolk	In marshes and mud dependent on saline soils
Beetle	<i>Biblopectus minutissimus</i>	RDB	In shingle and under stones
Mud wasp	<i>Podalonia affinis</i>	RDB; England north to Yorks & Lancs	Sandy soil, dunes in Norfolk
Bee-wolf	<i>Philanthus triangulum</i>	RDB	Sand dunes and other coastal habitats.
Leaf hopper	<i>Doratura impudica</i>	RDB; only recorded so far from N. Norfolk coast	sand dunes
Ground bug	<i>Ortholomus punctipennis</i>	RDB only known from Norfolk, Suffolk & Dorset	sand dunes (in N.Norfolk)
Spider	<i>Clubiona similis</i>	RDB; confined to the coasts of Norfolk to Kent	sand dunes
*Wolf spider	<i>Arctosa fulvolineata</i>	RDB; recorded from the coasts from Norfolk to Hampshire	upper saltmarsh
*Jumping spider	<i>Euophrys browningi</i>	RDB; recorded from Norfolk, Suffolk, Essex & Kent, possibly endemic to the UK	tide litter & shingle banks
*Lagoon sand hopper	<i>Gammarus insensibilis</i>	RDB; a schedule 5 species, ? Extinct in Norfolk	saline lagoons
*Ramshorn snail	<i>Anisus vorticulus</i>	RDB	freshwater ditches
*Starlet sea anemone	<i>Nematostella vectensis</i>	RDB; only a few UK localities	saline lagoons

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