

Lyme Bay

A nature conservation profile

February 1997

Summary

The development of the Natural Area concept is a key part in English Nature's drive to conserve nature in England. A Natural Area is not a designation, but an area of countryside identified by its unique combination of physical attributes, wildlife, land use and culture. Natural Areas provide a framework for securing public support for wildlife and geological conservation, so that development of the idea will greatly improve the ability of us all to deliver effective nature conservation.

Overall, England and the seas around it have been divided into some 126 Natural Areas, including 24 Maritime Natural Areas. The boundaries of these Maritime Natural Areas extend from the inland limit of all coastal and estuarine habitats, offshore to the 12 mile limit. The lateral extent of each Maritime Natural Area is closely related to the coastal process cells and sub-cells which have been defined by Hydraulics Research for the Ministry of Agriculture, Fisheries and Food to aid the preparation of Shoreline Management Plans. The coastal process cells are areas within which coarse sediment movement is contained in discrete boundaries. Thus coastal processes within the cell will affect other areas within the cell but will have less effect outside that area.

The production of this Maritime Natural Area Profile is a first step towards securing local agreement on the priorities for nature conservation in the Lyme Bay Maritime Natural Area. It describes and evaluates the wildlife and geology of the area, and proposes key nature conservation objectives for discussion. It is hoped that these objectives will be accounted for in other coastal zone management work, including the development of shoreline management plans.

Lyme Bay is an area of change. It straddles the divide between the warm waters of the south west, and the colder waters of the North Sea and eastern Channel. The soft cliffs of the area are in a constant state of erosion and landslip, whilst the shingle structure of Chesil Bank is naturally mobile. The eroded areas of soft cliffs provide bare ground for colonisation by ruderal communities and insects adapted to the mobile and bare soil environment. Marine creatures are typically those of warmer south-western waters, reaching their easterly limit around the Lyme Bay area.

Internationally important areas of wildlife occur; the Fleet is the largest lagoon in the United Kingdom, harbouring unusual communities of plants and animals adapted to the brackish water conditions. The cliffs of Lyme Bay are internationally famous for their fossils, containing a number of important representatives of particular geological periods.

The status, characteristic wildlife and special species of each of the 12 key wildlife habitats found in the Maritime Natural Area are described, the current factors affecting them identified and nature conservation objectives proposed.

The Maritime Natural area profile is fully consistent with the UK Biodiversity Action Plan, and in particular with the UK Steering Group report on biodiversity submitted to Government in 1995. It is intended that this profile will form the basis of Local Biodiversity Action Plans for a number of smaller areas.

A vision for the future

Looking ahead to the next century, what do we want the natural world of Lyme Bay to look like? We certainly wish to see a landscape and sea which is at least as rich in wildlife and geological features as it is at present, and these should be in good heart. It is especially important that future management of these features is placed on a sound economic basis, and that their contribution to the local economy is recognised by visitors and local businesses.

Rock exposures and natural landforms that are important to the understanding of the origins of Lyme Bay should remain available for study and appreciation, and be accessible. The natural processes should be allowed wherever possible to continue unfettered. This will mean having to plan for the implications of accepting that some parts of the coast which are vulnerable to erosion are uneconomic to protect.

This vision goes further than just retaining what we have now - we would also like to see some reversal of recent losses or declines in quality. For example where wildlife habitats are not in optimal condition, we would like to see them restored, especially where woodland and scrub are invading important grassland communities on hard and soft cliffs. There may also be scope for recreating grassland along cliff tops where intensive agriculture is currently practised up to the cliff edge.

All those native plants and animals currently found in the Natural Area will survive well into the future, common species as well as rarities. We must conserve skylarks as well as little terns, limpets as well as corals. In this way we will maintain the biodiversity of Lyme Bay for future generations. Where species have been lost through habitat deterioration, we will encourage their re-colonisation or re-introduce them once favourable conditions have been restored. We must recognise though that the world is ever-changing, with genetic evolution and climate change being largely or completely beyond our control.

To achieve this vision, the Natural Area must continue to be managed by people. We anticipate that a number of issues have the potential to prevent the fulfilment of the vision. Recreation, tourism and education need to be managed so that leisure use of the environment is in harmony with nature and promotes its conservation. Shoreline management needs to meet the difficult objective of maintaining essential coast protection without disrupting coastal processes. There is further scope to develop fisheries into a more economically and environmentally sustainable industry. Water resources need to sustain healthy wildlife populations and to support human activities. There is further potential for developing sustainable agriculture with minimal adverse and maximum positive impact on the quality of coastal waters and habitats. Finally, oil and gas exploration, production and transport needs to be carried out with minimal impact on the environment.

We must ensure too that proposed measures are compatible with other conservation interests, such as archaeology, and that a balance is struck with activities that may at times conflict with nature conservation.

The final part of this vision for the future is that all the people of Lyme Bay, residents and visitors alike, will come in the next century to appreciate, understand and value the natural world within it. If this happens, the force for conservation will be irresistible.

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1. The Natural Area concept

The development of the Natural Area concept is a key part of English Nature's drive to conserve nature in England. We believe that Natural Areas provide an improved framework for securing public support for wildlife and geological conservation, and greatly improve our ability to work together with others to deliver effective action.

A Natural Area is not a designation, but an area of countryside identified by its unique combination of physical attributes, wildlife, land use and culture. These features give a Natural Area a 'sense of place' and a distinctive nature conservation character which we can seek to sustain. The concept relies on wide participation, and enables us to 'Think globally, act locally'.

Overall, England and the seas around it have been divided into some 126 Natural Areas, including 24 Maritime Natural Areas. The boundaries of these Maritime Natural Areas extend from the inland limit of all coastal and estuarine habitats, offshore to the 12 mile limit. The lateral extent of each Maritime Natural Area is closely related to the coastal process cells and sub-cells which have been defined by Hydraulics Research for the Ministry of Agriculture, Fisheries and Food to aid the preparation of Shoreline Management Plans. The coastal process cells are areas within which coarse sediment movement is contained in discrete boundaries. Thus coastal processes within the cell will affect other areas within the cell but will have less effect outside that area.

The Maritime Natural Areas concept is proposed to facilitate integrated coastal zone management, within which each MNA will be viewed and managed as an entity. Natural Areas not only set the context for special sites such as nature reserves and Sites of Special Scientific Interest, but just as importantly to promote action to conserve wildlife and geological features throughout the area.

Major uses and activities in Lyme Bay Maritime Natural Area

Fisheries (Potting, trawling, fixed netting and longlining)

Tourism and recreation

Military use

Oil and Gas exploitation

Shoreline management and urban development

Shipping and docks

Quarrying and aggregate extraction

Agriculture

2. The role of this profile

This profile is designed to describe and evaluate the wildlife and geological features of the Lyme Bay area, and to identify the most meaningful areas of action to take. Important habitats, species, physical features and coastal processes within the Maritime Natural Area are identified and described, and objectives set for their conservation.

Although the document has been prepared by English Nature, we have incorporated comments on earlier drafts from a number of other organisations with experience of, or interests in Lyme Bay. The profile is written for everyone with an interest in nature conservation in and around Lyme Bay. Hopefully it will serve to pull conservation bodies, local people and sea-users in Lyme Bay closer together, working towards the achievement of shared objectives that address the top priorities for conservation in the Maritime Natural Area.

This document is fully consistent with recent UK thinking on the conservation of biodiversity, a process initiated in Rio in 1992 when the Prime Minister, together with over 150 world leaders, signed the Biodiversity Convention. In particular, the profile draws heavily on *Biodiversity: The UK Steering Group Report*, a December 1995 report to Government which develops several of the prime objectives laid out in *Biodiversity: The UK Action Plan (1994)*. The Steering Group report, to which the Government responded in May 1996, includes lists of species of conservation concern within the UK, as well as costed action plans for some 14 key habitats and 116 key species. It also covers the production of Local Biodiversity Action Plans as a means of implementing the UK plans at the local level.

This profile has been written in a style and format which will allow it to be used as a basis for production of local Biodiversity Action Plans in the Lyme Bay area.

3. The Maritime Natural Area boundary

The Lyme Bay Maritime Natural Area stretches from Portland Bill in the east to Start Point in the west. It includes the Fleet, England's largest saline lagoon, and additionally includes Portland Harbour, which although east of Portland Bill is functionally related to the Fleet in terms of water exchange. Between Start Point and Portland Bill is a distance of 100 kms as the crow flies, but the gentle curve of this magnificent bay comprises over 150 kms of some of the most varied, spectacular and ecologically important coastline in England.

The Maritime Natural Area includes open sea out to the 12 mile limit and the estuaries of the Dart, Teign, Exe, Otter and Axe. The MNA extends inland to include coastal habitats such as vegetated shingle structures, sand dunes, sea cliffs and salt marshes. Because of the complex nature of the coastal zone, in which activities distant from the coast may impinge on maritime or marine habitats, the landward boundary of the Maritime Natural Area is defined in two categories. The *Core Area* comprises Ordnance Survey 1 km grid squares which wholly or in part contain the coastline and maritime habitats, the Fleet and Slapton Ley. The *Buffer Zone* is not continuous and includes adjacent land which directly affects the maritime habitats. This includes the immediate hinterland of the estuaries, the Fleet and Slapton Ley, and the land behind the undercliffs in East Devon and West Dorset.

Directly adjacent are five Terrestrial Natural Areas; South Devon, Devon Redland, Blackdowns, Wessex Vales and Isles of Portland and Purbeck. Inevitably there will be some overlap with some maritime habitats described in this profile also described in the terrestrial natural area profile also.

4. Geology and landforms

4.1 Introduction

The maritime natural area contains a number of internationally important geological sites, along with two exceptionally famous coastal process sites, Chesil Bank and Slapton Bar, both shingle dominated sites. The one sand dune feature in the MNA, Dawlish Warren, forms a small but classic bar protecting the mouth of the Exe Estuary.

There are 17 coastal (p)SSSIs in the MNA covering 83 separate GCR sites and 27 different GCR networks. This indicates the very high diversity of the areas geological heritage. The largest of these sites are those which expose the Jurassic strata, such as Axmouth to Lyme Regis SSSI, West Dorset Coast SSSI and South Dorset Coast SSSI. These sites contain many of the notable fossil localities, although the Devonian limestones in Torbay (such as Daddy Hole SSSI and Hopes Nose to Walls Hill SSSI) are also fossiliferous in places. The landslips at Axmouth to Lyme Regis SSSI form one of the largest landslide areas in England and are internationally renowned.

Table 1 Earth Science (p)SSSIs in the Maritime Natural Area

Isle of Portland	Chesil Beach and the Fleet	South Dorset Coast
West Dorset Coast	Axmouth to Lyme Regis	Sidmouth to Beer Coast
Ladram Bay to Sidmouth	Budleigh Salterton Cliffs	Babbacombe Cliffs
Hopes Nose to Walls Hill	Daddy Hole	Saltern Cove
Dawlish Warren	Dawlish Cliffs	Slapton Ley
Burton Bradstock	Hall sands	

The key geological and coastal process features within the Lyme Bay Maritime Natural Area

- **Coastal exposures of Devonian, Jurassic and Cretaceous strata, many key localities of international importance**
- **Fossil localities including type localities for vertebrate remains (marine reptiles, dinosaurs and fish) and invertebrates**
- **Coastal landslips**
- **Largest shingle ridge in Europe**
- **Classic examples of longshore drift and pebble sorting**
- **Extensive research and educational use**
- **Estuary bar dune feature**
- **Implications for coast protection and shingle extraction.**

4.2 Onshore geology

The onshore area comprises rocks of the Devonian age (410 to 355 million years old) in the west. Eastwards there are Permo-Triassic 'red beds' (205 to 135 myo) between Lyme Regis and Portland Bill. Both Triassic and Jurassic rocks are overlain by Cretaceous sediments (110 to 80 myo) which form the 'cappings' to the coastal high points such as Stonebarrow Hill and Golden Cap. All the strata are superbly exposed along the coastal sections and the area contains many key localities of international geological significance for stratigraphy and palaeontology. The more resistant Devonian rocks in the west of the bay produce a rocky cliff line to the Natural Area, the softer Jurassic clays and shales to the east of Lyme Bay give rise to a distinctive smooth arcuate coastline which rapidly erodes and is dominated by coastal landslips and mass movements. In the east of the area, hard limestone juts out in the form of the Isles of Portland.

Onshore rock exposures between Start Point and Brixham consist of the Start Complex, of Devonian/Precambrian schists and gneisses, with areas of younger Devonian metamorphic schists formed during the Variscan Orogeny (a mountain building period 375 to 300 million years ago). From Brixham northwards to Torquay the strata are primarily of mid Devonian age. Certain beds contain typical and abundant reef fossils including corals. Between Babbacombe Bay and east of Sidmouth, the cliffs comprise mainly Permo-triassic sandstones and interbedded conglomerates (the 'red beds'); these represent sediments which were deposited at a time of arid environment. Red sandstones near Sidmouth occasionally yield fossil remains of terrestrial reptiles.

Jurassic sediments are admirably exposed between Pinhay Bay (west of Lyme Regis) and Portland Bill, with virtually the whole of the Jurassic period represented. The sequence exposes classic sections, perhaps the best in Europe, which have been studied and the fossil fauna collected since the eighteenth century. The Jurassic strata consist mainly of fossil rich clays and shales (interbedded with limestones in parts). The area is internationally renowned for its fossils which include vertebrates (marine lizards, pterosaurs, dinosaurs, fish) and abundant invertebrates (including ammonites, belemnites, bivalves, corals and insects). The Cretaceous sediments represent mainly marine deposits which are also rich in fossils. The area around Beer Head and Seaton comprises condensed mid Cretaceous limestones overlain by a sequence of fossiliferous chalk. Eastwards the Cretaceous strata are typically represented by clays, greensands and chalks which overlay the Jurassic sediments and form the capping to higher ground.

4.3 Offshore geology

The offshore geology in Lyme Bay largely mirrors the sequence onshore. To the west of the bay the Permo-Triassic sediments dominate (Devonian strata have a very limited extent offshore being confined exclusively to relatively narrow areas in Start Bay). Offshore strata become younger progressively eastwards and comprise near horizontal lower, middle and upper Jurassic sediments. Cretaceous sediments do not crop out offshore until a point approximately 35 nautical miles south of Lyme Regis. These strata are overlain by a sequence of Quaternary sea bed sediments which vary in grain size from mud to gravel. Near shore seabed sediments between Bridport and Budleigh Salterton comprise gravely sands; coarser sandy gravels occur adjacent to Chesil Beach. Further offshore, and to the west of the bay, the seabed sediments are dominated by sands and muddy sands.

4.4 Coastal geomorphology

Lyme Bay is also famous for its coastal geomorphology with numerous classic landforms such as shingle beaches and spits. The constantly crumbling soft cliffs and high rates of erosion have led to a number of spectacular large scale landslips, including that at Black Venn which is the largest active landslide in Europe.

Chesil Bank, a shingle ridge, stretches for some 28 km and connects the island of Portland to the mainland. It exhibits a classic example of sorted sediment, with wave action grading pebbles along the ridge according to size. The ridge has attracted the attentions of coastal geomorphologists for centuries. Slapton Bar, on the west side of the bay, is smaller, but is part of another coastal process site dominated by shingle. Nearby, disappearance of the village of Hallsands into the sea during storms early this century illustrates the folly of nearshore aggregate extraction.

The one sand dune feature in the MNA, Dawlish Warren, forms a small but classic bar due to longshore drift protecting the mouth of the Exe estuary. Its continuing existence is vital to the sheltered habitats of the estuary.

Sediment movement is largely contained within the Lyme Bay area, with sediment showing little net movement in Chesil Bank and around Start Bay. Elsewhere, there is a net north-easterly movement of sediment from Tor Bay to a sediment sink around the mouth of the Exe Estuary and a further net movement of sediment easterly into Lyme Bay itself. There is net sediment accretion around Lyme Regis, Dawlish Warren and Tor Bay, whilst cliff and beach erosion occurs throughout much of the area.

The area subdivides into two sub-cells; Portland Bill to Dawlish Warren, and Dawlish Warren to Start Point. Within Portland Bill to Dawlish Warren littoral drift is generally eastwards and sediment transport is low and intermittent. Sand and shingle build up at Lyme Regis due to the trapping effect of the harbour wall, and consequently there is downstream erosion to the east due to the interruption of sediment supply. Sand accretion occurs at Exmouth, the sand coming from Dawlish Warren and being transported by waves and tidal currents across the bar at the estuary mouth.

Between Lyme Regis and Exmouth the cliffs are subject to rapid erosion and slippage. At Lyme Regis the coastline consists of soft, easily eroded cliffs of clay. These are eroded by waves and fine sediments are transported seaward in suspension by rip currents.

Between Dawlish Warren and Start Point there is weak northward drift, although the extensive beaches are subject to strong seasonal changes in drift direction. Coastal processes are dominated by wave action, and in areas such as Start Bay, onshore-offshore sediment movement is as important as alongshore movement in controlling beach sediments. There is erosion of sandstone cliffs north of Torquay, providing beach sand. In sand-filled estuary mouths such as Teignmouth, waves and currents interact to produce complex and largely unpredictable patterns of movement. Due to the indented nature of the coast there is little interaction between the adjacent bays, although there are major drift movements within individual bays such as Babbacombe, Tor and Start Bays.

Key geological and coastal process objectives

The Lyme Bay area is of key international and national importance for its geology and coastal processes. The following are the key conservation objectives which will enable the geological and coastal geomorphological interest to be maintained.

1. **Permit the operation of natural coastal processes within Lyme Bay, including the present cliff erosion, sediment transport and deposition patterns.**
2. **Maintain the integrity of coastal exposures and coastal landslips.**
3. **Encourage responsible fossil collecting in sensitive localities.**
4. **Undertake production and application of estuarine and shoreline management plans to ensure a holistic approach to planning.**
5. **Promote further geological and geomorphological research.**
6. **Ensure sustainable development of tourism.**
7. **Prevent further extraction of shingle.**

5. Key species for conservation attention

5.1 The selection of key species

The Lyme Bay Maritime Natural area contains a number of species which are highly valued, whether by wildlife conservation bodies or by the general public. Limitations on human and financial resources mean we are unlikely to be able to focus conservation action on them all, but we must identify those which are priorities for action, by virtue of the criteria listed below. However, we can rely on habitat conservation measures to conserve the great majority of the remaining species.

Table 2 lists species that may be regarded as key species for Lyme Bay which are a priority for action, even if that is only monitoring numbers to confirm they are remaining stable.

Each of the key species listed in Table 2 is described, in terms of its status and distribution, within the *Special species* part of its primary habitat description (see 6.2.2-6.2.12).

Selection criteria for key species

- a. *Species that are endemic to the UK, or which are threatened on a global or European scale, and which have significant populations in the Lyme Bay Maritime Natural Area. (Protected by the European Habitats Directive, Berne or Bonn Conventions, or are listed on CITES (Convention on the Trade in Endangered Species)).*
- b. *Species which are rapidly declining throughout the UK and which have a national stronghold in Lyme Bay. (Protected by the Wildlife & Countryside Act).*

c.	<i>Species which are threatened in Great Britain, being listed in the relevant Red Data Book, and which are on the extreme edge of their normal range in Lyme Bay.</i>
d.	<i>Marine species occurring in the area which are nationally rare or nationally scarce.</i>
e.	<i>Species which are highly characteristic of Lyme Bay, seldom found in such numbers elsewhere in England, and/or which are popular with the general public.</i>
Some account has also been taken of ensuring that all the important taxa in the MNA are represented and that the species selected are spread across the key habitats present.	

Table 2 Key species occurring in the Lyme Bay Maritime Natural Area

Common name	Scientific name	Selection criteria	Primary habitat
Mammals			
Harbour porpoise	<i>Phocoena phocoena</i>	a,b	Open sea
Bottlenose dolphin	<i>Tursiops truncatus</i>	a,b	Open sea
Common dolphin	<i>Delphinus delphis</i>	a,b	Open sea
Long-finned pilot whale	<i>Globicephala melas</i>	a,b	Open sea
Otter	<i>Lutra lutra</i>	a,b,c,	Lagoons
Greater Horseshoe Bat	<i>Rhinolophus ferrumequinum</i>	a,b	Caves in disused quarries, hard cliffs
Lesser Horseshoe Bat	<i>Rhinolophus hipposideros</i>	a,b	Caves in disused quarries, hard cliffs
Reptiles			
Sand Lizard	<i>Lacerta agilis</i>	a	Sand dunes (Dawlish Warren)
Birds			
Wigeon	<i>Anas penelope</i>	a	Intertidal flats, estuaries
Dark bellied Brent Goose	<i>Branta bernicla bernicla</i>	a	Intertidal sediments, saltmarsh, estuaries and sand dunes
Dunlin	<i>Calidris alpina</i>	a	Intertidal flats, estuaries
Cetti's Warbler	<i>Cettia cetti</i>	a	Reedbeds, lakes & lagoons
Cirl Bunting	<i>Emberiza cirlus</i>	a	Farmland, hard cliffs
Oystercatcher	<i>Haematopus ostralegus</i>	e	Intertidal flats, estuaries, sand dunes
Bar-tailed Godwit	<i>Limosa lapponica</i>	a	Intertidal flats, estuaries, sand dunes
Black-tailed Godwit	<i>Limosa limosa</i>	a	Saltmarsh, estuaries
Curlew	<i>Numenius arquata</i>	a	Saltmarsh, intertidal sediments, estuaries
Whimbrel	<i>Numenius phaeopus</i>	a	Intertidal flats, estuaries

Common name	Scientific name	Selection criteria	Primary habitat
Grey Plover	<i>Pluvialis squatarola</i>	a	Shingle and intertidal flats, estuaries
Avocet	<i>Recurvirostra avosetta</i>	a	Intertidal flats, estuaries
Little Tern	<i>Sterna albifrons</i>	a	Shingle, lagoons
Greenshank	<i>Tringa nebularia</i>	a	Intertidal flats, estuaries
Redshank	<i>Tringa totanus</i>	a	Intertidal sediments saltmarsh, estuaries
Guillimot	<i>Uria aalge</i>	e	Hard cliffs and open sea
Lapwing	<i>Vanellus vanellus</i>	a	Intertidal flats, agricultural land, estuaries
Fish			
Allis shad	<i>Alosa alosa</i>	a	Estuaries
Twaite Shad	<i>Alosa fallax</i>	a	Estuaries
Red band fish	<i>Cepola rubescens</i>	e	Subtidal sediments, Portland Harbour and the Fleet
Basking shark	<i>Cetorhinus maximus</i>	e	Open sea
Bass	<i>Dicentrarchus labrax</i>	e	Estuaries
Couch's goby	<i>Gobius couchi</i>	a	The Fleet
Sea Lamprey	<i>Petromyzon marinus</i>	a	Estuaries
Black face blenny	<i>Tripterygion atlanticus</i>	e	Portland Harbour
Marine invertebrates			
A sponge	<i>Adreus fascicularis</i>	d	Subtidal rock
Trumpet anemone	<i>Aiptasia mutabilis</i>	d	Subtidal rock
A worm	<i>Alkmaria romijni</i>	d	Lagoons
Lagoon sand worm	<i>Armandia cirrhosa</i>	b,d	Lagoons, intertidal sediments
A sponge	<i>Axinella damicornis</i>	d	Subtidal rock
Gold & scarlet star coral	<i>Balanophyllia regia</i>	d	Subtidal rock
DeFolin's lagoon snail	<i>Caecum armoricum</i>	d	Lagoons
Latticed corklet	<i>Cataphellia brodicii</i>	d	Subtidal rock
A sponge	<i>Dysidea pallescens</i>	d	Subtidal rock
Pink sea fan	<i>Eunicella verrucosa</i>	d	Subtidal rock
An amphipod	<i>Gammarus chevreuxi</i>	d	Estuaries, saltmarsh
Lagoon sand shrimp	<i>Gammarus insensibilis</i>	d	Lagoons
Ginger tiny anemone	<i>Isozoanthus sulcatus</i>	d	Intertidal and subtidal rock
Sunset coral	<i>Leptopsammia pruvoti</i>	d	Subtidal rock
Starlet anemone	<i>Nematostella vectensis</i>	d	Lagoons

Common name	Scientific name	Selection criteria	Primary habitat
Yellow skirt slug	<i>Okenia elegans</i>	d	Subtidal rock
A worm	<i>Ophelia bicornis</i>	d	Intertidal sediments, Exe Estuary
Lagoon snail	<i>Paludinella littorina</i>	d	Lagoons
Ross coral	<i>Pentapora foliacea</i>	e	Subtidal rock
Sea squirt	<i>Phallusia mammillata</i>	d	Intertidal and subtidal rock
Sea squirt	<i>Pycnoclavella aurilucens</i>	d	Subtidal rock
Worm anemone	<i>Scolanthus callimorphus</i>	d	Subtidal sediments, lagoons
A bristle worm	<i>Sternapsis scutata</i>	d	Subtidal sediments
A sponge	<i>Suberites massa</i>	d	Subtidal rock, the Fleet, lagoons
Lagoon sea slug	<i>Tenellia adspersa</i>	d	Lagoons
A sponge	<i>Thymosia guernei</i>	d	Subtidal rock
Sea slug	<i>Trapania maculata</i>	d	Subtidal rock
Looping snail	<i>Truncatella subcylindrica</i>	d	Lagoons, shingle
Sea pen	<i>Virgularia mirabilis</i>	e	Subtidal sediment, Portland Harbour
Seaweeds			
Brown seaweed	<i>Asperococcus compressus</i>	d	Intertidal rock
Green seaweed	<i>Cladophora battersii</i>	d	Lagoons
Red seaweed	<i>Gigartina pistillata</i>	d	Intertidal rock
Red seaweed	<i>Gracilaria bursa-pastoris</i>	d	Subtidal rock, lagoons
Red seaweed	<i>Gracilaria multipartita</i>	d	Subtidal rock, lagoons
Foxtail stonewort	<i>Lamprothamnium papulosum</i>	b,d	Lagoons
Red seaweed	<i>Lphosiphonia reptabunda</i>	d	Intertidal rock
Brown seaweed	<i>Padina pavonica</i>	d	Intertidal rock
Brown seaweed	<i>Zanardinia prototypus</i>	d	Subtidal rock
Flowering Plants			
Babington's leek	<i>Allium ampeloprasum</i>	c	Shingle
Goldilocks aster	<i>Aster linosyris</i>	c	Hard cliffs
Small hare's ear	<i>Bupleurum baldense</i>	b,c	Hard cliffs
Sedge	<i>Carex divisa</i>	e	Estuaries
Slender centaury	<i>Centaurium tenuiflorim</i>	b,c	Hard cliffs, soft cliffs
Stinking goosefoot	<i>Chenopodium vulvaria</i>	b,c	Hard cliffs, soft cliffs
Strapwort	<i>Corrigiola littoralis</i>	b,c	Shoreline of Slapton Ley, lakes & lagoons
Field eryngo	<i>Eryngium campestre</i>	c	Hard cliffs
Early gentian	<i>Gentianella anglica</i>	c	Soft cliffs, hard cliffs

Common name	Scientific name	Selection criteria	Primary habitat
White rock rose	<i>Helianthemum appeninum</i>	c	Hard cliffs
Nit grass	<i>Gastridium ventricosum</i>	c	Hard cliffs
Little robin	<i>Geranium purpureum</i>	c	Hard cliffs, shingle
Flax leaved St John's wort	<i>Hypericum linariifolium</i>	c	Hard cliffs
Sea pea	<i>Lathyrus japonicus</i>	c	Shingle
Small tree mallow	<i>Lavatera cretica</i>	c	Hard cliffs
Lavender	<i>Limonium binervosum</i>	e	Estuaries, hard cliffs
Portland sea lavender	<i>Limonium recurvum</i>	c	Hard cliffs, Portland
Purple gromwell	<i>Lithospermum purpurocaeruleum</i>	c	Soft cliffs, hard cliffs
Small rest-harrow	<i>Ononis reclinata</i>	b,c	Hard cliff
Early meadow- grass	<i>Poa infirma</i>	c	Hard cliff, soft cliff
Sand crocus	<i>Romulea columnae</i>	b,c	Sand dunes, Dawlish Warren
Shoredock	<i>Rumex rupestris</i>	a,b,c	Driftline, Hard cliff, soft cliff, shingle
Tasselweed	<i>Ruppia spiralis</i>	c	Lagoons & lakes
Shrubby seablite	<i>Suaeda vera</i>	c	Lagoons & lakes
Honewort	<i>Trinia glauca</i>	c	Hard cliff
Eel grass	<i>Zostera angustifolia</i>	e	Lagoons, intertidal sediments, estuaries
Eel grass	<i>Zostera marina</i>	e	Subtidal sediments
Eel grass	<i>Zostera noltii</i>	e	Lagoons, intertidal sediments, estuaries
Land invertebrates			
Ground beetle	<i>Anthicus tristis</i>	c	Shingle, Chesil
Darkling beetle	<i>Omophlus rufitarsus</i>	e	Shingle, Chesil
Jumping spider	<i>Pellenes tripunctatus</i>	c	Shingle, Chesil
Silver studded blue butterfly	<i>Plebejus argus ssp cretaceus</i>	b	Portland, hard cliffs
Scaly cricket	<i>Pseudomegoplistes squamiger</i>	c	Shingle, Chesil

6. Key wildlife habitats

6.1 Comparative importance and extent

The Lyme Bay area supports a wide range of marine, coastal and maritime habitats. The main ones which occur in the area are listed below, ranked according to current thinking on their importance in international, national or regional context. Very approximate figures on the area occupied by each habitat are given in Table 3.

<p>International importance</p> <p>Shingle Lagoons Soft cliffs</p> <p>National importance</p> <p>None</p>	<p>Local importance</p> <p>Sand dunes Estuaries Saltmarsh Hard cliffs Intertidal rock Intertidal sediment Subtidal rock Subtidal sediment Open sea</p>
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Table 3 The approximate extent of each major habitat within Lyme Bay Maritime Natural Area

Habitat	Approximate area (km ²) or length (km)	Approximate % of UK resource
Shingle	3.84	7.6
Dunes	0.46	0.4
Estuaries	48.39	2
Saltmarsh	2.09	0.6
Lagoons and lakes	4.8	38
Soft cliffs	26.5 km	5.8
Hard cliffs	Unknown	Unknown
Intertidal rock	Unknown	Unknown
Intertidal sediment	Unknown	Unknown
Subtidal rock	Unknown	Unknown
Subtidal sediment	Unknown	Unknown
Open sea	Unknown	Unknown

Figures are derived from Radley (1994), Burd (1989), Sneddon & Randall (1994) Pye & French (1993) and Moffat (1994).

6.2 Habitat descriptions and specific conservation objectives

The status, characteristic wildlife, special species and, where known, extinct species, of each habitat are described in the sections that follow. **Key species, as identified in Table 2, are highlighted in bold.**

The main factors currently affecting each habitat are also given, together with suggested nature conservation objectives. **These objectives, although hopefully realistic in the long term are deliberately visionary and unconstrained. They are not intended to include targets - these will be provided in the Local Biodiversity Action Plan.** They are amalgamated across all the habitats in section 6.3, which gives seven key goals for wildlife conservation within the Maritime Natural Area.

6.2.1 Shingle

Shingle beaches occur very widely around England's coast, but in most cases the stones and pebbles which make up the beach are so mobile that vegetation is unable to become established. Large shingle beaches where areas of shingle become stabilized and support vegetation are relatively few, and occur mainly on the south and east coasts of England.

The Lyme Bay Maritime Natural Area includes two exceptional shingle structures which make up around 7.6% of the total area in England. Chesil Bank stretches for some 28 km connecting the Isle of Portland with the mainland and covers over 2.5 km². Slapton Bar covers 34 ha and separates Slapton Ley from the sea.

Vegetation on coastal shingle structures divides into two broad categories. At the top of the intertidal zone, temporary stability of the shingle during calm summer weather allows the development of annual vegetation on the strandline. Typical species include sea sandwort *Honkenya peploides*, saltwort *Salsola kali*, sea rocket *Cakile maritima*, cleavers *Galium aparine* and scentless mayweed *Tripleurospermum maritimum*. Also present may be sea kale *Crambe maritima* and seabed *Beta vulgaris*.

On higher level shingle, out of the reach of wave action, a greater range of vegetation occurs. This ranges from open pioneer communities close to the strandline to the grasslands, scrub and moss and lichen dominated vegetation of very old, stable shingle further inland.

Characteristic wildlife

Chesil Bank exhibits a range of species poor strandline and pioneer vegetation communities, many dominated by bare shingle and sea campion. Communities dominated by curled dock *Rumex crispus* and sea campion *Silene vulgaris* ssp *maritima* are common, whilst the more stable lee slopes support a fragile lichen rich community dominated by the lichen *Cladonia furcata* and red fescue *Festuca rubra*. Slapton Bar supports more species rich communities which merge into grassland and scrub communities. Herb-rich grassland communities dominated by red fescue, yarrow *Achillea millefolium*, false oat-grass *Arrhenatherum elatius* and sea radish *Raphanus maritimus* are especially common.

Special species

Chesil Bank is an internationally important breeding ground for **Little Terns**.

A number of Red Data Book species of invertebrates occur on the shingle of Chesil Bank, including the scaly cricket *Pseudomegoplistes squamiger*, the darkling beetle *Omophlus rufitarsus*, the jumping spider *Pellenes tripunctatus* and the ground beetle *Anthicus tristis*.

The most important plant species of the shingle in the area is the large population of sea pea *Lathyrus japonicus* at Chesil. This species has declined substantially or become extinct at other known south coast sites. Good populations of sea kale, which is declining nationally, also occur at Chesil. *Suaeda vera* occurs along almost the whole length of the Fleet.

Protected sites

Chesil and the Fleet are protected by a number of designations. Internationally, they are a Special Protection Area and Ramsar site, and have been put forward as a possible Special Area of Conservation under the EC Habitats and Species Directive.

Slapton Ley is a National Nature Reserve, whilst SSSI designations cover Chesil and The Fleet, Slapton Ley and West Dorset Coast. There is also a local nature reserve at Chesil Bank and the Fleet, and National Trust ownership of Burton Cliff and Cogden Beach.

Current factors affecting the habitat

- Coastal shingle is in a constant state of change from natural sediment processes. Coast protection in many areas of Lyme Bay affect this naturally dynamic process, affecting the stability of shingle structures, often increasing erosion in adjacent areas and the rate of movement of shingle beyond that which naturally occurs.
- Aggregate extraction offshore and in the intertidal zone removes vital sediments which continue to be deposited on shores. Removal of this sediment unbalances the process of sediment deposition and erosion, resulting in loss of intertidal areas and consequent increased erosion of the coastal fringe.
- Vehicle access to the shore damages delicate vegetation communities which rely on shingle stability. The loss of vegetation further destabilises the shingle, increasing erosion and preventing re-establishment of characteristic plants.
- Recreational use of shingle structure has similar effects to vehicle access. Increased passage of visitors damages plant communities and increased erosion.

Key nature conservation objectives

1. Undertake shoreline management plans to ensure a holistic approach to planning activities.
2. Promote interpretation to ensure that visitors and local people are aware of the key interest and nature conservation priorities of the area.
3. Encourage the development of sustainable tourism, ensuring activities are targeted to appropriate areas.
4. Control access of both vehicles and people to sensitive sites to prevent damage to fragile communities.
5. Place an embargo on all aggregate extraction

6.2.2 Sand dunes

Status

The accumulation of sand to form sand dunes is entirely a coastal phenomenon in Great Britain. On our coast sand dunes cover an area almost as great as that occupied by saltmarshes. Two major factors are required for sand dunes to form: a supply of mobile sand along with the wind to move it, and plant colonisation to stabilise deposited material and encourage further sand deposition.

Dawlish Warren is the only sand dune site within the Lyme Bay MNA, covering an area of just 46 ha, approximately 0.4% of the total resource in England. It is a spit dune system forming a sandy promontory on the western entrance to the Exe Estuary.

Characteristic wildlife

The main vegetation types in Dawlish Warren include communities dominated by sand sedge *Carex arenaria*, marram grass *Ammophila arenaria* and red fescue *Festuca rubra*. In the centre of the site there are herb-rich damp mire communities and willow scrub. The golf course is dominated by acid grassland with sheep's fescue *Festuca ovina* and common bent grass *Agrostis capillaris*. Invasive tree lupins *Lupinus arboreus* have been a major problem in the past.

Special species

Dawlish Warren is the only British location for the sand crocus *Romulea columnae* var. *occidentalis*.

The sand lizard *Lacerta agilis* has been reintroduced to Dawlish as part of English Nature's Species Recovery Programme.

Protected sites

Dawlish Warren is included within the Exe Estuary Special Protection Area and Ramsar site. Dawlish Warren is also a Site of Special Scientific Interest, and part is a Local Nature Reserve owned by Devon Wildlife Trust. Additionally part of the sand dune area is within the Maer Local Nature Reserve.

Current factors affecting the habitat

- Both marine erosion and coastal defence affect the natural development of the spit which supports the dunes of Dawlish Warren.
- Recreational pressures and the presence of a golf course on the dunes affect natural vegetation communities through trampling and increased erosion.
- Scrub invasion and increase in tree lupins are a problem, changing the character of the dunes and altering the key sand dune vegetation types.

- Rabbit viral haemorrhagic disease is likely to greatly reduce the rabbit population. This would drastically alter the grazing regime and change the nature of the vegetation.
- Lowering of groundwater levels leading to drying out of herb-rich turf and consequent loss of species.

Key nature conservation objectives

1. Ensure current tourism and recreation activities are carried out in a sustainable manner.
2. Undertake production and implementation of a Shoreline Management Plan to ensure planning decisions are made in a holistic fashion, allowing natural coastal processes such as maintenance of the coastal spit at Dawlish Warren.
3. Control scrub invasion to ensure that dune slack vegetation and rare plant communities are maintained.
4. Monitor, maintain and enhance populations of the sand crocus.
5. Maintain grazing to at least current levels, monitor and consider introduction of increased grazing if rabbit populations are drastically reduced.
6. Monitor, maintain and enhance current sand lizard population, reintroduced as part of EN's species recovery programme.
7. Maintain a high water table.

6.2.3 Estuaries

Status

Five estuaries open on to Lyme Bay: the Axe, Otter, Exe, Teign and Dart, representing both bar-built estuaries and rias. The estuaries are different in character, arising from their different geomorphological origins. The bar-built estuaries of the Axe, Otter and Exe are essentially shallow inlets with predominantly intertidal sediments and little rocky substrata. In contrast the rias of the Teign and Dart have extensive intertidal sediment areas and deeper water central channels with rock and sediment habitats.

Estuaries in the area cover around 4.8 km² and represent around 2% of the total resource in England. The Exe is the largest estuary in the MNA, covering 1.8 km² with extensive tracts of mudflat and grazing marsh and some saltmarsh. The estuarine habitats of Lyme Bay are particularly important for passage birds on migration and support internationally important populations of wintering waterfowl.

Characteristic wildlife

Estuaries are typically areas of transition, from fully marine to freshwater communities, and from marine subtidal communities to maritime terrestrial habitats. Within these gradients a number of important habitats for wildlife occur. These are described in more detail in the

relevant habitat sections 6.2.4 Saltmarsh, 6.2.8 Intertidal rock, 6.2.9 Intertidal sediment, 6.2.10 Subtidal rock and 6.2.11 Subtidal sediment.

Tidal flats are a major part of estuarine ecosystems, varying from soft mud in the inner parts of estuaries to firm sandflats in the outer parts. Typical species include a range of invertebrate animals such as crustacea, molluscs and worms, which may be particularly dense in muddy sediments, additionally there are dense areas of green algae *Enteromorpha* spp. And eelgrass *Zostera* spp. These are the key species on which the internationally important wintering populations of waterfowl feed.

Special species

The estuaries of the Maritime Natural Area contain internationally important numbers of wintering **Dark-bellied Brent Geese** and wintering **Avocets**.

Sandy sediments at the mouth of the Exe contain a rare polychaete worm *Ophelia bicornis* which is known from only a few other locations in Britain.

Site protection

Only one estuary in the area is protected by international designations, the Exe estuary which is a Special Protection Area and Ramsar site.

Two estuaries in the area are protected by SSSI designation, the Exe and the Otter estuaries. There are additionally a number of local nature reserves, Wildlife Trust and RSPB reserves: Exmouth, Exminster Marshes, Old Sludge Beds, Exe Reed Beds, Otter Estuary, and Lympstone.

Current factors affecting the habitat

- Estuaries are subject to a high degree of recreational disturbance.
- Disposal of waste and agricultural run-off into enclosed estuarine water results in lowered water quality and increased nutrient loading.
- Many estuarine habitats are affected by dredging, both to maintain deep water channels and to create new deep water areas for leisure purposes.
- Reclamation of land in estuaries results in major reduction in estuarine habitats.
- Mariculture (cultivation of shellfish) in sensitive areas can reduce the quality of natural estuarine habitats by changing the natural sediment on their shore.
- Spread of cord grass into saltmarsh communities, leading to a loss of native species.

Key nature conservation objectives

1. Complete production of estuary management plans for all estuaries in the Lyme Bay MNA and fund their implementation. Extend the scope of Shoreline Management Plans to include estuaries.
2. Develop codes of conduct for water sports which take place in estuarine areas.
3. Improve water quality, by appropriate Water Quality Objectives, including nitrate reduction to control eutrophication, and promote the development of catchment management plans.
4. Increase water levels on grazing marsh.
5. Assess the environmental impacts of dredging and mariculture before the areas affected are considered for extension.
6. Ensure no further loss of grazing marsh to intensive agriculture.

6.2.4 Saltmarsh

Saltmarshes are areas of coastal sediment, covered by vegetation, which are only subject to periodic flooding by the sea. During the flooding, mud is deposited on the marsh as the water movement slows down, thus gradually raising the level of the marsh.

Although the estuaries of the Lyme Bay MNA do not support extensive areas of saltmarsh (only 2.09 km²) those areas which do occur are particularly important in providing feeding grounds for wintering wildfowl.

The Lyme Bay coast, unlike East Anglia for example is not subject to significant sea level rise, so saltmarsh erosion from this cause is not a major problem. Saltmarshes of the MNA are more likely to be affected by problems of water quality, reclamation, and the birds that frequent them by disturbance from recreational activities.

Characteristic wildlife

Many of the saltmarsh habitats are dominated by saltmarsh grass *Puccinellia* spp. swards, although in many places there has been a rapid spread of the cord grass *Spartina anglica* a vigorous hybrid which first arose in Southampton Water in the late 19th century.

Wintering wildfowl use the marsh for roosting during high tide periods.

Special species

A number of waders & wildfowl feed or roost on saltmarshes. These include **redshank**, **dark bellied brent goose**, **black-tailed godwit**, and **Curlew**.

Protected sites

Saltmarsh in the Lyme Bay MNA occurs within a number of protected sites. The Exe Estuary and Chesil and the Fleet are both Special Protection Areas, whilst Chesil and the Fleet is additionally a Ramsar site and possible Special Area of Conservation.

There are a number of SSSI's: Chesil and the Fleet, the Otter Estuary, the Exe Estuary and Dawlish Warren. Chesil Bank and the Fleet and the Otter Estuary are also private nature reserve and Devon Wildlife Trust Reserve respectively.

Current factors affecting the habitat

- Recreational activities lead to disturbance of roosting waterfowl populations during high tide periods.
- Poor water quality due to eutrophication affects some areas of saltmarsh.
- Rapid spread of the cord grass *Spartina anglica* displaces natural vegetation on lower level saltmarsh.

Key nature conservation objectives

1. Complete estuary management plans and fund their implementation.
2. Disturbance due to recreation should be controlled by careful zoning of activities to appropriate areas.
3. Setting of Water Quality Objectives should be used to reduce nitrate loading and eutrophication of estuarine waters.
4. In order to compensate past losses of saltmarsh due to reclamation, coastal defences *etc.* habitat recreation and setback should be encouraged.

6.2.5 Lagoons/lakes

Status

Lagoons are a priority marine habitat under the EC Habitats and Species Directive. Lagoons are a scarce coastal feature, often transient in soft coastlines and easily infilled for reclamation, rubbish disposal or damaged during coastal protection works.

Lagoons typically contain a mixture of freshwater and seawater, which enters via percolation through a shingle barrier or through a restricted connecting channel to the open sea. Tidal levels do not fluctuate markedly, and communities of plants and animals within lagoons are adapted to the stresses of variable salinity caused by increased freshwater input from rainfall, or increased salinity due to evaporation in dry hot weather.

Lyme Bay contains two important sites. The Fleet is by far the United Kingdom's largest saline lagoon, covering some 4.8 km², whilst Slapton Ley is the largest freshwater lake in south-west England.

Characteristic wildlife

The Fleet supports a characteristic suite of lagoonal plants and animals along with many lagoonal specialists which thrive in the fine sediment substrate subject to minimal wave exposure, weak currents and low tidal flushing. The Fleet is unusual in demonstrating a range of physiographic variations, from the variable salinity tide-swept sponge communities in the narrows where it connects to Portland Harbour, to the sheltered low salinity upper reaches near Abbotsbury, where saline water only enters the lagoon by percolation through the shingle barrier, dominated by tasselweed *Ruppia* spp.

Slapton Ley is the largest freshwater lake in South-west Britain. Geologically the lake would initially have developed as a saline lagoon, enclosed by shingle movement. Further shingle deposition and changes in the rate of inflow of seawater led to natural evolution to a freshwater lake.

Special species

A number of lagoonal species occur in the Fleet, some of which are protected under the Wildlife & Countryside Act. Lagoonal specialists include the lagoon sandworm *Armandia cirrhosa*, the starlet anemone *Nematostella vectensis*, the worm *Alkmaria romijni*, the lagoon sand shrimp *Gammarus insensibilis*, a range of lagoon snails: *Caecum armoricum*, *Truncatella subcylindrica*, and *Paludinella littorina*, the lagoon sea slug *Tenellia adspersa*, the green sea weed *Cladophora battersii* and the foxtail stonewort *Lamprothamnium papulosum*. The Fleet also has important beds of eelgrass *Zostera* spp., and tasselweed *Ruppia* spp. The Fleet holds populations of the rare Couch's goby, one of only a small number of sites where this species is found

Slapton Ley supports a colony of the nationally rare plant strapwort *Corrigola littoralis* which is under threat due to changing water levels. The Ley is also a stronghold for otters.

Protected sites

The Fleet is a Special Protection Area and Ramsar site and is a possible SAC. The lagoon is also included within Chesil and the Fleet SSSI and Chesil Bank and the Fleet Nature Reserve. Slapton Ley is a National Nature Reserve and SSSI.

Current factors affecting the habitat

- Water quality and eutrophication are a problem within the enclosed waters of the Fleet and Slapton Ley.
- Mariculture in the Fleet may be a cause for concern, due to introduction of non-native species, which could displace the natural biota.
- Agricultural management of the surrounding land in the catchment area is of key importance in controlling nutrient enrichment of the waters.

Key nature conservation objectives

1. Establish nitrate reduction zones in the catchment areas of both Slapton Ley and the Fleet.
2. Reduce eutrophication of waters due to all sources.
3. Develop a zoning system for mariculture to avoid conflict in areas of prime conservation value.
4. Contribute to shoreline management plans to ensure that processes relevant to coastal lagoons are taken into account.

6.2.6 Soft cliffs

Status

The coastline of the Lyme Bay MNA contains extensive sections of unprotected soft cliffs (those which have a slumped rather than a vertical profile), especially where the Lias and Gault clays outcrop. At Golden Cap these cliffs reach a height of 191 m, the highest point on the south coast of England.

Soft cliffs play an important part in coastal processes, supplying mobile material to sites down-current. Coast protection works here may cause sediment deficits and erosion to occur elsewhere.

Characteristic wildlife

Vegetation on soft mobile cliffs is often composed of ruderal communities and wet flush species. However, between Axmouth and Lyme Regis a species rich ash woodland with a diverse ground flora has developed on this, the largest and most important landslip area in England. Black Venn in Dorset is another large active slip. These soft cliffs also support an unusual range of rare insects which are adapted to the mobile and bare soil environments.

Special species

The constant availability of new areas of habitat due to landslips make soft cliffs important for a number of species. They include plants such as purple gromwell, and early gentian *Gentianella anglica*.

Site protection

The Axmouth to Lyme Regis section of the coast is protected by National Nature Reserve and SSSI status. Two other SSSIs include sections of soft cliffs; Chesil and the Fleet, and West Dorset coast.

Part of Lyme Bay is a proposed World Heritage Site for its geology, whilst Sidmouth to West Bay is SSSI and has been proposed as a possible Special Area of Conservation. National Trust ownership protects The Spittles and Black Venn, Golden Cap and Weldon Estates, whilst the Devon Wildlife Trust have a reserve at Weston Mouth.

Current factors affecting the habitat

- Coast protection/stabilisation to prevent further landslips and loss of property interferes with natural coastal processes of erosion and sediment movement.
- Development on unstable cliff top sites leads to the need for further coastal protection.
- Maintenance of natural coastal processes is paramount in ensuring the continued nature conservation interest.
- Farming very close to the cliff top leads to squeezing of vegetation between natural slumping of the cliffs and intensive land management.
- Lack of grazing (including by rabbits) on the cliff top leads to scrub invasion.

Key nature conservation objectives

1. Restrict new development to stable areas or existing urban areas where coastal protection is already in existence.
2. Create buffer zones to allow natural retreat of cliff lines where this is a viable option.
3. Undertake production and implementation of Shoreline Management Plans to ensure a holistic approach to management of coastal protection.
4. Establish a balance between coastal scrub and other coastal habitats to the benefit of wildlife.
5. Encourage more extensive management for wildlife of the coastal strip along cliff tops.
6. Monitor grazing levels and consider the introduction of stock grazing if there is a major reduction in the number of rabbits.

6.2.7 Hard cliffs

Status

Hard cliffs (those which erode to a more or less vertical face) extend intermittently from Start Point to Seaton, with limestone cliffs at Portland, and sandstone at Burton Bradstock. Much of the maritime clifftop habitat has been lost to agricultural improvement or urban development, but grassland and scrub communities remain near the cliff edge and on steep slopes.

Characteristic species

Berry Head has the remnants of an interesting calcareous grassland flora, and its cliffs support an important colony of breeding birds, including the largest colony of Guillemots in southern England, along with kittiwakes and fulmars. The cliffs of Portland, in the extreme east of the area are of international importance for their geology (and are the source of

Portland Limestone used in many buildings). They also support a varied flora reflecting the southerly and maritime position of the site.

Special species

Portland sea lavender *Limonium recurvum* occurs on cliffs at Portland, along with **early gentian** *Gentianella anglica*.

Site protection

Areas of hard cliff are included within a number of conservation sites. Lyme Bay is a proposed World Heritage Site, while Sidmouth to West Bay is a possible Special Area of Conservation along with the Isle of Portland. Sites of Special Scientific Interest include the Isle of Portland, Sidmouth to Beer Coast, Ladram Bay to Sidmouth, Babbacombe Cliffs, Hopes Nose to Walls Hill, Berry Head to Sharkham Point, Froward Point and part of Prawle Point and Start Point. Berry Head is a local nature reserve, whilst National Trust ownership includes Burton Cliff, Weston Estates, Orcombe Point, Froward Point, Colaton Fishacre and Little Dartmouth.

Current factors affecting the habitat

- Agricultural improvement has reduced substantially the area of natural maritime cliff top vegetation.
- Scrub invasion, caused in many cases by lack of grazing, is adversely affecting maritime vegetation.
- Recreational disturbance, especially by rock climbing, is affecting nesting seabirds and causing damage to maritime vegetation communities (especially crevice vegetation) on some cliffs.

Key nature conservation objectives

1. Control scrub and promote grazing to ensure maintenance of maritime grassland communities and a balance with other coastal habitats to the benefit of wildlife.
2. Undertake a programme of habitat recreation to restore former cliff top vegetation.
3. Promote zoning of recreational activities to prevent disturbance at key bird breeding times and control vegetation erosion at sensitive sites.
4. Monitor grazing levels and consider the introduction of stock grazing if there is a major reduction in the number of rabbits.

6.2.8 Intertidal rock

Status

Lyme Bay contains a number of rocky shores of varying wave exposures and rock types. Of particular importance is the presence of coastal chalk exposures between Lyme Regis and

Beer, with the section between Beer Head and Beer particularly notable. Coastal chalk exposures are rare in Britain and Europe and harbour specialist assemblages of species which bore into the soft rock, along with a number of rare splash zone algae. Many shores of all rock types in the area have a diverse range of habitats including rockpools, scoured gullies, fissures, crevices, overhangs and wave cut platforms, which provide ideal conditions for a diversity of Intertidal species.

Characteristic wildlife

Rocky shores contain a range of plant and animal species adapted to the rigours of constant immersion and exposure by seawater. Typical zonation of plant and animal communities occurs on many of the shores in the Lyme Bay area, with spiral wrack at the top of the shore, bladder wrack in the mid shore and serrated wrack on the low shore. Associated with these brown seaweeds are limpets, winkles and topshells, along with more specialised animals such as piddocks, which bore into suitable soft rock such as chalk or limestone. At the bottom of the shore, in the shallow subtidal area which is only uncovered during low spring tides, beds of kelp are present, with rich associated communities of sponges red algae and ascidians.

Special species

Lyme Bay is the easterly limit of a number of south-western marine species, which fail to extend further east up the channel than Portland Bill. Thus a number of species are important in being at the edge of their range and potentially of value in indicating any distributional changes which may be attributable to increases in sea temperature. A number of rare and scarce marine species have been identified as part of a review of the area for the Joint Nature Conservation Committee publications *Coasts and seas of the United Kingdom: Region 9 Southern England and Region 10 South-west England*. Many of these occur on shores within the Lyme Bay area. The brown seaweeds *Padina pavonica* and *Asperococcus compressus* and the red seaweed *Lophosiphonia reptabunda* have been noted from intertidal rocks in the area, along with the seasquirt *Phallusia mammillata*. On sand scoured rock the red seaweed *Gigartina pistillata* may also be present.

Protected sites

Around 22 SSSIs include an intertidal component. However, none of these have been designated on the basis of their marine biology, most having been notified for geological or other biological criteria. The list of SSSI's is as follows:

Axmouth to Lyme Regis
Babbacombe Cliffs
Berry Head to Sharkham Point
Budleigh Salterton Cliffs
Daddyhole
Dawlish Cliffs
Dawlish Warren
Dyer's Quarry
Exe Estuary
Froward Point
Hope's Nose to Walls Hill
Isle of Portland

Ladram Bay to Sidmouth
Meadfoot Sea Road
Otter Estuary
Portland Harbour Shore
Prawle Point and Start Point (part)
Roundham Head
Saltern Cove
Sidmouth to Beer Coast
Slapton Ley
West Dorset Coast.

In addition to the SSSI designations, the foreshore is included in the Axmouth to Lyme Regis Undercliffs National Nature Reserve. Berry Head Local Nature Reserve also includes foreshore, whilst National Trust ownership includes Orcombe Point, Froward Point, Colaton Fishacre and Little Dartmouth. A Voluntary Marine Nature Reserve is proposed for Charmouth.

Current factors affecting the habitat

- Recreation on rocky shores may affect the biota due to trampling or recreational collection. There is also educational collecting by students in some areas, again with adverse effects on the biota.
- Water quality, including oil pollution is an issue in some areas.
- Shoreline management, including coastal protection affects the natural processes of some rocky shores.

Key nature conservation objectives

1. Encourage the establishment/enhancement of areas suitable for interpretation, education and public appreciation.
2. Ensure realistic oil spill contingency plans exist.
3. Encourage the production and implementation of holistic shoreline management plans, including nature conservation objectives.
4. Establish suitable water quality objectives for coastal waters.

6.2.9 Intertidal sediment

Status

Intertidal sediments in Lyme Bay occur in small areas on the open coast, often on the low shore below rocks or shingle, or in extensive intertidal flats in the estuaries (refer to 6.2.3). Intertidal sediments range from coarse sand which is mobile due to wave action, with sparse animal communities of amphipods, to extremely stable muddy sediments in the inner reaches of some estuaries with dense populations of worms and bivalve molluscs.

Characteristic wildlife

Communities associated with sediments are animal dominated, with most sediments too mobile to support plants. Notable exceptions are ephemeral blankets of green algae which cover mudflats during summer, and areas of eelgrass *Zostera* spp. which are present on more stable mud and muddy sand flats. Associated with intertidal eelgrass beds are a diverse range of other animals inhabiting the stable organic sediments and plants and animals attached to the eelgrass itself.

Within the sediment is a variable community of burrowing animals. In mobile wave exposed sandy sediments, the only inhabitants may be small crustacean amphipods. With increasing stability, diversity and density of animals increases, to include a range of polychaete worms, bivalve molluscs and occasionally sea potatoes such as *Echinocardium cordatum*. Species diversity reaches a peak in stable lower shore sandy sediments, then begins to decrease in more muddy estuarine sediments, where dense populations of a small number of species of worm and mollusc dominate.

Special species

A number of rare or unusual marine species are present within the area. Portland Harbour contains an unusual assemblage of molluscs and polychaete worms. The rare lagoon sandworm *Armandia cirrhosa* is also present in Portland Harbour and the Fleet. This species is protected under the Wildlife and Countryside Act. In the Exe estuary, the polychaete *Ophelia bicornis* is found in intertidal sandbanks. This rare worm is known from only a few other locations in Britain.

Site Protection

A number of international, national and local designations protect the intertidal zone, although most have been designated for interest other than marine communities (for example ornithology, botany or geology). Chesil and the Fleet is a Ramsar and Special Protection Area and has been suggested as a possible Special Area of Conservation. The Exe estuary is also a Ramsar site and SPA. Axmouth to Lyme Regis Undercliffs is a National Nature Reserve, whilst at Charmouth there is a proposed Voluntary Marine Nature Reserve and at The Maer there is a Local Nature Reserve.

Sites of Special Scientific Interest occur at:

Axmouth to Lyme Regis
Babbacombe Cliffs
Berry Head to Sharkham Point
Budleigh Salterton Cliffs
Chesil and the Fleet
Daddyhole
Dawlish Cliffs
Dawlish Warren
Dyer's Quarry
Exe Estuary
Froward Point
Hope's Nose to Walls Hill

Isle of Portland
Ladram Bay to Sidmouth
Meadfoot Sea Road
Otter Estuary
Portland Harbour Shore
Prawle Point and Start Point (part)
Roundham Head
Saltern Cove
Sidmouth to Beer Coast
Slapton Ley
West Dorset Coast

Current factors affecting the habitat

- Recreational pressures on sediment shores can be high, from trampling for example or bait digging (which may also be carried out commercially).
- Mariculture in estuaries may substantially alter the characteristics of sediment type and biota.
- Oil pollution, both from catastrophic events and longer term inputs from harbour activities, can result in pollution.
- Shoreline management, in terms of coastal protection and harbour dredging can result in major changes to Intertidal communities.
- Water quality has an overall effect on the communities present, particularly since pollutants can become bound up with sediments.

Key nature conservation objectives

1. Encourage the establishment/enhancement of areas suitable for public interpretation and appreciation.
2. Ensure that realistic oil spill contingency plans exist.
3. Encourage the development and application of holistic Shoreline Management Plans which include nature conservation objectives.
4. Reduce pollution and eutrophication from terrestrial sources.
5. Agree the development of a sustainable mariculture strategy which balances the needs of the industry with the desire to prevent deterioration of conservation value.

6.2.10 Subtidal rock

Status

Subtidal rock in the Lyme Bay area consists largely of rocky reefs which fringe the coastline, particularly adjacent to hard cliffs and shores. Also of particular note are offshore bedrock

reefs which emerge from sediment. These reefs support unusually large and mature populations of a number of slow growing and fragile species, many of which have a limited distribution and do not occur further east than Lyme Bay.

Characteristic wildlife

Reefs support a range of plants and animals, depending on a range of factors such as depth, turbidity of water, tidal streams and substratum stability. In shallow water, light intensity is sufficient to allow the growth of dense forests of kelps. In deeper water, where light intensity is lower, communities become animal dominated, particularly with turfs of bryozoans and hydroids, and sponges and seasquirts where stronger tidal streams occur.

Special species

Lyme Bay represents the eastern limit along the Channel for a number of marine species which have a south western (lusitanian) distribution. A number of species occur which are only present in south western England. These include south-western specialities such as the pink sea fan *Eunicella verrucosa*, and the Ross coral *Pentapora foliacea* (although this species extends further eastwards into Purbeck). Shallow water kelp forests on bedrock harbour a number of other rare species, such as red seaweeds *Gracilaria bursa-pastoris* and *Gracilaria multipartita*. The brown seaweed *Zanardinia prototypus* may also be present. Amongst holdfasts of kelp may be the anemones *Isozoanthus sulcatus*, *Aiptasia mutabilis* and *Cataphellia brodicii*. In deeper water reefs, communities are animal dominated with sponges *Axinella damicornis*, *Adreus fascicularis*, *Dysidea pallens* and *Thymosia guernei*, the southern sunset coral *Leptopsammia pruvoti*, known from only a few locations, the gold and scarlet cup coral *Balanophyllia regia*, and a range of colourful sea slugs including *Okenia elegans*, *Trapania maculata*, sea squirts such as *Phallusia mammillata* and *Pycnoclavella aurilucens*. Shallow subtidal reefs in the Fleet have populations of the rare sponge *Suberites massa*.

Site protection

No statutory international or nationally designated sites cover the seabed in this area. However, Charmouth is the site of a proposed Voluntary Marine Nature Reserve.

Current factors affecting the habitat

- Mobile fishing gear, in particular scallop dredges, is able to operate over many of the low bedrock reefs in the area, causing damage to communities.
- Many species are slow growing and fragile. As such they are easily damaged by recreational sub aqua diving.
- Oil exploration/exploitation could have an effect on reef biota.
- Reduced water quality, particularly due to sewage discharge, may affect reef communities, through increased turbidity, reducing algal communities, or siltation, smothering animal communities.

Key nature conservation objectives

1. Encourage sustainable fishing practices and the development of possible exclusion zones in sensitive areas.
2. Aim to minimise the impact of long sea outfalls.
3. Promote understanding and awareness of the marine environment amongst the public, especially divers.
4. Ensure impacts of oil exploration are minimised, particularly with regard to avoidance of sensitive areas for drilling sites, cuttings disposal and adequate regard to sensitive sites in oil spill response plans.

6.2.11 Subtidal sediments

Status

Subtidal sediments cover a large proportion of the offshore Lyme Bay area. Sediments typically grade from coarse material such as pebbles and coarse sands in shallow water where maximum wave disturbance occurs, to fine silt and mud in deeper water where there is no disturbance from waves or currents. Fine sediments also occur in shallow water which is sheltered from wave action, such as Portland Harbour or the Fleet, whilst coarse sand occurs in mobile dunes in the tide-swept waters around Portland Bill and Start Point.

Characteristic wildlife

Communities of sediments are animal dominated, varying according to sediment stability and grain size. Algae have a limited distribution, occurring on the surface of some sandier sediments during summer. Also of note are beds of eelgrass *Zostera marina* which occur in some areas.

Burrowing animals consist of a rich variety of polychaete worms, molluscs, amphipods and burrowing anemones. Subtidal sediments in Lyme Bay support an extremely diverse fauna, with over 400 species recorded during a recent survey.

Special species

A number of unusual sediment dwelling species occur in the Lyme Bay area. Of particular note are populations of the red band fish *Cepola rubescens* which live in burrows in deep water sediments. In Portland Harbour, a fine mud habitat occurs in shallow water, with populations of the seapen *Virgularia mirabilis*. This is the only location in southern Britain where this seapen occurs in shallow water. Also present is a population of the rare black-faced blenny *Tripterygion atlanticus*, also occurring in Torbay and at Kimmeridge. Deeper sediments in the area support other rare species, such as the worm anemone *Scolanthus callimorphus* and the bristle worm *Sternapsis scutata*.

Beds of eelgrass also occur in Portland Harbour, the Fleet and around Torbay. This plant has shown a marked decline around England due to disease and increasing coastal pressures and is the subject of action as a result of the Biodiversity Action Plan.

Site protection

Shallow subtidal sediments (as deep as 6 m below chart datum) receive protection under Ramsar declarations in Chesil and the Fleet, and the Exe Estuary. Elsewhere, deeper sediments are under no form of protection, except those areas covered by the proposed Voluntary Marine Nature Reserve at Charmouth.

Current factors affecting the habitat

- Recreational pressures, in the form of marinas, moorings and anchoring, may cause damage to sediment communities, particularly those containing sensitive species such as eelgrass or seapens.
- Fisheries activities such as trawling cause damage to sediment communities.
- Oil pollution, from exploration and exploitation may affect sediments, particularly adjacent to production or exploratory activities where drill cuttings and debris may totally alter the characteristics of the sediment.
- Water quality affects sediment communities in the short term due to direct pollution, and in the long term as pollutants become bound up in sediments.
- Dredging proposals, both capital, maintenance and extraction, cause redistribution of sediments, and may change the environment drastically.

Key nature conservation objectives

1. Agree a sustainable mariculture strategy with users and regulators.
2. Involve all user groups in the development of possible management and zoning schemes.
3. Review the requirements for dredged material and the impacts of dredging.
4. Ensure the impacts of oil exploration and production are minimised.
5. Reduce pollution and eutrophication from land-based sources.

6.2.12 Open sea

Status

Within the Lyme Bay MNA there is a large amount of open sea, as the offshore boundary is the 12 mile limit. This section describes the wildlife importance of this watery habitat, and the species which inhabit the sea rather than being attached to the bottom (the benthos).

Within the area, water depths increase gradually offshore, to a maximum depth of around 60 metres at the 12 mile limit. However, around Start Point the seabed drops away steeply, and 60 metre depths are present within around 5 km of the coastline. Current speeds in Lyme

Bay are generally low, around 0.5 knots inshore, increasing around headlands such as Start Point and Portland Bill to around 3 knots at spring tides.

Characteristic wildlife

The range of plants and animals is larger than might at first be expected. In addition to the commercially fished species such as mackerel, herring and bass, there are a range of microscopic single celled plants and animals known as the plankton. These ultimately form the base of the food-chain upon which commercial species depend. At the larger end of the scale are a range of whales and porpoises which frequently occur in inshore waters within the area.

Special species

Four out of the 26 UK species of whales and dolphins occur regularly in the area. These are the harbour porpoise *Phocoena phocoena*, the bottlenose dolphin *Tursiops truncatus*, the common dolphin *Delphinus delphus*, and the long-finned pilot whale *Globicephalus melas*.

Of note are basking sharks *Cetorhinus maximus* which use the area in summer, filtering plankton from the surface waters.

Large numbers of auks, seaducks, grebes and divers use the inshore waters in the bay, especially during the winter.

Site protection

No sites have been proposed or given protection for open sea.

Current factors affecting the habitat

- Fisheries activities such as trawling cause changes to open sea species, both target species and non target species due to incidental capture.
- Oil pollution, and activities involved with exploration and exploitation may affect species of open water. Cetaceans in particular may be disturbed by noise pollution from shipping movements and offshore installations.
- Basking sharks and cetaceans have been shown to avoid areas intensively used by boats.

Key nature conservation objectives

1. Agree a sustainable mariculture strategy with users and regulators.
2. Involve all user groups in the development of possible management and zoning schemes.
3. Review the requirements for dredged material and the impacts of dredging.
4. Ensure the impacts of oil exploration and production are minimised.
5. Reduce pollution and eutrophication from land-based sources.

6.3 Key wildlife conservation goals

Although key nature conservation objectives are given under each of the habitats described above, this section combines these into seven overall wildlife goals for the Maritime Natural Area, to help prioritise action.

The key wildlife conservation goals (in no particular order) for the Maritime Natural Area are:

1. Undertake shoreline management plans to ensure a holistic approach to coastal planning activities, including dredging, aggregate extraction, coastal defence. These plans should aim to allow natural coastal processes to continue as far as is possible and should discourage new development which might result in a future requirement for coastal protection.
2. Promote interpretation to ensure that local people and visitors are aware of the important interest and nature conservation priorities of the area. Encourage 'wildlife oriented' tourism.
3. Encourage zoning of activities, particularly recreation, tourism, fisheries and mariculture, to ensure that appropriate activities are targeted to suitable areas. This will include developing codes of conduct for particular recreational and commercial activities.
4. Promote appropriate management of important habitats such as sand dune or cliff vegetation, including grazing and scrub control.
5. Complete production of estuaries management plans for all the estuaries of the Lyme Bay MNA and fund their implementation. These plans should enlist the cooperation of all estuary managers and user groups to ensure the well being of each estuary as a whole.
6. Improve water quality by developing suitable water quality objectives, particularly with respect to reducing nitrate input and eutrophication in enclosed and nearshore coastal waters.
7. Encourage habitat recreation, particularly of saltmarsh and soft cliff vegetation, to ameliorate past losses of habitat due to coastal protection or land claim.

7. Prime Biodiversity Areas in Lyme Bay Maritime Natural Area

Prime biodiversity areas are those where resources may be targeted most effectively to achieve wildlife conservation: they are areas of maximum opportunity. English Nature intends to identify one or more Prime Biodiversity Areas within each Maritime Natural Area. Like Maritime Natural Areas they are not a designation, they are proposed to help focus resources as effectively as possible.

In such a large and diverse area as Lyme Bay it has not been easy to select small areas which encompass important examples of the range of habitats which are present. However, two key areas stand out, which encompass the internationally important areas of Lyme Bay, and contain good examples of most of the key habitats.

7.1 Portland Bill, Chesil Bank and the Fleet

The Fleet is the largest saline lagoon in the United Kingdom. Within its boundaries are a number of important lagoonal and marine communities, including beds of tasselweed *Ruppia* spp., eelgrass *Zostera marina*, and areas of subtidal rock with rich sponge communities in the narrow entrance channel as the Fleet connects to Portland Harbour.

Chesil Bank is an internationally important shingle structure, which is of geomorphological, botanical and invertebrate interest. It connects Portland Bill to the mainland, and encloses the Fleet.

Portland Harbour is enclosed by artificial barriers, creating a sheltered environment in which rich intertidal and subtidal sediment communities occur. Of particular note are the presence of seapens *Virgularia mirabilis* in shallow water, a south-western species of sea squirt *Phallusia mammillata* and a population of the black-faced blenny *Tripterygion atlanticus*. The west facing rocky shores of Portland are steeply sloping and face directly into the prevailing wind and swell. They provide the best example of exposed rocky shore in the Lyme Bay area.

Table 3 Key habitats and species present within the proposed Portland Bill, Chesil and the Fleet Prime Biodiversity Area

Habitats	Species	
Shingle	Otter	<i>Virgularia mirabilis</i>
Saltmarsh	Dark bellied Brent Goose	<i>Suberites massa</i>
Lagoon	Grey Plover	<i>Sternopsis scutata</i>
Hard cliffs	Little Tern	<i>Aeolidiella alderi</i>
Intertidal rock	Black faced blenny	<i>Nematostella vectensis</i>
Intertidal sediment	Red band fish	<i>Scolanthus callimorphus</i>
Subtidal rock	Lagoon sandworm	<i>Leptopsammia pruvoti</i>
Subtidal sediment	Portland sea lavender	<i>Armandia cirrhosa</i>
	Shore dock	<i>Gammarus insensibilis</i>
	Tasselweed	<i>Caecum armoricum</i>
	Eelgrass	<i>Truncatella subcylindrica</i>
	Couch's goby	<i>Paludinella littorina</i>
		<i>Trapania maculata</i>

		<i>Tenellia adspersa</i> <i>Phallusia mammillata</i> <i>Gracilaria bursa-pastoris</i> <i>Gracilaria multipartita</i> <i>Cladophora battersii</i> <i>Lamprothamnium papulosum</i>
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7.2 Lyme Bay (Burton Bradstock to Budleigh Salterton)

The coastline of this section of Lyme Bay consists predominantly of shingle beaches with occasional sandy beaches in the east. Much of the coastline is backed by cliffs which are of international geological importance for their fossil faunas of invertebrates, fish, reptiles and rare mammals. The cliffs between Golden Cap and Lyme Regis are also of considerable importance for coastal geomorphology and for studying the interrelated processes of cliff denudation and beach formation.

The seabed within Lyme Bay is relatively shallow and gently shelving. Within the Bay, the substratum is predominantly of sand, dead maerl and gravel, which in places is formed into large ripples. There are however several areas of mixed bedrock and especially moving offshore, extensive bedrock reefs which harbour diverse communities. Lyme Bay lies at the transition zone between the colder boreal and warmer Lusitanian biogeographical provinces of the north-east Atlantic. Within the Bay are found a number of Mediterranean-Atlantic species, such as the rosette coral *Pentapora foliacea* and the sea fan *Eunicella verrucosa*. The saw-tooth ledges in the Bay are one of only a handful of sites where the southern sunset coral *Leptopsammia pruvoti* has been found.

Table 4 Key habitats and species present within the proposed Lyme Bay (Burton Bradstock to Budleigh Salterton) Prime Biodiversity Area

Habitats	Species	
Estuaries Soft cliffs Intertidal rock Intertidal sediment Subtidal rock Subtidal sediment	Early gentian	<i>Pentapora foliacea</i> <i>Thymosia guernei</i> <i>Dysidea pallescens</i> <i>Eunicella verrucosa</i> <i>Isozoanthus sulcatus</i> <i>Aiptasia mutabilis</i> <i>Leptopsammia pruvoti</i> <i>Phallusia mammillata</i>

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10. Glossary

Benthos

Those organisms attached to, or living on, in or near the seabed, including that part which is exposed by tides as the littoral zone.

Biodiversity

The variety of life on Earth or any given part of it.

Coastal cell

A compartment of coastline, divided from neighbouring sections of coast in terms of longshore drift, current flow, and wave convergence and divergence.

EC Birds Directive (79/409/EEC)

This applies to birds, their eggs, nests and habitats. It provides for the protection, management and control of all species of naturally occurring wild birds in European territory.

Endemic species

A species of animal or plant confined to a particular region and having, so far as is known, originated there.

Epiphyte

A plant or lichen which grows on another, usually without parasitising it.

Eutrophication

The over enrichment of an aquatic environment with nutrients, especially nitrates and phosphates, often anthropogenic (eg sewage, fertiliser run-off) which may result in stimulation of growth of algae and bacteria, and can reduce the oxygen content of the water.

Geological Conservation Review

A series of volumes published by the Joint Nature Conservation Committee, which reviews the current state of knowledge of key earth science sites in Great Britain.

Geomorphology

The study of the evolution of land forms or of the arrangement and form of the Earth's crust.

Habitat

A place in which a particular plant or animal lives. Often used in a wider sense referring to major assemblages of plants and animals found together.

Habitats and species Directive (92/43/EEC)

This requires member states of the European Union to take measures to maintain or restore natural habitats and wild species at a favourable conservation status in the Community, giving effect to both site and species protection objectives.

Infauna

Benthic animals which live within the seabed.

Invertebrate

Animal without a backbone (eg worms, insects, molluscs).

Littoral

The area of the shore that is occupied by organisms which are adapted to or need alternating exposure to air and by wetting by submersion, splash or spray.

Marine Nature Conservation Review

A project initiated by the Nature Conservancy Council in 1987 to consolidate the information already collected on British marine ecosystems, particularly that collected by marine survey projects commissioned by NCC since 1974, and to complete survey work and interpretation of data.

National Nature Reserve

A reserve declared under law and managed by English Nature or by a body approved by English Nature.

Nationally scarce species

A terrestrial species of plant or animal which occurs in between 16 and 100 ten km squares in Great Britain. Or, a marine species which occurs in between 9 and 55 of the ten km squares within the three mile limit of territorial seas for Great Britain.

Nationally rare species

A terrestrial species of plant or animal which occurs in 15 or less ten km squares in Great Britain. Or, a marine species which occurs in eight or fewer ten km squares within the three mile limit of territorial seas for Great Britain.

Red Data Book

Catalogues published by the International Union for the Conservation of Nature (IUCN) or by national authority listing species which are rare or in danger of becoming extinct either nationally or globally.

SSSI - Site of Special Scientific Interest

An area of land notified by English Nature under the Wildlife and Countryside Act as being of special nature conservation interest.

Sublittoral

The marine zone only exposed to air at its upper limit by the lowest spring tides, although almost continuous wave action on extremely exposed open coasts may extend the upper limit high into the intertidal region. The sublittoral zone extends from the upper limit of the large kelps and includes, for all practical purposes all nearshore areas below the littoral.