

The Wash

Natural Area Profile

November 1997

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1. Introduction

1.1 What are Natural Areas?

A Natural Area is not a designation. It is an area identified by a unique combination of physical attributes, wildlife, land use and culture. Geology, landforms and other aspects of the physical environment define the boundaries of Natural Areas. These features give the Area ‘a sense of place’ and distinctive natural character which English Nature seeks to sustain, enhance and restore.

Previously, English Nature used administrative boundaries as the basic units for objective setting. From a nature conservation viewpoint, such a division of the country had major drawbacks as wildlife does not adhere to such boundaries. We now aim to take an integrated approach to the whole environment as opposed to considering sites and habitats in isolation. Natural Areas provide the framework for this approach by giving an ecological basis for characterising features, species and habitats.

Twenty-four Maritime Natural Areas have been defined. They extend from the inland limit of all coastal and estuarine habitats to approximately 12 miles offshore. The lateral extent of each of these Areas is closely related to the coastal process cells that have been defined for the Ministry of Agriculture, Fisheries and Food to aid the preparation of Shoreline Management Plans. Coastal process cells are areas within which coarse sediment (sand and gravel) movement is contained. The coastal processes within each cell generally affect other areas within that cell but have less effect outside the area. However, it is important to realise that sediment cells are leaky. There are important sediment pathways both into and out of The Wash, particularly associated with the transport of fine muddy particles. The Wash Natural Area covers the area between Skegness and Old Hunstanton. However, so as not to neglect the Hunstanton to Holme dunes, which mirror the Gibraltar Point dunes on the north of the embayment, some figures include this system. This has inevitably led to an overlap with the North Norfolk Profile which should be consulted for more details on that area. On the landward boundary there is also some overlap with The Fens Natural Area so as to avoid any hard distinction between marine and terrestrial zone. Such overlap are typical of the maritime / coastal zone where natural processes operate over wide areas and ecological units are not easily divided.

1.2 The purpose of this document

The Natural Area profile summarises key species, habitats and physical features, and identifies the main issues affecting them. It aims to inspire strategic thinking and facilitate integrated coastal zone management. Natural Areas promote the conservation of wildlife and geological features in the wider landscape and seas, as well as special sites such as nature reserves and Sites of Special Scientific Interest.

The Profiles will be a source of information and provide guidance for local authority development plans, shoreline management plans, rural development plans, tourism strategies, etc. A number of nature conservation strategies, plans and other initiatives already exist at both national and local levels. The relationship between these various documents is shown diagrammatically in the figure below.

Although the present document has been prepared by English Nature, we aim to reach agreement with other organisations with experience of, or interests in, the area. The profile is written for everyone with an interest in nature conservation in and around The Wash. We hope it will serve to pull conservation bodies, local people and commercial and recreational users of The Wash closer together, working towards the achievement of shared objectives that address the top priorities for conservation in the Area. This document is offered as the first stage towards this goal and comments are invited.

1.3 Biodiversity Planning - The Context for Natural Areas

In June 1992 the Prime Minister of the United Kingdom and over 150 other Heads of Government signed the Convention on Biological Diversity at Rio de Janeiro. They did so to express a shared belief that action must be taken to halt the worldwide loss of animal and plant species and genetic resources. At the same time they agreed to draw up national plans and programmes and to share resources to help implement them. This resulted in the first UK Biodiversity Action Plan published in 1994. English Nature, as the Government's statutory advisor on nature conservation in England, has a role to play within the Biodiversity Action Plan by providing guidance and stimulating action. The development of the Natural Areas concept is an important part of that role.

Whilst Natural Area Profiles will help establish overall nature conservation objectives, they have no site specific targets and no prescriptive statements suggesting who is responsible for what. More definite targets and timetables are the subject of local Biodiversity Action Plans which are being drawn up at appropriate levels in broad partnerships.

The United Kingdom's Biodiversity Action Plan sets national objectives and targets for habitats and species, some of these will need to be delivered in The Wash area. Local Biodiversity Action Plans based on The Wash and adjoining areas will establish targets, timetables and mechanisms for the delivery of national and local biodiversity objectives. Natural Areas will provide the framework for much of English Nature's work and form the context for these local Biodiversity Action Plans.

1.4 The guiding principles of this document

Environmental sustainability. This means maintaining the environment's natural qualities, characteristics and capacity to fulfil its full range of functions, including the maintenance of biodiversity. Environmental sustainability can only be achieved through a sound scientific knowledge of the natural processes and working with, rather than against, nature. Where there is inadequate understanding of the impacts of an activity that is likely to have a significant adverse impact on nature conservation, it will be necessary to employ the precautionary principle.

Conserving biodiversity. This means protecting the whole range and variation in living organisms and habitats. Biodiversity is not just about rare and threatened species and habitats - all life, including ourselves, exists in an environmental balance which can be upset by the loss of species or habitats. At a global scale, this balance sustains life on earth and our own well-being.

The functionality of ecosystems. This means that we seek to maintain or restore the natural dynamics of the ecosystem and so enhance its ability to carry on its valuable natural

functions. Such an approach will improve the resilience of the ecosystem and therefore increase its ability to respond to long-term environmental changes, such as rising sea-level.

2. Overview

The Wash is the largest estuarine system in the UK. It is a large, mostly shallow, marine embayment where the Rivers Ouse, Nene, Welland and Witham drain in to the North Sea. Its macro-tidal range of 6.5 metres is the highest on the North Sea coast of Britain. Despite its large freshwater input, marine processes dominate its physical and biological character. The importance of The Wash in relation to the wider coastal and marine environment of the region cannot be overstated.

The ecology of The Wash is of outstanding importance for wildlife. It is also a valuable natural resource that people have long exploited. It has the second largest area of intertidal mud and sand flats in Britain and supports the largest numbers of migrating waterfowl of any site in the UK. It has the largest common seal colony in England and is an important flat fish nursery ground. For the birds and marine life which seasonally depend on the shelter and productivity of intertidal flats, The Wash is a vital part of a much wider regional or even global ecosystem. Its rural hinterland, particularly to the north and west, has lost most of its wildlife interest and value due to drainage and intensive agriculture.

As well as its large-scale sub and intertidal habitats, The Wash has a number of valuable fringing habitats of conservation significance, such as saline lagoons, shingle structures and dune complexes. Table 1 lists the extent and importance of some major habitats and features of The Wash.

Table 1 Summary and evaluation of conservation features within or depending on The Wash Natural Area

Feature	Area (ha)	% of british resource	Significance
total estuarine area	66,654	9.98	national/international
estuarine subtidal area	36,884	10.61	national/international
intertidal mud & sand flats	22,542	9.15	national/international
saltmarshes	4,228	10.31	national/international
sand dunes*	414	0.82	national
coastal lagoons	32	2.54	national
vegetated shingle structures	24	0.46	local
geological exposures			national
geomorphology			national
birds			national/international
marine life			national/international

* including Gibraltar Point and Hunstanton to Holme dunes

The Wash Natural Area is of outstanding importance to the overall ecology and sustainability of the coastal wildlife of Britain. The physical processes that have created and sustained the embayment and the future of environmental change, particularly rising sea-level, are the big themes of management thought. The sustainable, integrated management and use of living resources, such as fisheries and saltmarsh, are also important concerns for both wildlife and people. English Nature recognises the importance of The Wash in the lives of the local community. It is a place of quiet recreation, and has a long history of supporting local industry a number small scale traditional activities.

The importance of the Area, both ecologically and geomorphologically, has to be viewed on a large scale to appreciate its significance. The conservation of its valued functions and wildlife features also need to be planned at this large scale in order to ensure the long-term maintenance of its biodiversity. More detailed habitat accounts follow. However, any description of features as distinct units must be tempered with the caveat that conservation in such evolving coastal areas has as much to do with maintaining the important processes and interactions as preserving particular features.

3. Description

3.1 The Physical Environment

3.1.1 Geology & geomorphology

The solid Jurassic geology of the western part of The Wash is completely obscured by more recent deposits. North and east of a line between Wainfleet St Mary and Snettisham, Cretaceous strata form the upper-most solid geology. However, this too is mostly buried, except at Hunstanton where the cliffs expose an extraordinary sequence of Lower Greensand overlain by Red and then White Chalk.

During the Anglian glacial period (about 300,000 to 250,000 years ago) the entire area was overwhelmed by a vast ice-sheet hundreds of metres in depth. When the ice eventually melted it left the covering of glacial till which remains today. The exact extent of the ice-sheet that came with the last glaciation (The Devensian) is not known but it probably stopped somewhere across the middle of the Wash. The Devensian till cliffs, which outcrops on the eastern side of The Wash south of Hunstanton, is the most southerly known British deposit from the last glacial period that ended about 15,000 years ago.

However, across most of the Wash, even the most recent glacial deposits are covered with even more recent post-glacial fluvial and marine sediments. The Wash, as we know it today, is an immature shallow marine basin still in the making. The mud, sand and gravel that lays on the surface of the sea bed, intertidal areas and the enclosed hinterland have been deposited there in the past 6,000 years or so by the action of the sea or rivers. Intertidal peat exposures at Hunstanton are the remnants of a post-glacial freshwater dominated landscape.

The deepest part of The Wash is a central channel of over 50 metres at the mouth. However, this channel, known as The Well, rises steeply to a level of about -20 metres. From this trench the seabed slopes far more gently up to the shore, with the majority of The Wash being 10 metres or less in depth.

The bottom deposits of The Wash range from gravel, through sand to finer muds. The central main channel at the mouth is characterised by a high proportion of gravel. Moving closer to the shore, sand, mixed with varying amounts of gravel or mud, dominates large shallow subtidal areas. Higher up the foreshore, particularly where the Great Ouse and Welland drain into the Wash, fine muddy sediments are typical.

Although the waves that enter The Wash from the North Sea can have local effects, particularly on the Norfolk shoreline, the enclosed shallow nature and orientation of the embayment reduce their power and impacts considerably. The main driving force is the tide which rises and falls twice a day. The average spring tide range is 6.5 meters between high and low water levels at the mouth of The Wash - the highest on the east coast of Britain. Tidal currents, associated with these tides, move sediments into, out of and within the Wash. These currents and the availability of sediment in the region's coastal zone are responsible for the shape and overall nature of the embayment.

Since the last ice-age The Wash has been a sediment sink - that is to say that there has been a net accumulation of mud, sand and gravel within it. A small proportion of this sediment has come from the Fenland rivers. However, the vast majority is of marine origin. Approximately 6.8 million tons of sediment enters The Wash each year from the sea, mostly from the north. Although it is very difficult to demonstrate the origin of this sediment, the indications point to the eroding nearshore sea bed off central Lincolnshire and the Holderness coast of East Yorkshire as the most significant sources. Whilst much sediment settles within the Wash, some moves seaward again on to the North Norfolk coast.

3.1.2 Sea-level change and shoreline adjustment

After a very rapid rise in sea-level following the end of the last ice-age, there has been a fluctuating, but steadily increasing, trend of sea-level rise in the area; averaging about 1.66 mm per year for the past 6,000 years. Part of this change has been due to the land sinking. At present it is estimated that the land is sinking at about 1 mm per year. In addition to this, actual sea-level has been estimated to have risen between 1 and 1.5 mm per year, giving an overall relative sea-level rise of 2 to 2.5 mm per year. However, the rate of sea-level rise is expected to increase substantially due to global climate change and the Government has asked flood defence authorities to plan for an average sea-level rise of 6 mm per year to 2030. It has been estimated that between the years 2030 and 2100 the average annual rate of sea-level rise will increase to 8.5 mm per year. It is therefore likely that sea-level will rise by about 75 cm in the coming century.

For most of the past 6,500 years The Wash has been dominated by net accretion. Hence the shoreline has tended to advance as sedimentation exceeded sea-level rise. However, for the last 150 years the position of the low water mark has remained relatively stable. At the same time the high water mark has been pushed seaward by land claim resulting in a substantial loss of intertidal area. Around most of The Wash today the shoreline is either stable or retreating; only on the north-western shore between Wrangle and Gibraltar Point is there any indication of a slight advance.

3.1.3 Current trends, human impacts and conservation

Whilst sea-levels fluctuate naturally, there is now very little doubt that the present rate of global sea-level rise is largely due to the increase in atmospheric carbon dioxide caused by

human activity. The impacts associated with this are predicted to increase substantially in the near future. History reveals that The Wash is able to adjust to gradual rises in sea-level. However, research has shown that erosion has occurred when sea-level rise increases above 5 mm/year over a fifty year period. The best predications available suggest that this critical threshold will be breached in the near future.

The ability of intertidal areas to keep pace with rising sea-level also depends on the amount of sediment in coastal waters. Any reduction in the overall supply of sediment to the coastal zone will reduce the likelihood of intertidal areas being able to maintain themselves. For example, schemes that stopped the supply of sediment from the Holderness coast could have far reaching impacts on the sustainability of the Wash. Furthermore, it has been estimated that the predicted rates of sea-level rise and climate change may lead to an increase in storminess in the North Sea and higher wave energy entering the Wash. This could interrupt sediment deposition, particularly fine muddy particles, leading to erosion in the intertidal zone.

More land has been taken from The Wash than any other British estuary. The large areas of marshland and swamp which formed its natural hinterland have been progressively embanked and drained since Roman times. Forty-seven thousand hectares have been claimed since Saxon times, 32,000 ha since the 17th Century and about 3,000 hectares in the past 100 years. Although this trend has almost stopped since the late 1970s, indications that much of the shoreline is now retreating suggest that we may have taken more land from The Wash than it can give without undermining its ability to sustain itself.

The future of all of The Wash's tidal, subtidal and fringing coastal habitats depends on the maintenance of the physical processes which sustain them. These habitats are, by nature, dynamic features which adjust to the prevailing environmental conditions if they are allowed to do so. Saltmarshes, for example, naturally 'migrate' landward in periods of sea-level rise where sediment deposition is limited. All around The Wash, this process is prevented by defence embankments. Therefore, unless there is a planned relaxation of the artificially fixed high tide line, we must expect a loss of intertidal area in a process of 'coastal squeeze' as the rate at which sea-level rises continues to increase. The loss of intertidal habitats would not only have important adverse impacts on the conservation value of The Wash. Human interests would also be threatened. Intertidal areas are valuable for fisheries and they provide a very important part of the overall coastal defences that protect the hinterland from marine flooding. They dissipate, and substantially reduce, the wave and tidal energy reaching the shoreline hence improving the resilience of defences. Accreting intertidal areas also lock up pollutants and buffer the wider environment against their potentially harmful effects. Conversely, intertidal erosion may lead to buried contaminants finding their way back into coastal waters.

4. Habitats

4.1 Intertidal flats and marine habitats

Fifty-five percent of The Wash is permanently covered with sea water, although many areas are very shallow. Benthic (sea bed) habitats are defined principally by sediment type and wave climate. The distribution of the sediments (muds, sands and gravels) is summarised in the previous pages. Descriptions of biological communities in such naturally dynamic

environments are complicated by the fact that many species are found in a number of different habitats. What is more, as the sediment moves about so does the associated wildlife. Table 2 (below) lists eight types of community recorded in The Wash.

Areas of clean mobile sand which are present at the mouth of The Wash have a fauna characterised by the catworm *Nephtys* spp., *Spiophanes bombyx* and *Spio filicornis*. Muddy sands host a variable range of organisms including polychaete worms and arthropods. In the south and east of The Wash the brittlestars, *Ophiura albida* and *Ophiura ophiura* are widespread and, in places, very abundant. The tube worm *Sabellaria spinulosa* is widely distributed throughout The Wash and may have an important influence on other animals. This worm builds reef-like structures from coarse sands, creating niches for other species, which in turn provides an important food source for commercial species such as shrimps and flatfish. Some surveys have indicated a high level of biological diversity associated with sites where *S. spinulosa* is found, mostly to the north and north-east of the embayment. Brown shrimp and pink prawns are present in exploitable quantities and the habitat created by *Sabellaria spinulosa* is believed to be important for these animals.

Table 2 Sub and intertidal communities of The Wash

<p><i>Sabellaria spinulosa</i> / <i>Lanice conchilega</i> community - widely distributed but most abundant at the mouth on mobile sand in exposed locations where there are cobbles.</p> <p>Brittlestar <i>Ophiura ophiura</i> & <i>Ophiura albida</i> community on fine sand and silt, particularly throughout the southern part of The Wash, with densities up to 1,500/m². Also with the brittlestar <i>Ophiura texturata</i>, the starfishes <i>Asterias rubens</i> and <i>Crossaster papposus</i>, the urchin <i>Psammechinus miliaris</i>, the anemone <i>Sagartia troglodytes</i>, the shrimps <i>Crangon crangon</i> and <i>Pandalus montagui</i> and the sandmason worm <i>Lanice conchilega</i>.</p> <p>Fanworm <i>Sabella pavanina</i> community on fine sand overlying sticky clay mud, recorded at just two sites, NE of the Boston Deep and NE of Sunk Sand. The <i>Sabella</i> tubes provided a substratum for thick growths of the hydroid <i>Obelia dichotoma</i> and the bryozoan <i>Flustra foliacea</i>. The anemone <i>Sagartia troglodytes</i> is abundant in the mud between the <i>Sabella</i> tubes.</p> <p>Muddy sand with shell gravel and pebbles characterised by hydroids, the bryozoan <i>Flustra foliacea</i> and the soft coral <i>Alcyonium digitatum</i>. Other prominent species included the anemone <i>Sagartia troglodytes</i>, the sandmason worm <i>Lanice conchilega</i> and the brittlestar <i>Ophiura albida</i>.</p> <p>Horse mussel beds dominated by <i>Modiolus modiolus</i>, on gravelly or muddy gravel substrates at the mouth of the embayment.</p> <p>Rippled sand with, occasional empty shells and little epifauna. A sublittoral habitat</p> <p>Common mussel beds, in intertidal and shallow subtidal areas, dominated by the common mussel <i>Mytilus edulis</i>. Sometime with large number of the starfish <i>Asterias rubens</i>.</p> <p>Soft mud community with lugworms <i>Arenicola marina</i> with a large range of polychaetes and bivalves such as <i>Cerastoderma edule</i> and <i>Macoma balthica</i>. A mostly intertidal habitat.</p>

The intertidal flats cover about 40% of the total area of The Wash. They consist mainly of fine sands supporting a community characterised by lugworms, with cockles, baltic tellin, mussels, the tiny mud-snail *Hydrobia ulva*, the crustacean *Corophium volutator* and polychaete worms.

The striped Greensand and Chalk cliffs at Hunstanton provide an impressive backdrop to the shore of muddy sand and isolated boulders. Here, the sandflats are characterised by lugworms, but exposures of Greensand rock at extreme low water supports hard substratum communities, with a range of sponges, hydroids, molluscs and sea urchins. Intertidal areas of

estuarine systems like The Wash are the great biological engines fuelling the ecology and biodiversity of the north-east Atlantic. Muddy areas especially are very productive. They contain dense populations of the marine worms and bivalves. These intertidal communities, particularly the highly productive invertebrates of mudflats, provide an important food source for internationally important populations of migratory waterfowl. The intertidal areas of The Wash are exceedingly important for migrating and wintering waterfowl (duck, geese and waders). They regularly have the largest peak bird numbers of any British estuarine system with 23 species of national or international importance (see Table 3 below). Although most intertidal flats are apparently devoid of vegetation, studies have shown that algae strongly influence patterns of sedimentation on mudflats. Microphytobenthic alga (photosynthesising microscopic vegetation) also plays an important role at the base of the food chain in intertidal habitats. The Wash formally had significant eel-grass (*Zostera*) beds, however, these total disappeared since the mid 1970s.

Table 3 Migrating & wintering waterfowl for which The Wash is nationally or international important

Internationally Important		Nationally Important	
bar-tailed godwit	oystercatcher	Bewick's swan	sanderling
curlew	Pink-footed goose	black-tailed godwit	wigeon
dark-bellied brent goose	pintail	common scoter	
dunlin	redshank	cormorant	
grey plover	shelduck	golden plover	
knot	turnstone	little grebe	
lapwing		red-breasted merganser	

A number of important populations of exploited marine species are found in The Wash. Cockles occur in the intertidal zones. Mussels are found from the mid shore to the subtidal zone, in areas exposed to water currents. Commercial stocks of both cockles and mussels have declined dramatically in recent years. The native oyster diminished in the area in the early part of the century and there are now no known exploitable stocks. Communities of both sub and intertidal invertebrates are eaten by fish and predatory invertebrates such as shrimps and crabs. The Wash acts as an important nursery area for a number of species of fish, including plaice, cod, dab, herring and sole. Twenty-two species of fish have been recorded in The Wash. This figure is low due to under-reporting of non-exploited species and members of some groups not being identified separately. Smelt, a species which as suffered a national decline, are still found in The Wash although not in exploitable quantities.

The intertidal flats of The Wash are an important breeding place for common seals. About 4/5 of the total English population of common seals breed within the embayment. In 1988, The Wash population was reduced by approximately 50% after an outbreak of the phocine distemper virus. Although the population has now regained to near pre-epidemic numbers, the recovery was significantly slower than populations on the east side of the North Sea.

4.1.1 Current trends, human impacts and conservation

The conservation of marine habitats, including intertidal areas, relies on the protection of water quality and the maintenance of the physical conditions upon which plants and animals depend. The deliberate or incidental removal, or significant depletion, of key species may change the overall ecology and community composition. Dredging, oil and gas exploration and production activities, over exploitation of living resources and pollution are potential

threats. Micro-pollutants, particularly hormone disrupting substances that affect reproduction, may pose a risk to marine wildlife; they are difficult to identify and threaten profound impacts on populations and overall ecology.

The ecological value of intertidal mud and sandflats may be threatened by a reduction in either their area or quality. Gross or chronic pollution could effect the biological functions of flats as a valuable food source for birds and marine animals. Rising sea level is expected to lead to a reduction in the area of flats. Increasing storminess may cause further erosion of intertidal areas. A reduction in sediment supply would similarly threaten the sustainability of intertidal habitats and the wildlife populations that depend upon them.

Stocks of both mussels and cockles have plummeted in recent years. The last significant spatfall of mussels in The Wash was in 1986. The reasons for this decline, which is a major concern for both nature conservation and fisheries, remain unclear. The decline of the local oystercatcher populations since the late 1980s may be coincidental with, or more directly related to, the reduction in shellfish stocks, but again the reasons are unclear. The reason for the relatively slow recovery of common seals compared to other European populations and the total loss of eel-grass beds are also unknown.

In most British estuaries *Sabellaria spinulosa* has declined dramatically in recent years, although it is still abundant and wide spread in the Wash. New methods of harvesting commercial species, such as suction dredging, may prove unsustainable and damaging to the overall ecology of the habitat. Some benthic communities may also be damaged by trawling.

Land claim has already led to an enormous loss of intertidal area continuing until recent times. Between 1971 and 1985 alone there was an estimated net reduction of 781 hectares of intertidal mud and sandflats as a direct result of land claim. It has been estimated that 10,000 ha of intertidal flats could be lost by 2012 as a result of rising sea levels in England. Assuming The Wash suffered a loss proportional to its size, this would mean a further reduction of about 1,275 ha in the next 15 years. The vast majority of the predicted losses are likely to be in the south and east of England where the effects of sea-level rise are amplified by sinking land. Therefore, this figure could be a very conservative estimate for The Wash. The long-term conservation of intertidal habitats and the wildlife which depends upon them relies on maintaining sediment supplies and allowing them space to adjust to changes such as rising sea level.

Dredging for marine aggregates is increasing in the region. Any dredging, for either navigation or aggregates, which effected the physical or biological processes upon which The Wash depends could have an adverse impact on The Wash. Such developments, therefore, need to be carefully assessed with a view to their acceptability.

Studies have shown the potential for intensive bait digging to have impacts on the wildlife use of mudflats. As with other forms of exploitation of the living resources, the protection of the natural environment will depend on ensuring that the rate of use is sustainable and compatible with other objectives. Monitoring and the environmental assessment of plans, projects and present management practices should help guide management decisions.

4.2 Saltmarsh

Saltmarsh forms between the mean high water level of spring and neap tides on sheltered coasts. They are intimately related to the intertidal flats which front them. The movement of sediment between (both to and from) saltmarshes and tidal flats is a normal part of the functioning of the two habitats. Tidal creeks are an integral part of the saltmarsh system. At Gibraltar Point saltmarsh occurs in a complex sequence of habitats between dune ridges.

Saltmarshes play an important role in the overall ecology of the coastal environment. Like intertidal flats, healthy saltmarshes provide important buffers against the impacts of human activity. For example, accreting areas absorb pollutants which may otherwise affect the coastal environment. Equally important, in low lying areas such as The Wash, these habitats help protect the land from flooding. They dissipate and much reduce the amount of tidal energy reaching the shoreline. Saltmarshes also provide an important refuge and food source for wildlife.

The Wash has over 4,000 hectares of saltmarsh (approximately 10% of the British resource) and more than any other estuarine system in the country. These marshes play an important role in the overall ecology of the Area. Like mudflats they are highly productive and play a significant part in sustaining populations of birds and marine animals.

Pioneer and lower marsh communities dominate The Wash saltmarshes accounting for 78% of the total marsh area, of which 13% is pioneer and 65% low-mid marsh communities. The most common pioneer marsh is the annual *Salicornia* (glasswort) community. *Puccinellia* (common saltmarsh grass) dominated communities are widespread and abundant in the low-mid marsh zone; with the more structurally diverse *Halimione* (sea purslane) element of the typical flora reduced in many areas by grazing. Whilst light grazing may have a diversifying effect on the sea purslane dominated community, high grazing pressure reduces the conservation interest. Table 4 details the different saltmarsh communities recorded on The Wash in 1988 and Figure 1 illustrates the proportions of different zones.

By comparison with England as a whole, as a result of massive land claim, The Wash saltmarshes contain a very low high proportion of most diverse mid to upper marsh types. This is a common characteristic of marshes in south-eastern England. However, The Wash marshes differ from the general south-eastern marsh profile. They have a relatively small coverage of *Spartina* in the pioneer zone; 2.33% compared to an average of 9% for the south-east and 16% for the whole country. A relatively small proportion of mid to upper marsh communities is a common trait of most south-eastern marshes. However, The Wash marshes have less than the regional average; 6.28% compared with 20% for the South-east and 32% for the whole of England.

Saltmarsh habitats are important for a number of marine and terrestrial wildlife species, some of which are rare or scarce. For example the nationally scarce saltmarsh plants shrubby sea-blight, small cord-grass and sea-heath are at their northern limit at Gibraltar Point. Many specialised invertebrates, such as spiders, moths, beetles and flies, also depend on saltmarsh habitats. The flora and fauna of the upper zones of saltmarshes are more diverse than the lower zones. Many invertebrate rarities are herbivores associated with particular plants, for example the scarce pug moth, whose larvae are specialist feeders on sea wormwood. Other important saltmarsh foodplants for other rarities include sea-lavender and sea aster. Many rare flies have larval stages living within damp muddy substrates. Drier areas, bare of vegetation, are also important. Suites of coastal habitats may also be important, for example

the bee *Colletes halophilus* nests in upper saltmarsh but forages widely for the flowers of sea aster.

Table 4 Saltmarsh vegetation of The Wash

Saltmarsh zone	Saltmarsh Survey community	area (ha)	%	NVC code
Pioneer communities	<i>Spartina</i> community	96.7	2.33	SM6
	Annual <i>Salicornia</i> community	208.6	5.02	SM8
	<i>Spartina</i> / <i>Salicornia</i> community	80.9	1.95	SM6/ SM8
	<i>Suaeda maritima</i> community	4.8	0.12	SM9
	<i>Aster</i> community	134.1	3.23	SM11
Low-mid marsh communities	Transitional low marsh	286.7	6.90	SM10
	<i>Puccinellia</i> community	1243.7	29.91	SM13
	<i>Halimione</i> community <i>Puccinellia</i> -dominated sub-community	1051.1	25.28	SM14
	<i>Halimione</i> community <i>Halimione</i> -dominated sub-community	117.6	2.83	SM14
Mid-upper marsh communities	<i>Puccinellia</i> community	257.1	6.18	SM13
	<i>Spergularia marina</i> - <i>Puccinellia distans</i> community	4.0	0.10	SM23
Drift line communities	<i>Agropyron</i> * community	471.0	11.33	SM24
Borrow pits, bare ground		201.4	4.84	

* *Agropyron* = *Elymus pycnanthus* = *Elytrigia atherica*

More common saltmarsh plants provide grazing for large flocks of wintering duck and geese, seed eating birds (such as twite) and shelter for breeding species like redshank. Snow buntings, Lapland bunting, twite and other finches form wintering flocks in saltmarshes and other open habitats on the coastal fringe. It has been estimated that The Wash accommodates about 17% of the UK population of wintering twite and, in some years at least, a highly significant number of Lapland buntings and shorelarks.

4.2.1 Current trends, human impacts and conservation

The conservation of saltmarshes is inseparable from that of the flats which front them in the intertidal profile. The free exchange of sediment between marsh and flats is vital to the sustainability of both habitats. Therefore, the conservation of the two habitats must be treated in tandem.

The land claims on The Wash are the largest in British history. Forty-seven thousand hectares have been embanked and drained since Saxon times, including 32,000 ha since the 17th Century and about 3,000 ha in the past 100 years. It is impossible to say what proportion of this area would have been intertidal flats, saltmarsh or other habitats such as brackish

reedbeds. However, it is certain that saltmarsh would have formed a substantial amount. This high level of land-take is the reason for the very low proportion of mid to upper saltmarsh highlighted above. Although the pressure of land claim has eased since the early 1980s, sensitive upper marsh communities are still in danger of being damaged by tidal defence works and other human activities. In the coming decades, therefore, rising sea-level presents by far the greatest threat to the sustainability of saltmarshes.

Rising sea level and coastal squeeze present a major threat to saltmarshes nationally. In 1992 it was estimated that 2,750 hectares of saltmarsh are likely to be lost in England as a result of rising sea level over the next 20 years. If The Wash saltmarshes were to suffer an average share of this loss, a reduction of 363 ha of marsh could be expected as a result of rising sea level by 2012. However, as with tidal flats, the majority of the predicted losses will be in the south and east of England where the problem of rising global sea level is exacerbated by sinking land. Thus suggesting that 363 ha of loss may be a very conservative estimate for the Area. Surveys have already shown a net reduction of 83 ha of saltmarsh between 1971 and 1985 in The Wash. Unless ways are found to restore saltmarsh habitats to off-set these apparently inevitable losses, the conservation value of The Wash marshes will be seriously threatened in the next century.

Besides land claim, sea-level change and the interruption of sediment supplies, the grazing of domestic animals is probably the next most important human influence on saltmarshes in The Wash. The grazing has a considerable impact on the vegetation structure and overall ecology of the habitat. If it ceases, marsh vegetation becomes dominated by rank grasses, losing much of its biological diversity. The recovery of such marshes, even when grazing pressure is regulated, is a slow process. However, breeding redshank and some grazing wildfowl have benefited from the long history of grazing on The Wash saltmarshes.

Changes in agricultural practices and farm economies have led to a reduction of grazing in recent decades. The balance of grazing management is an important nature conservation consideration. The decision as to whether or not to graze, and if so how intensively, needs to be made on a site by site basis, within the context of an overall strategy to sustainably manage The Wash's special nature conservation value.

Major pollution events, particularly oil spills, could have a drastic impact on saltmarshes and their wildlife. Saltmarshes are slow to recover naturally from oil and cannot be effectively cleaned without doing more harm than good. Less apparent chronic pollution could be equally hazardous but is far more difficult to detect and monitor.

4.3 Sand and shingle shorelines

Sand and shingle shorelines are present at Gibraltar Point and north of Snettisham in the areas most exposed to incoming wave energy. The overall ecology of sand and shingle habitats is quite different from that of the muddy shores which fringe most of the northern and western shores of The Wash. Due to the lack of nutrients and the high mobility of the sediment, sand and shingle tends to support few plants and animals.

Shingle ridges at Gibraltar Point have been succeeded by dune development except at the southern tip where an open sandy shingle peninsula with a pioneer flora remains. On the east shore of the embayment, the shingle at Wolferton is silty, but becomes more sandy from Snettisham to Heacham. The total area of sand and shingle shoreline on The Wash has not

been estimated. However, vegetated shingle, which forms only a small part of the overall habitat, has been surveyed and estimated to cover about 24 hectares. Common plant species of vegetated shingle structures include yellow-horned poppy, curled dock, and sea mayweed, but in places this is replaced by such species as ragwort, with sticky groundsel, biting stonecrop and sea campion. Snettisham Spit is of national significance for its shingle vegetation. It is the only remaining natural habitat for the nationally scarce plant, hoary mullein. Shingle can be a very rich habitat for rare invertebrates. For example, a nationally rare woodlouse has been recorded at Snettisham spit.

Where organic detritus accumulates on the strandline of sandy beaches, mixed pioneer vegetation develops, usually dominated by sea sandwort. Both the biomass and animal diversity of strandlines make the habitat an important part of the beach-shoreline ecosystem. Strandlines are exploited by a wide variety of plants and animals and can trigger the process of dune formation.

The shingle structures in this area create an unusual mix of habitats including maritime grasslands and lagoons. A number of nationally scarce plants depend on these habitats. Shrubby seablite and sea heath are at the north-eastern limit of their British distribution at Gibraltar Point. Curved hard-grass, a southern species otherwise limited to a few sites from Suffolk to the Bristol Channel, is found on clayey shingle.

Snettisham and Gibraltar Point have nationally significant breeding colonies of little tern and ringed plover which are reliant on open sand and shingle habitats. The more vegetated landward shingle provides nesting habitat for nationally declining species such as skylark and meadow pipit. Avocets also breed at Snettisham and shingle habitats are important high tide roosts for a number of other wading birds.

4.3.1 Current trends, human impacts and conservation

There has been a loss of shingle through leisure development on the Norfolk shoreline, although some areas by the Snettisham lagoons have been protected. Snettisham shingle spit is also affected by the Hunstanton to Heacham beach recharge scheme, in which shingle is moved north to the Hunstanton area each winter. The impacts of the Lincolnshire beach renourishment scheme will probably be apparent at Gibraltar Point as longshore drift moves the deposited material south.

Many beaches are subject to high levels of visitor pressure, especially in summer, and trampling has a marked effect on shingle stability. The same areas are used by a number of birds such as Oystercatcher and gulls. Where shore nesting birds, such as little terns and ringed plovers, compete with people for space the birds invariably lose out.

The conservation of sand and shingle depends first and foremost on the maintenance of the physical processes and sediment supply. They are, like all sedimentary coastal habitats, naturally dynamic. Their biological communities rely on the stress of continual change to maintain their niches. Coastal sand and shingle deposits may be glacial in origin. Present day recharge rates from natural sources can be very slow or non-existent. The removal of such sediment from the shoreline would therefore undermine the sustainability of beaches and the other coastal habitats which they buffer. The relationship of offshore banks to beaches is crucial, particularly at Gibraltar Point.

On the terrestrial interface there is a natural movement of sand between the beaches and dunes. For most of the time this involves a net movement of sand from the beach to the dunes. However, in extreme events, sediment moves from the dunes to the beach. This two way interchange is an important process in the long term sustainability of dunes and beaches. Anything that interrupts it, such as hard coastal defences which isolate dunes from beaches, presents a significant threat to both habitats. On amenity beaches natural detritus on the strandline is sometimes cleared. If left in place, natural strandline detritus can provide an important habitat and facilitate dune formation.

Skegness, Heacham and Hunstanton are EU designated bathing beaches. All complied with the statutory EU Bathing Water Directive in 1996. However, only Hunstanton met the more stringent guideline standard specified in the Directive.

4.4 Sand dunes

Sand dune systems are present at the mouth of The Wash on both the Lincolnshire and Norfolk sides of the embayment. Coastal dunes are created by wind-driven and biological processes rather than wave action or tidal currents. However, marine processes play an important role in transporting sand to intertidal drying areas from which it becomes available for dune formation. The movement of sand between the nearshore zone, the beach and dunes is a two way process.

At the foot of the Lincolnshire coast, Gibraltar Point's sand dunes form part of a complex of natural coastal habitats including mudflats, saltmarshes and freshwater marsh. A sequence of dune ridges have established as spits build progressively further east. (A rare case of net accretion on the low tide line in the Area.) This is an active and continuing process which depends on an adequate supply of sediment moving down the Lincolnshire coast. The nearshore subtidal banks shelter the Lincolnshire coast south of Skegness and dissipate much of the tidal energy reaching the shore. These banks have played an important role in the development of Gibraltar Point and the vast areas of intertidal sand and mudflats at the mouth of The Wash.

On the Norfolk side of The Wash, a sand dune system runs from Hunstanton to Holme. These dunes have the only sizeable area (8 ha) of dune slack region - a nationally rare habitat which forms where the watertable is close to the surface between dune ridges. On both sides of the embayments, there are a good range of dune habitats, from embryonic fore dune through mobile dunes to dune grassland and scrub. However, north of Hunstanton development and stabilisation have impinged on the sequence.

Sea sandwort, sea rocket and prickly saltwort are characteristic pioneer fore-dune plants that are succeeded by dune building grasses such as sand couch-grass and marram in the mobile and semi-fixed vegetation. Sea-holly is an example of a typical but increasingly uncommon species of the mobile dunes in the area. As the dunes stabilise, plants such as red fescue and lady's bedstraw come to dominate the sward. Nationally scarce species, like bulbous poa and rush-leaved fescue, are also present in this habitat. At Hunstanton leaching has led to a transition, in the upper dunes, to acidic dune grassland, with plants such as sheep's fescue, sweet vernal grass and sand sedge characterising the sward. In the absence of grazing, dune scrub succeeds such habitats.

Sea-buckthorn is a native shrub in the region and a major component of the natural mature dune vegetation. It has spread considerably in recent decades with adverse effects, in some areas, on botanically rich short turf communities. Despite its local abundance, sea-buckthorn remains a nationally scarce plant and an important part of the local coastal ecology. However, little is known about mature sea-buckthorn scrub and its ecology in Britain. High densities of breeding songbirds, such as whitethroats, nest in sea-buckthorn scrub and large numbers of migratory thrushes (blackbirds, redwings and fieldfares) feed on, the berries.

Sand dunes and their associated habitats are important for many rare and scarce plants and animals which they support. Gibraltar Point and the North Norfolk dune systems are amongst the best dune sites in Britain for rare and uncommon invertebrates. Natterjack toads breed at Gibraltar Point and Holme.

Grazing animals play an important role in defining the type of dune vegetation. Although domestic stock may have been grazed on the area's dune in the past, the most significant grazers in recent decades have been rabbits. They can play a key role in maintaining some of the most interesting short turf communities.

4.4.1 Current trends, human impacts and conservation

The conservation of dunes, beaches and sediment sources is intimately linked. Under natural conditions, and given an adequate sediment supply, dune systems move in step with shoreline evolution. In areas of accretion dunes will move seaward and in areas of recession they would move landward. Dunes, therefore, are naturally dynamic features on evolving shorelines such as The Wash. Any impediment to their ability to move will threaten their long-term sustainability.

The Hunstanton to Holme dune system is eroding at the western end, near to Hunstanton cliffs and attempts have been made to stabilise the frontage using gabions and brushwood. Along much of the rest of the system areas of erosion alternate with areas of accretion. Close to Hunstanton, the dunes are occupied by rows of beach huts. This, combined with good access, has resulted in heavy trampling and the fragmentation of dune vegetation. Apart from the frontal dunes, the whole of the northern edge of Old Hunstanton up to the access road from Holme is occupied by a golf course. There is also a golf course on the dunes between Gibraltar Point and Skegness.

The spread of Sea-buckthorn in recent decades has led to a loss or reduction of some botanically rich short turf communities. This has led to a considerable effort on some sites to control the shrub. Nevertheless, the development of mature Sea-buckthorn vegetation is of ecological value and interest in itself. Grazing plays an important role in vegetation management on dunes and changes in grazing pressure will inevitably lead to changes in vegetation structure, micro-climate and species composition. A number of important species depend on a certain series of hydrological conditions. Water abstraction and quality can, therefore, be important considerations in the conservation of dune habitats. Erosion due to human activities can have an adverse impact but over-stabilisation is at least as great a threat.

4.5 Coastal lagoons

Coastal lagoons are virtually tideless saline water bodies, wholly or partially separated from the sea, but with some influx of sea water. Whilst The Wash Natural Area has only a small area

of lagoons, their importance is elevated by the fact that this habitat is nationally rare and a 'priority habitat type' under Annex 1 of the European Habitats Directive. The total area of saline lagoon around The Wash amounts to 2.45% of the national resource. However, if The Fleet (which accounts for about 70% of the natural saline lagoon habitat in Britain is excluded) The Wash's lagoons amount to almost 12% of the natural British resources.

The five coastal lagoons that were surveyed by the National Lagoon Survey during the 1980s are listed in Table 5. There are also a number of small (<0.5 ha) ditches and farm pools in the land-claimed marshlands bordering The Wash.

Table 5 Coastal Lagoons National Lagoon Survey in The Wash Natural Area

Site name	Grid ref.	ha	Lagoon type	% GB resource	Conservation status
New Marsh Drain	TF500551	5	sluice drain	0.40	
Lawyer's Farm Pool	TF417333	<1	percolation pool	< 0.10	
Snettisham	TF648320	18	natural, percolation	1.43	SSSI
Heacham Harbour	TF657356	4.5	natural, percolation	0.36	SSSI
Broad Water	TF716447	4.5	natural, percolation	0.36	SSSI
Total		32.0		2.45	

True lagoons in the area support just two types of aquatic vegetation; stands of green algae (*Chaetomorpha*, *Ulva* and *Enteromorpha* spp.) and sea-grasses and similar plants (predominantly *Ruppia* spp.). However, much of the bed surface of saline lagoons is typically bare. Fringing stands of reed or sea-rush swamp are a common feature. Lagoons have an unusual and characteristic invertebrate fauna. In Britain, several of these species are very rare and protected by the Wildlife and Countryside Act 1981. The lagoon sand shrimp *Gammarus insensibilis*, for example, is found at Lawyer's Farm Pool in Lincolnshire. Many small saline ditches support typical lagoon species such as the lagoon snail *Hydrobia ventrosa* and the lagoon prawn *Palaemonetes varians*. The nationally scarce plants, spiral tesselweed and brackish water-crowfoot, are present in a number of the areas brackish ditches.

4.5.1 Current trends, human impacts and conservation

The conservation of coastal lagoons depends on the maintenance of a suitable hydrological regime and water quality. The precise conditions vary from site to site and species to species. Therefore a reasonable understanding of the hydrology and appropriate management regime is essential. As well as being important for specialist brackish water lagoon plants and animals, coastal lagoons are often used by species with less exacting habitat requirements such as wading birds and wildfowl. Recent surveys have shown a notable decline in the number of nationally scarce plants associated with brackish water habitats in the area.

Coastal lagoons may also be attractive for human recreation. They should be managed to minimise any potential conflicts with human activity. Coastal defence embankments, holiday developments and shoreline access routes have impinged on the nationally important natural lagoons at Snettisham.

4.6 Farmed hinterland and other habitats

Much of the hinterland of The Wash is now low-lying intensively managed arable farmland. However, intertidal saltmarsh would once have graded into considerable areas of brackish and then fresh-water marsh. With the land-claim of both habitats for agricultural purposes, large tracts of wet grassland were formed extending for many kilometres inland. The vast majority of this highly productive farmland which has been converted to arable is now impoverished of most of its former natural interest. There are few hedgerows or woodland and little pasture. In such landscapes, ditches can provide an important wildlife refuge. However, in most cases, drainage and nutrient enrichment have destroyed most of the wildlife interest. Further inland, in the Fens, remnants of seasonally wet pasture remain and large flood storage areas on the rivers Nene and Great Ouse in the Washes are an important wetland habitat surrounded by arable land.

On the eastern side of The Wash, between Kings Lynn and Hunstanton, the landscape is more diverse with areas of heath, woodland, hedgerows and grazing marsh. The coastal fringe in this area has a high concentration of nationally scarce plants - most of which are associated with the sandy land behind Snettisham spit. Nonetheless, around most of The Wash there is a strong and dramatic contrast between the intensively managed, ecologically impoverished arable landscape on the landward side of the sea wall and the more natural and ecologically rich areas on the seaward side. Even the characteristic species of more diverse arable land are few in the area. Nonetheless, arable fields may provide a source of invertebrate food for some species of birds.

Less intensively managed defence embankments can provide a refuge for some species of plants and animal, such as the Essex skipper. Indeed, the linear grassland habitats associated with sea-wall has taken on an increasing significance as surrounding farmland habitats have lost much of their wildlife interest. At the mouth of the Rivers Nene, in the south of the embayment, two artificially embanked islands on the intertidal flats provide nesting opportunities for terns.

Brackish water ditches behind the embankment can also host a distinctive flora. In the few places where field margins escape chemical treatment a more diverse flora may be present. On the whole these places are incidental escapes from the effects of modern farming - curiosities that serve little if any significant function in the overall ecological value of the area.

There is some freshwater marsh within a matrix of coastal habitat types at Gibraltar Point that has an ecologically interesting flora including sedges and rushes. However, reedbeds are scarce around The Wash. Nonetheless, the area has become a strong hold of the marsh harrier, one of Britain's rarer breeding birds of prey that sometimes nests amongst arable crops. The still rarer Montagu's Harrier, which has been known to nest in winter wheat, barley and oil seed crops, has also recently bred in the area.

4.6.1 Current trends, human impacts and conservation

The agricultural economy of recent decades has encouraged intensification and a move away from mixed farming, especially on such productive farmland as that which surrounds most of The Wash. The post war years saw a reduction in livestock farming in the area and an increase in field size to accommodate modern machinery and farm practices. This change has

also affected saltmarsh management since the live stock which were seasonally grazed on intertidal marshes are no longer a significant part of the farm economy.

Few studies have been done to describe the value, if any, of the farmland surrounding the Wash, for wildlife which depend on the embayment. Across the country characteristic arable farmland bird populations, particularly seed eating species, such as reed bunting, corn bunting, linnnet and tree sparrow, have declined at an alarming rate - more than 50% in the last 25 years.

5. Nature conservation issues

Natural Area profiles provide the framework and context for more detailed nature conservation planning and action. The issues are generic in nature. They are, however, orientated towards, and particularly applicable to, estuarine management in general and The Wash in particular. The most pressing current issues on The Wash are printed in bold.

- **Reduction of intertidal area due to rising sea level**
- Reduction of intertidal area due to land claim
- **Reduction of intertidal area due to erosion**
- Diminishing sediment supply resulting from coastal protection
- **The interruption of sediment movement by coastal protection**
- **The stabilisation of naturally dynamic coastal landforms**
- **Development on the coast which prevents the landward movement of coastal features**
- **Marine aggregate extraction**
- The impacts of navigational dredging
- The use or disposal of dredgings
- Chronic pollution impacts
- Catastrophic pollution impacts (accidents)
- **Unsustainable exploitation of living resources**
- **The loss of biodiversity**
- **The decline of shellfish populations**
- **The declining numbers of some species of birds**
- **Agricultural practices - intensification and reduction of diversity**
- New species in the area
- **Vegetation management**
- Recreational pressures
- The lack of a fully integrated coastal zone management system and national coastal strategy
- **Lack of information and understanding in marine ecology and coastal geomorphology**
- **People's perception of the coastline as a fixed entity in space and time**

6. Nature Conservation Objectives

As outlined in the Introduction, it is not the purpose of this Profile to set down any site specific targets or prescriptive statements as to what should happen where. Such objectives, together with detailed targets and timetables, are the subject of Biodiversity Action Plans and

other initiatives. The objectives below are, therefore, strategic goals which pertain to the embayment as a whole. These objectives are not new - they have been derived from agreed plans, policies and strategies which have all been subject to full and comprehensive public consultation. These include local plans (such as shoreline management plans or The Wash Estuary Management Plan) and national plans, guidance and legislation (such as The UK Biodiversity Action Plan and the Conservation (Natural Habitats, &c.) Regulations 1994). Planning Policy Guidance notes (such as PPG 20 on Coastal Planning) are published by Government to advise on the implementation of primary legislation in particular topic areas. In most cases they, rather the primary legislation which they interpret, have been listed as the source of an objective in the table below.

Objective	Sources
1. Establish and agree biodiversity targets and action plans to maintain and restore all aspects of the Area's natural biological and geological diversity	UK BAP
2. Ensure that all regulators and authorities integrate and reconcile all plans, projects and activities under their jurisdiction with nature conservation objectives	PPG 9 & 20
3. Ensure that coastal development does not create any new impediments to the natural adjustment of the coastline or the delivery of biodiversity targets	SMP/WEMP/LEAP
4. Maintain sediment supply from all important sources	SMP
5. Maintain or restore the natural mobility of sand & shingle structures	SMP
6. Work with the Environment Agency to monitor and maintain water quality to ensure no adverse impacts on wildlife or important physical processes	LEAP
7. Work with the Environment Agency to establish and maintain an acceptable residual minimum flow of freshwater through each of the river systems to the embayment	LEAP
8. Ensure that oil and gas exploration / exploitation is strategically assessed and regulated to safeguard the natural environment of The Wash	WEMP/PPG 9
9. Ensure, by way of strategic environmental assessment, research and monitoring, that present and future marine mineral extraction, dredging and/or disposal do not have an adverse impact on the biodiversity or sustainability of The Wash ecosystem	PPG 9 / WEMP
10. Minimise the risk of all pollution (including chronic or diffuse contamination) by the use of best available technology, training and management practices	EPA / WRA
11. Ensure that contingency plans to deal with large scale pollution events are agreed, adopted, regularly tested and are designed to minimise impacts on wildlife and natural habitats	WEMP
12. Work with and support the Eastern Sea Fisheries Joint Committee to ensure that any exploitation of the fishery is sustainable and compatible with the maintenance of biodiversity	WEMP
13. Support and assist the Eastern Sea Fisheries Joint Committee to restore sustainable cockle and mussel stocks	WEMP

Objective	Sources
14. Work with and support regulating authorities to control the introduction of non-native species to ensure no adverse impacts on habitats or native populations	WEMP/PPG 9
15. Implement and monitor the Saltmarsh Grazing Management Plan to ensure that grazing is managed at appropriate levels and that non-grazed areas can develop naturally	WEMP
16. Promote the sustainable use of bait stocks and minimise conflicts with nature conservation objectives	WEMP
17. Promote land management practices to improve the nature conservation value of the agricultural hinterland, particularly in the south and west of the embayment	WEMP
18. Promote the use and application of best available information and practices in all decision making, including sustainable management and habitat restoration techniques	WEMP / PPG 9
19. Improve the understanding of decision makers, professionals and the wider public of the nature of estuarine ecosystems	WEMP
20. Ensure, by working with key partner, that traditional and recreational activities are complementary to nature conservation objectives	WEMP
21. Encourage understand and appreciation of the nature conservation value of The Wash and the management measure undertaken by relevant authorities to ensure its sustainability	WEMP

Key

EPA	Environmental Protection Act 1990	WEMP	Wash Estuary Management Plan 1996
WRA	Water Resources Act 1991	SMP	Shoreline Management Plans
PPG 9	Nature Conservation	LEAP	Local Environment Agency Plan
PPG 20	Coastal Planning	UK BAP	UK Biodiversity Action Plan

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WINGFIELD, R.T R., and others. 1978. Geological and geophysical survey of the Wash. *Report of the Institute of Geological Sciences, No. 78/18.* London: HMSO.

Appendix 1 - Designated Sites

The Wash and various sites within the embayment are covered by a wide variety of national and international designations - these are summarised in the table below.

Designated sites		
Site	Designation	Reason for designation
International designations		
The Wash	Ramsar	Representative wetland; regularly supports 20,000 waterfowl and 1% of a waterfowl species population
Gibraltar Point (Wash Phase II)	Ramsar	Representative wetland; rare species; regularly supports 20,000 waterfowl and 1% of a waterfowl species population
The Wash & North Norfolk Coast	cSAC	Common seal, Atlantic salt meadows, large shallow inlets and bays, Mediterranean and thermo-Atlantic halophilous scrubs, Mediterranean salt meadows, mudflats and sandflats not covered by seawater at low tide, glasswort and other annuals colonising mud and sand, sandbanks which are slightly covered by sea water all the time
North Norfolk Coast and Gibraltar Point Dunes	cSAC	Embryonic shifting dunes, fixed dunes with herbaceous vegetation (grey dunes), humid dune slacks, lagoons, Mediterranean and thermo-Atlantic halophilous scrubs, perennial vegetation of stony banks, shifting dunes along the shoreline with marram (white dunes)
The Wash	SPA	Internationally important numbers of thirteen species of wintering wildfowl; nationally important numbers of seven species of wintering wildfowl and one species of passerine; regularly supports over 20,000 waterfowl
Gibraltar Point (Wash Phase II)	SPA	Wintering wildfowl (regularly supports 20,000 waterfowl and 1% of a waterfowl species population)
National designations		
Gibraltar Point	NNR	Tidal flats, dunes, shingle, grazing marsh
The Wash	NNR	Estuarine tidal flats, saltmarsh, sandbanks
Holme Dunes	NNR	Sand dunes, sand flats, saltmarsh and reedbeds
Gibraltar Point	SSSI	Tidal flats, dunes, shingle, grazing marsh
The Wash	SSSI	Exceptional biological interest, Estuarine tidal flats, saltmarsh, shingle communities, sandbanks, breeding, wintering & migrating birds, commons seals
Hunstanton Cliffs	SSSI	Geological interest & breeding sea birds
Gibraltar Point	LNR	Tidal flats, dunes, shingle, grazing marsh & educational value
Gibraltar Point	AOSP	Breeding, migrating & wintering birds

Norfolk Coast (inc. much of the Norfolk coast of the Wash)	AONB	nationally important landscape
Sites identified by statutory agencies		
Snettisham Coastal Park	CP	
Gibraltar Point	GCR	geomorphology
Heacham	GCR	geomorphology
Hunstanton Cliffs (2 SILs)	GCR	exposure of lower greensand & Cretaceous strata

Key

Ramsar: Wetland of International Importance	NNR: National Nature Reserve
SPA: Special Protection Area	LNR: Local Nature Reserve
SAC: Special Area of Conservation	AoSP: Areas of Special Protection
SSSI: Site of Special Scientific Interest	GCR: Geological Conservation Review sites
c: candidate	CP: Country Park

The meaning of the designations effecting The Wash

Ramsar sites are areas designated by the UK government under the Ramsar Convention (the Convention on wetlands of international importance especially as waterfowl habitat). Contracting parties (of which the UK is one) are required to designate wetlands of international importance and to promote their conservation and 'wise use'. Ramsar sites are designated for their waterfowl populations, their important plant and animal assemblages, their wetland interest or a combination of these.

Special Areas of Conservation (SACs) are implemented under the 1992 EC Habitats Directive. They are areas considered to be important in a European context for habitats and non-avian species of interest. The protection measures are based around a series of six annexes: Annexes I & II require the designation of SACs for certain habitats and species; Annex IV prohibits the taking of certain species; Annex V requires the taking of certain species to be monitored; and Annex VI prohibits some means of capture or killing of mammals and fish. In the UK the Directive will be implemented through the Habitats etc. Regulations 1994.

Special Protection Areas (SPAs). The 1979 EC Directive on the Conservation of Wild Birds (the Birds Directive) requires member states to take conservation measures particularly for certain rare or vulnerable species and for regularly occurring migratory species of birds. In part this is achieved through the designation of statutory Special Protection Areas by the UK government. This designation is implemented through the Wildlife and Countryside Act 1981; all SPAs have first to be notified as SSSIs.

National Nature Reserves (NNRs) contain examples of some of the most important natural and semi-natural ecosystems in Great Britain. They are managed to conserve their habitats, providing special opportunities for scientific study of the habitats, communities and species represented within them. They are statutorily declared by the country agencies under section 19 of the National Parks and Access to the Countryside Act 1949, or section 35 of the Wildlife and Countryside Act 1981.

Sites of Special Scientific Interest (SSSIs) are statutorily notified under the Wildlife and Countryside Act 1981. They are intended to form a national network of areas, representing the parts of Britain in which the natural features, especially those of greatest value to wildlife conservation. Each SSSI represents a significant fragment of the much-depleted resource of wild nature remaining in Britain. Within an SSSI the provisions of the Wildlife & Countryside Act 1981 and its 1985 amendments aim to ensure that actions damaging to the wildlife interest of the area are not carried out.

Local Nature Reserves (LNRs) are statutorily designated by local authorities, under section 21 of the National Parks and Access to the Countryside Act 1949, for the similar purposes as NNRs, but because of the local rather than the national interest of the site and its wildlife. Under this Act local authorities have the power to issue bylaws to protect LNRs. Educational use may be a consideration in the designation of LNRs.

Area of Special Protection (AoSP) designation is a statutory protection mechanism replacing Bird Sanctuary Orders made under the 1954 to 1967 Protection of Birds Acts, which were repealed and amended under the Wildlife and Countryside Act 1981. Designation aims to prevent the disturbance and destruction of the birds for which the area is identified, by

making it unlawful to damage or destroy either the birds or their nests and in some cases by prohibiting or restricting access to the site.

The primary purpose of the Area of Outstanding Natural Beauty (AONB) designation is to conserve natural beauty, but account is taken of the need to safeguard agriculture, forestry and other rural industries, and of the economic and social needs of local communities. AONBs are statutorily designated, in England by the Countryside Commission, under the National Parks and Access to the Countryside Act 1949.

Country Parks are primarily intended for recreation and leisure opportunities close to population centres and do not necessarily have any nature conservation interest. Nevertheless, many are in areas of semi-natural habitat and so form a valuable network of locations at which informal recreation and the natural environment co-exist. They are statutorily declared and managed by local authorities under section 7 of the Countryside Act 1968.

There are 953 confirmed Nature Conservation Review (NCR) sites (approximately 1,500,000 ha) existing in Britain. NCR sites are non-statutory sites identified by statutory conservation bodies. In this region NCR sites include all coastal sites supporting nationally and internationally important bird populations, as well as those holding the best representative examples of vegetative habitats. The NCR series helps to identify suitable candidates for biological National Nature Reserve designation.

Geological Conservation Review (GCR) sites are non-statutory sites identified by the statutory conservation agencies; they are sites of national and international earth science importance. The GCR selection process describes and assesses key sites in the context of their geology, palaeontology, mineralogy or geomorphology; GCR sites are the earth science equivalent of NCRs. Almost 3,000 individual GCR Single Interest Localities (SILs) have been identified throughout Britain.

Appendix 2 - Priority Species

Selection Criteria for Priority Species

The species have been selected using the following criteria.

UK biodiversity action plans species:	BAP1	UK BAP Short list of Globally Threatened/Declining Species
	BAP2	UK BAP Middle list of Globally Threatened/Declining Species
	BAP3	UK BAP Long list of Globally Threatened/Declining Species
	ap	species for which a national Action Plan has been produced
Internationally protected species:	I	species native in the area listed in the Bern or Bonn Conventions
Species protected by European law:	EU	species listed in the EU Directive on the conservation of natural habitats and wild fauna and flora (92/43/EEC) or Annex I of the EU Directive on the conservation of wild birds (79/409/EEC)
Species Protected by UK law:	WCA	species listed in the relevant schedule of the Wildlife and Countryside Act 1981 - as amended.
British Red Data Species:	RDB	species listed in British Red Data Books, RDB1 = endangered: RDB2 = vulnerable: RDB3 = rare. p = provisionally listed but not yet published
Bird of conservation concern:	BCCr/a	Bird listed as being of conservation concern based on historical population trends. r = red list species: a = amber list species
Nationally scarce:	NS	species recorded in between 16 than 100 10 kilometre squares in Britain
Locally extinct species:	*	species recorded in the Area in the recent past but now believed to be locally extinct

NB: More survey and research work would undoubtedly reveal a number of species qualifying under the above criteria not included below. Other species, particularly characteristic local species and those indicative of habitats quality, should also be considered in conservation plans. A number of species of high conservation concern, such as song thrushes, tree sparrows, corn buntings, skylarks and water voles, have not been included in this list despite their presence in the area because they do not have any particular affiliation with coastal habitats. Such species deserve consideration when considering the management of the non-marine hinterland. In general, conservation priorities for marine species and habitats are less well developed at a national scale. This has led to a bias in favour of the better known coastal species, particularly birds. Conservation planning and management will need to balance this with a view to conserving the overall ecosystem and the full range of biological diversity.

Rare, scarce and protected species			
Latin Name	Common Name	Reason for Section	Key Habitats
Plants			
<i>Althaea officianalis</i>	Marsh mallow	NS	saltmarsh, brackish water
<i>Bupleurum tenuissimum</i>	Slender hare's-ear	NS	brackish grassland
<i>Atriplex longipes</i>	Long-stalked orache	NS	saltmarsh
<i>Bupleurum tenuissimum</i>	Slender hare's-ear	NS	saltmarsh
<i>Calystegia soldanella</i>	Sea bindweed	LE	dynamic sand dunes
<i>Carex divisa</i>	Divided sedge	NS	saltmarsh
<i>Corynephorus canescens</i>	Grey hair-grass	NS	beaches & duunes
<i>Crambe maritima</i>	Sea-kale	NS	shingle beaches & dunes
<i>Crassula tillaea</i>	Mossy stonecrop	NS	open, bare sandy soil
<i>Eryngium maritimum</i>	Sea holly	LE	dynamic sand dunes
<i>Festuca arenaria</i>	Rush-leaved fescue	NS	sand dunes
<i>Frankenia laevis</i>	Sea heath	NS	saltmarsh-dune transition
<i>Hippophae rhamnoides</i>	Sea-buckthorn	NS	sand dunes
<i>Hordeum marinum</i>	Sea barley	NS	brackish grassland
<i>Hypochaeris glabra</i>	Smooth cat's-ear	NS	sandy pasture
<i>Inula crithmiodes</i>	Golden-samphire	* NS	saltmarsh
<i>Limonium binervosum</i>	Rock sea-lavender	NS, BAP2	saltmarsh / sand dunes
<i>Limonium humile</i>	Lax-flowered sea-lavender	* NS	saltmarsh
<i>Medicago manima</i>	Bur medick	NS	sandy or gravelly places
<i>Parapholis incurva</i>	Curved hard-grass	NS	saltmarsh / sand dunes
<i>Poa bulbosa</i>	Bulbous meadow-grass	NS	sand dunes
<i>Polygonum oxyspermum</i>	Ray's knotgrass	* NS	shingle/sandy silty mud
<i>Potentilla argentea</i>	Hoary cinquefoil	NS	dry, warm free draining soil
<i>Puccinellia farciculata</i>	Borrer's saltmarsh-grass	NS	disturbed saline ground
<i>Puccinellia rupestris</i>	Stiff saltmarsh-grass	NS	disturbed saline ground
<i>Ranunculus baudotii</i>	Brackish water-crowfoot	NS	brackish water
<i>Ruppia cirrhosa</i>	Spiral tesselweed	NS	brackish water
<i>Salicornia pusilla</i>	One-flowered glasswort	NS	saltmarsh
<i>Sarcocornia perennis</i>	Perennial glasswort	NS	saltmarsh & driftlines
<i>Silene conica</i>	Sand catchfly	NS	dunes & sandy ground
<i>Spartina maritima</i>	Small cord-grass	NS	upper saltmarsh
<i>Suaeda vera</i>	Shrubby seablite	NS	shingle driftlines & upper saltmarsh

Rare, scarce and protected species			
Latin Name	Common Name	Reason for Section	Key Habitats
<i>Trifolium ornithopodioides</i>	Bird's-foot clover	NS	coastal habitats
<i>Verbascum pulverulentum</i>	Hoary mullein	NS	coastal shingle on the east side of the Wash
<i>Vulpia ciliata ambigua</i>	Bearded fescue	NS	disturbed sandy soil
<i>Vulpia fasciculata</i>	Dune fescue	NS	dunes & shingle
<i>Zostera angustifolia</i>	Narrow-leaved eelgrass	NS	intertidal flats / lagoons
<i>Zostera marina</i>	Eelgrass	* NS, BAP3	subtidal/intertidal flats
<i>Zostera noltii</i>	Dwarf eelgrass	NS	intertidal flats
Marine invertebrates			
<i>Gammarus insensibilis</i>	Lagoon sand shrimp	NS, BAP3, WCA5	saline lagoons
Terrestrial & freshwater invertebrates of the coastal fringe			
<i>Athetis pallustris</i>	moth	RDB3, BAP2	wet areas in dunes
<i>Clubiona juvenis</i>	spider	RDB2	
<i>Eucosma maritima</i>	moth	pRDB3	Saltmarsh
<i>Eupithecia extensaria</i>	scarce pug (moth)	RDB3, BAP3	Saltmarsh
<i>Evergestis pallidata</i>	moth	pRDB2	
<i>Gelechia hippophaella</i>	moth	pRDB2	<i>Hippophae</i> scrub
<i>Gymnancyla canella</i>	moth	pRDB2	
<i>Haematopota bigoti</i>	fly	RDB3	
<i>Haliphus mucronatus</i>	Beetle	RDB2	
<i>Phaonia fusca</i>	fly	RDB3	
<i>Pherbellia dorsata</i>	fly	RDB3	
<i>Rymosia connexa</i>	fly	RDB3	
<i>Salticella fasciata</i>	snail-killing fly	RDB2	sand dunes
<i>Spilongona biseriata</i>	fly	RDB3	
Fish			
<i>Osmerus eperlanus</i>	Smelt	BAP3	
<i>Pomatoschistus microps</i>	Common goby	WCA, BAP3	
<i>Pomatoschistus minutus</i>	Sand goby	WCA5, BAP3	
Amphibians			
<i>Bufo calamita</i>	Natterjack toads	BAP1ap, EC, I, WCA5	seasonal pools in dunes
<i>Tritus cristatus</i>	Great crested newt	BAP1ap, EC, I, WCA5	ponds
Birds			
<i>Anas acuta</i>	Pintail	I, WCA1, BAP3, BCCa	estuaries, open water
<i>Anas crecca</i>	Teal	BAP3, BCCa, I	lowland & coast

Rare, scarce and protected species			
Latin Name	Common Name	Reason for Section	Key Habitats
<i>Anas penelope</i>	Wigeon	BCCa, I, BAP3	estuaries/coastal marshes
<i>Anser brachyrhynchos</i>	Pink-footed goose	I, BCCa, BAP3	estuaries / farmland
<i>Arenaria interpres</i>	Turnstone	BAP3, BCCa, I	shoreline, estuaries
<i>Aythya marila</i>	Scaup	BAP3, BCCa, I	coastal waters
<i>Branta bernicla</i>	Dark bellied brent goose	BAP3, BCCa, I	intertidal, grassland
<i>Calcarius lapponicus</i>	Lapland bunting	BAP3, I	coastal
<i>Calidris alba</i>	Sanderling	BAP3, I	shoreline
<i>Calidris alpina</i>	Dunlin	BAP3, BCCa, I	intertidal flats
<i>Calidris canutus</i>	Knot	BAP3, BCCaI	intertidal flats
<i>Carduelis flavirostris</i>	Twite	BCCr, BAP3, I	saltmarshes & coastal
<i>Charadrius hiaticula</i>	Ringed plover	RDB, BAP3, BCCa, I	sand & shingle beaches
<i>Circus aeruginosus</i>	Marsh harrier	BAP3, BCCr, EU, I, WCA1	reedbeds
<i>Cygnus columbianus</i>	Bewick's swan	I, EU, WCA,1, BCCa, BAP3	wetlands
<i>Emberiza schoeniclus</i>	Reed bunting	BCCr, BAP2, I	marginal vegetation
<i>Eremopila alpestris</i>	Shore lark	BAP3, I, WCA1	coastal habitats
<i>Haematopus ostralegus</i>	Oystercatcher	RDB, BCCa	coastal habitats
<i>Larus argentatus</i>	Herring gull	BAP3, BCCa	coastal habitats
<i>Larus canus</i>	Common gull	BCCa	moorland & coasts
<i>Limosa lapponica</i>	Bar-tailed Godwit	BAP3, BCCa, I	intertidal flats
<i>Limosa limosa</i>	Black-tailed Godwit	BAP3, BCCr, I WCA	intertidal flats
<i>Melanitta nigra</i>	Common scoter	BAP2, BCCr, I, WCA1	coastal waters
<i>Mergus serrator</i>	Red-breasted merganser	I, BAP3	coastal waters
<i>Numenius arquata</i>	Curlew	BAP3, BCCa, I	coastal habitats
<i>Plectrophenax nivalis</i>	Snow bunting	BAP3, BCCa, I, WCA1	sandy shores
<i>Pluvialis apricaria</i>	Golden plover	BAP3, BCCa, EU, I, WCA	coastal flats & grassland
<i>Pluvialis squatarola</i>	Grey plover	BAP3, BCCa, I	mudflats
<i>Recurvirostra avosetta</i>	Avocet	BCCa, I, WCA	brackish lagoons
<i>Sterna albifrons</i>	Little tern	BAP3, BCCa, EU, I WCA1	sand & shingle beaches
<i>Sterna hirundo</i>	Common tern	BAP3, EU, I, WCA	sand & shingle beaches
<i>Tadorna tadorna</i>	Shelduck	BAP3, BCCa, I	mud & sandy shores
<i>Tringa totanus</i>	Redshank	BAP3, BCCa, I	coastal flats & marshes

Rare, scarce and protected species			
Latin Name	Common Name	Reason for Section	Key Habitats
<i>Vanellus vanellus</i>	Lapwing	BAP3, I BCCa	coasts, farmland
Mammals			
<i>Phoca vitulina</i>	Common seal	BAP3, EU, WCA5	
<i>Halichoerus grypus</i>	Grey seal	BAP3, EU, WCA5	

Appendix 3 - Latin names of species mentioned in the text

Avocet	<i>Recurvirostra avosetta</i>	Marram	<i>Ammophila arenaria</i>
Baltic tellin	<i>Macoma balthica</i>	Marsh harrier	<i>Circus aeruginosus</i>
Bar-tailed Godwit	<i>Limosa lapponica</i>	Marsh mallow	<i>Althaea officianalis</i>
Bearded fescue	<i>Vulpia ciliata ambigua</i>	Montagu's harrier	<i>Circus pygargus</i>
Bewick's swan	<i>Cygnus columbianus</i>	Mossy stonecrop	<i>Crassula tillaea</i>
Bird's-foot clover	<i>Trifolium ornithopodioides</i>	Mussel	<i>Mytilus edulis</i>
Biting stonecrop	<i>Sedum acre</i>	Narrow-leaved eelgrass	<i>Zostera angustifolia</i>
Black-tailed Godwit	<i>Limosa limosa</i>	Natterjack toads	<i>Bufo calamita</i>
Borrer's saltmarsh- grass	<i>Puccinellia farculata</i>	Night-flowering catchfly	<i>Silene noctiflora</i>
Brackish water- crowfoot	<i>Ranunculus baudotii</i>	One-flowered glasswort	<i>Salicornia pusilla</i>
Bulbous meadow-grass	<i>Poa bulbosa</i>	Oystercatcher	<i>Haematopus ostralegus</i>
Bur medick	<i>Medicago manima</i>	Perennial glasswort	<i>Sarcocornia perennis</i>
Cockle	<i>Cerastoderma edule</i>	Pink-footed goose	<i>Anser brachyrhynchos</i>
Common goby	<i>Pomatoschistus microps</i>	Pintail	<i>Anas acuta</i>
Common gull	<i>Larus canus</i>	Plaice	<i>Pleuronectes platessa</i>
Common scoter	<i>Melanitta nigra</i>	Prickly saltwort	<i>Salsola kali</i>
Common seal	<i>Phoca vitulina</i>	Ragwort	<i>Senecio jacobaea</i>
Common tern	<i>Sterna hirundo</i>	Ray's knotgrass	<i>Polygonum oxyspermum</i>
Curlew	<i>Numenius arquata</i>	Red fescue	<i>Festuca rubra</i>
Curved hard-grass	<i>Parapholis incurva</i>	Red-breasted merganser	<i>Mergus serrator</i>
Dark bellied brent goose	<i>Branta bernicla</i>	Redshank	<i>Tringa totanus</i>
Divided sedge	<i>Carex divisa</i>	Reed bunting	<i>Emberiza schoeniclus</i>
Dune fescue	<i>Vulpia fasciculata</i>	Ringed plover	<i>Charadrius hiaticula</i>
Dunlin	<i>Calidris alpina</i>	Rock sea-lavender	<i>Limonium binervosum</i>
Dwarf eelgrass	<i>Zostera noltii</i>	Rough poppy	<i>Papaver hybridum</i>
Eelgrass	<i>Zostera marina</i>	Rush-leaved fescue	<i>Festuca arenaria</i>
Essex skipper	<i>Thymelicus lineola</i>	Sand catchfly	<i>Silene conica</i>
Fine-leaved fumitory	<i>Fumaria parviflora</i>	Sand couch	<i>Elytrigia juncea</i>
Fulmar	<i>Fulmarus glacialis</i>	Sand goby	<i>Pomatoschistus minutus</i>
Gannet	<i>Morus bassanus</i>	Sanderling	<i>Calidris alba</i>
Golden plover	<i>Pluvialis apricaria</i>	Scarce pug	<i>Eupithecia extensaria</i>
Golden-samphire	<i>Inula crithmiodes</i>	Scaup	<i>Aythya marila</i>
Great crested newt	<i>Tritus cristatus</i>	Sea aster	<i>Aster tripolium</i>
Grey hair-grass	<i>Corynephorus canescens</i>	Sea barley	<i>Hordeum marinum</i>
Grey plover	<i>Pluvialis squatarola</i>	Sea bindweed	<i>Calystegia soldanella</i>
Grey seal	<i>Halichoerus grypus</i>	Sea couch-grass	<i>Agropyron pycnanthus = Elymus pycnanthus = Elytrigia atherica</i>
Herring gull	<i>Larus argentatus</i>	Sea holly	<i>Eryngium maritimum</i>
Hoary cinquefoil	<i>Potentilla argentea</i>	Sea mayweed	<i>Tripleurospermum maritimum</i>
Hoary mullein	<i>Verbascum pulverulentum</i>	Sea purslane	<i>(Halimione portulacoides =) Atriplex portulacoides</i>
Knot	<i>Calidris canutus</i>	Sea rocket	<i>Cakile maritima</i>
Lady's bedstraw	<i>Galium verum</i>	Sea sandwort	<i>Honckenya peploides</i>
Lagoon sand shrimp	<i>Gammarus insensibilis</i>	Sea wormwood	<i>Artemisia maritima</i>
Lapland bunting	<i>Calcarius lapponicus</i>	Sea blight	<i>Suaeda vera</i>
Lapwing	<i>Vanellus vanellus</i>	Sea buckthorn	<i>Hippophae rhamnoides</i>
Lax-flowered sea- lavender	<i>Limonium humile</i>	Sea-heath	<i>Frankenia laevis</i>
Little tern	<i>Sterna albifrons</i>	Sea-kale	<i>Crambe maritima</i>
Long-stalked orache	<i>Atriplex longipes</i>	Sea-lavender	<i>Limonium vulgare</i>
Lugworm	<i>Arenicola marina</i>	Shelduck	<i>Tadorna tadorna</i>
Lyme-grass	<i>Leymus arenarius</i>	Shore lark	<i>Eremopila alpestris</i>

Shrubby sea-blight	<i>Suaeda vera</i>
Slender hare's-ear	<i>Bupleurum tenuissimum</i>
Small cord-grass	<i>Spartina maritima</i>
Smelt	<i>Osmerus eperlanus</i>
Smooth cat's-ear	<i>Hypochaeris glabra</i>
Snail-killing fly	<i>Salticella fasciata</i>
Snow bunting	<i>Plectrophenax nivalis</i>
Spider	<i>Clubiona juvenis</i>
Spiral tesselweed	<i>Ruppia cirrhosa</i>
Sticky groundsel	<i>Senecio viscosus</i>
Stiff saltmarsh-grass	<i>Puccinellia rupestris</i>
Sturgeon	<i>Acipenser sturio</i>
Teal	<i>Anas crecca</i>
Tope	<i>Galeorhinus galeus</i>
Turnstone	<i>Arenaria interpres</i>
Twite	<i>Carduelis flavirostris</i>
Wigeon	<i>Anas penelope</i>
Yellow horned-poppy	<i>Glaucium flavum</i>