JOINT NATURE CONSERVATION COMMITTEE

An inventory of UK estuaries

Volume 6
Southern England

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City Road
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UK

ISBN 1 873701 41 1 Vol. 6. Southern England
ISBN 1 873701 35 7 Set of seven vols.

This report should be quoted as:

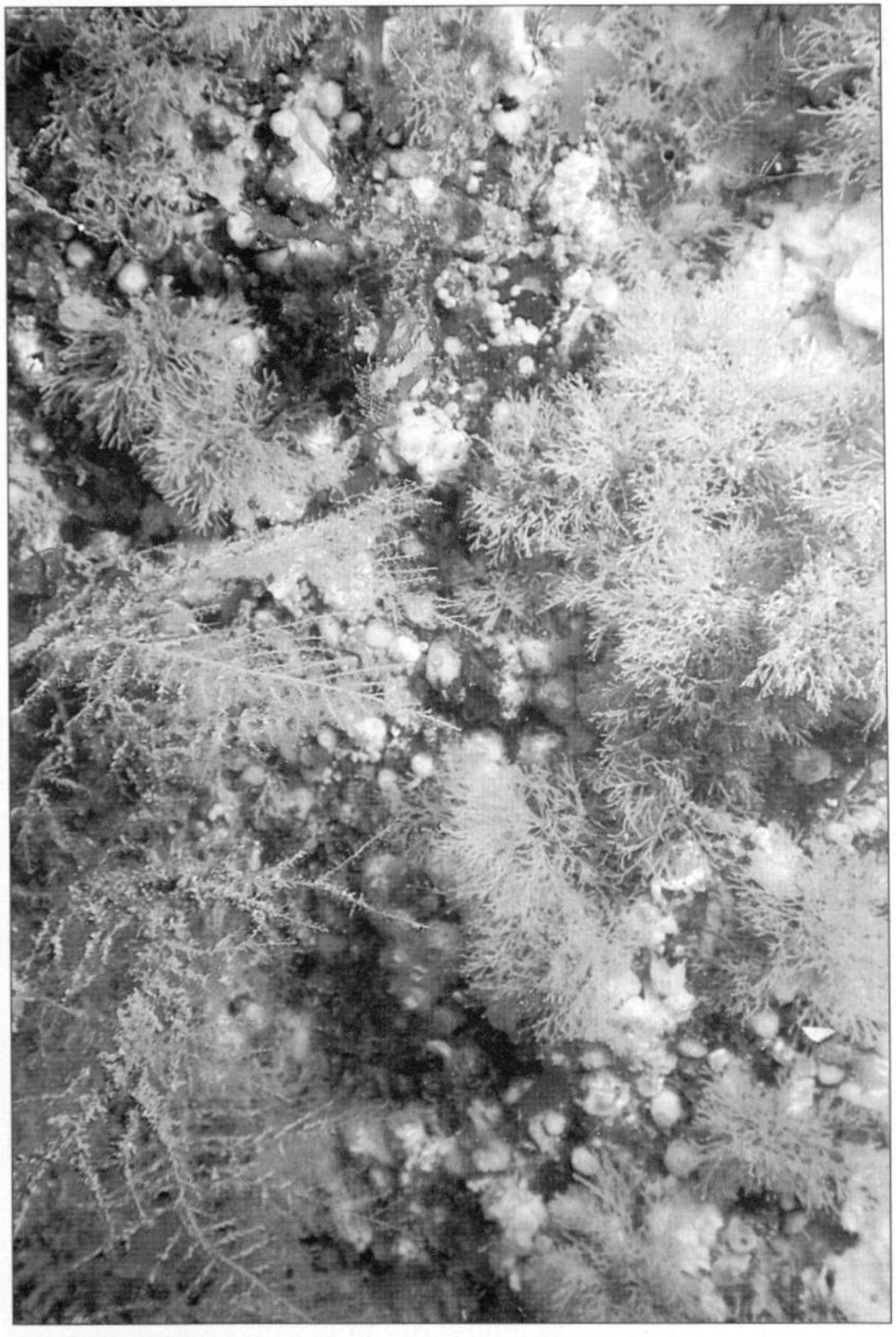
Buck, A.L. 1997. *An inventory of UK estuaries. Volume 6. Southern England.* Peterborough, Joint Nature Conservation Committee.

All sections of this report are authored by A.L. Buck unless otherwise indicated.

An inventory of UK estuaries is produced in seven volumes by JNCC's Coastal Conservation Branch.

ISBN 1 873701 35 7 Set of seven vols.
ISBN 1 873701 36 5 vol. 1. Introduction
ISBN 1 873701 37 3 vol. 2. South-west England
ISBN 1 873701 38 1 vol. 3. North-west England
ISBN 1 873701 39 X vol. 4. North and east Scotland
ISBN 1 873701 40 3 vol. 5. Eastern England
ISBN 1 873701 41 1 vol. 6. Southern England
ISBN 1 873701 42 X vol. 7. Northern Ireland

Design by Professional Communications Ltd.
Cover design by Nature Conservation Bureau.
Printed by W. Lake.



Many estuaries in Southern England are of note for their marine communities; the Helford Estuary (above) supports a range of communities and is considered to be of international marine biological importance. (MNCR, JNCC)

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1 Foreword

Professor Peter Evans
Chairman, Department of Biological Sciences, University of Durham

Viewed worldwide, estuaries are a scarce natural resource, even though some in the deltas of great rivers are of immense size. The British Isles are fortunate in holding a large number and variety of types of estuary, particularly when compared with the rest of temperate and Mediterranean Europe. Yet we have not used most of our estuaries either wisely or sustainably, probably for two reasons: first a lack of knowledge of the natural resources they contain and second a lack of understanding of the effects of the human uses to which they have been, or are being, put.

Pollution problems up-river have readily been apparent to anglers and recreational users alike and there have been long-standing campaigns to improve water quality in many of our rivers. These have begun to bear fruit. Many of the larger estuaries have not attracted such concern from the general public in relation to their water quality. People have increasingly turned their backs on the river corridors as they near the sea and looked further afield for clean recreational areas. As a result discharges of industrial and domestic wastes into estuaries have continued on a large scale, though restrictions are gradually being introduced (or even self-imposed by environmentally aware industrial concerns).

Even less obvious to the general public has been the steady loss of intertidal land within estuaries, to land-claim for industrial development and to dredging for the creation of wider and deeper shipping channels and berths needed to accept the larger vessels in which we import more raw material as our own accessible resources of many minerals and chemicals decline. Intertidal and even permanent shallow-water areas of estuaries have been buried under domestic rubbish and other solid wastes, or sometimes permanently flooded for water storage schemes. To these established, though often not sustainable, uses are being added new demands: barrage schemes for power generation, harbour developments for pleasure craft and many others.

Knowledge of the natural resources of the British estuaries has been slow to accumulate. Even one of the most obvious of the biological resources, the bird populations, had not been counted in more than a few of the smaller estuaries before the 'Birds of Estuaries Enquiry', now organised by the BTO, WWT, RSPB, and JNCC, was launched in 1969. The very idea of attempting a count of all the birds using the shores of the Wash in Lincolnshire and Norfolk was considered impractical before a Cambridge Bird Club team, of which I was a member, attempted the task in the mid-1950s. Quantification of other resources has proven even more difficult: fishery catch statistics do not necessarily permit identification of spawning and nursery areas, yet for several species these lie in estuaries and are vital for the continued health of our fish stocks. The role of algae and other plants in stabilising estuarine shores against erosion is only now becoming understood in a more quantitative way though it had been appreciated for more than half a century that planting of the cord-grass *Spartina* provided an extra line of defence against erosion of soft shores.

Now we are faced with the reality of sea level rise and the need for rethinking coastal defences. People have come to appreciate the value of the wildlife resources of estuaries, and industries located on estuaries increasingly appreciate the advantages of developing a 'green image' backed by actions such as the reduction of waste discharges to confirm it. This, therefore, is a particularly appropriate time to launch this *Inventory of UK estuaries*, building on the excellent publication *Nature conservation and estuaries in Great Britain* which appeared in 1991. That book, edited by Dr Davidson, who is a co-author of several of the chapters in these present inventory volumes, was the last major review published by the former Nature Conservancy Council. I am proud to have persuaded my fellow Council members in the mid-1980s to commission that work which has, I believe, influenced attitudes to estuary use in a most positive way.

I well recall, during the Examination in Public of the Teesside Structure Plan in 1975, appealing for a national planning policy to be developed for estuarine use. It was considered impossible at that time. But today there is great enthusiasm including guidance from government for coastal conservation and management, in part as a result of our growing international responsibilities for example in relation to the management of the North Sea, the implementation of the Ramsar Convention on Wetlands of International Importance and the acceptance of the EC Directives on the Conservation of Wild Birds (1979) and Habitats and Species (1992). The need for detailed information to enable sensible estuarine management plans to be formulated not only in a local but also a national and international context has never been greater. I commend these volumes to all interested in the planning, sustainable development, management and conservation of UK estuaries. It is an authoritative base-line from which to prepare for the 21st century.

Peter Evans

Durham, January 1993

2 Introduction

N.C. Davidson & A.L. Buck

Coastlines change continually under the forces of wave, tide, current and wind. In some places along the coast the hard rocks laid down millions of years ago or the softer, more recent, glacial deposits are being eroded. These eroded sediments are transported by currents, often for considerable distances, out into deeper water or along the shore. Much of this sediment is deposited along the coastline: coarse sediments forming shingle and sand beaches, and fine particles forming mudflats in sheltered bays, inlets and river estuaries. All these types of estuary act as 'sediment sinks' that trap much of the sediment moving along the coast. Where the estuary is formed by a river discharging into the sea, particles carried downstream by the rivers are deposited in the reduced currents and shelter of the river mouth, adding to the sediments of marine origin.

In time these sediments build up in estuaries, become stable and parts may become vegetated to provide a complex of habitats. Saltmarsh vegetation colonises intertidal flats that have accumulated to levels above mid-tide height. Where sand is blown onshore there is development of sand dunes, or where larger deposits move onshore shingle ridges develop. In the event of restricted drainage within sand dunes or shingle ridges, or even within saltmarshes, saline lagoons can form. This variety of coastal habitats is often in a state of change, adjusting to the short-term effects of winds, tides, waves and currents, and are shaped by the more gradual changes over periods of thousands of years as sea levels rise and fall.

The inflow of water from rivers and the sea brings a continual influx of nutrients. In river estuaries the freshwater brought down the river meets the saline water from the sea. In some estuaries these water bodies mix well, with tidal movements and variations in river flow creating large variations in water salinity over short periods of time.

The complex of estuarine habitats that develops under these conditions supports a variety of plants and animals which have adapted to exploit the nutrient-rich but continually changing tidal conditions. Relatively few species have evolved to cope with the extremes of constantly changing salinity and tidal levels of river estuaries but those that have often occur in great densities. As a result the estuarine mudflats and saltmarshes in temperate regions such as the United Kingdom are amongst the most productive ecosystems in the world. This rich plant and invertebrate life provides an abundant food supply for predators such as fish, which often use the shelter of estuaries for spawning and as nursery areas. Some species of birds and mammals feed on these fish, whilst many others feed directly on the saltmarsh vegetation and on the abundant molluscs, crustaceans and worms living in soft sediments. The relatively mild winter weather conditions of estuaries in the United Kingdom make them additionally attractive wintering grounds for migratory waterfowl from a large area of the northern hemisphere.

The coastline of the United Kingdom is particularly well endowed with estuaries, and these vary greatly in their geomorphological origins, size, shape, extent of freshwater influence, and the complex of marine and coastal habitats that occur there. These estuaries are widely recognised as one of the greatest natural assets in the UK.

UK estuaries vary greatly also in the extent to which they have been used, changed or destroyed by people exploiting their natural resources. People have used estuaries for many centuries and for many purposes. Some uses, such as ports, exploit the shelter offered by the physical structure of the estuary. Others, for example barrages, control or exploit tidal movements. Many traditional practices depend on sustainable use of the rich natural resources such as fish and shellfish found in estuaries. A recent trend has seen estuaries as the focus for leisure activities, in water, land and air. These range from organised activities such as sailing regattas to informal uses such as walking and the quiet enjoyment of these often spectacular wild landscapes and their wildlife.

Effective conservation of estuaries for their wildlife requires the maintenance of the diversity of the estuarine network throughout Britain and internationally, and the sustainable management of individual estuaries in this network. Yet many parts of estuaries have already been destroyed through human activities leading to land-claim and degradation. Such pressures continue and damage can arise through the subtle interaction of the human urge to control estuaries (e.g. by constructing sea defences against flooding) and the estuaries' natural movement in response to rising sea levels.

There is increasing recognition that managing and maintaining our coasts and estuaries for the future depends on co-operation between the groups of users, coastal managers and decision makers. This co-operation is increasingly being sought through processes of integrated coastal zone planning and management (CZM). Many CZM initiatives are focused on estuaries since it is often here that there is most overlap and potential conflict between people and the natural estuarine resource.

In developing estuary management plans there is a need for sound baseline information on the natural resource and how it is being used. Such information is needed both in detail for the estuary under consideration and more broadly so as to set a particular feature or site in its wider national and international context. To provide this British national context as a baseline for the development of sustainable use objectives, the Nature Conservancy Council (NCC) undertook an Estuaries Review which published *Nature conservation and estuaries in Great Britain* as a national overview of estuaries, their wildlife, their conservation and their human uses (Davidson *et al.* 1991).

An inventory of UK estuaries follows on from this national overview, and provides a summary of resource, wildlife, conservation status and human use features on each of the 163 estuaries identified by the Estuaries Review around the coasts of the United Kingdom. Much of the information presented in the inventory was collated between 1988 and 1991 during the work of the Estuaries Review. Where possible, however, we have included more up-to-date information. Where this more recent information is given the relevant dates are indicated in each display. The inventory thus provides a 'snap-shot' in time for the state of the UK estuarine resource at the end of the 1980s.

An inventory of UK estuaries takes the form of a series of standardised dossiers, taking each estuary (as defined by the Estuaries Review) in turn. Each of these reports gives a summary of the key features of interest or significance for estuary management from a nature conservation perspective. An inventory entry is designed to give initial summary information about a feature and to help direct users to more detailed sources of information should this be required. The inventory is not, however, intended to provide comprehensive listings of plant and animal species recorded on the estuary. Nor can it provide more than the initial basis for the development of practical coastal zone management initiatives such as integrated estuary management plans.

The inventory provides part of a sound information base for estuary management. Taken together with the national overview provided by *Nature conservation and estuaries in Great Britain,* the information in the inventory permits estuary managers to set the resource on a particular estuary in its national and international context - an important stage in the identification of management issues. The inventory should also help understanding of the great importance of the UK estuarine resource by the many user-groups and those involved in decision-making. Its availability for use in matters of development planning and control ensures that there is a readily available single source of summarised information, eliminating the need to search through a great variety of sources in many different styles of presentation. In addition the snap-shot information in the summary provides an easy-to-use basis for broad-scale monitoring of change in the estuarine resource and its human uses.

An inventory of UK estuaries is being published in six regional volumes, most including 20-30 estuary reports. The regions are shown in Figure 1. Boundaries have been chosen largely on topographical grounds to provide meaningful geographical zones. For England and Wales these boundaries coincide broadly with the known divisions of major coastal sediment cells.

There is also an introductory volume (volume 1). This provides more detail of the rationale of the inventory, explanations of the approach to site definition and selection, details of the information sources used for the inventory, and summary tables listing estuary locations and characteristics updated and corrected from those in Davidson *et al.* (1991). Users of the inventory are strongly urged to consult this volume for definitions before undertaking detailed interpretation of site reports. Since many people who have helped with the Estuaries Review and inventory work have contributed to more than one volume we have included a full Acknowledgements section in this introductory publication rather than in each regional volume.

We give below a brief overview of the overall estuarine resource in this Southern England coastal area covered by Volume 6, then a short key to using and interpreting the information entries in each site report, followed by the site reports.

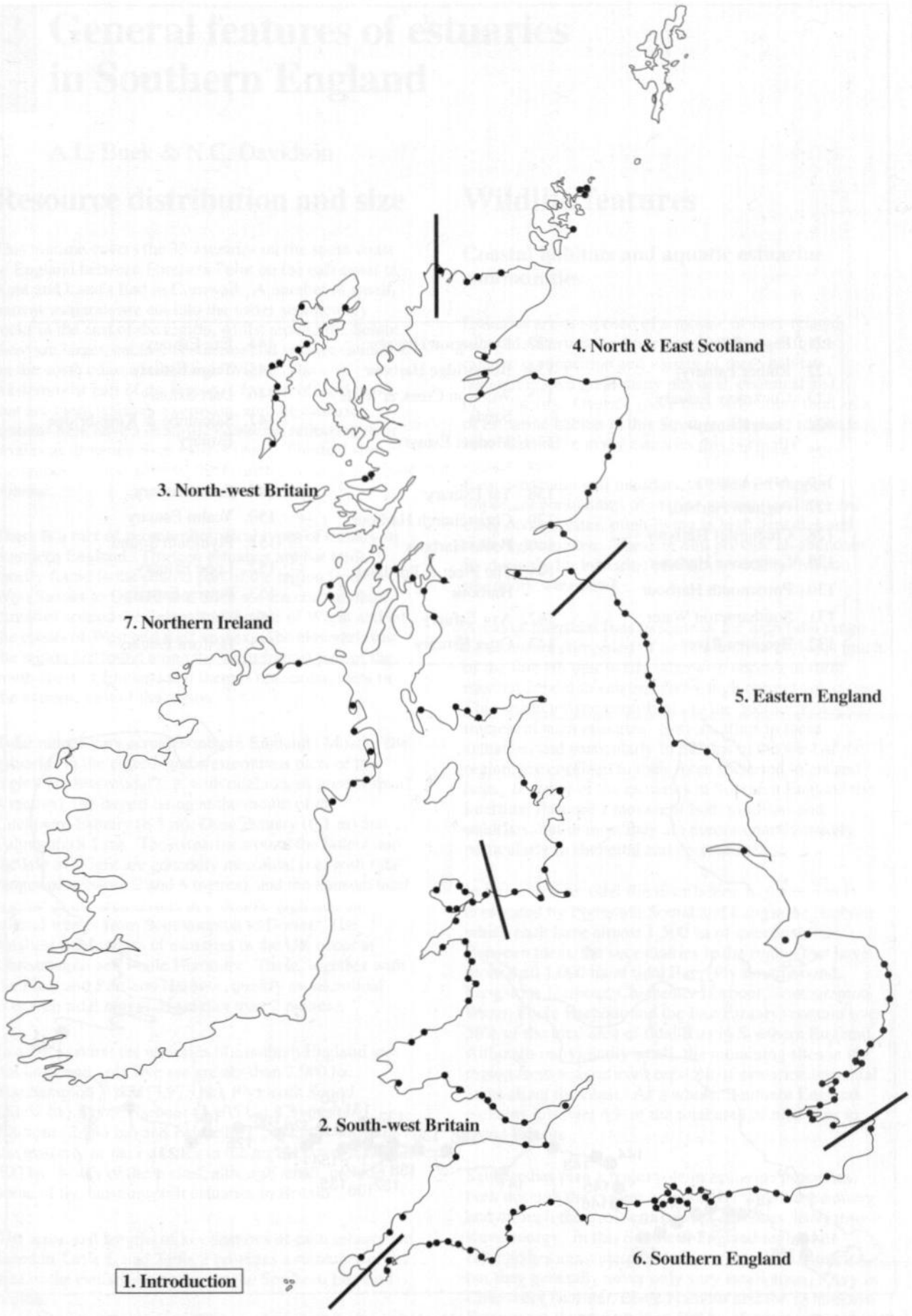

Figure 1 The regional volumes comprising *An inventory of UK estuaries*. Each estuary is marked by its centre grid reference.

121. Pegwell Bay
122. Rother Estuary
123. Cuckmere Estuary
124. Ouse Estuary
125. Adur Estuary
126. Arun Estuary
127. Pagham Harbour
128. Chichester Harbour
129. Langstone Harbour
130. Portsmouth Harbour
131. Southampton Water
132. Beaulieu River
133. Lymington Estuary
134. Bembridge Harbour
135. Wootton Creek & Ryde Sands
136. Medina Estuary
137. Newtown Estuary
138. Yar Estuary
139. Christchurch Harbour
140. Poole Harbour
141. The Fleet & Portland Harbour
142. Axe Estuary
143. Otter Estuary
144. Exe Estuary
145. Teign Estuary
146. Dart Estuary
147. Salcombe & Kingsbridge Estuary
148. Avon Estuary
149. Erme Estuary
150. Yealm Estuary
151. Plymouth Sound
152. Looe Estuary
153. Fowey Estuary
154. Fal Estuary
155. Helford Estuary

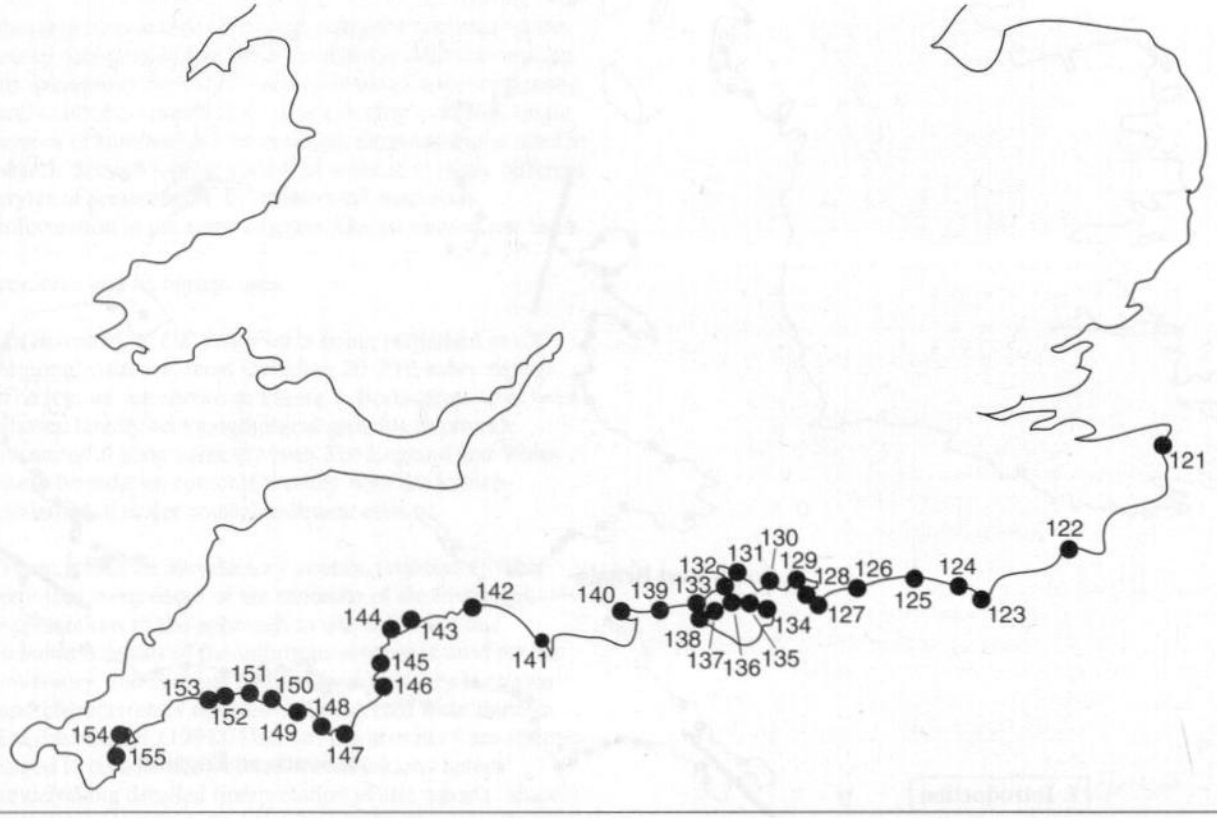

Figure 2 The locations and names of the 35 estuaries covered by Volume 6 of *An inventory of UK estuaries.* See the site map in each regional report for the precise boundaries of the site identified as the core estuary.

3 General features of estuaries in Southern England

A.L. Buck & N.C. Davidson

Resource distribution and size

This volume covers the 35 estuaries on the south coast of England between Foreness Point on the east coast of Kent and Land's End in Cornwall. A number of small, narrow estuaries are cut into the softer sedimentary rocks in the east of the region, whilst around the Solent there are larger, enclosed estuaries and smaller estuaries on the north coast of the Isle of Wight. The westernmost part of the region is formed of hard rocks that are more resistant to erosion, and the estuarine systems here have a dendritic coastline, reflecting their origins as drowned river valleys (rias). Figure 2 shows the names and locations of the estuaries covered by this volume.

There is a mix of geomorphological types of estuary in Southern England. Thirteen estuaries are bar built, mostly found in the central part of the region from West Sussex to Dorset, and there are ten coastal plain estuaries around the Solent and the Isle of Wight and on the coasts of West and East Sussex. The eleven rias in the region are found along the westernmost part of the south coast of England and there is one embayment in the extreme east of the region.

Tidal ranges vary across Southern England. Most of the estuaries in the eastern and westernmost parts of the region are macrotidal (i.e. with tidal ranges greater than 4 metres), the largest being at the mouth of the Cuckmere Estuary (6.5 m), Ouse Estuary (6.1 m) and Falmouth (8.1 m). The estuaries around the Solent and the Isle of Wight are generally mesotidal (i.e. with tidal ranges of between 2 and 4 metres), and the unusual tidal regime of the area results in a 'double high tide' in coastal waters from Southampton to Dorset. The smallest tidal ranges of estuaries in the UK occur at Christchurch and Poole Harbours. These, together with the Fleet and Portland Harbour, qualify as microtidal (i.e. with tidal ranges of smaller than 2 metres).

In a UK context the estuaries of Southern England are not large and only five are greater than 2,000 ha: Southampton Water (3,975 ha), Plymouth Sound (3,962 ha), Poole Harbour (3,805 ha), Chichester Harbour (2,946 ha) and Falmouth (2,482 ha). Indeed, the majority of the estuaries in the region cover less than 500 ha. Many of these sites, although small, include some of the most unspoilt estuaries in Britain.

The areas and lengths of key features of each estuary are listed in Table 1, and Table 2 provides a summary of the size of the estuarine resource in the Southern England region.

Wildlife features

Coastal habitats and aquatic estuarine communities

Estuaries are composed of a mosaic of inter-related subtidal, intertidal and terrestrial habitats, with the relative composition and variety of these habitats depending on a great many physical, chemical and biotic factors. Overall, more than 50% of the total area of estuarine habitat in this Southern England region is intertidal and in many estuaries this is chiefly represented by sandflats and mudflats. The intertidal flats, especially soft mudflats, of estuaries support important populations of marine worms, molluscs and other invertebrates, often living in high densities and with high biomass. These in turn provide an abundant food supply for estuarine predators, notably fish and migratory waterfowl.

Areas of intertidal flats in some of the high tidal range estuaries are composed of mobile sediments, since much of the fine silt that would otherwise deposit to form mudflat is held in suspension by high current velocities. This characteristic contributes to the geomorphological interest of such estuaries. Soft mudflats in these estuaries, and particularly in the rias in the west of the region, are confined to their more sheltered inlets and bays. In many of the estuaries in Southern England the intertidal flats are a mosaic of both sandflats and mudflats, but in most they are predominantly muddy, particularly in sheltered and enclosed sites.

In terms of size, tidal flat distribution in the region is dominated by Plymouth Sound and Langstone Harbour which each have almost 1,500 ha of intertidal flats. Between them, the six estuaries in the region that have more than 1,000 ha of tidal flats (Plymouth Sound, Langstone Harbour, Chichester Harbour, Southampton Water, Poole Harbour and the Exe Estuary) contain over 50% of the total area of tidal flats in Southern England. Although individually small, the remaining sites in the region form a significant network of estuarine intertidal areas along the coast. As a whole, Southern England contains just over 4% of the total area of tidal flats in Great Britain.

Saltmarshes play a major role in estuarine processes, both through the cycling of nutrients within the estuary and through their role as 'soft' sea defences dissipating wave energy. In this Southern England region saltmarshes are widespread, occurring on 33 estuaries, but they generally cover only very small areas. Only in Chichester Harbour, Poole Harbour and the Lymington Estuary are there more than 500 ha of saltmarsh, and in the Lymington Estuary these form over 85% of the intertidal area of the estuary. In total, eight estuaries in

Table 1. Areas, shoreline and channel lengths and mean spring tidal range measurements for estuaries in Southern England.

Estuary	Area (ha)	Intertidal area (ha)	Saltmarsh (ha)	Shoreline (km)	Channel length (km)	Tidal range (m)
121. Pegwell Bay	863	709	99	79.9	35.1	4.5
122. Rother Estuary	376	344	54	23.0	6.6	5.3
123. Cuckmere Estuary	47	15	10	16.7	8.4	6.5
124. Ouse Estuary	124	6	0	49.2	20.3	6.1
125. Adur Estuary	153	46	9	46.5	20.6	5.5
126. Arun Estuary	171	3	0	80.3	37.1	5.3
127. Pagham Harbour	266	245	33	9.8	2.6	4.9
128. Chichester Harbour	2,946	2,342	1,077	80.6	8.1	4.2
129. Langstone Harbour	1,925	1,513	100	43.0	7.7	4.2
130. Portsmouth Harbour	1,593	964	181	55.2	10.8	4.1
131. Southampton Water	3,975	1,376	355	109.8	20.2	4.0
132. Beaulieu River	546	417	185	31.3	10.4	3.2
133. Lymington Estuary	1,367	589	506	18.1	4.2	2.5
134. Bembridge Harbour	158	130	<1	7.7	2.3	3.1
135. Wootton Creek & Ryde Sands	475	466	14	18.5	1.8	3.8
136. Medina Estuary	219	101	13	19.6	7.4	4.2
137. Newtown Estuary	332	296	120	30.0	3.3	2.9
138. Yar Estuary	110	97	66	7.9	3.2	2.5
139. Christchurch Harbour	239	122	50	21.4	6.6	1.2
140. Poole Harbour	3,805	2,050	697	102.9	16.3	1.4
141. The Fleet & Portland Harbour	1,617	278	51	47.5	16.7	1.9
142. Axe Estuary	79	62	34	8.1	3.8	3.7
143. Otter Estuary	36	19	19	6.1	1.1	4.1
144. Exe Estuary	1,874	1,201	66	47.8	16.7	4.1
145. Teign Estuary	370	219	13	20.4	9.1	4.2
146. Dart Estuary	863	313	25	60.5	19.8	4.0
147. Salcombe & Kingsbridge Estuary	674	446	4	48.6	8.3	4.6
148. Avon Estuary	214	146	26	19.8	7.8	4.7
149. Erme Estuary	145	72	21	17.1	6	4.7
150. Yealm Estuary	446	154	2	28.1	7.7	4.7
151. Plymouth Sound	3,962	1,809	359	208.6	34.1	4.7
152. Looe Estuary	56	43	6	12.6	4.1	4.8
153. Fowey Estuary	305	146	3	39.2	11.1	4.8
154. Falmouth	2,482	746	93	126.8	18.1	5.3
155. Helford Estuary	568	186	5	44.3	9.2	4.7

Table 2. Total areas and lengths of the regional estuarine resource in Southern England.

Total area (ha)	Subtidal area (ha)	Intertidal area (ha)	Intertidal flats (ha)	Saltmarsh (ha)	Shoreline (km)	Channel length (km)
33,381	15,710	17,671	13,375	4,296	1,587	406.6

the region (Chichester Harbour, Langstone Harbour, Southampton Water, Lymington Estuary, Newtown Harbour, Poole Harbour, Exe Estuary and Falmouth) contain nationally important saltmarshes. That is, they support a full and representative sequence of plant communities covering the variation found in Great Britain. The total area of saltmarsh in the region (4,296 ha) forms 10% of the British saltmarsh resource.

The cordgrass *Spartina anglica* originated in Southampton Water and on at least five estuaries in the region *Spartina* was deliberately planted between 1900 and 1950 to encourage shoreline stabilisation. *Spartina* is now widespread and extensive around the Solent and Isle of Wight, and in many sites it comprises a major part of the total saltmarsh area: in six estuaries (Chichester Harbour, Langstone Harbour, Portsmouth Harbour, Beaulieu River, Lymington Estuary and Poole Harbour) *Spartina* forms over half the saltmarsh area. However, in Southern England *Spartina* is known to be suffering from a phenomenon known as 'die-back', which appears to be a natural process.

There are few extensive sand dune systems on the south coast of England, where a high-energy environment and conditions of prevailing and dominant winds combine to form large accumulations of sand. Six estuaries in Southern England have associated sand dune systems, of which two, Sandwich Bay dunes adjacent to Pegwell Bay and Studland Heath adjacent to Poole Harbour, are of national importance. A further six estuaries have at least a small area of sand dunes within their habitat mosaic.

There are three substantial shingle structures associated with estuaries in Southern England, namely Rye Shingle (Rother Estuary), Pagham Harbour and Chesil Beach (Fleet & Portland Harbour). Rye Shingle is a fan-shaped area of shingle whose growth assisted the silting-up of Rye Harbour further upstream of the estuary. The two shingle spits at the mouth of Pagham Harbour are essentially a breached shingle barrier across the mouth of the Harbour, and the shingle bar of Chesil Beach, that led to the formation of the Fleet lagoon behind it, is one of the most important shingle structures in Britain. Many other estuaries within Southern England have patches of bare intertidal shingle, and shingle is found on over half (nineteen) of the estuaries in this region.

Coastal saline lagoons are more frequent in Southern England than in any other region, where they are associated with twenty estuaries. Many of these lagoons are small and in some localities several lagoons are associated with a single estuary. Of particular note are: the Fleet, which at 40 ha is Britain's largest lagoon; Widewater Lagoon adjacent to the Adur Estuary; the lagoons of Brading Marshes and Bembridge Harbour; and the small lagoons in the marshes around the Lymington Estuary.

The most extensive areas of coastal grazing marshes and lowland wet grasslands are outside the Southern England area covered in this volume, but fourteen of the estuaries have some associated grazing marsh or lowland wet grassland. On some sites in Southern England the grazing marshes are sited on former intertidal areas of the estuary which have undergone land-claim, but many are on the river terraces and floodplains, for example on the Arun and Ouse Estuaries. Many of these marshes are of note for their botanical and invertebrate interest.

The aquatic estuarine communities of many of the estuaries within this Southern England region have been recorded and several sites are known to be of great marine biological and conservation importance. The diversity of both soft substrate and hard substrate communities within the west of the region is higher than that of many estuaries throughout Britain, with the largest recorded diversity (fifteen or more communities) in Poole Harbour and the ria systems of the Salcombe & Kingsbridge Estuary, Yealm Estuary, Plymouth Sound and Falmouth. A number of sites in the west of the region in particular support communities that are considered to be of national or regional conservation importance. In general, the estuaries towards the east of the region support lower numbers of aquatic estuarine communities.

Plant and animal species

At least seventeen estuaries within the Southern England region support nationally rare or Red List species of vascular plants. Some of these plants are associated with calcareous grasslands or heathland adjacent to the estuary, but a number occur on more typically coastal habitats. Of particular note is dwarf spike-rush *Eleocharis parvula* which occurs on the intertidal mud of at least two estuaries in the region; little robin *Geranium purpureum* which is recorded on four estuaries in Southern England; a species listed for protection under the EC Habitats and Species Directive, shore dock *Rumex rupestris,* is found in Plymouth Sound, and this estuary is also the only known location in Britain for triangular club-rush *Schoenoplectus triqueter*. In addition, a number of estuaries in the region support nationally scarce species of plant.

The terrestrial invertebrate faunas of saltmarshes and the adjacent habitats of estuaries in Southern England are generally rather better studied than those of some other regions. In this region 21 estuaries and their adjacent habitats are known to support at least one Red Data Book (RDB) species, with the largest numbers (fifteen or more) of RDB species associated with the saltmarsh and sand dunes of Pegwell Bay, the shingle of the Rother Estuary and the marshes along the floodplain of the Ouse Estuary. These sites also support large numbers of nationally Notable species of invertebrate. The shingle of the Rother Estuary and the marshes of the Ouse support a variety of beetles and the shingle adjacent to the Cuckmere Estuary is of note for supporting three nationally uncommon species of centipede, two of which have not been recorded elsewhere in the UK.

The estuaries of Southern England and their associated lagoons are of importance to a number of rare or scarce marine benthic species. At least 22 nationally rare marine benthic species are found in estuarine areas in the region, of which ten have been recorded from the Fleet and Portland Harbour alone. One of these species, the sponge *Suberites massa*, is known in the UK from only four estuaries in Southern England. Some other

nationally rare species recorded in the region are specialists of lagoonal habitats, for example the starlet sea anemone *Nematostella vectensis,* the lagoon sand shrimp *Gammarus insensibilis* and the lagoon sandworm *Armandia cirrhosa:* this latter species is present in a lagoon of the Lymington Estuary and has recently also been recorded from the Fleet and Portland Harbour.

The estuaries of Southern England support a variety of adult fish species and are spawning and nursery areas for others. Of particular note is the presence of a number of major nurseries for sea bass *Dicentrarchus labrax*. In order to safeguard the bass fishery in coastal waters MAFF have legally designated certain areas where juvenile bass are abundant and easily caught, to prohibit fishing for the species during a closed season. In all there are 34 designated bass nursery areas in England and Wales; of these, fifteen occur in the estuaries of Southern England.

Many estuaries in the UK are of great importance to migratory and wintering waterfowl (waders and wildfowl), and the habitat mosaics of estuaries in this part of Southern England provide feeding and roosting sites for many waterfowl species. Many of these birds, which come from a vast area of arctic and boreal breeding grounds between Canada and Siberia, are wholly or largely dependent on estuaries during their non-breeding period. The larger estuaries on the north shore of the Solent (Chichester Harbour, Langstone Harbour, Portsmouth Harbour, Southampton Water and the Lymington Estuary), Poole Harbour and the Exe Estuary support the largest waterfowl populations. Whilst the smaller estuaries and rias generally support smaller total numbers of waterfowl, they contribute to the geographical network upon which waterfowl depend. Overall the estuaries in Southern England hold over 176,000 waterfowl in midwinter (January), around 10% of the British estuarine population in that month. The relatively mild winter weather on these south coast estuaries can be of critical importance to the survival of wintering waterfowl during periods of severe weather. At such times waterfowl move west to estuaries, including those in Southern England, to escape freezing weather in continental Europe and eastern Britain.

Since migratory waterfowl depend on a network of estuaries during their year, many birds move between estuaries, even during the winter period, so that the total number of individuals using a site is considerably higher than those present at any one time. Average peak winter counts of waterfowl suggest that at least 309,000 birds may be using the estuaries covered by this volume during the winter period, and as the bird populations of some sites in the region have not been regularly counted, this figure is considered to be an underestimate.

Seven of the estuaries in Southern England attain international importance by supporting over 1% of the flyway population of at least one waterfowl species. Four estuaries (Chichester Harbour, Langstone Harbour, Poole Harbour and the Exe Estuary) are currently also of international importance for supporting more than 20,000 waterfowl during winter.

There is over 1% of the British population of at least 23 species of waterfowl on some of the estuaries in Southern England. Of these, seven species occur in numbers greater than 1% of their flyway or biogeographic population and hence are considered to be of international importance. These species are dark-bellied brent goose *Branta bernicla bernicla,* shelduck *Tadorna tadorna,* grey plover *Pluvialis squatorola,* ringed plover *Charadrius hiaticula,* dunlin *C. alpina,* black-tailed godwit *Limosa limosa* and bar-tailed godwit *L. lapponica.*

The estuaries of Southern England support one of the main wintering concentrations in Great Britain of dark-bellied brent goose, where it occurs in internationally or nationally important numbers on many of the estuaries between Pagham Harbour and the Exe Estuary. The region also provides the stronghold of the small but increasing British wintering population of avocets. In winter they occur in estuaries in Southern and Eastern England and three estuaries in this region (Poole Harbour, Exe Estuary and Plymouth Sound) support nationally important numbers of avocets. The region is also of note for wintering black-tailed godwits. Nationally important numbers of this species occur on several estuaries around the Hampshire coast and the Solent, and on the Exe Estuary, Plymouth Sound and Falmouth.

Outside the wintering period, many estuaries throughout the Southern England region have additional importance for their migratory waterfowl populations as staging and moulting areas in autumn and spring. During these periods birds pass through rapidly so that many more individuals depend on these estuaries than are present at any one time. This part of the estuarine resource is important for spring migrant waders (e.g. dunlin and ringed plover) and in autumn concentrations of migrant and moulting waders occur on this part of the coast.

The saltmarshes, shingle banks and coastal grazing marshes around the estuaries also support breeding populations of waders (chiefly redshank *Tringa totanus*, oystercatcher *Haematopus ostralegus*, lapwing *Vanellus vanellus* and ringed plover). The most diverse assemblages in the Southern England region are on the estuaries around the Solent (Southampton Water & Beaulieu River support five species; most other Solent Estuaries support four species), and on the estuaries of Sussex and Kent (four species). In particular the saltmarshes around the Solent support high densities of breeding redshanks. Some estuaries in the region are also of note for the colonies of breeding seabirds that they support, such as little tern *Sterna albifrons*, common tern *S. hirundo*, Sandwich tern *S. sandivicensis* and black-headed gull *Larus ridibundus*. The sand, shingle or gravel beaches adjacent to the Rother Estuary, Langstone Harbour, Beaulieu River and the Fleet and Portland Harbour are known to support nationally important colonies of seabirds.

Although seals are occasionally seen off the coast of the region, few regularly visit the estuaries of Southern England. However, otters *Lutra lutra* are known to occur on seven estuaries in the region, mostly on estuaries in Devon and Cornwall (Otter, Erme and Yealm Estuaries, Falmouth and Helford Estuary).

They have also been recorded on the Yar Estuary on the Isle of Wight and in reedbeds in the upper reaches of the Lymington Estuary.

Conservation status

The important and diverse wildlife and landscape features of much of the UK estuarine resource has been recognised by many parts of estuaries and their surroundings being designated under a variety of local, national and international measures, both statutory and non-statutory. The estuaries of Southern England are typical of this pattern in which there are often many overlapping site designations covering parts of an estuary. In addition to this site-based approach through which much of estuarine conservation has traditionally been delivered, some of the estuaries covered in this report (Pagham Harbour, Chichester Harbour, Portsmouth Harbour, Medina Estuary, Yar Estuary, Poole Harbour, Exe Estuary, Fowey Estuary, Falmouth and Helford Estuary) are now also included in a variety of coastal zone planning and management initiatives.

Sites of Special Scientific Interest (SSSIs), the major statutory designation for the delivery of site-based wildlife conservation, cover many parts of the intertidal and associated terrestrial areas of estuaries in Southern England. At least one SSSI is associated with all but four (Teign, Avon, Looe and Fowey) of the estuaries covered by this volume, although SSSIs, like most other designations, sometimes cover only parts of each estuary. In all there are 66 SSSIs in this region, around 18% of estuarine SSSIs in Great Britain. Southampton Water currently has the largest number of SSSIs (seven) associated with estuaries in this area. Other estuaries in the region with four or more associated SSSIs are the Arun Estuary and Plymouth Sound. SSSIs on some sites such as Plymouth Sound are typical of those on many estuaries - a mixture of small SSSIs notified for their geological and geomorphological features and a few larger sites of biological or mixed interest covering tidal flats, saltmarshes and associated terrestrial habitats. SSSIs associated with estuaries in this region cover a total of 36,118 ha (just under 8% of the British estuarine SSSI area), with by far the largest areas of SSSI associated with Poole Harbour (4,285 ha), followed by Pegwell Bay, Rother Estuary, Chichester Harbour, Langstone Harbour, Exe Estuary and Plymouth Sound (each with more than 2,000 ha of SSSI).

Seven National Nature Reserves (NNRs) in Britain are on the intertidal or terrestrial habitats of the estuaries covered by this volume. These include areas of intertidal flats or saltmarshes, e.g. North Solent on the Beaulieu River and Newtown Harbour. However, a number of NNRs include other habitats associated with estuaries, such as the flood meadow and reedbeds of Stodmarsh on the upper reaches of Pegwell Bay; the reedbed at Arne and the dunes, heath and foreshore of Studland and Godlingstone Heaths on Poole Harbour; and the cliff woodlands of Axmouth-Lyme Regis Undercliffs adjacent to the Axe Estuary.

Local Nature Reserves are statutory designations made by local authorities (in consultation with country conservation agencies) with objectives similar to those of NNRs but for the local interest of the site and its wildlife. Of the 94 designated LNRs present on the coast of Great Britain, 21 are associated with estuaries in the region.

Two international designations are particularly relevant to estuarine habitats and their birds. The Ramsar Convention designates wetlands of international importance especially as waterfowl habitat (Ramsar sites) and Special Protection Areas (SPAs) are classified under the EC Directive on the conservation of wild birds. For estuarine waterfowl populations both designations often apply. Parts of Pegwell Bay, Pagham Harbour, Chichester Harbour, Langstone Harbour, Portsmouth Harbour, the Fleet and Portland Harbour and the Exe Estuary have been designated as Ramsar sites and SPAs. There are proposals for further Ramsar/SPA sites which would include parts of the Rother Estuary, Arun Estuary, Southampton Water, Beaulieu River, Lymington, Medina, Newtown and Yar Estuaries, Poole Harbour and Plymouth Sound.

Another international designation relevant to estuarine habitats has recently come into force. Under the EU Directive on the Conservation of Natural Habitats and of Wild Fauna and Flora (the 'Habitats and Species Directive'), sites may be designated for the habitats or species they support that are considered to be under threat. Six sites in Southern England are proposed as Special Areas of Conservation (SACs) under the Habitats Directive: Sandwich Bay (Pegwell Bay); Solent and Isle of Wight Maritime; Solent and Isle of Wight Lagoons; Chesil Beach and the Fleet; Plymouth Sound and Estuaries; and Fal and Helford. Note that some of these sites encompass more than one estuary.

Twenty four estuaries fall within the ten Sensitive Marine Areas (SMAs) in the region (Seven Sisters, Solent and Isle of Wight, Poole Bay & Isle of Purbeck, Portland & the Fleet, Lyme Bay, Torbay to Start Point, Bolt Tail to Start Point, Exe Estuary, Plymouth Sound, Tamar, Yealm & Eddystone, Dodman Point to the Lizard). Twelve estuaries lie within the Solent and Isle of Wight SMA alone. There are also six voluntary Marine Nature Reserves on estuaries in the region, namely Seven Sisters (Cuckmere Estuary), Fleet/Portland, Wembury (Yealm Estuary), Looe, Roseland (Falmouth) and Helford.

Other wildlife conservation sites include County Wildlife Trust reserves on 25 estuaries, RSPB reserves on or adjacent to seven estuaries, and the Wildfowl and Wetlands Trust reserve at Arundel Park adjacent to the Arun Estuary.

There are, in addition, several landscape conservation designations that partly cover estuaries in Southern England. The New Forest National Park overlaps with the Beaulieu River and 21 estuaries lie within Areas of Outstanding Natural Beauty. Parts of twelve estuaries in the region lie within Heritage Coasts. In addition there are six Country Parks adjacent to four estuaries in Southern England (Cuckmere Estuary, Southampton Water, Beaulieu River and Plymouth Sound) and there are National Trust properties on sixteen estuaries in the Southern England region.

Features of human use

Many parts of the coastline of Southern England are largely natural and little affected by damaging human activities. Rather few people live close to a number of the estuaries covered in this volume, particularly those in the west of the region, apart from Plymouth Sound and the Exe Estuary which each have surrounding populations greater than 100,000. Elsewhere, only the large estuaries around the Solent (Southampton Water, Portsmouth Harbour, Langstone Harbour) and Poole Harbour have nearby urban populations exceeding 50,000 people. In contrast a number of the remaining estuaries, such as those on the Isle of Wight and in Devon, have nearby populations of less than 5,000 people. Hence there are parts of the estuarine resource in Southern England that have been subjected to the major urban and industrial pressures characteristic of estuaries close to large conurbations; conversely, there are parts of the estuarine resource where the more typical human uses are the exploitation of natural resources and recreation.

Some estuaries in Southern England have been subjected to substantial sea defence measures such as construction of sea walls. This is due, in part, to land areas falling relative to sea level (isostatic rebound after the last ice age), particularly in South-east England. As a result, the erosion problems which often lead to the construction of major sea defences are significant in low-lying parts of Southern England, in this region from the Solent eastwards. In the west of the region most estuaries are not surrounded by substantial low-lying areas and the effects of erosion and flooding are less pronounced; consequently there are fewer estuaries here where long stretches of the shore are protected by sea defences.

There are a number of places in Southern England where intensive human use occurs and where there has been substantial loss and damage to the estuarine resource. For example, there have been extensive areas of historical land-claim on some estuaries such as Portsmouth Harbour, where 490 ha of intertidal area have been lost since 1540; Southampton Water (690 ha lost since 1830); and Poole Harbour (530 ha lost since 1807). Historically, in the Solent the pattern of land-claim has been piecemeal, mostly associated with the expansion of naval dockyards and other port and harbour facilities. More recent land-claims have been associated with industry (i.e. oil refineries, power station construction, disposal of dredged spoil) and marinas. However, as in some locations in Eastern England, parts of the estuarine resource that were formerly claimed have now reverted to intertidal areas. A notable example in Southern England is Pagham Harbour, which was claimed for agriculture in the 19th century. Subsequent breaching of the sea walls allowed the tide to flood the bay, which has now reverted to intertidal mudflats and saltmarshes.

Heavy industrial activities are concentrated on the larger estuaries. On Southampton Water extensive dock systems, major shipbuilding/repair sites, an oil refinery and power station stretch along the shores of the estuary, and at Poole Harbour there is a large engineering works, a chemicals plant, an onshore oil field and an oil 'gathering station'. Plymouth Sound, the site of a major naval base, has many docks, shipbuilding and metal industries and similarly Portsmouth Harbour is dominated by naval bases, harbours and docks. Most other estuaries in Southern England have port and harbour facilities, many of them the location of industry or used as a base for fishing boats.

Parts of the coastline of Southern England are popular spots for tourism and recreation. A wide variety of leisure pursuits, from general beach use and bathing to water-based recreation, take place on many estuaries, especially during the summer months. Almost all estuaries in the region have some marina or mooring facilities and the Solent area is intensively used for water sports such as sailing, wind-surfing, power-boating and water-skiing. These activities also occur on many other estuaries in the region. There have been recent proposals for further marinas on a number of estuaries in Southern England, which may not only incur some land-claim, but would also intensify the recreational use of nearby waters.

Alongside recreation there are a variety of traditional land uses which exploit the natural plant and animal resources of these south coast estuaries. Stock grazing of saltmarshes occurs but there is little grazing of stable sand dunes. Other resource use includes fisheries and shellfisheries for oysters, cockles, mussels and winkles. Cultivation of oysters and mussels occurs on several estuaries in the region, particularly in the west, and a small number of estuaries support fish farms.

Whilst this is only a brief overview of some of the key features of the estuaries of Southern England and their human uses, it is clear that this network of estuaries is both of great interest and value for wildlife and has a wide variety of human uses. Despite some areas of considerable degradation and past land-claim, and some proposals that could further alter the ecosystem processes on important parts of the resource, many estuaries in this part of Britain have been subject to largely sustainable human exploitation. There is great opportunity therefore for all those involved in using and managing these estuaries to collaborate, through such approaches as integrated coastal zone management. Such future management can ensure that this part of Britain's estuarine heritage continues to be used in sustainable ways that allow for the retention of its varied wildlife.

4 Using the inventory

A.L. Buck

This section provides some brief descriptions and keys to interpreting the presentations of information in the site reports. Full descriptions of the methodology, information sources and presentations are given in Volume 1 (Introduction) of the inventory.

The rationale for site definition and selection follows that developed by Davidson *et al.* (1991). It should be noted that some of the information collated by Davidson *et al.* (1991) has been updated and corrected in some instances, and that the core estuary sites as presented in the inventory now include some adjacent intertidal areas treated separately in the Estuaries Review (also see below).

A short key to the inventory

Inventory sites are numbered and presented in clockwise sequence from Land's End. Note, however, that the numbering of estuaries in Northern Ireland follows on from those in Great Britain. Where data was collected or measured from sources other than the Estuaries Review or Coastal Review Unit, these sources are identified below. Information refers to the period 1988-1990 unless otherwise stated.

Site map

Sites were selected for inclusion in the Estuaries Review and inventory using a definition of an estuary based on that developed by NERC (1975): a partially enclosed area at least partly composed of soft tidal shores, open to saline water from the sea, and receiving fresh water from rivers, land run-off or seepage.

For the inventory only sites with a tidal channel longer than 2 km or sites with a shore width of over 0.5 km at low water along a shoreline greater than 2 km are included. The upstream limit is normally taken as the Normal Tidal Limit (NTL), the upper shoreline limit is an interpreted high water mark approximating to the highest astronomical tides (EHWS), and seaward limits are set as either a 'bay closing line' or 'across mouth' (XM) or an 'along shore' (AS) set by the low water mark. On sites that are not isolated from their neighbours, an arbitrary boundary 'between adjacent estuaries' (BAE) has been set, usually at the mid-point of the shore between the sites, or where the intertidal zone is at its narrowest. Note that the low water mark is that shown on 1:50,000 O.S. maps - mean low water in England and Wales, low water spring tides in Scotland.

The approach used for the Estuaries Review and inventory has been to locate a 'core site' of intertidal and subtidal habitats. The core site boundary is shown on the site map. For a few estuaries we have, in addition, defined adjacent areas of 'associated intertidal' habitat where this is outside the inventory estuary mouth but has a functional link to the estuary, for example where the area forms part of an estuarine structure when considered at larger scale, or where there are links through area use by mobile wildlife.

It is difficult to define standard geographical zones for the inclusion of terrestrial habitats associated with estuaries. For this reason we have followed the Estuaries Review in collating information for an 'associated terrestrial' zone that varies in extent between sites, but which includes functional units of maritime-influenced wildlife habitat and areas of human use that closely affect the core estuary.

Estuary size characteristics and description

Measurements of *total area* and *intertidal area* have been rounded to the nearest 1 ha.

Shore length and *channel length* measurements have been rounded to the nearest 0.1 km.

Tidal ranges have been derived from High and Low Water for Mean Spring Tides for the site closest to the defined estuary mouth, from Hewitt & Lees-Spalding (1988).

Human population gives numbers of people living in towns reaching within 1 km of the tidal shore, from the results of the 1981 population census. Population figures greater than 5,000 have been rounded off to the nearest 1,000.

Water quality descriptions are from the DoE River Quality in England and Wales Survey 1991, (National Rivers Authority 1991) and the Water Quality Survey of Scotland 1985 (Scottish Development Department 1987).

Wildlife features

All *coastal habitat* areas are rounded to the nearest 1 ha. Areas for sandflats and mudflats were not measured separately, and are given as a combined figure. Saltmarsh areas are derived from NCC's *Saltmarsh survey of Great Britain* (Burd 1989) unless stated otherwise.

Aquatic estuarine communities. The classification of aquatic estuarine communities - subtidal and intertidal marine communities of substrates not vegetated by higher plants - was prepared by the Estuaries Review using methodology developed by the Marine Nature Conservation Review (MNCR). The Estuaries Review classification was prepared before completion of all relevant survey work by MNCR so this classification should be treated as preliminary. It is being developed further by MNCR. Information on the presence of these benthic communities (rather than the substrates on which they occur) was not available during the review for all sites, although further work is in progress. The benthic plant and animal communities are divided into two broad categories: those on soft substrates and those on hard substrates, and are further divided into communities describable largely on their physico-chemical characteristics. Some of the communities occur on both the intertidal and subtidal parts of estuaries. Communities are as follows:

Soft substrates

1. Gravel/shell gravel community
2. Maerl beds
3. Exposed sand community
4. Clean sand community
5. Common mussel beds
6. Horse mussel beds
7. European oyster beds
8. Surface algal community
9. Current-swept sand community
10. Sand/muddy sand community
11. Muddy gravel community
12. Muddy 'offshore' sand community
13. Normal/variable salinity muddy community
14. *Zostera* and *Ruppia* beds
15. Variable/reduced salinity mud community
16. Reduced salinity mud community

Hard substrates

17. Exposed rocky shore community
18. Moderately exposed rocky shore community
19. Sheltered rocky shore community
20. Variable salinity rocky shore community
21. Reduced (variable) salinity rocky shore community
22. Reduced salinity rocky shore community
23. *Sabellaria* reef community
24. Current-exposed sheltered rocky shore community
25. Exposed rock community
26. Sheltered rock community
27. Hydrozoan/bryozoan turf community
28. Slipper limpet beds
29. Artificial substrata community
30. Variable salinity rock community
31. Variable salinity clay community
32. Reduced (variable) salinity rock community
33. Reduced salinity rock community

Birds. Major sources of information on wintering waders and wildfowl are the Wetland Birds Survey (WeBS) counts organised and funded by the British Trust for Ornithology, the Wildfowl and Wetlands Trust, the Royal Society for the Protection of Birds and the Joint Nature Conservation Committee. Information in the inventory is calculated from five year peak monthly counts for waterfowl for the winters 1989/90 - 1993/94. The proportions of international and national populations of individual species are shown where these are of national or international importance (≥1% of the relevant population except where this value is <50 birds).

Information for some estuaries or parts of estuaries not regularly covered by the BoEE is included from the BTO/WSG Winter Shorebird Count from midwinter 1984/85. Breeding bird data comes from the JNCC/ Seabird Group's Seabird Colony Register and a variety of other national, regional and local surveys (see Volume 1 for details).

Additional wildlife features. Information presented here includes: nationally rare plants i.e. those found in fifteen or fewer 10 km squares in Great Britain (from the Rare Plants Database); Red Data Book (RDB) terrestrial invertebrates (from JNCC's Invertebrate Site Register - ISR); and a variety of other recorded features of conservation interest, for example rare fish, amphibians, reptiles and mammals. Note that 'recently recorded' species of terrestrial invertebrate have been recorded since 1970.

Conservation status

The presence of both statutory and non-statutory wildlife and landscape conservation sites is shown. Known proposals for Sites of Special Scientific Interest, National Nature Reserves, Local Nature Reserves, 'Ramsar' sites, Special Protection Areas and Special Areas of Conservation are also indicated.

Abbreviations to the designations are as follows:

NCR	Nature Conservation Review site
GCR	Geological Conservation Review site
SSSI (B)	Site of Special Scientific Interest (biological)
SSSI (G)	Site of Special Scientific Interest (geological and/or geomorphological)
SSSI (M)	Site of Special Scientific Interest (mixed biological and geological/geomorphological)
NNR	National Nature Reserve
LNR	Local Nature Reserve
Ramsar	Wetland of International Importance (Ramsar Convention)
SPA	Special Protection Area (EC Directive on the conservation of wild birds)
SAC	Special Area of Conservation (Habitats Directive)
AONB	Area of Outstanding Natural Beauty (Countryside Commission)
CWT	County Wildlife Trust reserve
RSPB	Royal Society for the Protection of Birds reserve
ESA	Environmentally Sensitive Area (MAFF)
NP	National Park (England and Wales only)
WWT	Wildfowl and Wetlands Trust centre/reserve
NT	National Trust land
NSA	National Scenic Area (Scotland only)
HC	Heritage Coast (Countryside Commission)
Other	Marine Nature Reserves, Areas of Special Protection, Country Parks etc.

Human use

Features of human use data were collected and collated largely between 1989 and 1993 (from a wide variety of sources chiefly through members of NCC's regional staff with responsibility for conservation management for each estuary). Activities listed as 'Present' and/or 'Proposed' indicate that status only during that period. Proposals include both those developments subject to consent applications and those subject to less formal public discussion and/or investigation. When more recent information is available, changes since 1989 in present activities or the status of proposals are noted in the text, as are major proposals that have arisen since 1989.

Categories of human use. The bar chart shows, for each broad use category, the percentage of activity types in that category listed as 'Present'. For a fuller explanation of this analysis see the introductory volume of the Inventory.

Further reading

Further reading lists selected references containing further information on the estuary and its wildlife. Note that not all this further reading refers to detailed scientific studies: some sources are general or are historical descriptions of life on these estuaries or are even part of the extensive fictional literature that describes estuaries.

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5 The estuaries

A.L. Buck

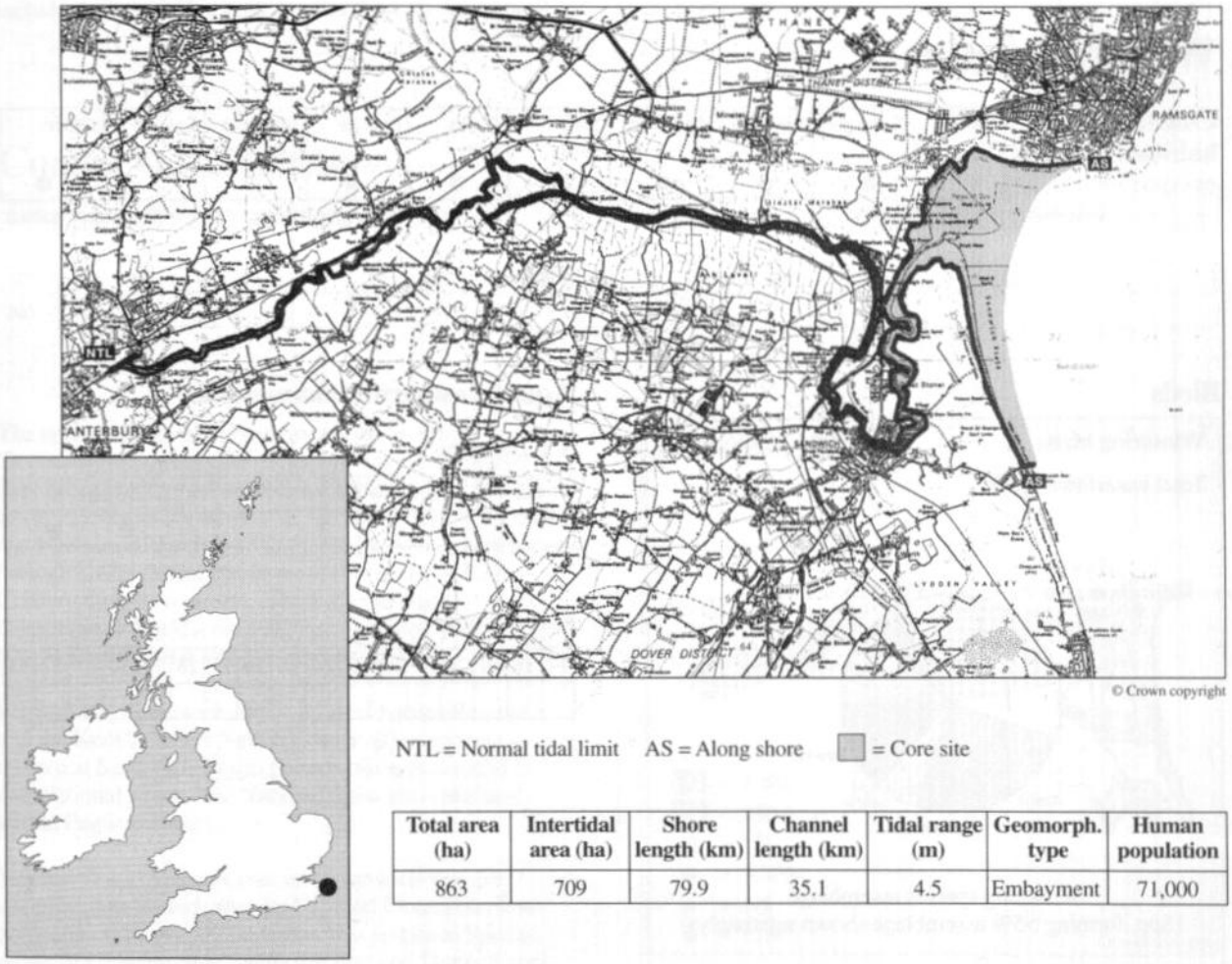
Many parts of estuaries on the south coast, such as here on the Exe Estuary, are intensively used for sailing. (Peter Wakely, English Nature)

121 Pegwell Bay

Centre grid: TR3563
County: Kent

Districts: Canterbury, Dover, Thanet
EN area: Kent

Review site location



NTL = Normal tidal limit AS = Along shore = Core site

Total area (ha)	Intertidal area (ha)	Shore length (km)	Channel length (km)	Tidal range (m)	Geomorph. type	Human population
863	709	79.9	35.1	4.5	Embayment	71,000

Description

This site is the estuary of the River Stour, a long, narrow channel for much of its length, that broadens into Pegwell Bay and Sandwich Flats. Water quality in the estuary has been classified as grade B.

Much of the lower estuary is intertidal flats, largely a mixture of mud and sand, but which ranges from fine sands immediately south of Pegwell Bay, to fine muds in the Bay itself. The broad area of flats supports a rich invertebrate fauna. Also of note are the marine algal communities of the chalk cliffs of Pegwell Bay, which are regarded as internationally important: a range of communities are present in association with the cliff faces, gullies and caves, and show a distinct vertical zonation.

Saltmarsh has developed along both banks of the River Stour, with the largest remaining areas on the easternmost bank; saltmarsh on the western bank has been lost largely to land-claim. Within the remaining saltmarsh, mid-upper marsh communities are extensive, showing some

freshwater influences. To the north of the Stour mouth where it widens into the bay, an area of saltmarsh has developed with low-mid marsh and mid-upper marsh vegetation communities. *Spartina* is slowly colonising the lower reaches of the estuary.

To the south of the estuary the shore is backed by a long stretch of bare shingle, which, to landward, is overlain by an extensive area of sand dunes and sandy grassland. The dunes stretch to the mouth of the Stour and are growing rapidly northwards, diverting the channel. These dunes support an exceptionally large number of plants including many which are rare or scarce, and a diverse invertebrate fauna that contains many rare species.

The wide range of estuarine and coastal habitats present along the estuary support an abundant and diverse flora and fauna. Pegwell Bay is also of importance to waders and wildfowl and supports a variety of wintering species.

Wildlife features

Coastal habitats

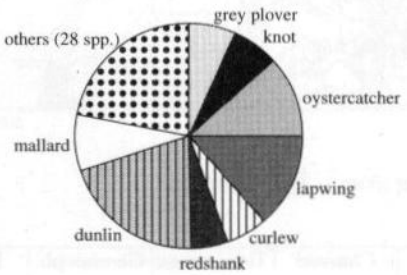
	Subtidal	Saltmarsh	Sandflats	Mudflats	Sand dunes	Rocky shores	Shingle	Lowland grassland	Lagoon	Other
	●	●	●	●	●	●	●	●		●
Area (ha)	154	99	610							

● = major habitat ● = minor habitat

Birds

Wintering birds 1989/90 – 1993/94 data

Total waterfowl: 7,200



Wintering species assemblage
(Spp. forming >5% assemblage shown separately)

Breeding birds: a small colony of little tern breeds within Pegwell Bay. Small numbers of redshank, lapwing and snipe breed within the grasslands adjacent to the estuary and small numbers of ringed plover breed within the estuary.

Aquatic estuarine communities

Soft substrate

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
												●		●	

Hard substrate

17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33

Additional wildlife features

Two Red List plant species, lizard orchid *Himantoglossum hircinum* and clove-scented broomrape *Orobanche caryophyllacea*, have been recorded on the dunes adjacent to estuary. Two nationally scarce plants have also been recorded from Pegwell Bay.

The invertebrate fauna recently recorded is very rich and includes several RDB 1 species: the moth *Stigmella repentiella*, the spider wasp *Evagetes pectinipes* and the digger wasp *Cerceris quadricincta*; RDB 2 species include the beetle *Hypocaccus metallicus*, the silver barred moth *Deltote bankiana*, the fly *Poecilobothrus ducalis* and the digger wasp *Miscophus ater*; the RDB 3 invertebrate fauna includes the snail *Monacha cartusiana*, the bug *Odontoscelis fuliginosa*, the rest harrow moth *Aplasta ononaria*, the pygmy footman moth *Eilema pygmaeola*, the bright wave moth *Idaea ochrata*, the fly *Miltogramma germari*, the bee *Coelioxys mandibularis* and the wasp *Podalonia affinis*. In addition four proposed RDB species and 183 Notable species have been recorded from Pegwell Bay.

Conservation status

● = designated ● = proposed

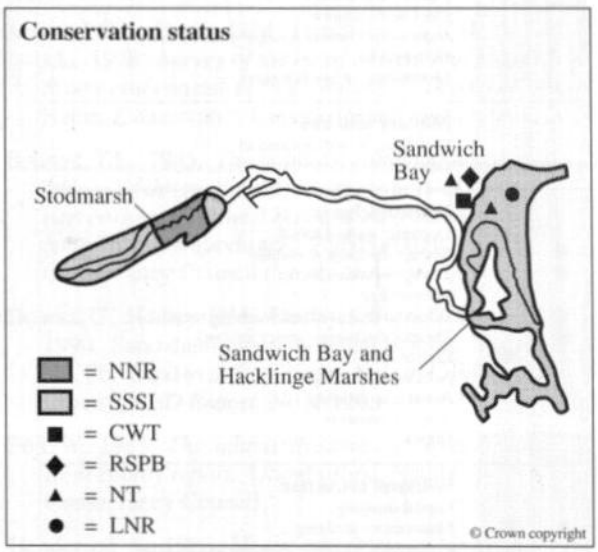
	NCR	GCR	SSSI (B)	SSSI (G)	SSSI (M)	NNR	LNR	Ramsar	SPA	SAC	AONB	CWT	RSPB	ESA	NP	WWT	NT	NSA	HC	Other
	●	●	●		●	●	●	●	●	●		●	●				●			
No.	1	3	1		1	1	1	1	1	2		1	1				2			

The upper reaches of the estuary are covered by Stodmarsh biological Site of Special Scientific Interest (604 ha), part of which is a National Nature Reserve. The lower reaches of the estuary lie within the Sandwich Bay and Hacklinge Marshes SSSI (1,743 ha), designated for its biological and geological interest; it is also a Nature Conservation Review site. There are Geological Conservation Review sites at three localities within the site, at Thanet Coast and two at Pegwell Bay.

Pegwell Bay-Sandwich Bay is a Local Nature Reserve and the Kent Trust for Nature Conservation manage a reserve at Sandwich Bay in partnership with the RSPB and National Trust. The National Trust also own land within Pegwell Bay.

Stodmarsh and Thanet Coast and Sandwich Bay are designated as Ramsar sites and Special Protection Areas, and parts of the estuary lie within two proposed Special Areas of Conservation: Sandwich Bay and Thanet Coast.

Conservation status



Human activities (in 1992)

Present	Proposed	
		Coast protection & sea defences
●	●	Linear defences
●		Training walls
		Groynes
		Brushwood fences
		Spartina planting
		Marram grass planting
		Barrage schemes
		Weirs & barrages for river management
		Storm surge barrages
		Water storage barrages & bunds
		Leisure barrages
		Tidal power barrages
		Power generation
●		Thermal power stations
		Import/export jetties (power generation)
●		Wind-power generation
		Industrial, port & related development
●		Dock, port & harbour facilities
		Manufacturing industries
●		Chemical industries
●		Ship & boat building/repair
		Others
		Extraction & processing of natural gas & oil
		Exploration
		Production
		Rig & platform construction
		Pipeline construction
		Pipeline installation
		Import/export jetties & single-point moorings
		Oil refineries
		Mothballing of rigs & tankers
		Military activities
		Overflying by military aircraft
		Others
		Waste discharge
●		Domestic waste disposal
●		Sewage discharge & outfalls
		Sewage treatment works
●		Rubbish tips
●		Industrial & agricultural waste discharge
		Thermal discharges (power stations)
	●	Dredge spoil
		Accidental discharges
		Aerial crop spraying
		Waste incinerators
		Others
		Sediment extraction
●	●	Capital dredging
		Maintenance dredging
		Commercial estuarine aggregates extraction
		Commercial terrestrial aggregates extraction
		Non-commercial aggregates extraction
		Hard-rock quarrying
		Transport & communications
●		Airports & helipads
		Tunnels, bridges & aqueducts
		Causeways & fords
	●	Road schemes
●		Ferries
●		Cables
		Urbanisation
	●	Land-claim for housing & car parks
		Education & scientific research
●		Sampling, specimen collection & observation
●		Nature trails & interpretative facilities
●		Seismic studies & geological test drilling
		Marine & terrestrial archaeology
●		Fossil collecting

Present	Proposed	
		Tourism & recreation
		Infrastructure developments
●		Marinas
●		Non-marina moorings
●		Dinghy & boat parks
●		Caravan parks & chalets
	●	Leisure centres, complexes & piers
		Aquatic-based recreation
●		Power-boating & water-skiing
	●	Jet-skiing
●		Sailing
●		Sailboarding & wind-surfing
		SCUBA & snorkelling
		Canoeing
		Surfing
		Rowing
●		Tourist boat trips/leisure barges
●		Angling
		Other non-commercial fishing
●		Bathing & general beach recreation
		Terrestrial & intertidal-based recreation
●		Walking, including dog walking
●		Bird-watching
		Sand-yachting
●		4WD & trial-biking
		Car sand-racing
		Horse-riding
		Rock-climbing
●		Golf courses
	●	Clay-pigeon shooting
●		Others
		Airborne recreation
		Overflying by light aircraft
		Radio-controlled model aircraft
		Others
		Wildfowling & hunting
●		Wildfowling
●		Other hunting-related activities
		Bait-collecting
●		Digging & pumping for lugworms & ragworms
		Hydraulic dredging for worms
		Others
		Commercial fisheries
		Fish-netting & trawling
		Fyke-netting for eels
		Fish traps & other fixed devices & nets
		Crustacea
		Molluscs – Hand-gathering
		Dredging
		Hydraulic dredging
		Cultivation of living resource
●		Saltmarsh grazing
		Sand dune grazing
		Agricultural land-claim
		Fish-farming
		Shellfish farming
		Bottom & tray cultivation
		Suspended cultivation
		Crustacea farming
●		Reeds for roofing
		Salicornia picking
●		Others
		Management & killing of birds & mammals
		Killing of mammals
		Killing of birds
		Adult fish-eating birds
		Adult shellfish-eating birds
		Gulls
		Geese
		Wildlife habitat management
		Spartina control
		Habitat creation & restoration
		Marine
		Intertidal
●		Terrestrial
●		Habitat management
		Others

Features of human use

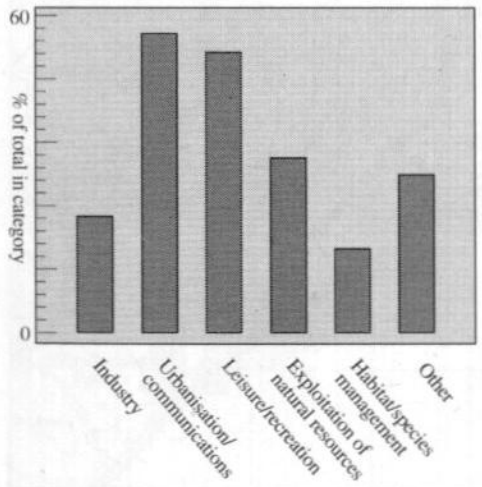
Leisure activities are numerous, with a marina at Ramsgate and many moorings along the Stour; most sailing occurs from the estuary out to sea. Power-boating, wind-surfing and water-skiing occur over 200 ha of the bay, and walking and bird-watching take place over the intertidal flats and along most of the riverbanks. Beach recreation is centred on the bay.

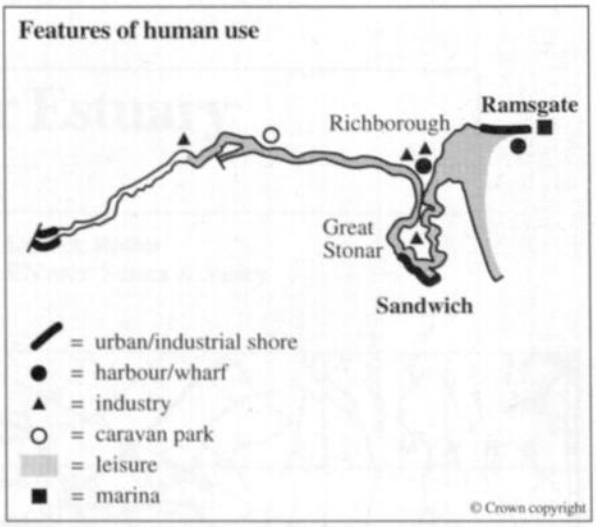
Exploitation of the natural resource includes grazing over 15 ha of the saltmarsh, reed-cutting for roofing, turf-cutting from the grazing marsh at Stodmarsh and bait-digging. A wildfowling club shoots over the grazing marshes.

Industrial activities are mostly located in the lower reaches of the estuary. At Richborough there is an oil-fired power station with an industrial wharf, at Great Stonar there is a pharmaceutical works and there is a harbour at Ramsgate. There is also a very small boat-building yard upstream at Grove Ferry.

Proposals in 1992 included linear defences in Pegwell Bay, a road scheme to Ramsgate harbour and two leisure centres at Ramsgate. There was also a proposal for clay pigeon shooting over the north of the bay. Since that time there have been proposals for the development of an old hoverport and jet-ski areas in Pegwell Bay.

Categories of human use





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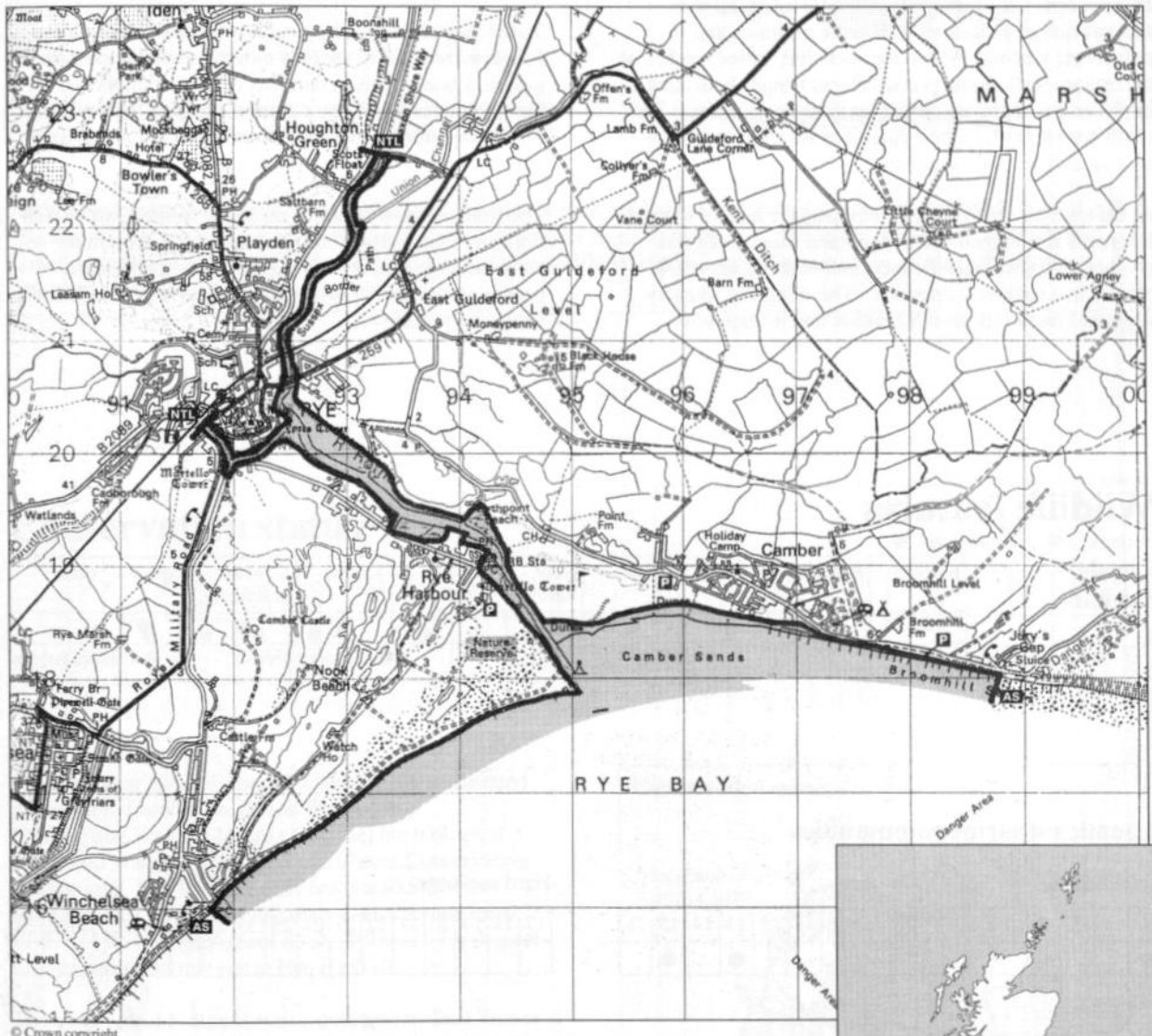
122 Rother Estuary

Centre grid: TQ9419
County: East Sussex

District: Rother
EN area: Sussex & Surrey

Review site location



NTL = Normal tidal limit AS = Along shore ▭ = Core site

Total area (ha)	Intertidal area (ha)	Shore length (km)	Channel length (km)	Tidal range (m)	Geomorph. type	Human population
376	344	23.0	6.6	5.3	Bar built	<5,000

Description

The Rother is a small estuary, flowing past the town of Rye and opening out into a sandy bay. Rye Harbour is a fraction of its former self, as the continual accretion of shingle has gradually diverted the mouth of the estuary to the east. Water quality within the estuary has been classified as grade A.

The river channel has only very narrow strips of intertidal flats, which are muddy but become sandy where the channel opens out into the bay. These intertidal flats support rich communities of bivalve molluscs and polychaete worms. Within the sheltered, lower reaches of the estuary well-developed saltmarsh fringes both banks; in places the edges are cliffed, with some slumping. The south-facing bank of the estuary has the most extensive area of undisturbed saltmarsh.

At the mouth of the river lies an extensive area of shingle. It forms a fan-shaped belt of sand and shingle of great geomorphological significance, and which is accreting rapidly in a southerly direction. The shingle is sparsely vegetated due to its unstable nature and its exposed position, but the plant and animal communities present reflect the age of the shingle ridges and the degree of maritime influence. The flora includes a number of uncommon plants. In places extraction of the shingle has created a series of pools and lakes which range from brackish to freshwater. Two lagoons within the shingle, Winchelsea Beach Pond and Rye Harbour lagoon, receive seawater by percolation through the shingle and support a high diversity of species.

To the east of the estuary mouth is Camber Sands, a sandy foreshore backed by the only extensive sand dune system in East Sussex. This system has developed in the lee of the shingle bank and has a zone of unstable yellow dunes, poorly vegetated in parts due to erosion, and a stabilised dune system that is now used as a golf course.

The Rother Estuary has a complex of habitats with a rich flora and fauna, which includes nationally important communities of plants and invertebrates (particularly beetles and moths), and supports a diverse population of wintering waterfowl.

Wildlife features

Coastal habitats

	Subtidal	Saltmarsh	Sandflats	Mudflats	Sand dunes	Rocky shores	Shingle	Lowland grassland	Lagoon	Other
	●	●	●	●	●		●	●	●	
Area (ha)	32	54	290							

● = major habitat ◍ = minor habitat

Aquatic estuarine communities

Soft substrate

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
●												●		●	

Hard substrate

17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33

Additional wildlife features

The Red List plant least lettuce *Lactuca saligna* has been recorded from the estuary. The invertebrate fauna recently recorded includes the RDB 1 beetles *Dibolia cynoglossi*, *Dyschirius obscurus* and *Omophron limbatum*; the RDB 2 beetles *Bagous cylindrus* and *Hypocaccus metallicus*; the RDB 3 beetles *Berosus spinosus*, *Bledius diota*, *B. occidentalis*, *Bradycellus distinctus*, *Cercyon bifenestratus*, *Haliplus variegatus*, *Heterocerus hispidulus*, *Hydrovatus clypealis*, *Leiodes ciliaris*, *Macroplea mutica*, *Masoreus wetterhalli*, *Onthophagus nuchicornis* and *Platynaspis luteorubra*; the RDB 3 pygmy footman moth *Eilema pygmaeola* and flame wainscot moth *Senta flammea*. In addition a further four proposed RDB species and 81 Notable species have been recorded.

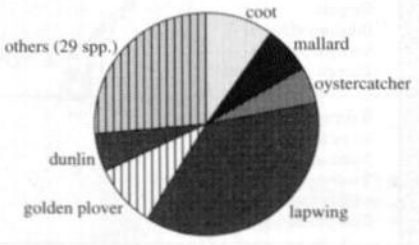
Birds

Wintering birds 1989/90 – 1993/94 data

Total waterfowl: 8,500

% National population

shoveler 1.0%



Wintering species assemblage
(Spp. forming >5% assemblage shown separately)

Breeding birds: there are a number of seabird colonies present, including moderate-sized colonies of black-headed gull, Sandwich tern and little tern and small colonies of common tern and herring gull. Moderate numbers of lapwing and small numbers of redshank, oystercatcher and snipe breed within the grasslands adjacent to the estuary. Moderate numbers of ringed plover also breed on the site.

Conservation status

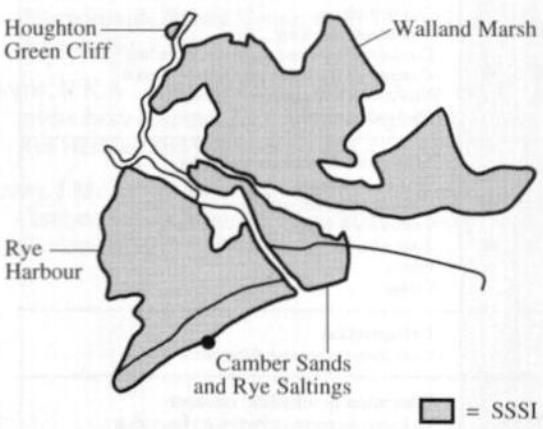
● = designated ● = proposed

	NCR	GCR	SSSI (B)	SSSI (G)	SSSI (M)	NNR	LNR	Ramsar	SPA	SAC	AONB	CWT	RSPB	ESA	NP	WWT	NT	NSA	HC	Other
	●	●	●	●	●		●	●	●											
No.	1	1	2	1	1		1	1	1											

There are four Sites of Special Scientific Interest around the estuary. Camber Sands and Rye Saltings (239 ha) and Walland Marsh (1,946 ha) are biological SSSIs and Walland Marsh is also a Nature Conservation Review site. Rye Harbour (759 ha) is a SSSI for its biological and geological interest and Houghton Green Cliff (0.1 ha) is a geological SSSI. There is a Geological Conservation Review site at Rye Harbour.

There is a Local Nature Reserve managed by East Sussex County Council at Rye Harbour. Part of the estuary lies within the Dungeness to Pett Levels proposed Special Protection Area and Ramsar site.

Conservation status



Human activities (in 1991)

Present	Proposed	
		Coast protection & sea defences
●		Linear defences
●		Training walls
		Groynes
		Brushwood fences
		Spartina planting
		Marram grass planting
		Barrage schemes
		Weirs & barrages for river management
		Storm surge barrages
		Water storage barrages & bunds
		Leisure barrages
		Tidal power barrages
		Power generation
		Thermal power stations
		Import/export jetties (power generation)
		Wind-power generation
		Industrial, port & related development
●	●	Dock, port & harbour facilities
		Manufacturing industries
●		Chemical industries
●		Ship & boat building/repair
		Others
		Extraction & processing of natural gas & oil
		Exploration
		Production
		Rig & platform construction
		Pipeline construction
		Pipeline installation
		Import/export jetties & single-point moorings
		Oil refineries
		Mothballing of rigs & tankers
		Military activities
		Overflying by military aircraft
		Others
		Waste discharge
		Domestic waste disposal
		Sewage discharge & outfalls
		Sewage treatment works
		Rubbish tips
		Industrial & agricultural waste discharge
		Thermal discharges (power stations)
		Dredge spoil
		Accidental discharges
●		Aerial crop spraying
		Waste incinerators
		Others
		Sediment extraction
●		Capital dredging
		Maintenance dredging
●	●	Commercial estuarine aggregates extraction
●		Commercial terrestrial aggregates extraction
		Non-commercial aggregates extraction
		Hard-rock quarrying
		Transport & communications
●	●	Airports & helipads
		Tunnels, bridges & aqueducts
	●	Causeways & fords
		Road schemes
		Ferries
		Cables
		Urbanisation
		Land-claim for housing & car parks
		Education & scientific research
●		Sampling, specimen collection & observation
●		Nature trails & interpretative facilities
●		Seismic studies & geological test drilling
●		Marine & terrestrial archaeology
		Fossil collecting

Present	Proposed	
		Tourism & recreation
		Infrastructure developments
●	●	Marinas
		Non-marina moorings
●		Dinghy & boat parks
●		Caravan parks & chalets
		Leisure centres, complexes & piers
		Aquatic-based recreation
●		Power-boating & water-skiing
		Jet-skiing
●		Sailing
●		Sailboarding & wind-surfing
	●	SCUBA & snorkelling
●		Canoeing
		Surfing
		Rowing
		Tourist boat trips/leisure barges
●		Angling
		Other non-commercial fishing
●		Bathing & general beach recreation
		Terrestrial & intertidal-based recreation
●		Walking, including dog walking
●		Bird-watching
		Sand-yachting
		4WD & trial-biking
		Car sand-racing
●		Horse-riding
		Rock-climbing
●		Golf courses
		Clay-pigeon shooting
		Others
		Airborne recreation
●		Overflying by light aircraft
●		Radio-controlled model aircraft
		Others
		Wildfowling & hunting
●		Wildfowling
●		Other hunting-related activities
		Bait-collecting
●		Digging & pumping for lugworms & ragworms
		Hydraulic dredging for worms
		Others
		Commercial fisheries
		Fish-netting & trawling
		Fyke-netting for eels
		Fish traps & other fixed devices & nets
		Crustacea
		Molluscs – Hand-gathering
		Dredging
		Hydraulic dredging
		Cultivation of living resource
●		Saltmarsh grazing
		Sand dune grazing
		Agricultural land-claim
		Fish-farming
		Shellfish farming
		Bottom & tray cultivation
		Suspended cultivation
		Crustacea farming
		Reeds for roofing
		Salicornia picking
		Others
		Management & killing of birds & mammals
		Killing of mammals
		Killing of birds
		Adult fish-eating birds
		Adult shellfish-eating birds
		Gulls
●		Geese
		Wildlife habitat management
		Spartina control
		Habitat creation & restoration
		Marine
		Intertidal
●		Terrestrial
●		Habitat management
		Others

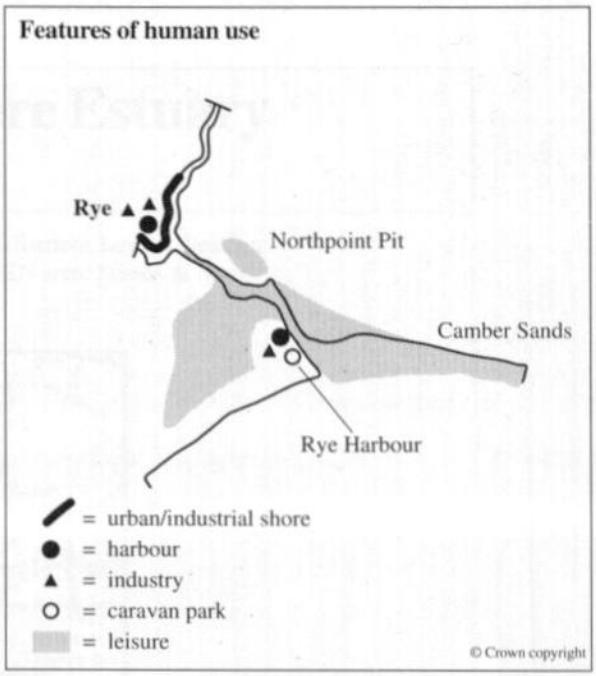
Features of human use

Leisure activities are dominant, with sailing and power-boating occurring in the lower reaches of the estuary between Rye Harbour and Rye. Most watersports occur on the Castle Water Estate lakes within the shingle to the south of Rye, and include sailing, water-skiing, canoeing and paragliding. Wind-surfing occurs on Northpoint Pit adjacent to the estuary on the eastern bank. Beach recreation and horse-riding are focused on Camber Sands, and walking and bird-watching take place within the LNR. In 1989, consent had been granted for the development of three marinas between Rye and the estuary mouth.

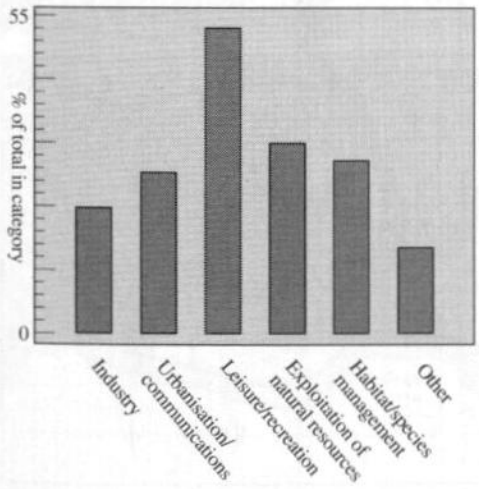
Exploitation of the natural resource includes bait-digging at Camber Sands, the study of coastline projects and marine archaeology. Wildfowling occurs on Nook Beach gravel pits adjacent to the estuary. Habitat management includes the creation of freshwater scrapes and clearing vegetation from the shingle to provide tern nesting areas.

Industrial activity includes a port at Rye Harbour, and at Rye which is the base for a fishing fleet. There is a chemical industry at Rye Harbour and boat-building/repair yards at Rye and Rye Harbour.

In 1991 there were proposals for further wharf and industrial development of Rye Harbour; there were also proposals for gravel extraction, a road by-pass scheme, and for marinas on the east and west bank at Rye.



Categories of human use



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123 Cuckmere Estuary

Centre grid: TV5198
County: East Sussex

Districts: Lewes, Wealden
EN area: Sussex & Surrey

Review site location

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NTL = Normal tidal limit

AS = Along shore

= Core site

Total area (ha)	Intertidal area (ha)	Shore length (km)	Channel length (km)	Tidal range (m)	Geomorph. type	Human population
47	15	16.7	8.4	6.5	Coastal plain	<5,000

Description

The River Cuckmere breaches the South Downs to form an estuary within a broad, alluvial valley. Although the river has been artificially over-steepened and embanked, and its natural course much altered, the meanders within the floodplain remain. Today the meadows and drainage ditches which dissect the floodplain are seldom flooded, but they support a number of unusual plants. Water quality in the estuary has been classified as grade A.

With the artificial nature of the shoreline, saltmarsh development has been limited. Saltmarsh communities line the canalised and upper reaches of the estuary, but the majority occurs on the banks of the lower reaches south of Exceat Bridge. A small area of saltmarsh north of the Bridge is heavily grazed.

On either side of the estuary mouth a shingle bank has developed, most extensively on the eastern side. The shingle is sparsely vegetated but with a representative flora, and supports three nationally uncommon centipedes: two of these have not been recorded elsewhere in the UK. The Cuckmere has large areas of chalk foreshore where, below the shoreline, unusual chalk ridges and gullies support a rich and diverse marine life.

Around the lower reaches of the Cuckmere Estuary there are a series of interconnected lagoons. The Oxbow Lake is an isolated meandering section of the Cuckmere which remained when the cut was constructed from Exceat Bridge seawards. Its upper end is connected to the estuary by a controlled sluice, and its lower end is joined to a tidal pond lagoon by a series of drainage channels. A third lagoon, known as the Coastal lagoon, represents an old channel of the Cuckmere which lies behind the shingle. Each lagoon supports a number of specialist lagoonal species.

Wildlife features

Coastal habitats

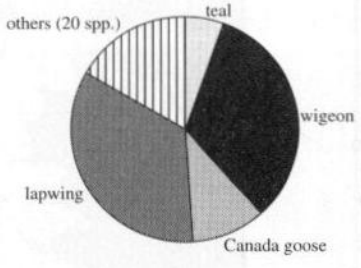
	Subtidal	Saltmarsh	Sandflats	Mudflats	Sand dunes	Rocky shores	Shingle	Lowland grassland	Lagoon	Other
	●	●		●		●	●		●	
Area (ha)	32	10	5							

● = major habitat ● = minor habitat

Birds

Wintering birds 1989/90 – 1993/94 data

Total waterfowl: 2,280



Wintering species assemblage
(Spp. forming >5% assemblage shown separately)

Breeding birds: small numbers of ringed plover have been recorded breeding on the estuary.

Aquatic estuarine communities

Soft substrate

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16

Hard substrate

17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33
				●												

Additional wildlife features

The nationally rare plant star thistle *Centaurea calcitrapa* has been recorded adjacent to the upper estuary. The invertebrate fauna includes three Notable species of centipede found within the shingle: *Pachymenium ferrugineum*, *Schendyla peyerimhoffi* and *Geophilus pusillifrater*.

Conservation status

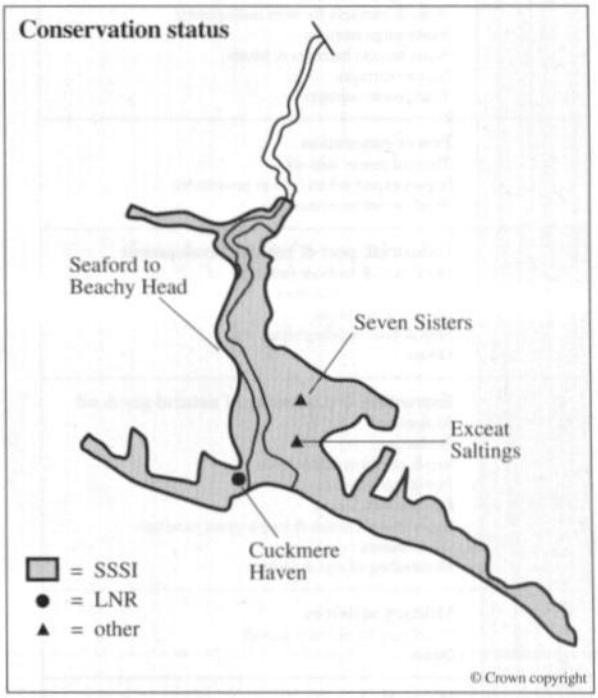
● = designated ● = proposed

	NCR	GCR	SSSI (B)	SSSI (G)	SSSI (M)	NNR	LNR	Ramsar	SPA	SAC	AONB	CWT	RSPB	ESA	NP	WWT	NT	NSA	HC	Other
	●	●			●		●				●			●			●		●	●
No.	1	2			1		1				1			1			1		1	3

Much of the estuary lies within the Seaford to Beachy Head Site of Special Scientific Interest (1,091 ha), designated for its biological and geomorphological interest; this forms part of the Cuckmere Haven to Beachy Head Nature Conservation Review site. There are two Geological Conservation Review sites on the estuary, Beachy Head to Seaford and Cuckmere to Seaford.

Cuckmere Haven has been designated a Local Nature Reserve by East Sussex County Council and Lewes District Council, and Exceat Saltings are owned by the National Trust. Adjacent to the estuary is Seven Sisters Country Park. The Seven Sisters is a voluntary Marine Nature Reserve and a Sensitive Marine Area.

The Cuckmere Estuary lies within the Sussex Heritage Coast, the Sussex Downs Area of Outstanding Natural Beauty and the South Downs Environmentally Sensitive Area.



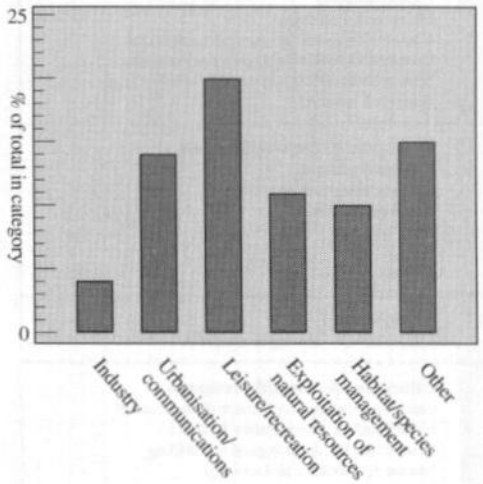
Features of human use

There are few on-going activities within the estuary. Leisure activities include canoeing on the meanders of the river, beach recreation and angling within Cuckmere Haven, walking occurs alongside the river and within the country park, and bird-watching occurs in the river valley.

Exploitation of the natural resource involves grazing a small area of saltmarsh and educational studies. Other activities include small-scale dredging at the estuary mouth to counteract the long-shore drift of the shingle, and the creation of a brackish lagoon for waders.

In 1991 there was a proposal to carry out work on the sea walls along the river embankments.

Categories of human use



Human activities (in 1991)

Present	Proposed	
●	●	**Coast protection & sea defences**
		Linear defences
		Training walls
●		Groynes
		Brushwood fences
		Spartina planting
		Marram grass planting
		Barrage schemes
		Weirs & barrages for river management
		Storm surge barrages
		Water storage barrages & bunds
		Leisure barrages
		Tidal power barrages
		Power generation
		Thermal power stations
		Import/export jetties (power generation)
		Wind-power generation
		Industrial, port & related development
		Dock, port & harbour facilities
		Manufacturing industries
		Chemical industries
		Ship & boat building/repair
		Others
		Extraction & processing of natural gas & oil
		Exploration
		Production
		Rig & platform construction
		Pipeline construction
		Pipeline installation
		Import/export jetties & single-point moorings
		Oil refineries
		Mothballing of rigs & tankers
		Military activities
		Overflying by military aircraft
		Others
●		**Waste discharge**
		Domestic waste disposal
		Sewage discharge & outfalls
		Sewage treatment works
		Rubbish tips
		Industrial & agricultural waste discharge
		Thermal discharges (power stations)
		Dredge spoil
		Accidental discharges
		Aerial crop spraying
		Waste incinerators
		Others
●		**Sediment extraction**
		Capital dredging
		Maintenance dredging
		Commercial estuarine aggregates extraction
		Commercial terrestrial aggregates extraction
		Non-commercial aggregates extraction
		Hard-rock quarrying
●		**Transport & communications**
		Airports & helipads
		Tunnels, bridges & aqueducts
		Causeways & fords
		Road schemes
		Ferries
		Cables
		Urbanisation
		Land-claim for housing & car parks
●		**Education & scientific research**
●		Sampling, specimen collection & observation
		Nature trails & interpretative facilities
		Seismic studies & geological test drilling
		Marine & terrestrial archaeology
		Fossil collecting

Present	Proposed	
		Tourism & recreation
		Infrastructure developments
		Marinas
		Non-marina moorings
		Dinghy & boat parks
		Caravan parks & chalets
		Leisure centres, complexes & piers
		Aquatic-based recreation
		Power-boating & water-skiing
		Jet-skiing
		Sailing
		Sailboarding & wind-surfing
		SCUBA & snorkelling
●		Canoeing
		Surfing
		Rowing
		Tourist boat trips/leisure barges
●		Angling
		Other non-commercial fishing
●		Bathing & general beach recreation
		Terrestrial & intertidal-based recreation
●		Walking, including dog walking
●		Bird-watching
		Sand-yachting
		4WD & trial-biking
		Car sand-racing
		Horse-riding
		Rock-climbing
		Golf courses
		Clay-pigeon shooting
		Others
		Airborne recreation
●		Overflying by light aircraft
		Radio-controlled model aircraft
		Others
		Wildfowling & hunting
		Wildfowling
		Other hunting-related activities
		Bait-collecting
		Digging & pumping for lugworms & ragworms
		Hydraulic dredging for worms
		Others
		Commercial fisheries
		Fish-netting & trawling
		Fyke-netting for eels
		Fish traps & other fixed devices & nets
		Crustacea
		Molluscs – Hand-gathering
		Dredging
		Hydraulic dredging
●		**Cultivation of living resource**
		Saltmarsh grazing
		Sand dune grazing
		Agricultural land-claim
		Fish-farming
		Shellfish farming
		Bottom & tray cultivation
		Suspended cultivation
		Crustacea farming
		Reeds for roofing
		Salicornia picking
		Others
		Management & killing of birds & mammals
		Killing of mammals
		Killing of birds
		Adult fish-eating birds
		Adult shellfish-eating birds
		Gulls
		Geese
		Wildlife habitat management
		Spartina control
		Habitat creation & restoration
		Marine
●		Intertidal
		Terrestrial
		Habitat management
		Others

Further reading

Arnott, J.G.L., Barter, G.M., Henderson, A.C.B., & Nall, J.L. 1978. *Survey of the coast of Kent and Sussex. Rivers and coastal survey, volume 5*. Peterborough, Nature Conservancy Council (South-east region).

Fojt, W. 1985. *Saltmarsh survey of Great Britain. Sussex county report*. Peterborough, Nature Conservancy Council.

Sheader, M., & Sheader, A.L. 1985. Survey of brackish coastal lagoons, Sussex to Dorset. *Nature Conservancy Council, CSD report*, No. 739.

Wood, C. 1984. Sussex sublittoral survey. Selsey Bill to Beachy Head. *Nature Conservancy Council, CSD report*, No. 527.

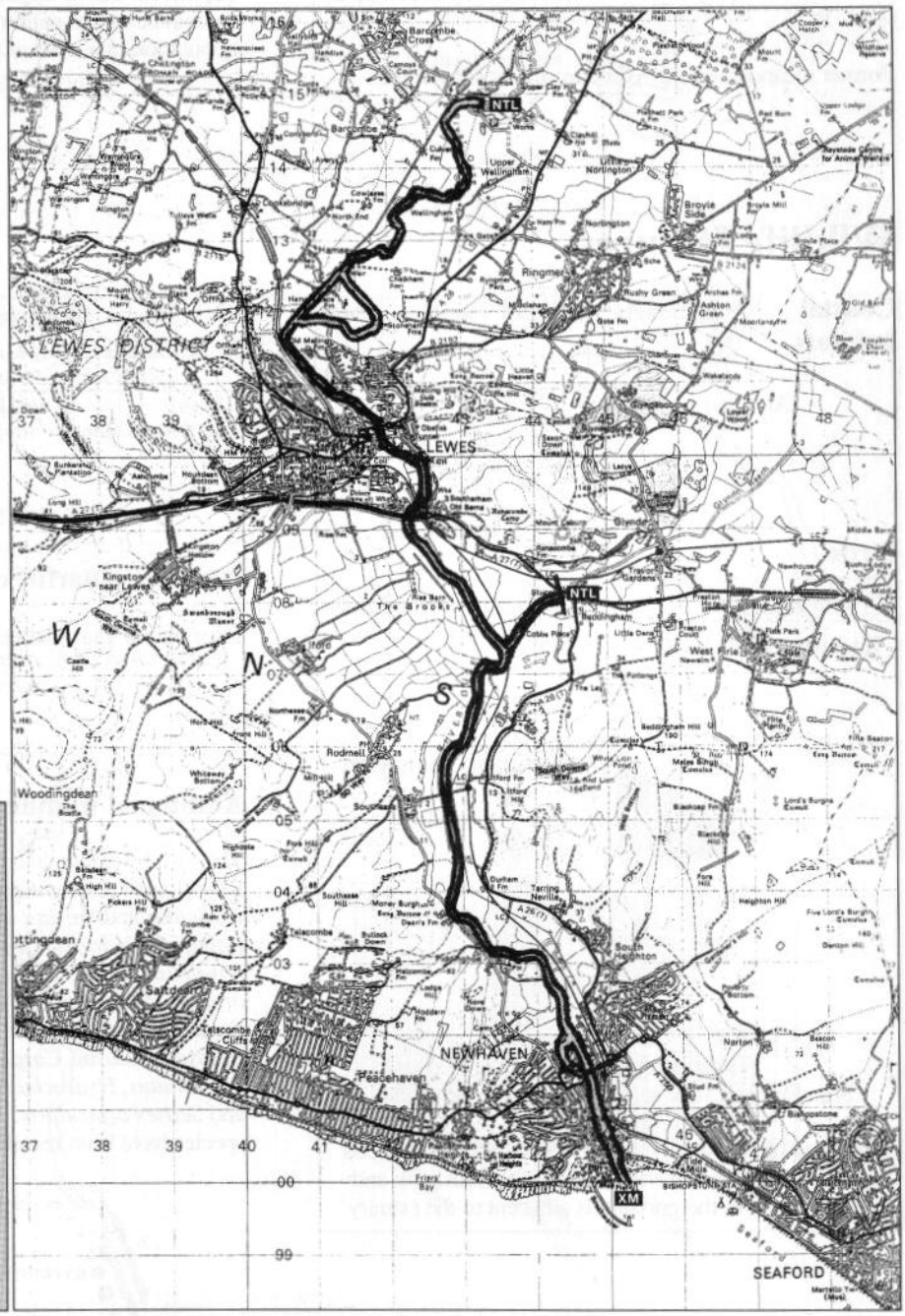
Wood, C., & Jones, E. 1986. Seven Sisters marine surveys. *Nature Conservancy Council, CSD report*, No. 684.

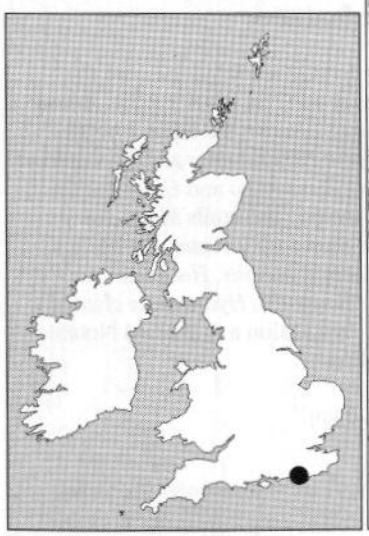
124 Ouse Estuary

Centre grid: TQ4402
County: East Sussex

District: Lewes
EN area: Sussex & Surrey

Review site location





NTL = Normal tidal limit

XM = Across mouth

= Core site

Total area (ha)	Intertidal area (ha)	Shore length (km)	Channel length (km)	Tidal range (m)	Geomorph. type	Human population
124	6	49.2	20.3	6.1	Coastal plain	25,000

Description

The estuary of the River Ouse flows through an alluvial floodplain of the South Downs and enters the sea at Newhaven. The channel is very narrow, for canalisation and pumping of the floodplain has greatly reduced the original extent of the estuary; as a result the development of saltmarsh has been prevented, and at low tide there is only a small mudflat exposed at Newhaven. Water quality in the Ouse has been classified as grade A, except for a short section south of Lewes which has been classified as grade B.

Former meanders of the river can still be seen in the floodplain of the Ouse and ditches which cut through the alluvium vary in salinity from freshwater to brackish. The Lewes Brooks area supports a wide diversity of invertebrates, with many rare and uncommon species of water beetles, snails and moths, and the ditch banks support a rich mixture of plants. There are also several scarce species of dragonfly present. Further upstream, the alluvial grazing marsh at Offham Marshes is of importance for its large populations of common toad, smooth newt and palmate newt. Such amphibian populations are unusual for this type of habitat in Sussex.

Wildlife features

Coastal habitats

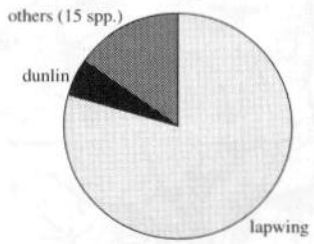
	Subtidal	Saltmarsh	Sandflats	Mudflats	Sand dunes	Rocky shores	Shingle	Lowland grassland	Lagoon	Other
	●			●				●		
Area (ha)	118		6							

● = major habitat ● = minor habitat

Birds

Wintering birds 1989/90 – 1993/94 data

Total waterfowl: 1,440



Wintering species assemblage
(Spp. forming >5% assemblage shown separately)

Breeding birds: small numbers of ringed plover breed within the estuary and small numbers of redshank and lapwing breed in the grasslands adjacent to the estuary.

Aquatic estuarine communities

Information unavailable.

Additional wildlife features

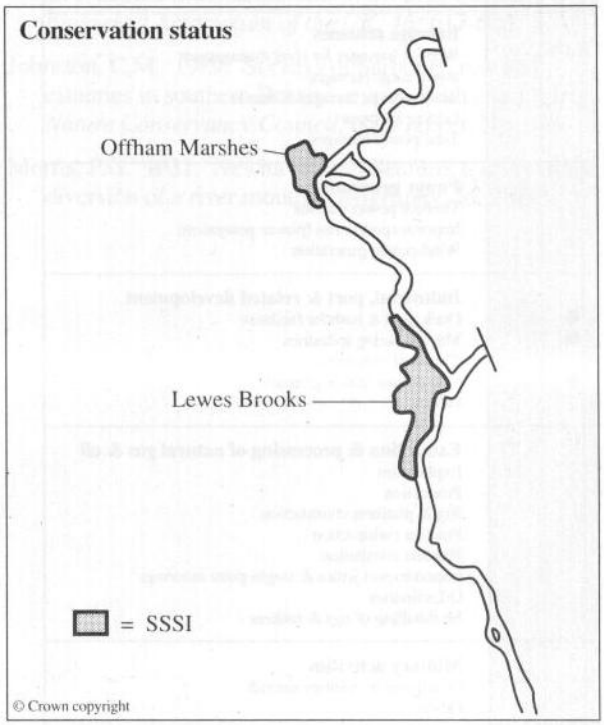
The invertebrate fauna recently recorded includes the RDB 1 snail *Segmentina nitida*, the RDB 2 snails *Anisus vorticulus* and *Valvata macrostoma*, the RDB 2 beetles *Bagous cylindricus*, *Graptodytes flavipes* and *Laccophilus obsoletus*, and the flies *Lejops vittata* and *Odontomyia ornata*. RDB 3 species include the snails *Monacha cartusiana* and *Pisidium pseudosphaerium*, the beetles *Berosus spinosus*, *Carpelimus subtilis*, *Haliplus mucronatus*, *Hydrochus elongatus*, *Hydrovatus clypealis* and *Scirtes orbicularis*. In addition a further 44 Notable species have been recorded.

Conservation status

● = designated ◍ = proposed

	NCR	GCR	SSSI (B)	SSSI (G)	SSSI (M)	NNR	LNR	Ramsar	SPA	SAC	AONB	CWT	RSPB	ESA	NP	WWT	NT	NSA	HC	Other
			●								●			●					●	
No.			2								1			1					1	

Small areas of the estuary lie within biological Sites of Special Scientific Interest: Lewes Brooks (333 ha) and Offham Marshes (38 ha). The Ouse lies within the Sussex Heritage Coast and the South Downs Environmentally Sensitive Area, and part of the estuary lies within the Sussex Downs Area of Outstanding Natural Beauty.

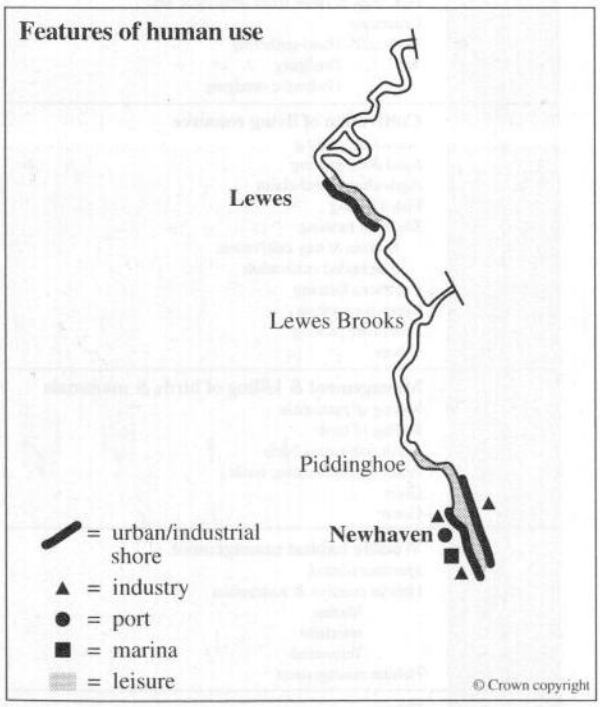


Features of human use

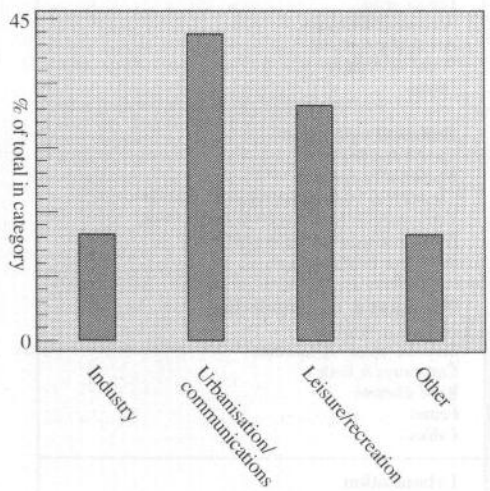
Leisure activities include a marina and moorings at Newhaven and further moorings at Piddinghoe and Lewes. Power-boating and sailing occur mainly in the lower reaches of the estuary and out to sea, whereas canoeing is more widespread. Walking occurs alongside most of the estuary, and bird-watching is concentrated on the Lewes Brooks.

Industrial activities are limited and include a port at Newhaven which is used by fishing boats and a ferry; and light industry at Newhaven, where there are also two boat-building yards.

Exploitation of the natural resource includes wildfowling on the brooks, but this is not intensive.



Categories of human use



Human activities (in 1991)

Present	Proposed	
●		**Coast protection & sea defences** Linear defences Training walls Groynes Brushwood fences *Spartina* planting Marram grass planting
		Barrage schemes Weirs & barrages for river management Storm surge barrages Water storage barrages & bunds Leisure barrages Tidal power barrages
		Power generation Thermal power stations Import/export jetties (power generation) Wind-power generation
● ● ●		**Industrial, port & related development** Dock, port & harbour facilities Manufacturing industries Chemical industries Ship & boat building/repair Others
		Extraction & processing of natural gas & oil Exploration Production Rig & platform construction Pipeline construction Pipeline installation Import/export jetties & single-point moorings Oil refineries Mothballing of rigs & tankers
		Military activities Overflying by military aircraft Others
● ●		**Waste discharge** Domestic waste disposal Sewage discharge & outfalls Sewage treatment works Rubbish tips Industrial & agricultural waste discharge Thermal discharges (power stations) Dredge spoil Accidental discharges Aerial crop spraying Waste incinerators Others
●		**Sediment extraction** Capital dredging Maintenance dredging Commercial estuarine aggregates extraction Commercial terrestrial aggregates extraction Non-commercial aggregates extraction Hard-rock quarrying
● ● ●		**Transport & communications** Airports & helipads Tunnels, bridges & aqueducts Causeways & fords Road schemes Ferries Cables
		Urbanisation Land-claim for housing & car parks
●		**Education & scientific research** Sampling, specimen collection & observation Nature trails & interpretative facilities Seismic studies & geological test drilling Marine & terrestrial archaeology Fossil collecting

Present	Proposed	
● ● ●		**Tourism & recreation** Infrastructure developments Marinas Non-marina moorings Dinghy & boat parks Caravan parks & chalets Leisure centres, complexes & piers Aquatic-based recreation Power-boating & water-skiing Jet-skiing Sailing Sailboarding & wind-surfing SCUBA & snorkelling Canoeing Surfing Rowing Tourist boat trips/leisure barges Angling Other non-commercial fishing Bathing & general beach recreation Terrestrial & intertidal-based recreation Walking, including dog walking Bird-watching Sand-yachting 4WD & trial-biking Car sand-racing Horse-riding Rock-climbing Golf courses Clay-pigeon shooting Others Airborne recreation Overflying by light aircraft Radio-controlled model aircraft Others
● ●		**Wildfowling & hunting** Wildfowling Other hunting-related activities
		Bait-collecting Digging & pumping for lugworms & ragworms Hydraulic dredging for worms Others
		Commercial fisheries Fish-netting & trawling Fyke-netting for eels Fish traps & other fixed devices & nets Crustacea Molluscs – Hand-gathering Dredging Hydraulic dredging
		Cultivation of living resource Saltmarsh grazing Sand dune grazing Agricultural land-claim Fish-farming Shellfish farming Bottom & tray cultivation Suspended cultivation Crustacea farming Reeds for roofing *Salicornia* picking Others
		Management & killing of birds & mammals Killing of mammals Killing of birds Adult fish-eating birds Adult shellfish-eating birds Gulls Geese
		Wildlife habitat management *Spartina* control Habitat creation & restoration Marine Intertidal Terrestrial Habitat management
		Others

Further reading

Arnott, J.G.L., Barter, G.M., Henderson, A.C.B., & Nall, J.L. 1978. *Survey of the coast of Kent and Sussex. Rivers and coastal survey, volume 5.* Peterborough, Nature Conservancy Council (South-east region).

Farrant, J.H. 1972. The evolution of Newhaven Harbour and the lower Ouse before 1800. *Sussex Archaeological Collections, V.110.*

Hopkins, J.T. 1964. A study of the diatoms of the Ouse Estuary, Sussex. II. The ecology of the mudflat diatom flora. *Journal of the Marine Biological Association of the UK, 44:* 333-341.

Hopkins, J.T. 1964. A study of the diatoms of the Ouse Estuary, Sussex. III. The seasonal variation in the littoral epiphyte flora and the shore plankton. *Journal of the Marine Biological Association of the UK, 44:* 613-644.

Hopkins, J.T. 1966. The role of water in the behaviour of an estuarine mudflat diatom. *Journal of the Marine Biological Association of the UK, 46:* 617-626.

Johnston, C.M. 1989. Surveys of harbours, rias and estuaries in southern Britain: minor south coast inlets. *Nature Conservancy Council, CSD report*, No. 978.

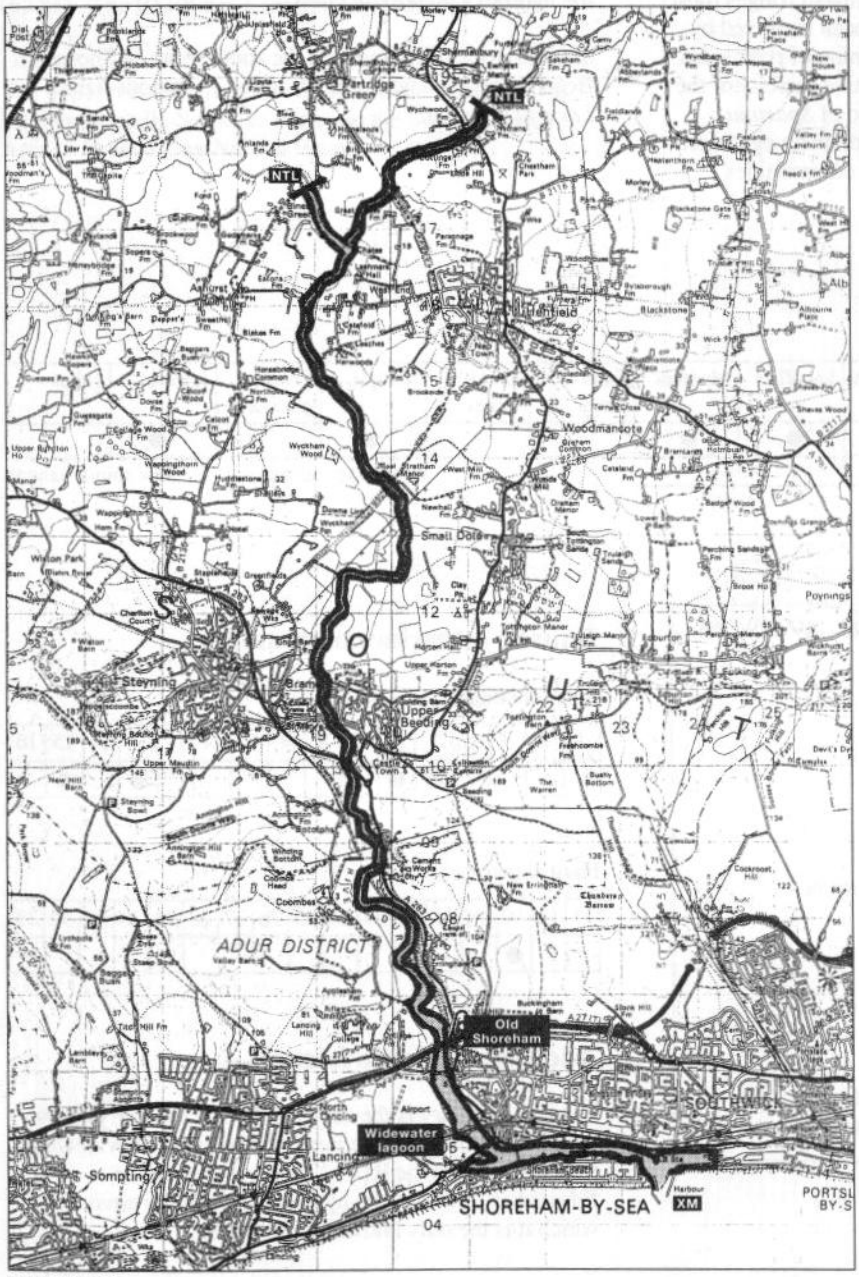
Morris, F.G. 1931. Newhaven and Seaford, a study in the diversion of a river mouth. *Geography, 16:* 28-33.

125 Adur Estuary

Centre grid: TQ2105
County: West Sussex

Districts: Adur, Horsham
EN area: Sussex & Surrey

Review site location



NTL = Normal tidal limit

XM = Across mouth

= Core site

Total area (ha)	Intertidal area (ha)	Shore length (km)	Channel length (km)	Tidal range (m)	Geomorph. type	Human population
153	46	46.5	20.6	5.5	Coastal plain	40,000

Description

The River Adur flows through a valley of the South Downs and discharges into the sea at Shoreham. The mouth of the estuary has been diverted eastwards by a shingle spit, upon which the town of Shoreham-by-Sea and its large port has developed. Water quality in the estuary has been classified as grade A.

The estuary takes the form of a narrow, winding channel and has a relatively large area of intertidal mudflats which become sandy towards the mouth. Saltmarsh fringes most of the estuary, but its development has been restricted by the embankment of the river and steepening of river sides. The saltmarsh is unusual due to the relative scarcity of the cordgrass *Spartina*; there is a small stand of *Spartina* south-east of Old Shoreham, but the saltmarsh vegetation largely consists of low-mid marsh plant communities.

West of the estuary there is a shallow saltwater lagoon known as Widewater lagoon, separated from the sea by a shingle bank. At its western end, the lagoon shore has shingle flora merging into saltmarsh vegetation. Widewater lagoon is the only known site where Ivell's sea anemone *Edwardsia ivelli* has been recently found, but with deterioration of the quality of the lagoon, it is possible that the sea anemone has become extinct. Widewater lagoon is also the only known site in Britain of the hydroid *Clavopsella navis*.

The estuary embankment on the south shore of Shoreham Beach supports a large colony of the viviparous lizard *Lacerta vivipara*.

Wildlife features

Coastal habitats

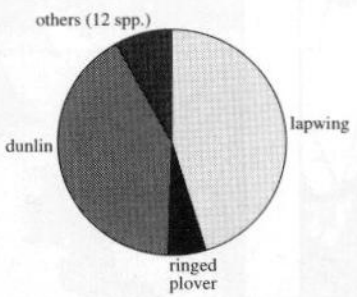
	Subtidal	Saltmarsh	Sandflats	Mudflats	Sand dunes	Rocky shores	Shingle	Lowland grassland	Lagoon	Other
	●	●	●	●			●		●	
Area (ha)	107	9	37							

● = major habitat ● = minor habitat

Birds

Wintering birds 1989/90 – 1993/94 data

Total waterfowl: 3,030



Wintering species assemblage
(Spp. forming >5% assemblage shown separately)

Aquatic estuarine communities

Soft substrate

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
				●	●							●		●	

Hard substrate

17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33
		●														

Additional wildlife features

The Adur Estuary is the only British site for starry clover *Trifolium stellatum*. The invertebrate fauna of Widewater Lagoon includes the RDB 1 Ivell's sea anemone *Edwardsia ivelli* and the hydroid *Clavopsella navis*, for which it is the only known site in Britain.

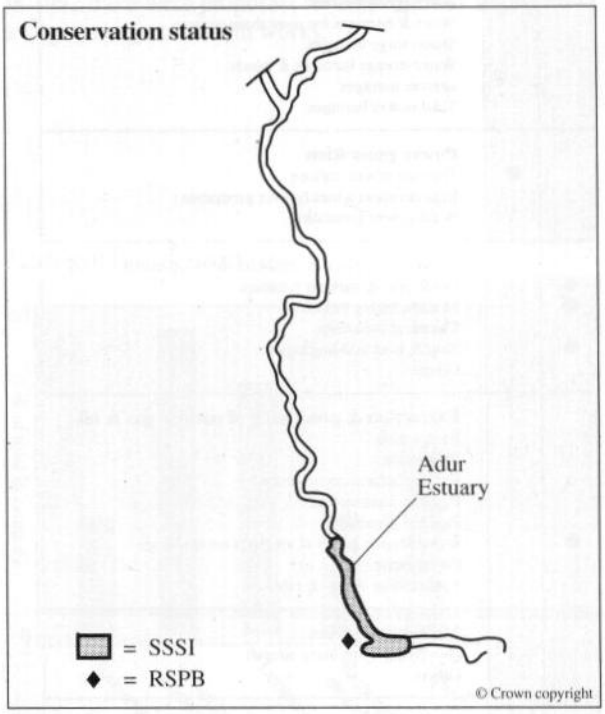
Conservation status

● = designated ● = proposed

	NCR	GCR	SSSI (B)	SSSI (G)	SSSI (M)	NNR	LNR	Ramsar	SPA	SAC	AONB	CWT	RSPB	ESA	NP	WWT	NT	NSA	HC	Other
			●								●		●	●						
No.			1								1		1	1						

The lower reaches of the estuary lie within the the Adur Estuary biological Site of Special Scientific Interest (62 ha). The RSPB has a reserve adjacent to the Adur Estuary.

The upper reaches of the site lie within the South Downs Environmentally Sensitive Area and the Sussex Downs Area of Outstanding Natural Beauty.



Human activities (in 1992)

Present	Proposed	
		Coast protection & sea defences
●		Linear defences
●		Training walls
●		Groynes
		Brushwood fences
		Spartina planting
		Marram grass planting
		Barrage schemes
		Weirs & barrages for river management
		Storm surge barrages
		Water storage barrages & bunds
		Leisure barrages
		Tidal power barrages
		Power generation
	●	Thermal power stations
		Import/export jetties (power generation)
		Wind-power generation
		Industrial, port & related development
●		Dock, port & harbour facilities
●		Manufacturing industries
		Chemical industries
●		Ship & boat building/repair
		Others
		Extraction & processing of natural gas & oil
		Exploration
		Production
		Rig & platform construction
		Pipeline construction
		Pipeline installation
●		Import/export jetties & single-point moorings
		Oil refineries
		Mothballing of rigs & tankers
		Military activities
		Overflying by military aircraft
		Others
		Waste discharge
●	●	Domestic waste disposal
●	●	Sewage discharge & outfalls
		Sewage treatment works
		Rubbish tips
	●	Industrial & agricultural waste discharge
		Thermal discharges (power stations)
		Dredge spoil
		Accidental discharges
●		Aerial crop spraying
		Waste incinerators
		Others
		Sediment extraction
●		Capital dredging
		Maintenance dredging
		Commercial estuarine aggregates extraction
		Commercial terrestrial aggregates extraction
		Non-commercial aggregates extraction
		Hard-rock quarrying
		Transport & communications
●		Airports & helipads
●		Tunnels, bridges & aqueducts
		Causeways & fords
		Road schemes
		Ferries
●		Cables
		Urbanisation
●		Land-claim for housing & car parks
		Education & scientific research
●	●	Sampling, specimen collection & observation
●	●	Nature trails & interpretative facilities
		Seismic studies & geological test drilling
		Marine & terrestrial archaeology
		Fossil collecting

Present	Proposed	
		Tourism & recreation
		Infrastructure developments
●		Marinas
●		Non-marina moorings
●		Dinghy & boat parks
		Caravan parks & chalets
●		Leisure centres, complexes & piers
		Aquatic-based recreation
●		Power-boating & water-skiing
●		Jet-skiing
●		Sailing
●		Sailboarding & wind-surfing
●		SCUBA & snorkelling
●		Canoeing
		Surfing
		Rowing
		Tourist boat trips/leisure barges
●		Angling
		Other non-commercial fishing
		Bathing & general beach recreation
		Terrestrial & intertidal-based recreation
●		Walking, including dog walking
●		Bird-watching
		Sand-yachting
		4WD & trial-biking
		Car sand-racing
		Horse-riding
		Rock-climbing
		Golf courses
		Clay-pigeon shooting
		Others
		Airborne recreation
●		Overflying by light aircraft
		Radio-controlled model aircraft
		Others
		Wildfowling & hunting
●		Wildfowling
		Other hunting-related activities
		Bait-collecting
●		Digging & pumping for lugworms & ragworms
		Hydraulic dredging for worms
		Others
		Commercial fisheries
		Fish-netting & trawling
		Fyke-netting for eels
		Fish traps & other fixed devices & nets
		Crustacea
●		Molluscs – Hand-gathering
		Dredging
		Hydraulic dredging
		Cultivation of living resource
		Saltmarsh grazing
		Sand dune grazing
		Agricultural land-claim
●		Fish-farming
		Shellfish farming
		Bottom & tray cultivation
		Suspended cultivation
		Crustacea farming
		Reeds for roofing
		Salicornia picking
		Others
		Management & killing of birds & mammals
		Killing of mammals
		Killing of birds
		Adult fish-eating birds
		Adult shellfish-eating birds
		Gulls
		Geese
		Wildlife habitat management
		Spartina control
		Habitat creation & restoration
		Marine
		Intertidal
		Terrestrial
		Habitat management
●		**Others**

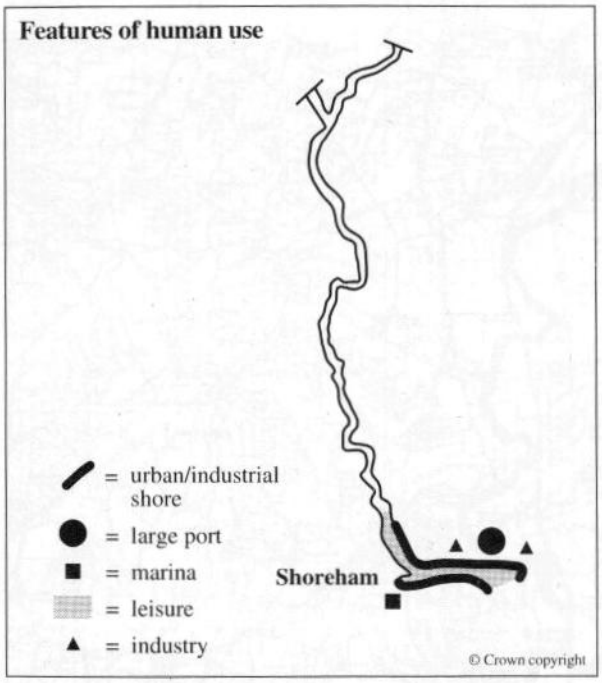
Features of human use

The lower reaches of the estuary are dominated by leisure and industrial activities. Water-based pursuits include power-boating, sailing, canoeing and jet-skiing, the latter being particularly intensive. In addition there is a marina at Shoreham. Land-based recreation includes bird-watching in the lower reaches of the Adur, and walking along the riverbanks.

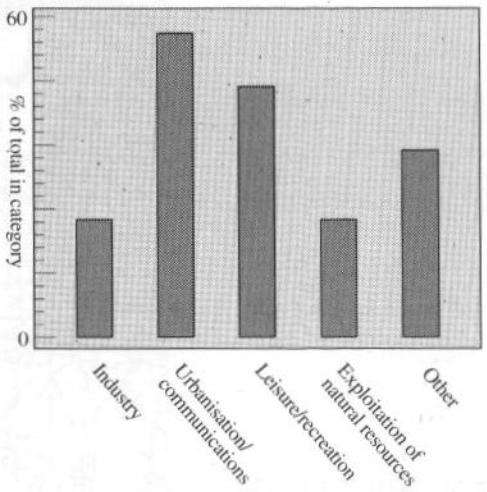
Industrial activity includes the large port at Shoreham, for which there are plans to extend handling facilities, and onshore oil-holding tanks. There are also a number of metal industries around Shoreham, and boat-building yards.

Exploitation of the natural resource includes a trout farm located in the upper reaches of the river adjacent to the site, a commercial mussel fishery inside the estuary mouth, and bait-digging in the lower reaches. Some wildfowling occurs on the brooks in the upper parts of the estuary.

In 1992 there were proposals for a new power station and a large sewage treatment works.



Categories of human use



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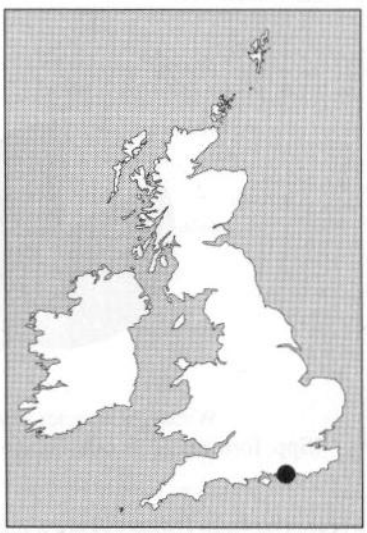
126 Arun Estuary

Centre grid: TQ0103
County: West Sussex

Districts: Arun, Horsham, Chichester
EN area: Sussex & Surrey

Review site location



NTL = Normal tidal limit

XM = Across mouth

= Core site

Total area (ha)	Intertidal area (ha)	Shore length (km)	Channel length (km)	Tidal range (m)	Geomorph. type	Human population
171	3	80.3	37.1	5.3	Coastal plain	46,000

Description

The estuary of the River Arun is a long, meandering channel that flows past Pulborough in its upper parts and past Arundel in its lower reaches, to discharge into the sea at Littlehampton. The estuary has a history of artificial straightening and has flood embankments present along its entire length and artificial cuts which have isolated meanders. Today, the estuary is a deep and fast-flowing tidal channel, with a very small area of intertidal flats. Water quality within the estuary has been classified as grade A.

In the upper reaches of the estuary some of the isolated meanders are only partly sealed and still receive some water flow. These areas have a range of habitats including an extensive reedbed, and bankside communities are well established with a rich and varied flora.

The estuary is surrounded by some of the few surviving areas of alluvial grazing marsh in West Sussex, dissected by drainage ditches with a species-rich community of aquatic plants, retaining a brackish flora in places. The grazing marshes support a diverse invertebrate fauna which is particularly rich in dragonflies; the marshes are also important areas for wintering and breeding waterfowl.

Towards the estuary mouth at Littlehampton there is a small intertidal zone of soft muds and sands, which supports large populations of marine invertebrates. The aquatic estuarine communities present include a surface algal community and beds of slipper limpets.
To the west of the estuary mouth lies Climping Beach, a shingle beach which is vegetated on sheltered areas behind the main bank. To landward of the shingle there is a small sand dune system.

Wildlife features

Coastal habitats

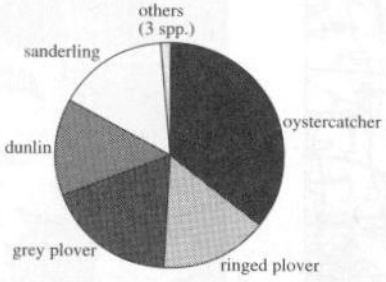
	Subtidal	Saltmarsh	Sandflats	Mudflats	Sand dunes	Rocky shores	Shingle	Lowland grassland	Lagoon	Other
	●		●	●	●		●	●		
Area (ha)	168		3							

● = major habitat ◍ = minor habitat

Birds

Wintering birds 1989/90 – 1993/94 data

Total waders: 411



Wintering species assemblage
(Spp. forming >5% assemblage shown separately)

N.B. The Arun Estuary is not a regularly counted site and there are no recent data available for wildfowl.

Breeding birds: moderate numbers of redshank and lapwing and large numbers of snipe breed on the grasslands adjacent to the estuary.

Aquatic estuarine communities

Soft substrate

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
							●					●		●	

Hard substrate

17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33
											●					

Additional wildlife features

The invertebrate fauna recorded on the estuary includes the RDB 1 snail *Pseudamnicola confusa*, the RDB 2 snail *Anisus vorticulus* and 30 Notable species.

Conservation status

● = designated ● = proposed

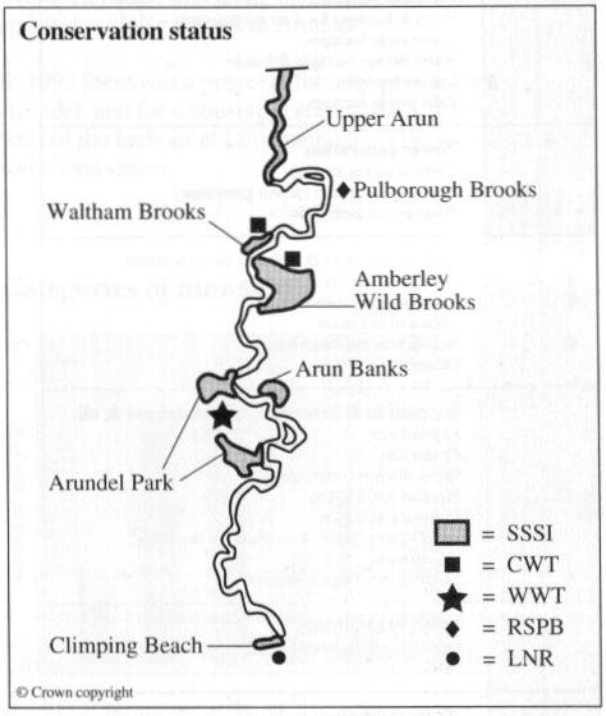
	NCR	GCR	SSSI (B)	SSSI (G)	SSSI (M)	NNR	LNR	Ramsar	SPA	SAC	AONB	CWT	RSPB	ESA	NP	WWT	NT	NSA	HC	Other
	●		●				●	●	●		●	●	●	●		●				
No.	1		6				1	1	1		1	2	1	1		1				

Small areas of the estuary lie within biological Sites of Special Scientific Interest. These include Climping Beach (65 ha), Arundel Park (141 ha), Waltham Brooks (43 ha), Upper Arun (40 ha), Amberley Wild Brooks (323 ha) and Arun Banks (25 ha). Amberley Wild Brooks is a Nature Conservation Review site and West Beach and Climping is a Local Nature Reserve.

Parts of Waltham Brooks and Amberley Wild Brooks are Sussex Wildlife Trust reserves and part of Arundel Park is a Wildfowl and Wetlands Trust reserve. The RSPB has a reserve at Pulborough Brooks.

The middle reaches of the estuary lie within the South Downs Environmentally Sensitive Area and parts of the Arun lie within the Sussex Downs Area of Outstanding Natural Beauty. Amberley is proposed as a Ramsar site and as a Special Protection Area.

Conservation status



Human activities (in 1992)

Present	Proposed	
		Coast protection & sea defences
●		Linear defences
		Training walls
		Groynes
		Brushwood fences
		Spartina planting
●		Marram grass planting
		Barrage schemes
		Weirs & barrages for river management
		Storm surge barrages
		Water storage barrages & bunds
		Leisure barrages
		Tidal power barrages
		Power generation
		Thermal power stations
		Import/export jetties (power generation)
		Wind-power generation
		Industrial, port & related development
●		Dock, port & harbour facilities
●		Manufacturing industries
		Chemical industries
●		Ship & boat building/repair
		Others
		Extraction & processing of natural gas & oil
		Exploration
		Production
		Rig & platform construction
		Pipeline construction
		Pipeline installation
		Import/export jetties & single-point moorings
		Oil refineries
		Mothballing of rigs & tankers
		Military activities
		Overflying by military aircraft
		Others
		Waste discharge
●		Domestic waste disposal
●		Sewage discharge & outfalls
		Sewage treatment works
		Rubbish tips
		Industrial & agricultural waste discharge
		Thermal discharges (power stations)
		Dredge spoil
		Accidental discharges
●		Aerial crop spraying
		Waste incinerators
		Others
		Sediment extraction
●		Capital dredging
		Maintenance dredging
		Commercial estuarine aggregates extraction
		Commercial terrestrial aggregates extraction
		Non-commercial aggregates extraction
		Hard-rock quarrying
		Transport & communications
●	●	Airports & helipads
		Tunnels, bridges & aqueducts
	●	Causeways & fords
		Road schemes
		Ferries
		Cables
		Urbanisation
	●	Land-claim for housing & car parks
		Education & scientific research
●		Sampling, specimen collection & observation
●		Nature trails & interpretative facilities
●		Seismic studies & geological test drilling
●		Marine & terrestrial archaeology
		Fossil collecting

Present	Proposed	
		Tourism & recreation
		Infrastructure developments
●	●	Marinas
●		Non-marina moorings
●		Dinghy & boat parks
●		Caravan parks & chalets
●		Leisure centres, complexes & piers
		Aquatic-based recreation
●		Power-boating & water-skiing
		Jet-skiing
●		Sailing
		Sailboarding & wind-surfing
		SCUBA & snorkelling
●		Canoeing
		Surfing
		Rowing
●		Tourist boat trips/leisure barges
●		Angling
		Other non-commercial fishing
●		Bathing & general beach recreation
		Terrestrial & intertidal-based recreation
●		Walking, including dog walking
●		Bird-watching
		Sand-yachting
		4WD & trial-biking
		Car sand-racing
●		Horse-riding
		Rock-climbing
●		Golf courses
		Clay-pigeon shooting
		Others
		Airborne recreation
		Overflying by light aircraft
		Radio-controlled model aircraft
		Others
		Wildfowling & hunting
●		Wildfowling
		Other hunting-related activities
		Bait-collecting
		Digging & pumping for lugworms & ragworms
		Hydraulic dredging for worms
		Others
		Commercial fisheries
		Fish-netting & trawling
		Fyke-netting for eels
		Fish traps & other fixed devices & nets
		Crustacea
		Molluscs – Hand-gathering
		Dredging
		Hydraulic dredging
		Cultivation of living resource
		Saltmarsh grazing
		Sand dune grazing
		Agricultural land-claim
		Fish-farming
		Shellfish farming
		Bottom & tray cultivation
		Suspended cultivation
		Crustacea farming
		Reeds for roofing
		Salicornia picking
		Others
		Management & killing of birds & mammals
●		Killing of mammals
		Killing of birds
		Adult fish-eating birds
		Adult shellfish-eating birds
		Gulls
		Geese
		Wildlife habitat management
		Spartina control
		Habitat creation & restoration
		Marine
		Intertidal
●		Terrestrial
●		Habitat management
●		**Others**

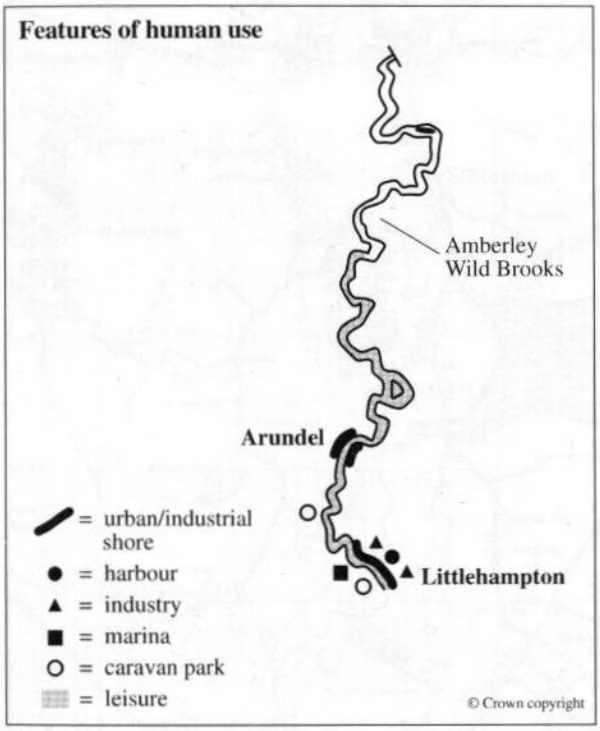
Features of human use

Leisure and recreational activities are numerous, with marinas and groups of moorings at Littlehampton and Arundel, and a leisure centre and caravan parks at Littlehampton. Power-boating and sailing occur in the lower reaches of the site and canoeing is relatively intensive in the middle reaches of the estuary. Beach recreation occurs on either side of the estuary mouth, with horse-riding along the eastern shore south from Arundel, and walking along all river banks.

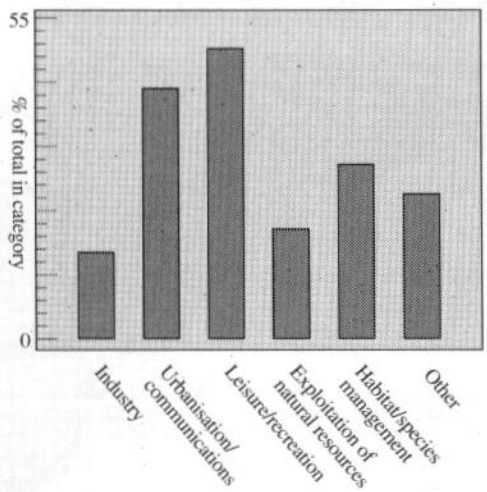
Industrial activities are centred around Littlehampton, where there is a harbour, metal industries and boat-building yards.

Habitat and species management includes restoration work on the RSPB reserve and on the dunes west of the estuary mouth, and various techniques are employed on the Sussex Wildlife Trust, RSPB and Wildfowl and Wetlands Trust reserves. Exploitation of the natural resource includes private wildfowling on farmland adjacent to the estuary, research studies on Amberley Wild Brooks, a nature trail along the whole length of the estuary and archaeological work at Arundel.

In 1992 there was a proposal for a by-pass around Arundel, and for a housing complex and small marina west of the harbour at Littlehampton. This would involve some land-claim.



Categories of human use



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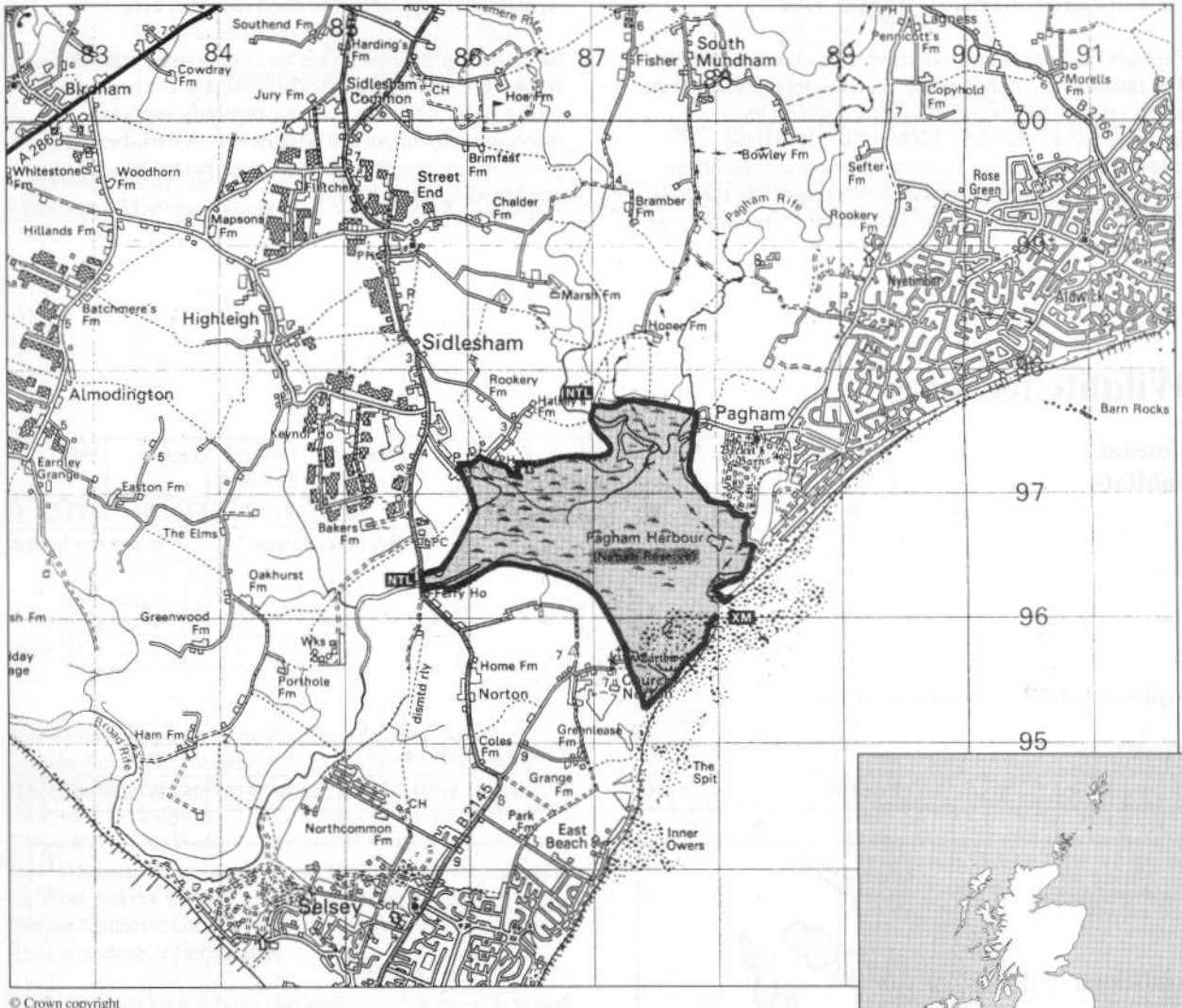
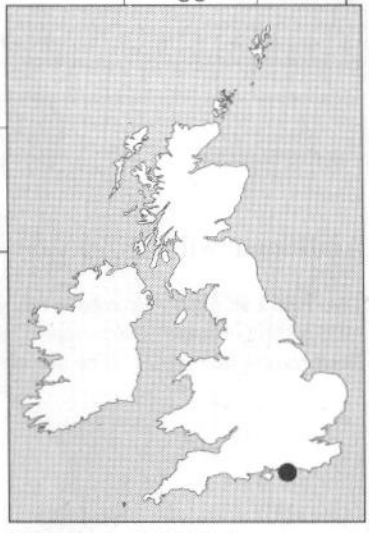
127 Pagham Harbour

Centre grid: SZ8796
County: West Sussex

Districts: Arun, Chichester
EN area: Sussex & Surrey

Review site location





Total area (ha)	Intertidal area (ha)	Shore length (km)	Channel length (km)	Tidal range (m)	Geomorph. type	Human population
266	254	9.8	2.6	4.9	Bar built	<5,000

NTL = Normal tidal limit

XM = Across mouth

= Core site

Description

Pagham Harbour is an intertidal basin protected at its mouth by shingle spits. Historically, land-claim for agriculture occurred around the estuary, although many areas have subsequently been breached by the sea. The latest such occurrence was in the early 20th century when the barrier bar across the entrance to Pagham Harbour was breached during a storm. The position of the breach is where the entrance to Pagham Harbour stands today, which since the 1960's has been stabilised by a man-made cut with a series of groynes along the shore.

Pagham Harbour has an extensive area of intertidal flats. The mudflats are rich in algae and invertebrates and most of the saltmarsh now present in the Harbour has developed since the early 1900s. Almost half the saltmarsh is dominated by cordgrass *Spartina* and there has been little upper saltmarsh development. In the north of the site there is a pure stand of sea purslane *Halimione* saltmarsh.

The shingle spits to the north and south of the estuary mouth are largely bare, with small areas of vegetation. The shingle on the south side has pioneer vegetation, while to the north the more sheltered areas of shingle have grassland vegetation. To seaward, both spits become sandy. East of the estuary mouth a naturally-formed lagoon, which was the original exit to the sea, lies within the shingle. Although the lagoon supports few faunal species, the nationally endangered starlet sea anemone *Nematostella vectensis* has been recorded here.

Surrounding the estuary are areas of coastal grassland and reedbeds dissected by brackish drainage ditches, which attract birds. Pagham Harbour regularly supports internationally important populations of dark-bellied brent goose and nationally important populations of wintering and breeding waterfowl.

Wildlife features

Coastal habitats

	Subtidal	Saltmarsh	Sandflats	Mudflats	Sand dunes	Rocky shores	Shingle	Lowland grassland	Lagoon	Other
	●	●	◉	●			●	●	●	
Area (ha)	12	33	221							

● = major habitat ◉ = minor habitat

Aquatic estuarine communities

Soft substrate

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
												●		●	

Hard substrate

17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33

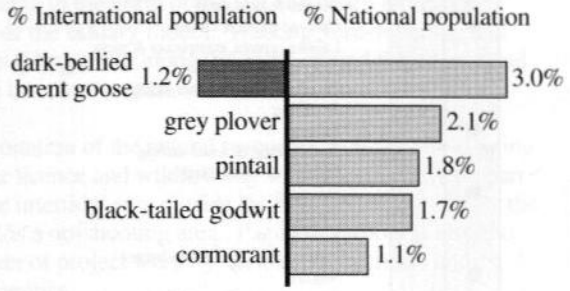
Additional wildlife features

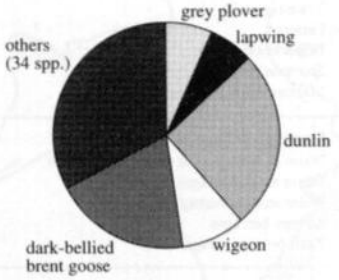
Two Red List plants have been recorded from the estuary: little robin *Geranium purpureum* and childing pink *Petrorhagia nanteuillii*. The invertebrate fauna recorded on the estuary includes the RDB 3 starlet sea anemone *Nematostella vectensis*, the RDB 3 fly *Atylotus latistriatus* and eighteen Notable species.

Birds

Wintering birds 1989/90 – 1993/94 data

Total waterfowl: 14,200





Wintering species assemblage
(Spp. forming >5% assemblage shown separately)

Breeding birds: small colonies of common and little terns and moderate numbers of ringed plover breed within Pagham Harbour. Moderate numbers of oystercatcher, lapwing and small numbers of redshank breed within the grasslands adjacent to the estuary.

Conservation status

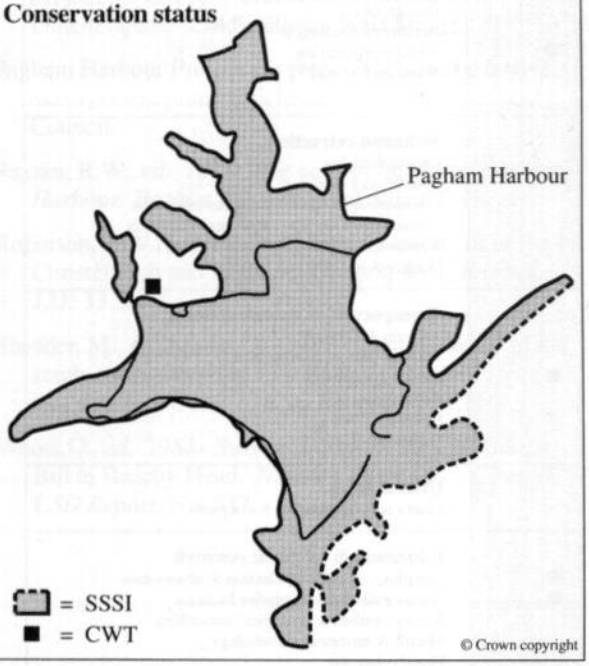
● = designated ● = proposed

	NCR	GCR	SSSI (B)	SSSI (G)	SSSI (M)	NNR	LNR	Ramsar	SPA	SAC	AONB	CWT	RSPB	ESA	NP	WWT	NT	NSA	HC	Other
	●	●			●		●	●	●			●								●
No.	1	2			1		1	1	1			1								1

The estuary lies within the Pagham Harbour Site of Special Scientific Interest (615 ha), which is designated for its biological, geomorphological and geological interest; it contains the Pagham Harbour Geological Conservation Review site and part of Bognor Regis GCR site. Pagham Harbour is a Local Nature Reserve managed by West Sussex County Council and it is proposed as a Nature Conservation Review site. Sussex Wildlife Trust have a reserve at Ferryfields.

Pagham Harbour has been designated as a Ramsar site and as a Special Protection Area. It also lies within the Solent and Isle of Wight Sensitive Marine Area.

Conservation status



Human activities (in 1992)

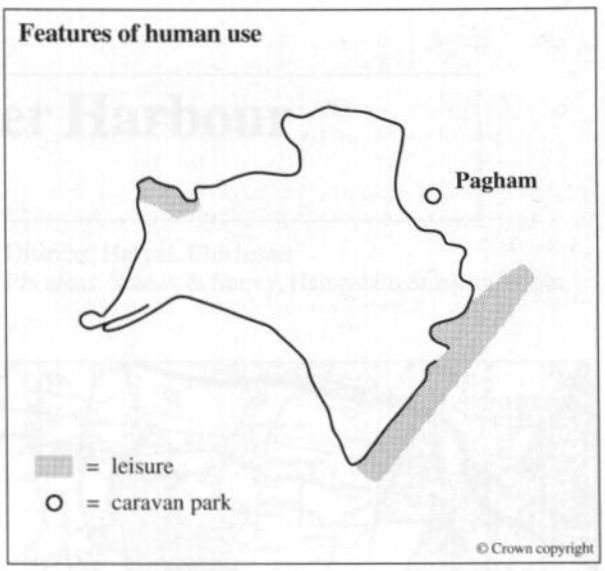
Present	Proposed	
●●●		**Coast protection & sea defences** Linear defences Training walls Groynes Brushwood fences *Spartina* planting Marram grass planting
		Barrage schemes Weirs & barrages for river management Storm surge barrages Water storage barrages & bunds Leisure barrages Tidal power barrages
		Power generation Thermal power stations Import/export jetties (power generation) Wind-power generation
		Industrial, port & related development Dock, port & harbour facilities Manufacturing industries Chemical industries Ship & boat building/repair Others
		Extraction & processing of natural gas & oil Exploration Production Rig & platform construction Pipeline construction Pipeline installation Import/export jetties & single-point moorings Oil refineries Mothballing of rigs & tankers
		Military activities Overflying by military aircraft Others
●● ●		**Waste discharge** Domestic waste disposal Sewage discharge & outfalls Sewage treatment works Rubbish tips Industrial & agricultural waste discharge Thermal discharges (power stations) Dredge spoil Accidental discharges Aerial crop spraying Waste incinerators Others
		Sediment extraction Capital dredging Maintenance dredging Commercial estuarine aggregates extraction Commercial terrestrial aggregates extraction Non-commercial aggregates extraction Hard-rock quarrying
●		**Transport & communications** Airports & helipads Tunnels, bridges & aqueducts Causeways & fords Road schemes Ferries Cables
		Urbanisation Land-claim for housing & car parks
●●		**Education & scientific research** Sampling, specimen collection & observation Nature trails & interpretative facilities Seismic studies & geological test drilling Marine & terrestrial archaeology Fossil collecting

Present	Proposed	
● ● ● ● ● ● ● ●		**Tourism & recreation** Infrastructure developments Marinas Non-marina moorings Dinghy & boat parks Caravan parks & chalets Leisure centres, complexes & piers Aquatic-based recreation Power-boating & water-skiing Jet-skiing Sailing Sailboarding & wind-surfing SCUBA & snorkelling Canoeing Surfing Rowing Tourist boat trips/leisure barges Angling Other non-commercial fishing Bathing & general beach recreation Terrestrial & intertidal-based recreation Walking, including dog walking Bird-watching Sand-yachting 4WD & trial-biking Car sand-racing Horse-riding Rock-climbing Golf courses Clay-pigeon shooting Others Airborne recreation Overflying by light aircraft Radio-controlled model aircraft Others
●●		**Wildfowling & hunting** Wildfowling Other hunting-related activities
●		**Bait-collecting** Digging & pumping for lugworms & ragworms Hydraulic dredging for worms Others
		Commercial fisheries Fish-netting & trawling Fyke-netting for eels Fish traps & other fixed devices & nets Crustacea Molluscs – Hand-gathering Dredging Hydraulic dredging
		Cultivation of living resource Saltmarsh grazing Sand dune grazing Agricultural land-claim Fish-farming Shellfish farming Bottom & tray cultivation Suspended cultivation Crustacea farming Reeds for roofing *Salicornia* picking Others
● ●		**Management & killing of birds & mammals** Killing of mammals Killing of birds Adult fish-eating birds Adult shellfish-eating birds Gulls Geese
●●		**Wildlife habitat management** *Spartina* control Habitat creation & restoration Marine Intertidal Terrestrial Habitat management
		Others

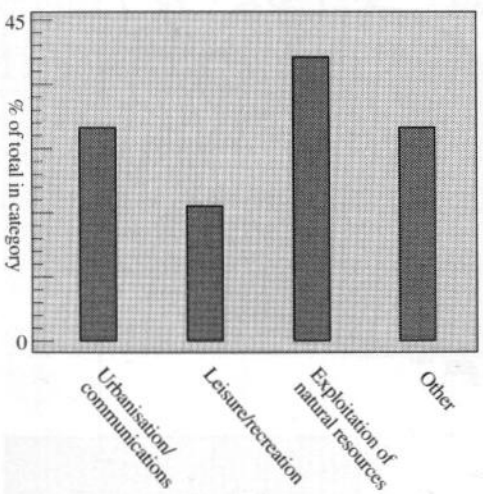
Features of human use

There is no industrial activity within the site and the most numerous form of human use is leisure and recreation. Such activities include sailing from the few moorings that were historically allowed within Pagham Harbour, canoeing in the north of the site and beach recreation outside the estuary mouth. Walking, bird-watching and horse-riding occur along the paths around the estuary and there is a caravan park south of Pagham.

Exploitation of the natural resources includes bait-digging under licence and wildfowling which occurs only on part of the intertidal area outside the Local Nature Reserve; the LNR is a no-shooting area. Pagham Harbour is also the subject of project work by various polytechnics and universities.



Categories of human use



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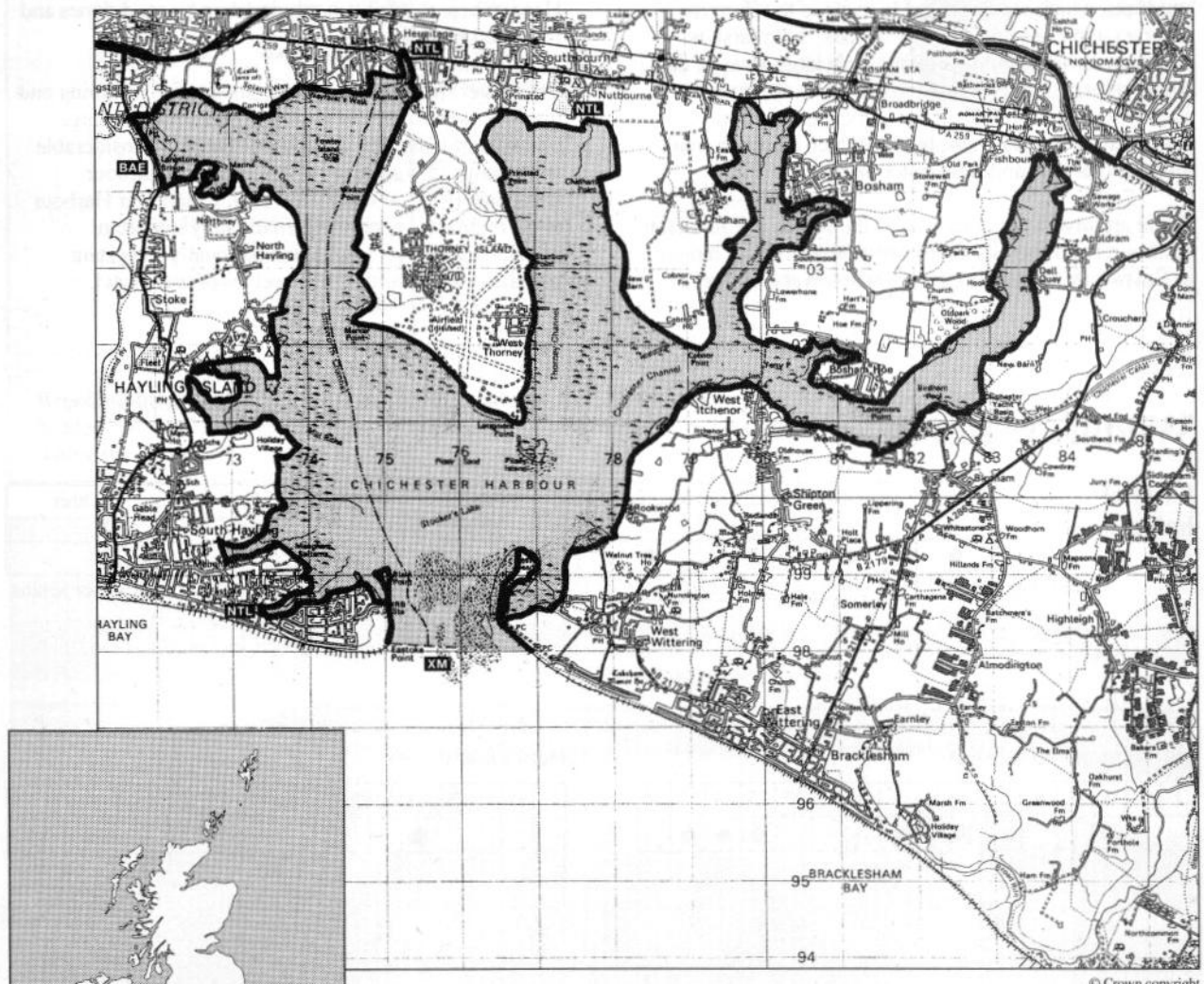
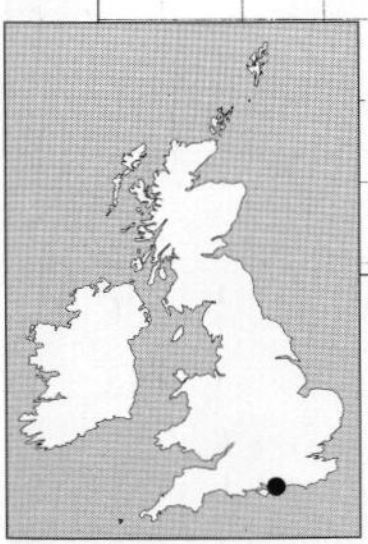
128 Chichester Harbour

Centre grid: SU7600
Counties: West Sussex, Hampshire
Districts: Havant, Chichester
EN areas: Sussex & Surrey, Hampshire & Isle of Wight

Review site location





NTL = Normal tidal limit XM = Across mouth

BAE = Boundary with adjacent estuary = Core site

Total area (ha)	Intertidal area (ha)	Shore length (km)	Channel length (km)	Tidal range (m)	Geomorph. type	Human population
2,946	2,342	80.6	8.1	4.2	Bar built	76,000

Description

Chichester Harbour is a one of a series of intertidal basins on the southern shore of England and in its upper reaches it is adjacent to Langstone Harbour, with which its ecology is closely linked. Historically the estuary has been subject to a variety of land-claim schemes. Water quality within the estuary has been classified as grade A.

The freshwater inflow to the harbour is relatively small and at low tide the estuary is an extensive area of sand and mudflats, which are colonised by beds of the *Zostera* eelgrass and *Enteromorpha* algae beds. Saltmarsh is extensive throughout the estuary, with large areas of the lower saltmarsh vegetation dominated by cordgrass *Spartina*. Upper saltmarsh development has been restricted by the sea walls, behind which there are small areas of brackish and freshwater marsh.

There are several lagoons around the shores of Chichester Harbour, including Selsmore, west of the estuary mouth; at Emsworth; the Great Deep, which traverses Thorney Island; and Birdham Pool. Most notable of these are the Great Deep, which supports three specialist lagoonal species, and the lagoon at Birdham, from which five specialist lagoonal species have been recorded.

At the mouth of the estuary a sandy shingle spit projects into the harbour. The shingle is unstable and little vegetation has become established. The only significant shingle vegetation has developed on the foreshore at East Head, where the spit is partly overlain by sand dunes and is backed by saltmarsh.

Chichester Harbour is an important site for wintering and breeding waterfowl and regularly supports very large numbers of wintering waterfowl. There is considerable interchange of waterfowl with Langstone Harbour immediately to the west. However, Chichester Harbour alone regularly supports internationally important populations of five species and nationally important populations of a further five species of waterfowl.

Wildlife features

Coastal habitats

	Subtidal	Saltmarsh	Sandflats	Mudflats	Sand dunes	Rocky shores	Shingle	Lowland grassland	Lagoon	Other
	●	●	●	●	◉		●	◉	●	
Area (ha)	604	1,077	1,265							

● = major habitat ◉ = minor habitat

Aquatic estuarine communities

Soft substrate

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
		●				●		●				●	●	●	

Hard substrate

17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33
				●										●		

Additional wildlife features

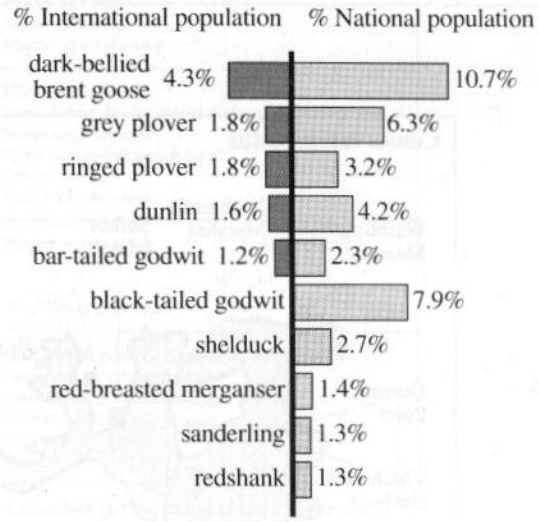
The invertebrate fauna recorded on the estuary includes the following RDB 2 species: the bug *Tuponia carayoni*, the fly *Stratiomys longicornis*, the weevil *Cathormiocerus socius;* and the following RDB 3 species: the flies *Atyolytus latistriatus*, *Haematopota bigoti* and *Haematopota grandis*, the beetle *Dromius vectensisa.* A proposed RDB 2 species and a further 23 Notable species have also been recorded on the site.

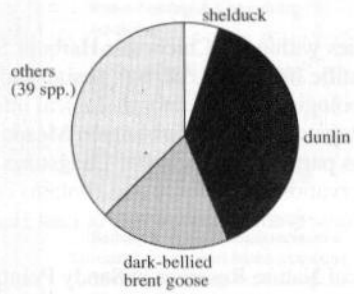
The estuary is a major nursery for sea bass *Dicentrarchus labrax*.

Birds

Wintering birds 1989/90 – 1993/94 data

Total waterfowl: 54,400





Wintering species assemblage
(Spp. forming >5% assemblage shown separately)

Breeding birds: there are small colonies of Sandwich tern, common tern and little tern and a large colony of black-headed gull in Chichester Harbour. Moderate numbers of ringed plover and redshank, lapwing and oystercatcher breed within the estuary.

Chichester Harbour has one of the largest areas of saltmarsh on the south coast of England. (Peter Wakely, English Nature)

Conservation status

● = designated ● = proposed

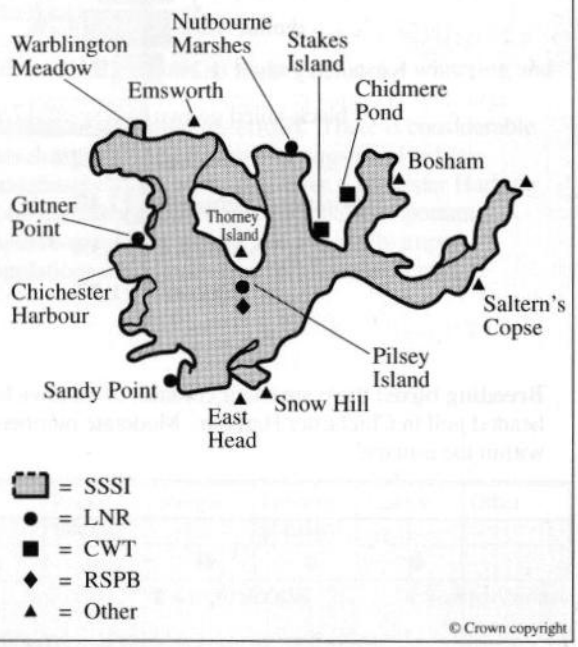
	NCR	GCR	SSSI (B)	SSSI (G)	SSSI (M)	NNR	LNR	Ramsar	SPA	SAC	AONB	CWT	RSPB	ESA	NP	WWT	NT	NSA	HC	Other
	●	●	●		●		●	●	●	●	●	●	●				●			●
No.	1	1	1		1		4	1	1	1	1	2	1				2			6

The estuary lies within the Chichester Harbour Site of Special Scientific Interest (3,680 ha), designated for its biological, geological and geomorphological interest and there is a biological SSSI at Warblington Meadow (4 ha). The site forms part of the Chichester-Langstone Harbour Nature Conservation Review site and contains one Geological Conservation Review site at East Head.

There are Local Nature Reserves at Sandy Point, Gutner Point, Nutbourne Marshes and Pilsey Island. Pilsey Island is also a RSPB reserve. The Sussex Wildlife Trust have reserves at Chidmere Pond and Stakes Island, and the National Trust have land at East Head and Bosham, Quay Meadow. There are private reserves at Saltern's Copse, Emsworth and the Bird Reserve near Chichester; the Sussex Ornithologist's Society have a management agreement at Snow Hill and the Ministry of Defence own land on Thorney Island.

The estuary lies within the Chichester Harbour Area of Outstanding Natural Beauty and is part of the Chichester and Langstone Harbours Ramsar site and Special Protection Area. It is also part of the Solent and Isle of Wight Sensitive Marine Area. Areas of Chichester Harbour lie within the Solent Maritime proposed Special Areas of Conservation.

Conservation status



Human activities (in 1992)

Present	Proposed	
		Coast protection & sea defences
●		Linear defences
		Training walls
●		Groynes
●		Brushwood fences
		Spartina planting
		Marram grass planting
		Barrage schemes
		Weirs & barrages for river management
		Storm surge barrages
		Water storage barrages & bunds
		Leisure barrages
		Tidal power barrages
		Power generation
		Thermal power stations
		Import/export jetties (power generation)
		Wind-power generation
		Industrial, port & related development
●		Dock, port & harbour facilities
		Manufacturing industries
		Chemical industries
●		Ship & boat building/repair
	●	Others
		Extraction & processing of natural gas & oil
		Exploration
		Production
		Rig & platform construction
		Pipeline construction
		Pipeline installation
		Import/export jetties & single-point moorings
		Oil refineries
		Mothballing of rigs & tankers
		Military activities
●		Overflying by military aircraft
●		Others
		Waste discharge
●		Domestic waste disposal
●		Sewage discharge & outfalls
		Sewage treatment works
		Rubbish tips
		Industrial & agricultural waste discharge
		Thermal discharges (power stations)
		Dredge spoil
		Accidental discharges
		Aerial crop spraying
		Waste incinerators
		Others
		Sediment extraction
●		Capital dredging
●		Maintenance dredging
		Commercial estuarine aggregates extraction
		Commercial terrestrial aggregates extraction
		Non-commercial aggregates extraction
		Hard-rock quarrying
		Transport & communications
●		Airports & helipads
●		Tunnels, bridges & aqueducts
●		Causeways & fords
		Road schemes
●		Ferries
●		Cables
		Urbanisation
		Land-claim for housing & car parks
		Education & scientific research
●		Sampling, specimen collection & observation
●	●	Nature trails & interpretative facilities
		Seismic studies & geological test drilling
●		Marine & terrestrial archaeology
		Fossil collecting

Present	Proposed	
		Tourism & recreation
		Infrastructure developments
●		Marinas
●		Non-marina moorings
●		Dinghy & boat parks
●		Caravan parks & chalets
●		Leisure centres, complexes & piers
		Aquatic-based recreation
●		Power-boating & water-skiing
		Jet-skiing
●		Sailing
●		Sailboarding & wind-surfing
●		SCUBA & snorkelling
●		Canoeing
●		Surfing
		Rowing
●		Tourist boat trips/leisure barges
●		Angling
		Other non-commercial fishing
●		Bathing & general beach recreation
		Terrestrial & intertidal-based recreation
●		Walking, including dog walking
●		Bird-watching
		Sand-yachting
		4WD & trial-biking
		Car sand-racing
●		Horse-riding
		Rock-climbing
●		Golf courses
		Clay-pigeon shooting
		Others
		Airborne recreation
●		Overflying by light aircraft
●		Radio-controlled model aircraft
		Others
		Wildfowling & hunting
●		Wildfowling
●		Other hunting-related activities
		Bait-collecting
●		Digging & pumping for lugworms & ragworms
		Hydraulic dredging for worms
		Others
		Commercial fisheries
●		Fish-netting & trawling
		Fyke-netting for eels
●		Fish traps & other fixed devices & nets
		Crustacea
●		Molluscs – Hand-gathering
●		Dredging
		Hydraulic dredging
		Cultivation of living resource
		Saltmarsh grazing
		Sand dune grazing
		Agricultural land-claim
		Fish-farming
		Shellfish farming
●		Bottom & tray cultivation
		Suspended cultivation
		Crustacea farming
		Reeds for roofing
		Salicornia picking
		Others
		Management & killing of birds & mammals
		Killing of mammals
		Killing of birds
		Adult fish-eating birds
		Adult shellfish-eating birds
		Gulls
		Geese
		Wildlife habitat management
		Spartina control
		Habitat creation & restoration
●	●	Marine
●		Intertidal
●		Terrestrial
		Habitat management
		Others

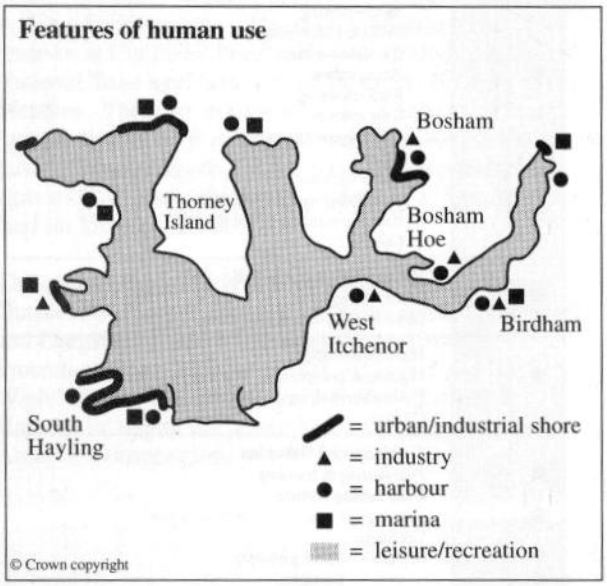
Features of human use

Leisure activities are particularly numerous, and with several marinas and around 4,000 moorings water-based sports are widespread wherever the water is deep enough. These include power-boating, sailing, wind-surfing and surfing which occurs in the estuary mouth. There are numerous holiday camps on Hayling Island shore. Beach recreation is centred around the mouth of the estuary and around 80% of the total shoreline is used by walkers. The Ministry of Defence use Thorney Island for horse-riding and as a base for flying gliders.

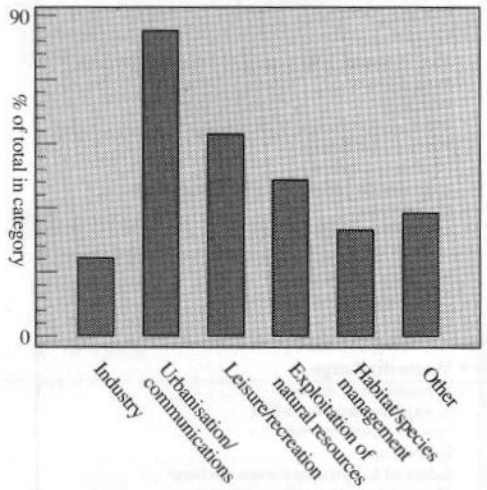
Exploitation of the natural resources includes wildfowling; two clubs and a number of private individuals shoot over the harbour, although some areas leased to the wildfowling clubs are no-shooting zones. Around 50% of the harbour is used for the cultivation of oysters. Commercial dredging for oysters and hand-gathering of cockles and mussels is known to occur and a Several Order regulating the exploitation of oysters, mussels and clams covers the Emsworth Channel until 2005.

There is little industry on the estuary, for the ten harbours present are used largely for recreation and fishing craft. There are around 250 slipways and jetties, some of which are pontoon structures, and there are ship and boat-building yards at West Itchenor, Birdham, Bosham Hoe and Bosham.

Since 1992 there have been proposals for linear defences and a storm surge barrage.



Categories of human use



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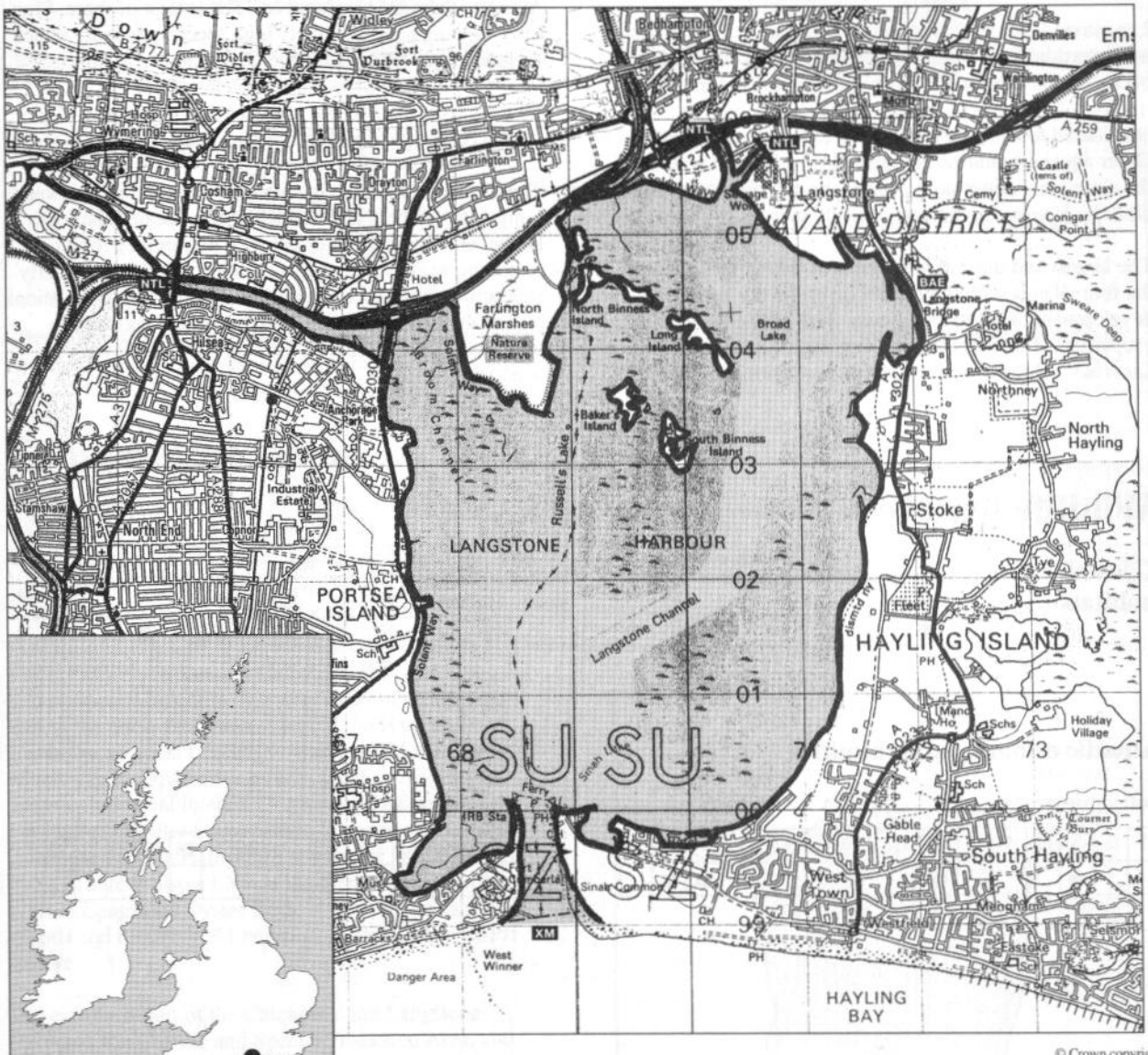
129 Langstone Harbour

Centre grid: SU7002
County: Hampshire

Districts: Havant, Portsmouth
EN area: Hampshire & Isle of Wight

Review site location



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NTL = Normal tidal limit

XM = Across mouth

BAE = Boundary with adjacent estuary

= Core site

Total area (ha)	Intertidal area (ha)	Shore length (km)	Channel length (km)	Tidal range (m)	Geomorph. type	Human population
1,925	1,513	43.0	7.7	4.2	Bar built	187,000

Description

Langstone Harbour lies between Portsmouth Harbour and Chichester Harbour. At high tide, the estuary resembles a land-locked lake, but at low tide extensive mudflats are exposed, drained by three main channels which unite to form a common exit to the sea. The mouth of the Harbour is narrowed by two recurved shingle spits. Water quality in Langstone Harbour has been classified as grade A, but the estuary is known to have suffered eutrophication from sewage effluents.

Langstone Harbour forms an extensive basin of saltmarsh and intertidal flats, which are predominantly muddy but become sandy towards the estuary mouth. The intertidal mudflats have beds of *Zostera* eelgrasses, which are considered to be some of the most extensive in Britain. Other aquatic estuarine communities include a variant of the clean sand community, where the polychaete worm *Ophelia bicornis* is characteristically present.

The largest and most diverse areas of saltmarsh surround the four islands within the harbour, with very limited development of saltmarsh around the periphery. A large proportion of the vegetation is dominated by cordgrass *Spartina*, with low-mid saltmarsh vegetation communities grading into mid-upper marsh around the islands. There is evidence that the *Spartina* is suffering dieback.

On the northern shore of the harbour lies Farlington Marshes, a peninsula of grassland and marsh which has developed as a result of enclosure by a sea wall; there is a similar habitat at Southmoor in the north-east of the site. The grassland flora in these areas is especially rich and supports a varied invertebrate fauna. Within Farlington Marshes there are two lagoons. The largest of these, Shut Lake lagoon, has a relatively high species diversity which includes three specialist lagoonal species.

To the east of the harbour entrance there is an area of vegetated shingle and dune heath.

There is a considerable interchange of waterfowl between Langstone Harbour and the nearby Chichester Harbour. However, Langstone Harbour is of importance for its wintering waders and wildfowl in its own right, regularly supporting internationally important wintering populations of dark-bellied brent geese and dunlin and nationally important populations of a further seven species of waterfowl.

Wildlife features

Coastal habitats

	Subtidal	Saltmarsh	Sandflats	Mudflats	Sand dunes	Rocky shores	Shingle	Lowland grassland	Lagoon	Other
	●	●	●	●			●		●	
Area (ha)	412	100	1,413							

● = major habitat ● = minor habitat

Aquatic estuarine communities

Soft substrate

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
		●				●						●	●	●	

Hard substrate

17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33

Additional wildlife features

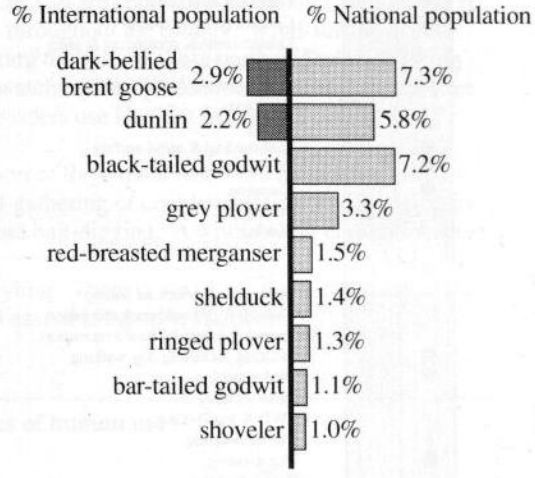
The Red List plant little robin *Geranium purpureum* ssp. *purpureum* can be found on the shingle islands. The invertebrate fauna recorded in the estuary includes the RDB1 fly *Atylotus rusticus*, the RDB 3 snail *Monacha cartusiana* and the looping snail *Truncatella subcylindrica*; a further seven Notable species have been recorded. Two nationally scarce benthic species have been recorded in Langstone Harbour, the hydroid *Laomedea angulata* and the red alga *Gracilaria bursa-pastoris*.

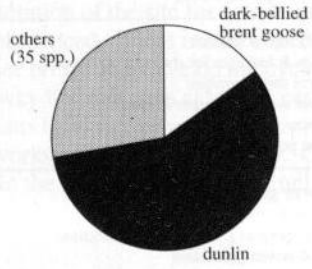
Langstone Harbour is a major nursery for sea bass *Dicentrarchus labrax*.

Birds

Wintering birds 1989/90 – 1993/94 data

Total waterfowl: 49,700





Wintering species assemblage
(Spp. forming >5% assemblage shown separately)

Breeding birds: there is a moderate-sized colony of little tern and small colonies of black-headed gull and common tern. Moderate numbers of ringed plover breed within Langstone Harbour.

Conservation status

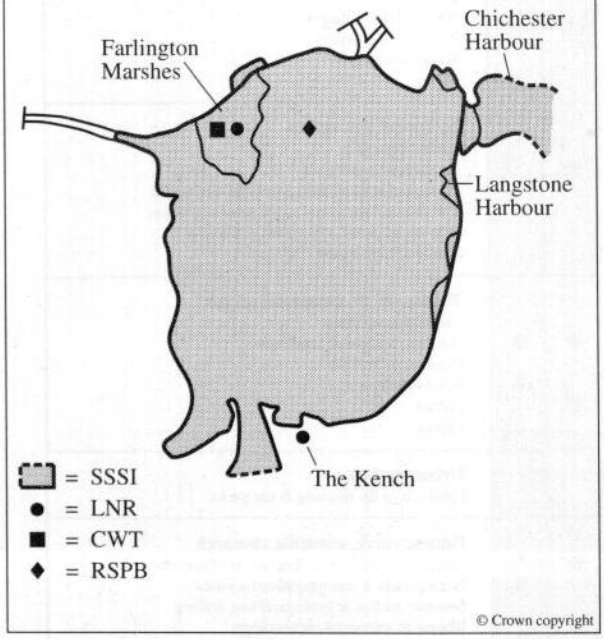
● = designated ● = proposed

	NCR	GCR	SSSI (B)	SSSI (G)	SSSI (M)	NNR	LNR	Ramsar	SPA	SAC	AONB	CWT	RSPB	ESA	NP	WWT	NT	NSA	HC	Other
			●		●		●	●	●	●		●	●							●
No.			1		1		2	1	1	2		1	1							1

The estuary lies within the Langstone Harbour biological Site of Special Scientific Interest (2,069 ha) and a small area in the north-easternmost part of the Harbour lies within the adjacent Chichester Harbour SSSI (3,680 ha), which was designated for its biological, geological and geomorphological interest. Adjacent to the estuary is Farlington Marshes Local Nature Reserve, part of which is managed by the Hampshire and Isle of Wight Wildlife Trust. There is also a LNR at the Kench and a proposed LNR at Langstone Oyster Beds. 550 ha of the saltmarsh, islands and mudflats of Langstone Harbour are a RSPB reserve.

The estuary is part of the Chichester and Langstone Harbours Ramsar site and Special Protection Area, and lies within the Solent and Isle of Wight Sensitive Marine Area. Shut Lake within Langstone Harbour forms part of the Solent and Isle of Wight Lagoons proposed Special Area of Conservation. Other parts of the Harbour are within the Solent Maritime proposed SAC.

Conservation status



Human activities (in 1993)

Present	Proposed	
		Coast protection & sea defences
●		Linear defences
		Training walls
		Groynes
		Brushwood fences
		Spartina planting
		Marram grass planting
		Barrage schemes
		Weirs & barrages for river management
		Storm surge barrages
		Water storage barrages & bunds
		Leisure barrages
		Tidal power barrages
		Power generation
		Thermal power stations
		Import/export jetties (power generation)
		Wind-power generation
		Industrial, port & related development
●		Dock, port & harbour facilities
		Manufacturing industries
		Chemical industries
		Ship & boat building/repair
		Others
		Extraction & processing of natural gas & oil
		Exploration
		Production
		Rig & platform construction
		Pipeline construction
		Pipeline installation
		Import/export jetties & single-point moorings
		Oil refineries
		Mothballing of rigs & tankers
		Military activities
●		Overflying by military aircraft
		Others
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		Domestic waste disposal
●		Sewage discharge & outfalls
●		Sewage treatment works
		Rubbish tips
●		Industrial & agricultural waste discharge
		Thermal discharges (power stations)
		Dredge spoil
		Accidental discharges
		Aerial crop spraying
		Waste incinerators
		Others
		Sediment extraction
●		Capital dredging
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		Commercial estuarine aggregates extraction
		Commercial terrestrial aggregates extraction
		Non-commercial aggregates extraction
		Hard-rock quarrying
		Transport & communications
●	●	Airports & helipads
		Tunnels, bridges & aqueducts
	●	Causeways & fords
●		Road schemes
		Ferries
		Cables
		Urbanisation
		Land-claim for housing & car parks
		Education & scientific research
●		Sampling, specimen collection & observation
	●	Nature trails & interpretative facilities
		Seismic studies & geological test drilling
●		Marine & terrestrial archaeology
		Fossil collecting

Present	Proposed	
		Tourism & recreation
		Infrastructure developments
●		Marinas
●		Non-marina moorings
●		Dinghy & boat parks
●		Caravan parks & chalets
		Leisure centres, complexes & piers
		Aquatic-based recreation
●		Power-boating & water-skiing
		Jet-skiing
●		Sailing
●		Sailboarding & wind-surfing
●		SCUBA & snorkelling
●		Canoeing
		Surfing
		Rowing
		Tourist boat trips/leisure barges
●		Angling
		Other non-commercial fishing
		Bathing & general beach recreation
		Terrestrial & intertidal-based recreation
●		Walking, including dog walking
●		Bird-watching
		Sand-yachting
		4WD & trial-biking
		Car sand-racing
●		Horse-riding
		Rock-climbing
●		Golf courses
●		Clay-pigeon shooting
		Others
		Airborne recreation
●		Overflying by light aircraft
		Radio-controlled model aircraft
		Others
		Wildfowling & hunting
●		Wildfowling
●		Other hunting-related activities
		Bait-collecting
●		Digging & pumping for lugworms & ragworms
		Hydraulic dredging for worms
●		Others
		Commercial fisheries
●		Fish-netting & trawling
		Fyke-netting for eels
		Fish traps & other fixed devices & nets
		Crustacea
●		Molluscs – Hand-gathering
●		Dredging
		Hydraulic dredging
		Cultivation of living resource
		Saltmarsh grazing
		Sand dune grazing
		Agricultural land-claim
		Fish-farming
		Shellfish farming
		Bottom & tray cultivation
		Suspended cultivation
		Crustacea farming
		Reeds for roofing
		Salicornia picking
		Others
		Management & killing of birds & mammals
		Killing of mammals
		Killing of birds
		Adult fish-eating birds
		Adult shellfish-eating birds
		Gulls
		Geese
		Wildlife habitat management
		Spartina control
		Habitat creation & restoration
		Marine
●		Intertidal
		Terrestrial
●		Habitat management
		Others

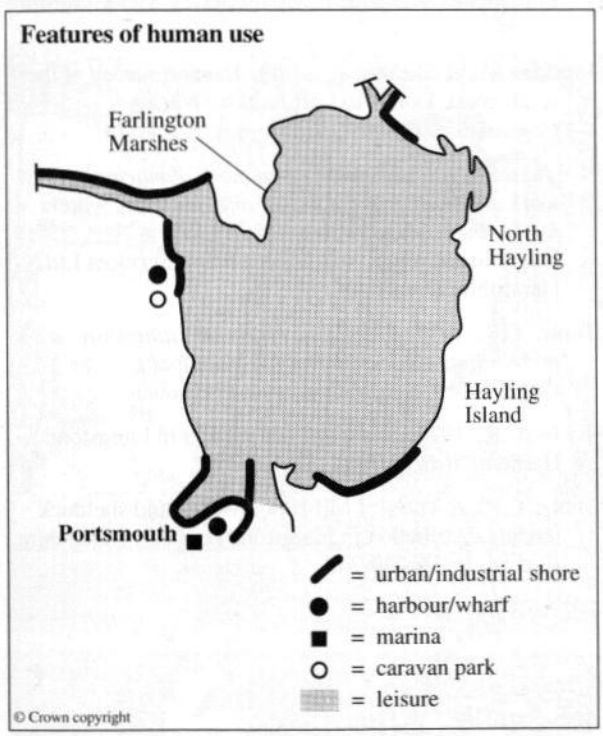
Features of human use

Leisure pursuits are the most numerous form of human use and are widespread, with a marina and around 1,600 moorings which are concentrated in the channels in the west and south-west of the site. Power-boating and water-skiing occur and are controlled by by-laws, and sailing is extensive throughout the estuary. Wind-surfing occurs mostly along the eastern shore north of Stoke. Walking and bird-watching take place around Farlington Marshes and horse-riders use Hayling Island.

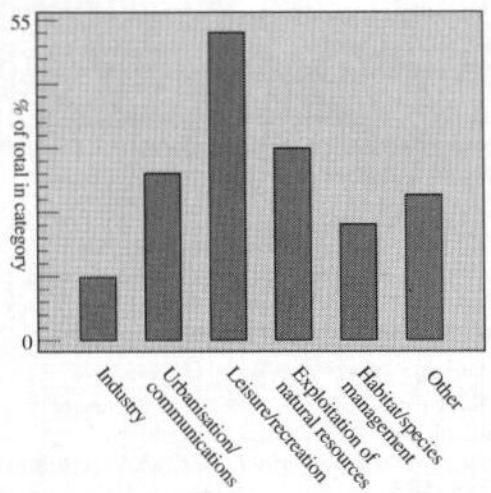
Exploitation of the natural resources includes netting for fish, hand-gathering of cockles and winkles, dredging for oysters, and bait-digging. A wildfowling club shoots over various areas of the RSPB reserve in the north, and over North Hayling. There is also a wildfowl sanctuary in the south and east of Langstone Harbour.

Industrial activity is limited, with two landing quays within Langstone Harbour.

In 1993 there was a proposal to restore mudflats at former oyster beds. The removal of tipped concrete and other materials from the former oyster beds at North Hayling and the restoration of the site for nature conservation has recently commenced. There is a more recent proposal to build a major bridge and develop the cycleway along the former railway line that runs along the east of the site, and there are plans for improvements to the present sewage treatment works adjacent to the estuary. Once operational, the outfall in the Harbour will be used only for storm overflows.



Categories of human use



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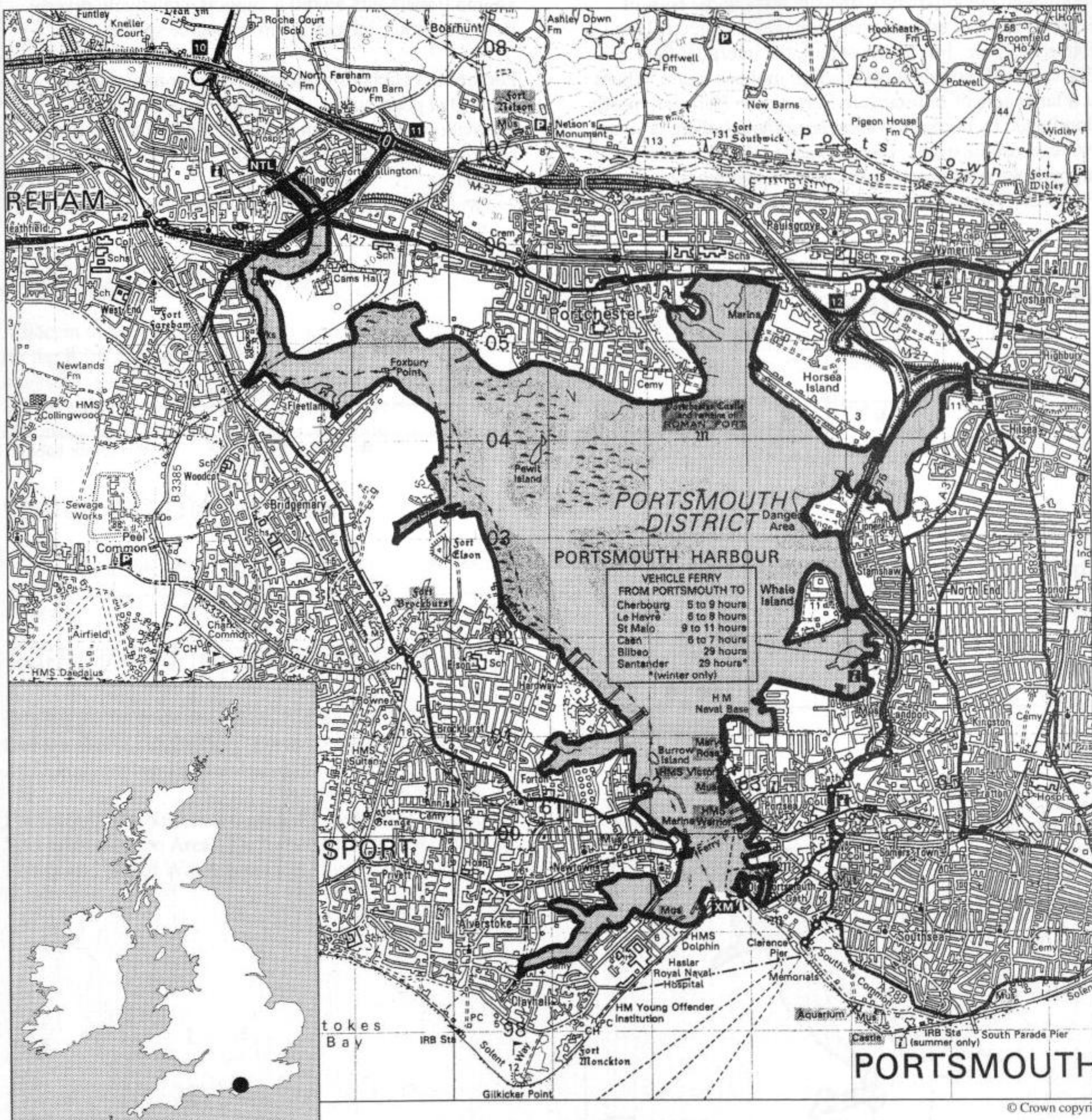
130 Portsmouth Harbour

Centre grid: SU6203
County: Hampshire

Districts: Fareham, Gosport, Portsmouth
EN area: Hampshire & Isle of Wight

Review site location



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NTL = Normal tidal limit

XM = Across mouth

▒ = Core site

Total area (ha)	Intertidal area (ha)	Shore length (km)	Channel length (km)	Tidal range (m)	Geomorph. type	Human population
1,593	964	55.2	10.8	4.1	Bar built	299,000

Description

Portsmouth Harbour is a tidal basin which receives a comparatively small freshwater input from several streams, most notably the River Wallington. The water quality throughout most of the harbour has been classified grade A, except for a small section close to the tidal limit of the Wallington, which was grade B.

At low tide a large expanse of intertidal flats and tidal creeks is exposed. The estuary is dominated by muddy sediments, predominantly fine silts, with large beds of eelgrass *Zostera* and extensive areas of the green algae *Enteromorpha*. For the most part, the intertidal flats in Portsmouth Harbour support a rich mollusc fauna. There is a large area of saltmarsh in Portsmouth Harbour, mostly dominated by cordgrass *Spartina*, although there is some evidence of die back. There is limited development of higher saltmarsh communites in the upper reaches of Fareham Channel and at Frater Lake on the western shore. Here the vegetation includes some small areas of low-mid marsh and very small areas of upper marsh vegetation.

There are a number of lagoon-like habitats within Portsmouth Harbour, mostly in the uppermost inlets of the Harbour, and which have formed as a result of human activities on the site. For example at Gosport, Little Anglesey is a large lagoon formed by the construction of viaduct and sill. Several of the lagoon-like habitats around Portsmouth Harbour support a relatively diverse flora and fauna, including rare or scarce species.

Portsmouth Harbour is most notable for its wintering waterfowl populations. It regularly supports an internationally important population of wintering dark-bellied brent geese and nationally important populations of dunlin.

Wildlife features

Coastal habitats

	Subtidal	Saltmarsh	Sandflats	Mudflats	Sand dunes	Rocky shores	Shingle	Lowland grassland	Lagoon	Other
	●	●		●					●	
Area (ha)	629	181	783							

● = major habitat ◍ = minor habitat

Aquatic estuarine communities

Soft substrate

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
						●						●	●		

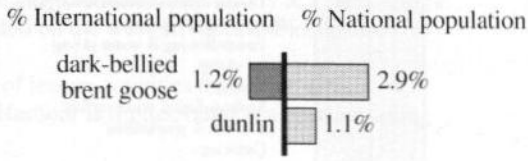
Hard substrate

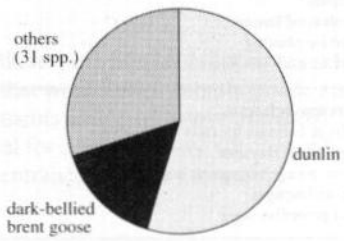
17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33

Birds

Wintering birds 1989/90 – 1993/94 data

Total waterfowl: 12,700





Wintering species assemblage
(Spp. forming >5% assemblage shown separately)

Breeding birds: small numbers of ringed plover have been recorded breeding on the estuary.

Additional wildlife features

Adjacent to the estuary is the only known site in Britain for the RDB 1 small weevil *Pachytychius haematocephalus*. Several of the lagoons around the habour support rare or scarce species of invertebrate, including the RDB 3 sea anemone *Nematostella vectensis* and the RDB 3 lagoon sand shrimp *Gammarus insensibilis*.

The channel in Portsmouth Harbour is a major nursery for sea bass *Dicentrarchus labrax*.

Conservation status

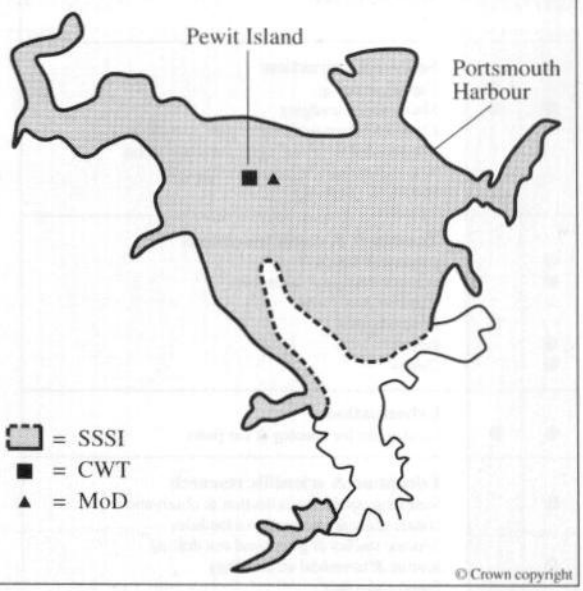
● = designated ● = proposed

	NCR	GCR	SSSI (B)	SSSI (G)	SSSI (M)	NNR	LNR	Ramsar	SPA	SAC	AONB	CWT	RSPB	ESA	NP	WWT	NT	NSA	HC	Other
			●					●	●			●								●
No.			1					1	1			1								2

Most of the harbour lies within Portsmouth Harbour biological SSSI (1,266 ha). Pewit Island is owned by the MoD and managed by the Hampshire Wildlife Trust.

Portsmouth Harbour is designated as a Ramsar site and a Special Protection Area. The estuary forms part of the Solent and Isle of Wight Sensitive Marine Area.

Conservation status



Human activities (in 1992)

Present	Proposed	
●	●	**Coast protection & sea defences** Linear defences Training walls Groynes Brushwood fences *Spartina* planting Marram grass planting
	●	**Barrage schemes** Weirs & barrages for river management Storm surge barrages Water storage barrages & bunds Leisure barrages Tidal power barrages
		Power generation Thermal power stations Import/export jetties (power generation) Wind-power generation
● ● ● ● ●	●	**Industrial, port & related development** Dock, port & harbour facilities Manufacturing industries Chemical industries Ship & boat building/repair Others
		Extraction & processing of natural gas & oil Exploration Production Rig & platform construction Pipeline construction Pipeline installation Import/export jetties & single-point moorings Oil refineries Mothballing of rigs & tankers
● ●		**Military activities** Overflying by military aircraft Others
● ● ●	●	**Waste discharge** Domestic waste disposal Sewage discharge & outfalls Sewage treatment works Rubbish tips Industrial & agricultural waste discharge Thermal discharges (power stations) Dredge spoil Accidental discharges Aerial crop spraying Waste incinerators Others
●	● ●	**Sediment extraction** Capital dredging Maintenance dredging Commercial estuarine aggregates extraction Commercial terrestrial aggregates extraction Non-commercial aggregates extraction Hard-rock quarrying
● ● ● ●	●	**Transport & communications** Airports & helipads Tunnels, bridges & aqueducts Causeways & fords Road schemes Ferries Cables
●	●	**Urbanisation** Land-claim for housing & car parks
● ●		**Education & scientific research** Sampling, specimen collection & observation Nature trails & interpretative facilities Seismic studies & geological test drilling Marine & terrestrial archaeology Fossil collecting

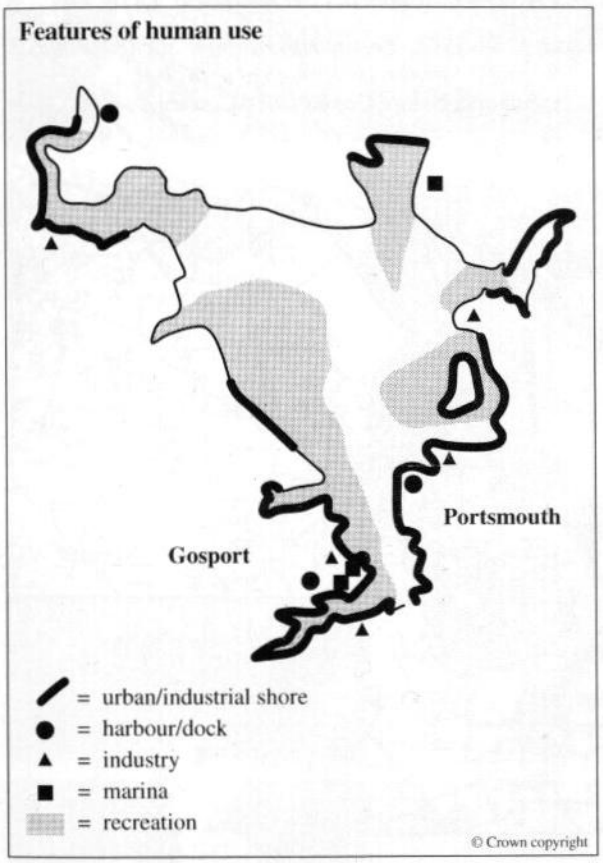
Present	Proposed	
		Tourism & recreation Infrastructure developments
●	●	Marinas
●		Non-marina moorings
●		Dinghy & boat parks
		Caravan parks & chalets
	●	Leisure centres, complexes & piers
		Aquatic-based recreation
		Power-boating & water-skiing
		Jet-skiing
●		Sailing
		Sailboarding & wind-surfing
		SCUBA & snorkelling
		Canoeing
		Surfing
●		Rowing
		Tourist boat trips/leisure barges
●		Angling
		Other non-commercial fishing
		Bathing & general beach recreation
		Terrestrial & intertidal-based recreation
●		Walking, including dog walking
		Bird-watching
		Sand-yachting
		4WD & trial-biking
		Car sand-racing
		Horse-riding
		Rock-climbing
		Golf courses
		Clay-pigeon shooting
		Others
		Airborne recreation
		Overflying by light aircraft
		Radio-controlled model aircraft
●		Others
●		**Wildfowling & hunting** Wildfowling Other hunting-related activities
●		**Bait-collecting** Digging & pumping for lugworms & ragworms Hydraulic dredging for worms Others
		Commercial fisheries Fish-netting & trawling Fyke-netting for eels Fish traps & other fixed devices & nets Crustacea Molluscs – Hand-gathering Dredging Hydraulic dredging
		Cultivation of living resource Saltmarsh grazing Sand dune grazing Agricultural land-claim Fish-farming Shellfish farming Bottom & tray cultivation Suspended cultivation Crustacea farming Reeds for roofing *Salicornia* picking Others
		Management & killing of birds & mammals Killing of mammals Killing of birds Adult fish-eating birds Adult shellfish-eating birds Gulls Geese
		Wildlife habitat management *Spartina* control Habitat creation & restoration
	●	Marine Intertidal Terrestrial
●		Habitat management
	●	**Others**

Features of human use

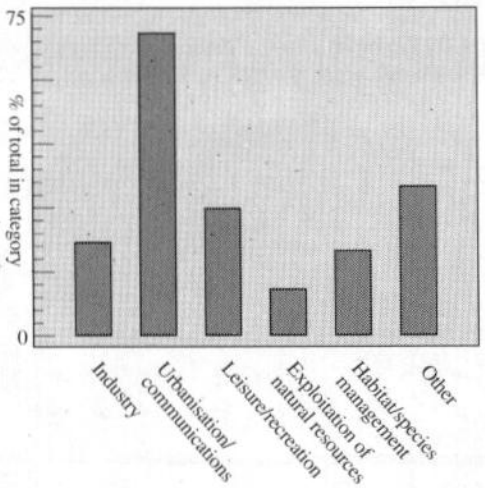
The dock and harbour are dominated by the presence of large naval bases at Portsmouth and Gosport on either side of the lower harbour, and there are major commercial docks and an international ferry port at Portsmouth. Much of the shore and surrounding land to the east is owned by the navy and used for military activities. Some industry is sited on the western shore at Fleetlands.

The number of leisure activities that occur within Portsmouth Harbour is limited but it is a popular sailing base. There are marinas at Port Solent and Gosport and moorings cover around 10% of the site. Exploitation of the natural resource is also limited and includes bait digging.

In 1996 there were proposals for developments to the harbour that would involve harbourside access improvements and leisure developments. There was also a proposal for a light railway which would cross the harbour entrance through a tunnel.



Categories of human use



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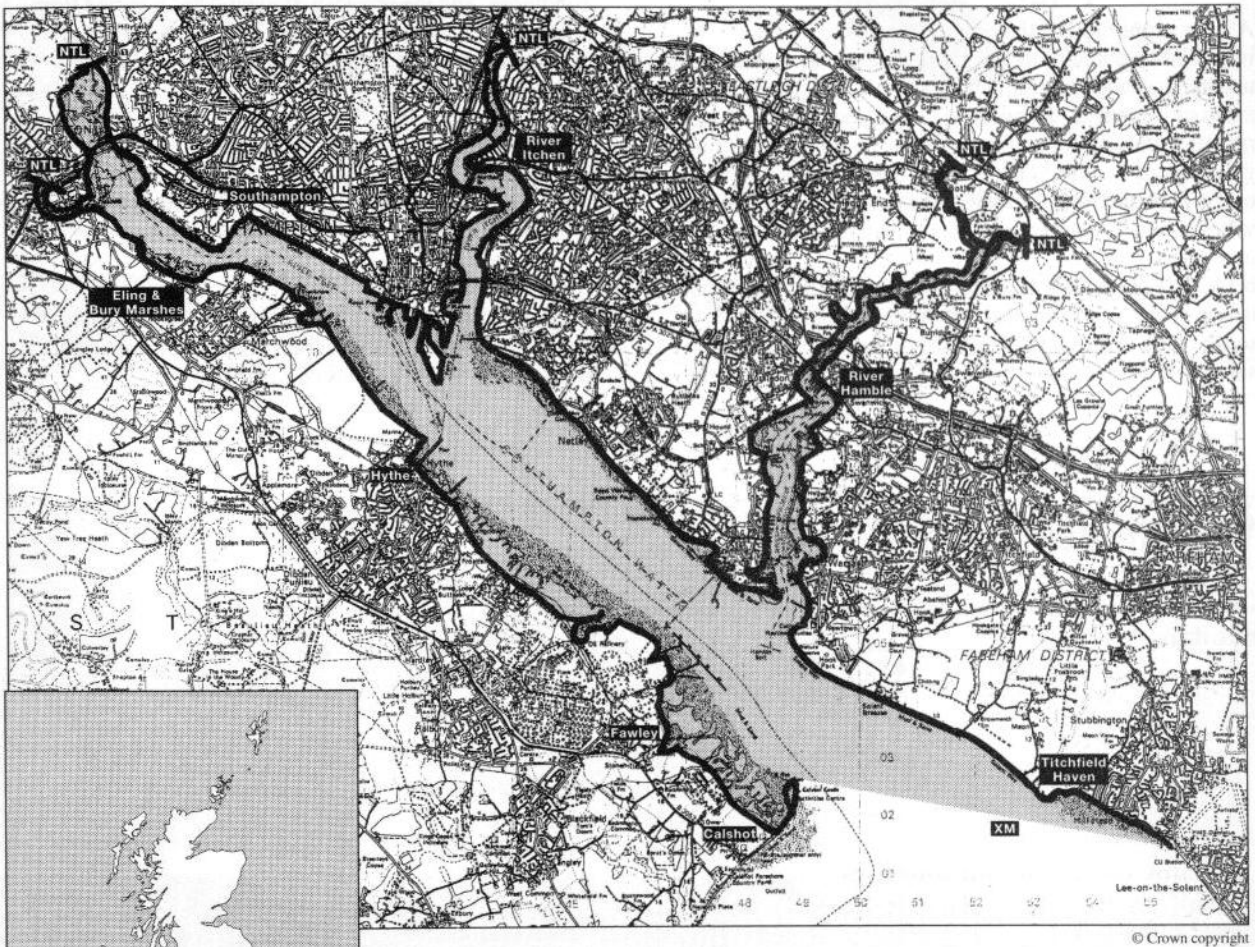
131 Southampton Water

Centre grid: SU4506
County: Hampshire

Districts: Eastleigh, Fareham, New Forest, Southampton, Test Valley
EN area: Hampshire & Isle of Wight

Review site location



NTL = Normal tidal limit XM = Across mouth = Core site

Total area (ha)	Intertidal area (ha)	Shore length (km)	Channel length (km)	Tidal range (m)	Geomorph. type	Human population
3,975	1,376	109.8	20.2	4.0	Coastal plain	249,000

Description

Southampton Water is the confluence of the Test, Itchen and Hamble Estuaries and it is one of the most highly developed estuaries in southern England, dominated by Southampton docks and harbours and the oil refinery and power station at Fawley. Water quality within the site varies: the upper reaches and the northern shore have been classified as grade A, while much of the southern shore has been classified as grade B. The estuary is adjacent to the Beaulieu Estuary to the west of the mouth.

A large proportion of the estuary is subtidal and the intertidal flats that flank the shores are predominantly mud and sand, or mud and sand with shingle. There are several areas of saltmarsh. Eling, Bury and Hythe Marshes are probably the only remaining natural site for smooth cord-grass *Spartina alterniflora* in Britain and the saltmarshes of the Hamble tributary show the gradation from estuarine saltmarsh to a semi-natural alder woodland, which is inundated by brackish water at high tide. On the west bank the saltmarsh is elevated and terminates in cliffs, and is one of the best examples of mature saltmarsh on the south coast. From Hythe to Calshot the large area of saltmarsh has extensive areas of *Spartina*, and is thought to be the site on which Townsend's cord-grass *S. townsendii* and common cord-grass *S. anglica* arose from hybridisation.

The head of the estuary supports one of the most extensive reedbeds on the south coast, backed by unimproved meadows with numerous tidal creeks which are flooded on the highest tides. The vegetation reflects the gradation from reeds in freshwater through brackish to saline conditions, and the brackish grassland has a varied flora with over 450 species recorded. This area is of importance as a breeding and roosting ground for waterfowl.

Towards the estuary mouth on the eastern shore Titchfield Haven is an extensive freshwater marsh backed by large reedbeds and wet meadows. It was formerly the estuary of the River Meon, but is no longer tidal due to the construction of sluices.

Southampton Water is an important site for wintering waterfowl and regularly supports nationally important populations of five species of waterfowl.

Wildlife features

Coastal habitats

	Subtidal	Saltmarsh	Sandflats	Mudflats	Sand dunes	Rocky shores	Shingle	Lowland grassland	Lagoon	Other
	●	●	◉	●			◉	●	●	
Area (ha)	2,599	355	1,021							

● = major habitat ◉ = minor habitat

Aquatic estuarine communities

Soft substrate

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
						●				●		●		●	

Hard substrate

17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33
											●			●		

Additional wildlife features

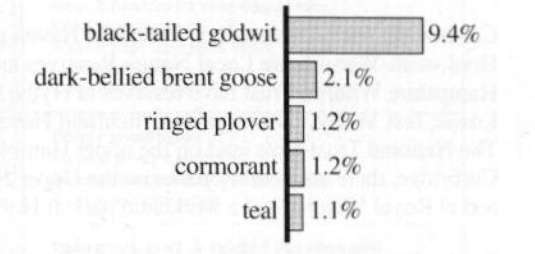
The Red List plants little robin *Geranium purpureum* ssp. *forsteri*, dwarf spike-rush *Eleocharis parvula* and the nationally rare species bermuda-grass *Cynodon dactylon* are found on the estuary. A further nine nationally scarce plant species have been recorded around the estuary.

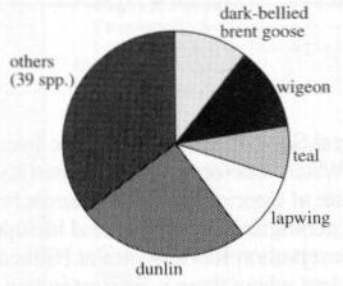
The invertebrate fauna recently recorded on Southampton Water includes the RDB 3 wasp *Pemphredon morio*, two proposed RDB species and a further 36 Notable species. The sea bed of Southampton Water supports the nationally rare sponge *Suberites massa* and the nationally scarce mantis shrimp *Meiosquilla desmaresti* and the looping snail *Truncatella subcylindrica*. Southampton Water is also a major nursery for sea bass *Dicentrarchus labrax*.

Birds

Wintering birds 1989/90 – 1993/94 data

Total waterfowl: 19,700





Wintering species assemblage
(Spp. forming >5% assemblage shown separately)

Breeding birds: large numbers of redshank and small numbers of oystercatcher breed within the saltmarshes. Small numbers of redshank, oystercatcher, lapwing and snipe breed within the grasslands adjacent to the estuary. Small numbers of ringed plover also breed within Southampton Water.

The large area of saltmarsh from Hythe to Calshot has extensive areas of the cord-grass *Spartina*. (Pat Doody, English Nature)

Conservation status

● = designated ◉ = proposed

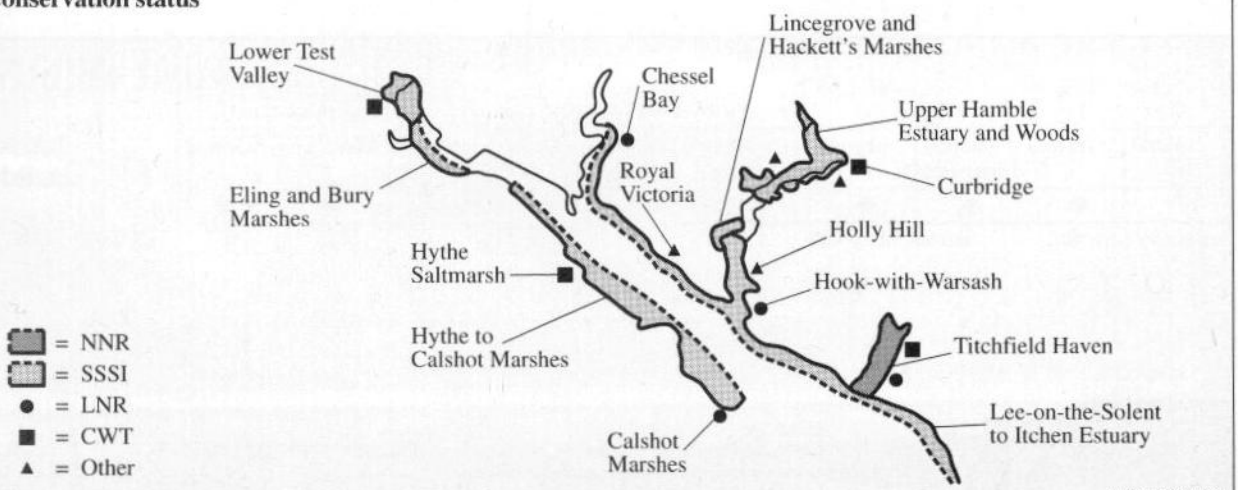
	NCR	GCR	SSSI (B)	SSSI (G)	SSSI (M)	NNR	LNR	Ramsar	SPA	SAC	AONB	CWT	RSPB	ESA	NP	WWT	NT	NSA	HC	Other
		●	●		●	●	●	◉	◉	◉		●					●			●
No.		3	6		1	1	4	1	1	1		4					1			4

There are several Sites of Special Scientific Interest in Southampton Water. Lee-on-Solent to Itchen Estuary (632 ha) is a Site of Special Scientific Interest for its biological and geological importance and includes Geological Conservation Review sites at Hillhead Cliffs and Lee-on-Solent where there is interest in two localities. There are a further six biological SSSIs on the estuary: Hythe to Calshot Marshes (437 ha), Eling and Bury Marshes (110 ha), Lower Test Valley (139 ha), Lincegrove and Hackett's Marshes (38 ha), Upper Hamble Estuary and Woods (149 ha) and Titchfield Haven (131 ha). Titchfield Haven has been designated as a National Nature Reserve.

Calshot Marshes, Chessel Bay, Titchfield Haven and Hook-with-Warsash are Local Nature Reserves and the Hampshire Wildlife Trust have reserves at Hythe Marsh, Lower Test Valley, Curbridge and Titchfield Haven. The National Trust have land on the upper Hamble near Curbridge, there are country parks on the Upper Hamble and at Royal Victoria and a woodland park at Holly Hill.

Southampton Water is within the Solent and Isle of Wight Sensitive Marine Area. Parts of the site lie within the Solent and Southampton Water proposed Ramsar site and Special Protection Area, and within the Solent Maritime proposed Special Area of Conservation.

Conservation status



Human activities (in 1992)

Present	Proposed	
		Coast protection & sea defences
●		Linear defences
		Training walls
●		Groynes
		Brushwood fences
		Spartina planting
		Marram grass planting
		Barrage schemes
		Weirs & barrages for river management
		Storm surge barrages
		Water storage barrages & bunds
		Leisure barrages
		Tidal power barrages
		Power generation
●		Thermal power stations
		Import/export jetties (power generation)
		Wind-power generation
		Industrial, port & related development
●		Dock, port & harbour facilities
		Manufacturing industries
●		Chemical industries
●		Ship & boat building/repair
●		Others
		Extraction & processing of natural gas & oil
		Exploration
		Production
		Rig & platform construction
●		Pipeline construction
		Pipeline installation
●		Import/export jetties & single-point moorings
●		Oil refineries
		Mothballing of rigs & tankers
		Military activities
		Overflying by military aircraft
●		Others
		Waste discharge
		Domestic waste disposal
●		Sewage discharge & outfalls
●		Sewage treatment works
		Rubbish tips
●		Industrial & agricultural waste discharge
●		Thermal discharges (power stations)
		Dredge spoil
●		Accidental discharges
		Aerial crop spraying
●		Waste incinerators
		Others
		Sediment extraction
●		Capital dredging
●		Maintenance dredging
		Commercial estuarine aggregates extraction
		Commercial terrestrial aggregates extraction
●		Non-commercial aggregates extraction
		Hard-rock quarrying
		Transport & communications
●		Airports & helipads
●		Tunnels, bridges & aqueducts
		Causeways & fords
		Road schemes
●		Ferries
●		Cables
		Urbanisation
●	●	Land-claim for housing & car parks
		Education & scientific research
●		Sampling, specimen collection & observation
		Nature trails & interpretative facilities
		Seismic studies & geological test drilling
●		Marine & terrestrial archaeology
●		Fossil collecting

Present	Proposed	
		Tourism & recreation
		Infrastructure developments
●	●	Marinas
●		Non-marina moorings
●		Dinghy & boat parks
		Caravan parks & chalets
●		Leisure centres, complexes & piers
		Aquatic-based recreation
●		Power-boating & water-skiing
●		Jet-skiing
●		Sailing
●		Sailboarding & wind-surfing
●		SCUBA & snorkelling
●		Canoeing
		Surfing
		Rowing
●		Tourist boat trips/leisure barges
●		Angling
		Other non-commercial fishing
●		Bathing & general beach recreation
		Terrestrial & intertidal-based recreation
●		Walking, including dog walking
●		Bird-watching
		Sand-yachting
		4WD & trial-biking
		Car sand-racing
		Horse-riding
		Rock-climbing
		Golf courses
●		Clay-pigeon shooting
		Others
		Airborne recreation
●		Overflying by light aircraft
		Radio-controlled model aircraft
		Others
		Wildfowling & hunting
●		Wildfowling
		Other hunting-related activities
		Bait-collecting
●		Digging & pumping for lugworms & ragworms
		Hydraulic dredging for worms
		Others
		Commercial fisheries
●		Fish-netting & trawling
		Fyke-netting for eels
		Fish traps & other fixed devices & nets
		Crustacea
		Molluscs – Hand-gathering
●		Dredging
		Hydraulic dredging
		Cultivation of living resource
●		Saltmarsh grazing
		Sand dune grazing
		Agricultural land-claim
		Fish-farming
		Shellfish farming
		Bottom & tray cultivation
		Suspended cultivation
		Crustacea farming
●		Reeds for roofing
		Salicornia picking
		Others
		Management & killing of birds & mammals
		Killing of mammals
		Killing of birds
●		Adult fish-eating birds
		Adult shellfish-eating birds
		Gulls
●		Geese
		Wildlife habitat management
		Spartina control
		Habitat creation & restoration
		Marine
		Intertidal
●		Terrestrial
●		Habitat management
		Others

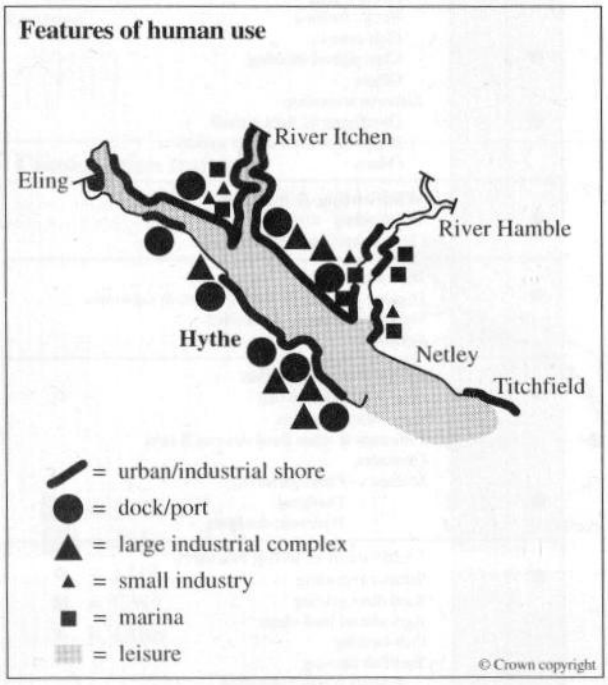
Features of human use

Southampton Water is one of the most developed estuaries on the south coast of England, with a high proportion of the shore dominated by urban areas, industry and port facilities. There are major dock complexes and three major ship-building sites within the estuary, and boat-building and repair yards are predominant on the Itchen and the Hamble. There is an oil refinery and an oil-fired power station at Fawley.

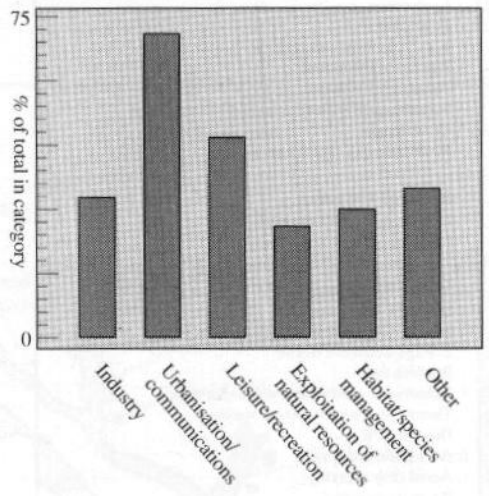
Leisure pursuits are also a major activity, with sailing and its associated land-based facilities centred on the Hamble and the Itchen. There are several marinas, a large number of moorings and dinghy parks within Southampton Water, and sailing occurs throughout the site and out into the Solent. Wind-surfing and canoeing occur in greatest numbers around Calshot and power-boats often go out into the Solent. Beach recreation is centred around Calshot and Titchfield and walkers and bird-watchers use most of the shores of the estuary.

Exploitation of the natural resources includes ponies grazing the saltmarsh at Eling, reed-cutting for roofing in the upper reaches of the estuary, oyster dredging in the lower parts of the site and bait-digging which is concentrated around Hythe and Netley.

In 1992 there was a proposal for housing on the shorefront at Hamble which would have involved around 60 ha of land-claim. There were four proposals for marinas within Southampton Water with a further five for marinas within the Hamble alone. Since that time there have been further proposals for linear sea defences, dock and port facilities, sewage treatment works, capital and maintenance dredging, road schemes and habitat management.



Categories of human use



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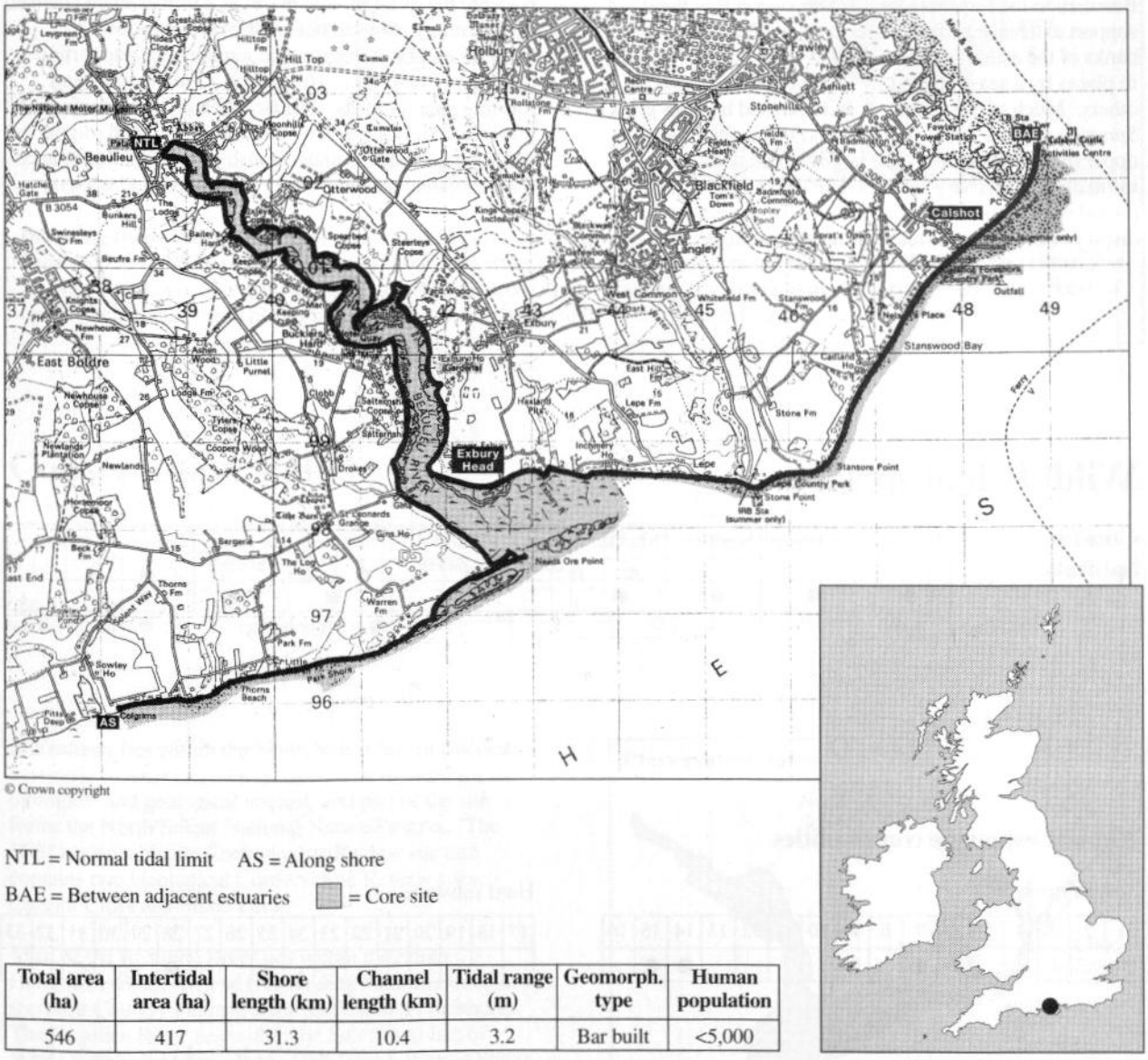
132 Beaulieu River

Centre grid: SU4100
County: Hampshire

District: New Forest
EN area: Hampshire & Isle of Wight

Review site location



NTL = Normal tidal limit AS = Along shore

BAE = Between adjacent estuaries ▭ = Core site

Total area (ha)	Intertidal area (ha)	Shore length (km)	Channel length (km)	Tidal range (m)	Geomorph. type	Human population
546	417	31.3	10.4	3.2	Bar built	<5,000

Description

The estuary of the Beaulieu River is a narrow, meandering channel which flows through a valley of the New Forest before reaching the sea. The estuary extends south-westwards along the shore and north-eastwards as far as Calshot, where it adjoins Southampton Water. The water quality of the Beaulieu River has been classified as grade A.

At low tide narrow bands of intertidal mudflats are exposed along the entire length of the estuary, from Beaulieu to the foreshore, and at Stanswood Bay these support extensive beds of *Zostera* eelgrasses. On both banks of the estuary saltmarshes have developed, bounded in places by a sea wall, and by ancient oak woodland in others. Much of the saltmarsh is dominated by cord-grass *Spartina anglica* with some low-mid marsh and mid-upper marsh vegetation. The largest continuous area of saltmarsh is at Exbury Head, where the shingle spit provides protection from the waves. The vegetation here displays the transition from saltmarsh to shingle.

The two parallel shingle spits that protect the mouth of the estuary have arisen from the eastward accretion of material across the estuary mouth. The shingle extends inland and has a rich flora with many uncommon shingle species. Brackish pools and lagoons have developed within the shingle, which support a highly specialised invertebrate community.

To the west of the estuary is an area of marshland, possibly the result of land-claim of a former main channel of the estuary. Substantial areas of wet meadows, brackish and freshwater marsh remain here, supporting a remarkably rich flora. This area is a vital feeding and roosting area for birds. The Beaulieu is of national importance for its populations of wintering and migratory wildfowl and waders and it is also of national importance for its populations of breeding gulls, terns and waders.

Wildlife features

Coastal habitats

	Subtidal	Saltmarsh	Sandflats	Mudflats	Sand dunes	Rocky shores	Shingle	Lowland grassland	Lagoon	Other
	●	●	●	●			●	●	●	
Area (ha)	129	185	232							

● = major habitat ● = minor habitat

Aquatic estuarine communities

Soft substrate

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
						●		●					●	●	

Hard substrate

17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33
											●					

Additional wildlife features

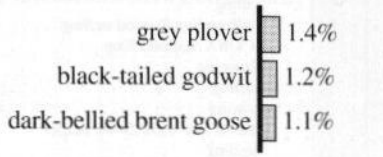
The Red List plant dwarf spike-rush *Eleocharis parvula* grows in the upper reaches of the Beaulieu and the nationally scarce lax-flowered sea lavender *Limonium humile* has been recorded on the estuary. The invertebrate fauna recently recorded includes the RDB 2 spider *Trichoncus hackmani*, the RDB 3 lagoon sand shrimp *Gammarus insensibilis*, the RDB 3 fly *Aphrosylus mitis*, one proposed RDB 3 species and 30 Notable species.

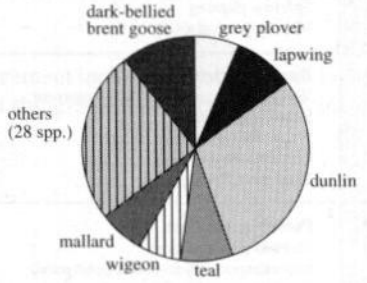
Birds

Wintering birds

1989/90 – 1993/94 data

Total waterfowl: 8,280





Wintering species assemblage
(Spp. forming >5% assemblage shown separately)

Breeding birds: large colonies of black-headed gulls, common terns and little terns and a moderate-sized colony of Sandwich terns breed on the estuary and enclosing shingle bars. Large numbers of redshank breed within the saltmarshes and small numbers of redshank, lapwing and snipe breed on the grasslands adjacent to the estuary. Moderate numbers of oystercatcher and ringed plover breed on the shingle banks to the west of the estuary.

Conservation status

● = designated ● = proposed

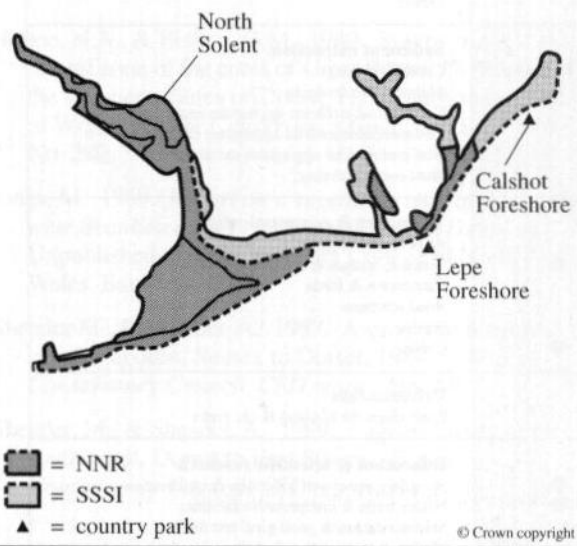
	NCR	GCR	SSSI (B)	SSSI (G)	SSSI (M)	NNR	LNR	Ramsar	SPA	SAC	AONB	CWT	RSPB	ESA	NP	WWT	NT	NSA	HC	Other
	●	●			●	●		●	●	●	●									●
No.	1	2			1	1		1	1	1	1									4

The estuary lies within the North Solent Site of Special Scientific Interest (1,189 ha) which is designated for its biological and geological interest, and part of the site forms the North Solent National Nature Reserve. The SSSI is also a Nature Conservation Review site and contains two Geological Conservation Review sites: Calshot Cliffs and Stone Point.

Most of the Beaulieu River lies within the South Hampshire Coast Area of Outstanding Natural Beauty and there are Country Parks at Lepe and Calshot Foreshores. The Beaulieu River lies within the Solent and Isle of Wight Sensitive Marine Area. Gull Island, Warren Shore and Needs Ore Point form an Area of Special Protection for birds.

The estuary is within the Solent and Southampton Water proposed Ramsar site and proposed Special Protection Area. Parts of the estuary lie within the Solent Maritime proposed Special Area of Conservation.

Conservation status



Human activities (in 1993)

Present	Proposed	
		Coast protection & sea defences
●		Linear defences
		Training walls
●		Groynes
		Brushwood fences
		Spartina planting
		Marram grass planting
		Barrage schemes
		Weirs & barrages for river management
		Storm surge barrages
		Water storage barrages & bunds
		Leisure barrages
		Tidal power barrages
		Power generation
●		Thermal power stations
		Import/export jetties (power generation)
		Wind-power generation
		Industrial, port & related development
		Dock, port & harbour facilities
		Manufacturing industries
		Chemical industries
●		Ship & boat building/repair
		Others
		Extraction & processing of natural gas & oil
		Exploration
		Production
		Rig & platform construction
●		Pipeline construction
		Pipeline installation
		Import/export jetties & single-point moorings
		Oil refineries
		Mothballing of rigs & tankers
		Military activities
		Overflying by military aircraft
		Others
		Waste discharge
●		Domestic waste disposal
●		Sewage discharge & outfalls
		Sewage treatment works
		Rubbish tips
		Industrial & agricultural waste discharge
		Thermal discharges (power stations)
		Dredge spoil
		Accidental discharges
		Aerial crop spraying
		Waste incinerators
		Others
		Sediment extraction
		Capital dredging
●		Maintenance dredging
		Commercial estuarine aggregates extraction
		Commercial terrestrial aggregates extraction
		Non-commercial aggregates extraction
		Hard-rock quarrying
		Transport & communications
●		Airports & helipads
		Tunnels, bridges & aqueducts
		Causeways & fords
		Road schemes
		Ferries
●		Cables
		Urbanisation
		Land-claim for housing & car parks
		Education & scientific research
●		Sampling, specimen collection & observation
●		Nature trails & interpretative facilities
		Seismic studies & geological test drilling
		Marine & terrestrial archaeology
		Fossil collecting

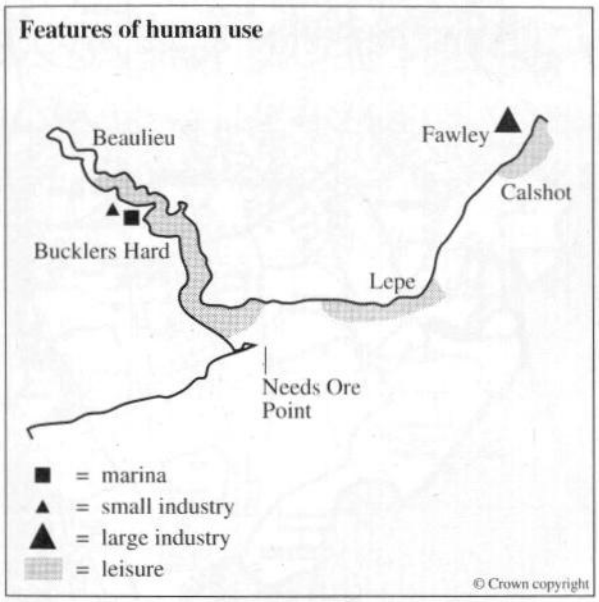
Present	Proposed	
		Tourism & recreation
		Infrastructure developments
●		Marinas
●		Non-marina moorings
●		Dinghy & boat parks
		Caravan parks & chalets
		Leisure centres, complexes & piers
		Aquatic-based recreation
		Power-boating & water-skiing
		Jet-skiing
●		Sailing
●		Sailboarding & wind-surfing
		SCUBA & snorkelling
		Canoeing
		Surfing
		Rowing
●		Tourist boat trips/leisure barges
●		Angling
		Other non-commercial fishing
●		Bathing & general beach recreation
		Terrestrial & intertidal-based recreation
●		Walking, including dog walking
●		Bird-watching
		Sand-yachting
		4WD & trial-biking
		Car sand-racing
		Horse-riding
		Rock-climbing
		Golf courses
		Clay-pigeon shooting
		Others
		Airborne recreation
		Overflying by light aircraft
		Radio-controlled model aircraft
		Others
		Wildfowling & hunting
●		Wildfowling
		Other hunting-related activities
		Bait-collecting
●		Digging & pumping for lugworms & ragworms
		Hydraulic dredging for worms
		Others
		Commercial fisheries
●		Fish-netting & trawling
		Fyke-netting for eels
		Fish traps & other fixed devices & nets
		Crustacea
●		Molluscs – Hand-gathering
		Dredging
		Hydraulic dredging
		Cultivation of living resource
●		Saltmarsh grazing
		Sand dune grazing
		Agricultural land-claim
		Fish-farming
		Shellfish farming
		Bottom & tray cultivation
		Suspended cultivation
		Crustacea farming
●		Reeds for roofing
		Salicornia picking
		Others
		Management & killing of birds & mammals
●		Killing of mammals
		Killing of birds
		Adult fish-eating birds
		Adult shellfish-eating birds
		Gulls
		Geese
		Wildlife habitat management
		Spartina control
		Habitat creation & restoration
		Marine
		Intertidal
●		Terrestrial
●		Habitat management
		Others

Features of human use

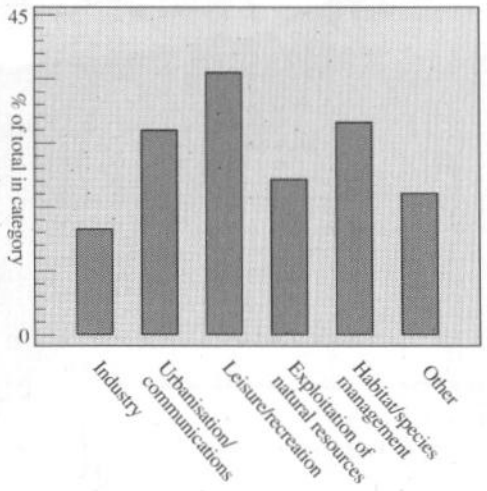
Leisure activities are numerous but generally are neither intensive nor intrusive. There are moorings within the river channel, a marina at Bucklers Hard and two dinghy/boat parks from which sailing occurs. Windsurfers use the beaches off Calshot and Lepe, and there is a public footpath along the western shore of the estuary from Beaulieu to Bucklers Hard.

There is little industrial activity on the site, with a boat-building yard at Bucklers Hard, and a power station adjacent to the estuary at Fawley. Exploitation of the natural resources include gathering of cockles and winkles by hand and an area of foreshore at Lepe is intensively dug for bait. Wildfowling occurs only on ponds adjacent to the estuary.

Habitat management includes the creation of lagoons and maintenace of shingle banks at Needs Ore Point.



Categories of human use



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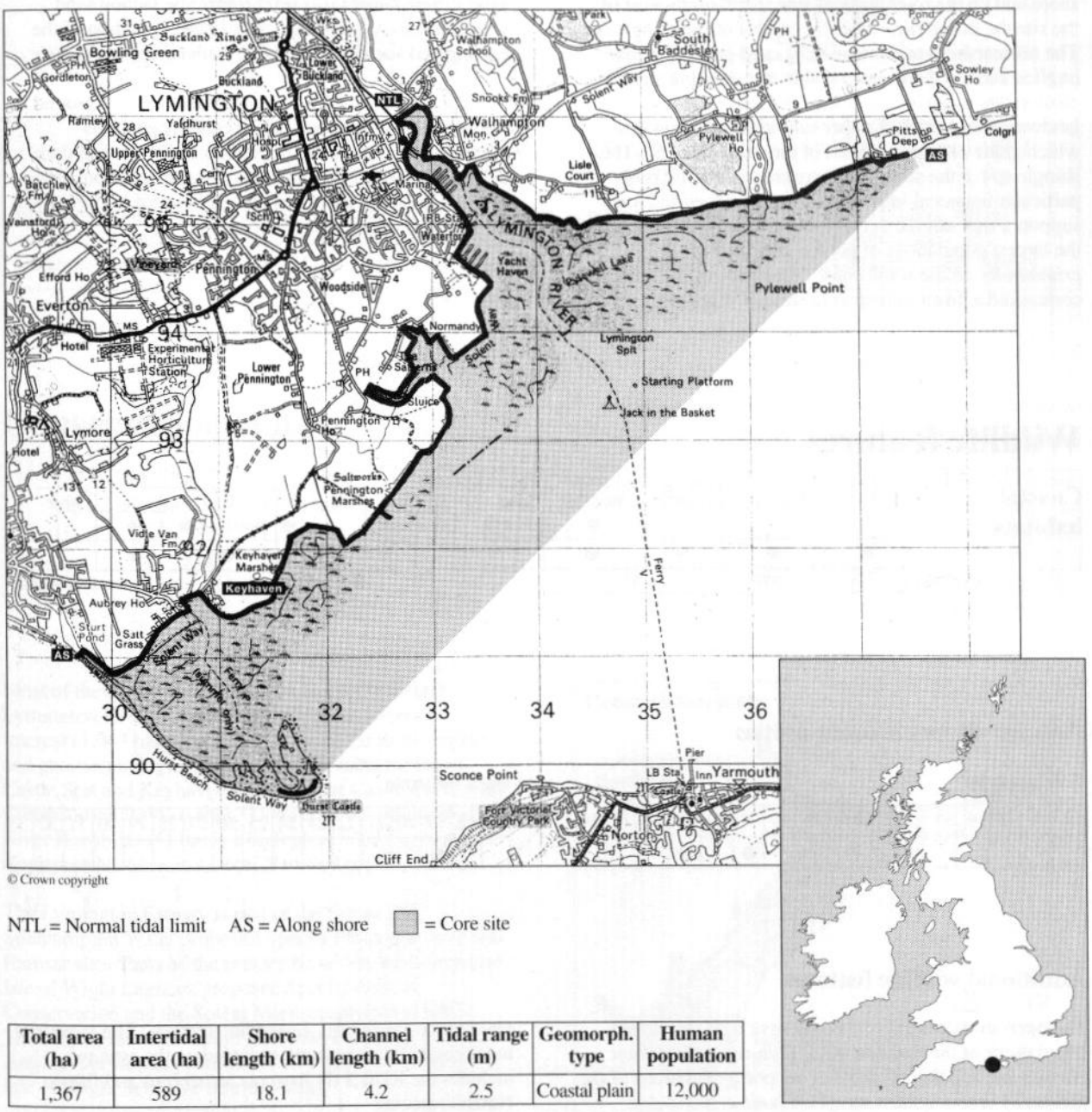
133 Lymington Estuary

Centre grid: SZ3395
County: Hampshire

District: New Forest
EN area: Hampshire & Isle of Wight

Review site location



NTL = Normal tidal limit AS = Along shore ▭ = Core site

Total area (ha)	Intertidal area (ha)	Shore length (km)	Channel length (km)	Tidal range (m)	Geomorph. type	Human population
1,367	589	18.1	4.2	2.5	Coastal plain	12,000

Description

The estuary of the Lymington River is a short, narrow channel that widens greatly as it reaches the sea. The site extends eastwards and westwards along the shore, and is bounded in the south-west by a well-developed shingle spit. Water quality in the estuary has been classified as grade A.

Around half the estuary is intertidal, of which the greater proportion is saltmarsh. The saltmarsh extends along the shore and up the river channel, and in the south-west of the site the marsh lies within the shelter of the shingle spit. The saltmarshes are dominated by cord-grass *Spartina anglica* and, on their seaward side, are showing signs of erosion due to wave action and *Spartina* die-back. To landward there are mid-upper saltmarsh communities which grade to grassland east of the main channel. The shingle spit at the south-west extreme of the site is of particular botanical importance, for the ridges and lows support a rich saltmarsh community which includes one of the largest populations of golden samphire *Inula crithmoides* on the south coast. Also present are transition communities from saltmarsh to shingle vegetation.

Historically the tidal silts of the Lymington were used as salterns, but were converted to grazing land in the early 19th century. Today these areas are one of the most extensive areas of brackish and freshwater marsh on the south coast and include saline, brackish and freshwater lagoons and ponds. Immediately inland of the sea walls that stretch from Lymington to Keyhaven there is a series of lagoons which are of national importance for the organisms they support. The fauna includes the lagoon sand shrimp *Gammarus insensibilis,* the lagoon sand worm *Armandia cirrhosa* and a large population of the endangered starlet sea anemone *Nematostella vectensis.*

The Lymington Estuary is an important feeding ground for waders, ducks and geese and it regularly supports internationally important populations of wintering dark-bellied brent geese and nationally important populations of black-tailed godwit. It is also of national importance for its breeding populations of terns.

Wildlife features

Coastal habitats

	Subtidal	Saltmarsh	Sandflats	Mudflats	Sand dunes	Rocky shores	Shingle	Lowland grassland	Lagoon	Other
	●	●	◉	●			●	●	●	
Area (ha)	778	506	83							

● = major habitat ◉ = minor habitat

Aquatic estuarine communities

Soft substrate

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
										●		●			

Hard substrate

17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33
		●														

Additional wildlife features

The open shingle areas of the spit have well-developed populations of the Red List plant little-robin *Geranium purpureum*, and the saltmarshes support populations of the nationally scarce golden samphire *Inula crithmoides*.

The invertebrate fauna of the lagoons includes the following specialist lagoonal species: the RDB 3 starlet sea anemone *Nematostella vectensis*, the RDB 3 lagoon sand shrimp *Gammarus insensibilis* and the nationally rare lagoon sandworm *Armandia cirrhosa*. The terrestrial invertebrate fauna recently recorded on the estuary includes the RDB 3 fly *Atylotus latistriatus* and fifteen Notable species.

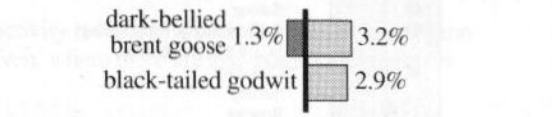
Reedbeds on the Lymington River support one of only two colonies of otters in Hampshire.

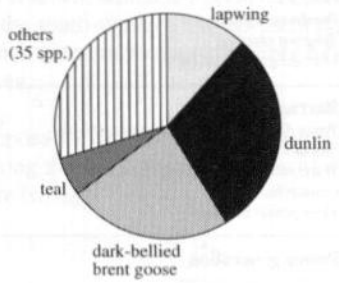
Birds

Wintering birds

1989/90 – 1993/94 data

Total waterfowl: 13,800





Wintering species assemblage
(Spp. forming >5% assemblage shown separately)

Breeding birds: there are breeding colonies of Sandwich terns, common terns and little terns on the estuary, whose numbers fluctuate. Large numbers of redshank and small numbers of oystercatcher breed on the saltmarshes, and moderate numbers of lapwing and small numbers of redshank and snipe breed on the grasslands adjacent to the estuary.

Conservation status

● = designated ● = proposed

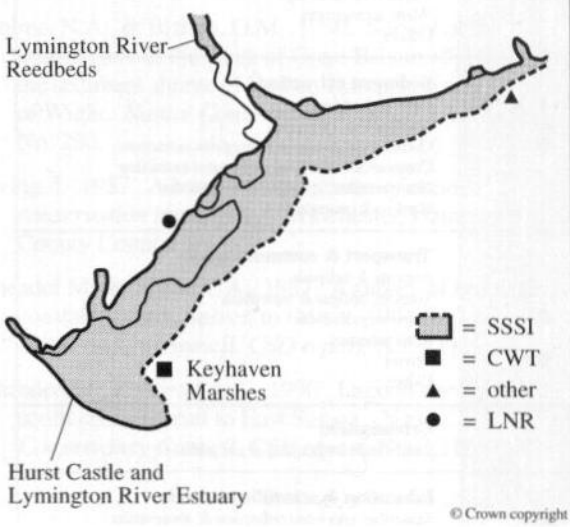
	NCR	GCR	SSSI (B)	SSSI (G)	SSSI (M)	NNR	LNR	Ramsar	SPA	SAC	AONB	CWT	RSPB	ESA	NP	WWT	NT	NSA	HC	Other
		●	●		●		●	●	●	●	●	●								●
No.		2	1		1		1	1	1	2	1	1								2

Most of the estuary lies within the Hurst Castle and Lymington River Estuary Site of Special Scientific Interest (1,044 ha), which is designated for its biological and geomorphological interest and contains the Hurst Castle Spit and Keyhaven Marsh, Hurst Castle Geological Conservation Review sites. Upriver of the site Lymington River Reedbeds (41 ha) is a biological SSSI. Lymington-Keyhaven Marshes is a Local Nature Reserve.

The Lymington Estuary is part of the Solent and Southampton Water proposed Special Protection Area and Ramsar site. Parts of the estuary lie within the Solent and Isle of Wight Lagoons proposed Special Area of Conservation and the Solent Maritime proposed SAC. The estuary also lies within the South Hampshire Coast Area of Outstanding Natural Beauty and the Solent and Isle of Wight Sensitive Marine Area.

The Hampshire and Isle of Wight Wildlife Trust have a reserve at Keyhaven Marshes and the Southampton Wildfowlers have a shooting lease over part of the foreshore.

Conservation status



Human activities (in 1993)

Present	Proposed	
		Coast protection & sea defences
●	●	Linear defences
		Training walls
●		Groynes
		Brushwood fences
		Spartina planting
		Marram grass planting
		Barrage schemes
●		Weirs & barrages for river management
		Storm surge barrages
		Water storage barrages & bunds
	●	Leisure barrages
		Tidal power barrages
		Power generation
		Thermal power stations
		Import/export jetties (power generation)
		Wind-power generation
		Industrial, port & related development
●		Dock, port & harbour facilities
		Manufacturing industries
		Chemical industries
●		Ship & boat building/repair
		Others
		Extraction & processing of natural gas & oil
		Exploration
		Production
		Rig & platform construction
		Pipeline construction
		Pipeline installation
		Import/export jetties & single-point moorings
		Oil refineries
		Mothballing of rigs & tankers
		Military activities
●		Overflying by military aircraft
		Others
		Waste discharge
●	●	Domestic waste disposal
		Sewage discharge & outfalls
		Sewage treatment works
		Rubbish tips
		Industrial & agricultural waste discharge
		Thermal discharges (power stations)
		Dredge spoil
		Accidental discharges
		Aerial crop spraying
		Waste incinerators
		Others
		Sediment extraction
	●	Capital dredging
●		Maintenance dredging
●		Commercial estuarine aggregates extraction
		Commercial terrestrial aggregates extraction
		Non-commercial aggregates extraction
		Hard-rock quarrying
		Transport & communications
		Airports & helipads
●		Tunnels, bridges & aqueducts
		Causeways & fords
●		Road schemes
		Ferries
		Cables
		Urbanisation
		Land-claim for housing & car parks
		Education & scientific research
●		Sampling, specimen collection & observation
		Nature trails & interpretative facilities
		Seismic studies & geological test drilling
●		Marine & terrestrial archaeology
		Fossil collecting

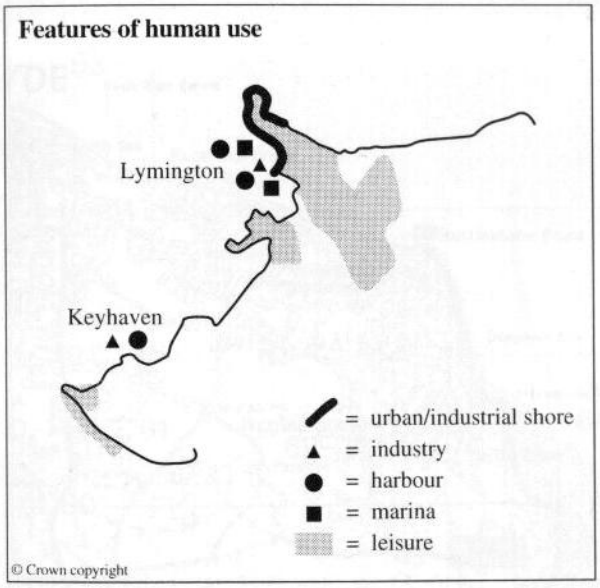
Present	Proposed	
		Tourism & recreation
		Infrastructure developments
●		Marinas
●		Non-marina moorings
●		Dinghy & boat parks
		Caravan parks & chalets
		Leisure centres, complexes & piers
		Aquatic-based recreation
●		Power-boating & water-skiing
		Jet-skiing
●		Sailing
●		Sailboarding & wind-surfing
		SCUBA & snorkelling
●		Canoeing
		Surfing
		Rowing
●		Tourist boat trips/leisure barges
●		Angling
		Other non-commercial fishing
		Bathing & general beach recreation
		Terrestrial & intertidal-based recreation
●		Walking, including dog walking
●		Bird-watching
		Sand-yachting
		4WD & trial-biking
		Car sand-racing
		Horse-riding
		Rock-climbing
		Golf courses
		Clay-pigeon shooting
		Others
		Airborne recreation
		Overflying by light aircraft
		Radio-controlled model aircraft
		Others
		Wildfowling & hunting
●		Wildfowling
		Other hunting-related activities
		Bait-collecting
●		Digging & pumping for lugworms & ragworms
		Hydraulic dredging for worms
		Others
		Commercial fisheries
●		Fish-netting & trawling
		Fyke-netting for eels
		Fish traps & other fixed devices & nets
		Crustacea
		Molluscs – Hand-gathering
		Dredging
		Hydraulic dredging
		Cultivation of living resource
		Saltmarsh grazing
		Sand dune grazing
		Agricultural land-claim
		Fish-farming
		Shellfish farming
		Bottom & tray cultivation
		Suspended cultivation
		Crustacea farming
●		Reeds for roofing
		Salicornia picking
		Others
		Management & killing of birds & mammals
		Killing of mammals
		Killing of birds
		Adult fish-eating birds
		Adult shellfish-eating birds
●		Gulls
●		Geese
		Wildlife habitat management
		Spartina control
		Habitat creation & restoration
		Marine
		Intertidal
		Terrestrial
●		Habitat management
		Others

Features of human use

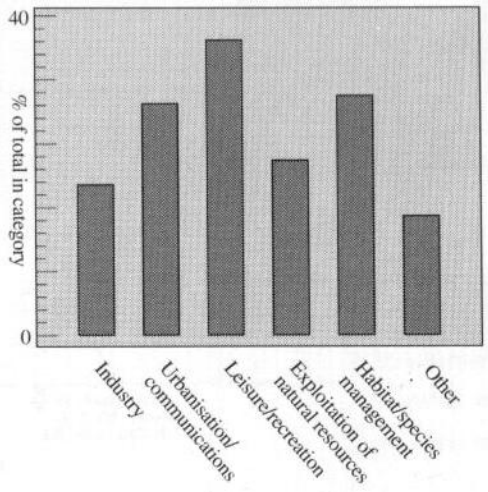
Leisure activities are most numerous, predominantly being water-based pursuits. Sailing is not intensive and occurs mainly from the marinas and dinghy parks within the estuary out into the Solent. Windsurfers use a very small area in the west of the estuary, and water-skiing occurs illegally east of the main channel. Beach recreation and angling is popular from Keyhaven and off the shingle spit.

Industrial activity includes harbour facilities at Lymington and Keyhaven, where there are also boat-building/repair yards. Exploitation of the natural resources involves reed-cutting from the Lymington reedbeds in the upper reaches of the estuary and bait-digging on the intertidal flats west of the main channel, which is intensive. Wildfowlers shoot over the south-western and northern parts of the estuary, which amounts to approximately half of the intertidal area.

In 1993 proposals included major reconstruction of the sea defences along the south-western shores of the estuary, and a leisure barrage.



Categories of human use



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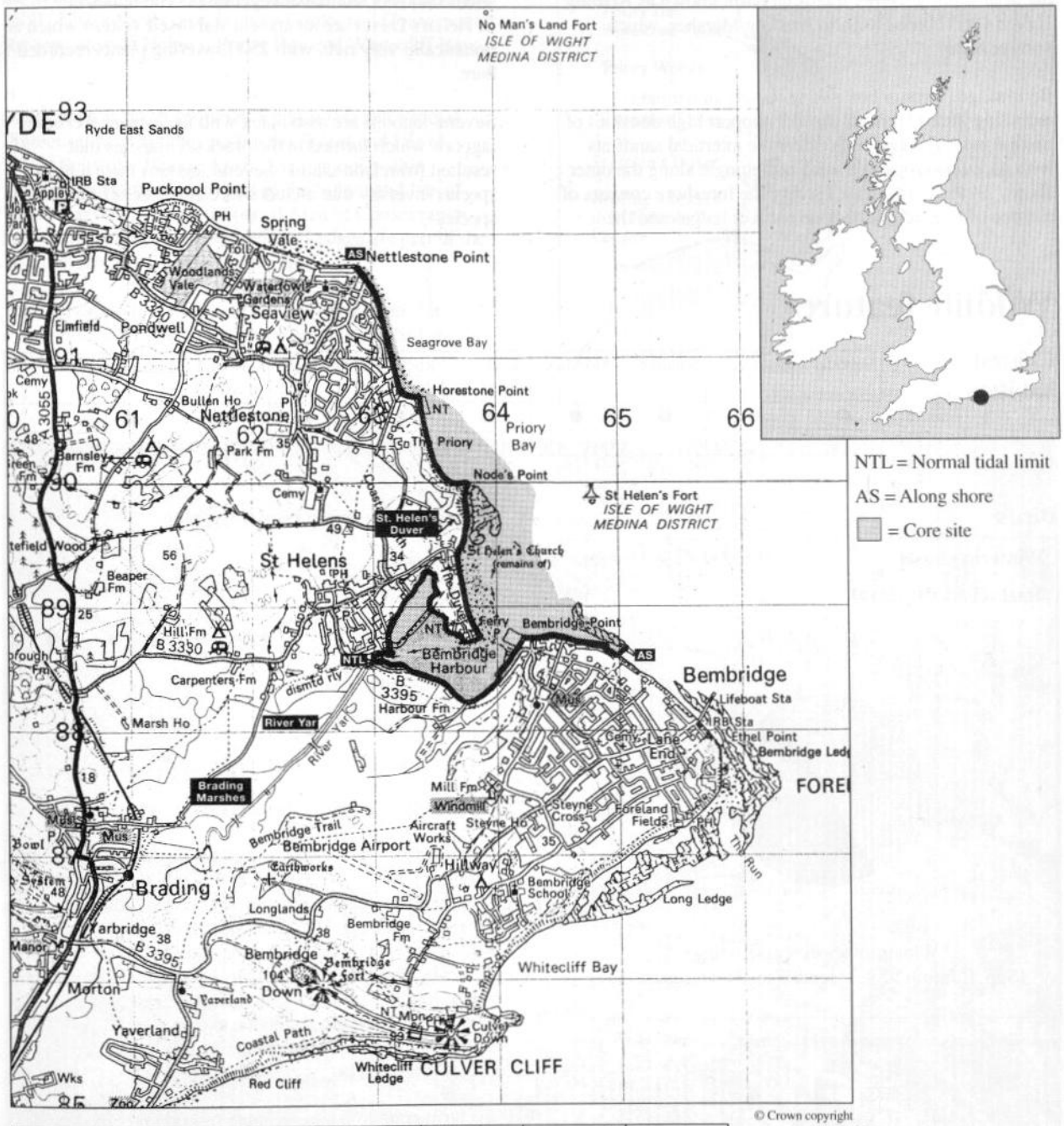
134 Bembridge Harbour

Centre grid: SZ6388
County: Isle of Wight

EN area: Hampshire & Isle of Wight

Review site location



Total area (ha)	Intertidal area (ha)	Shore length (km)	Channel length (km)	Tidal range (m)	Geomorph. type	Human population
158	130	7.7	2.3	3.1	Coastal plain	<5,000

Description

Bembridge Harbour is a small estuary of the river Yar that flows into the sea on the north-eastern shore of the Isle of Wight. The inner estuary is protected by the sand and shingle spits known as the Duver and Bembridge Point, and there is an area of intertidal foreshore which extends northwards along the coast to Nettlestone Point. Water quality of the estuary has been classified as grade A. Historically the estuary has undergone a series of land-claims. The River Yar has been canalised and in the 1870s the tidal silt of a former intertidal basin known as Brading Haven was claimed to form Brading Marshes, which survive today.

Bembridge Harbour has a wide variety of habitats including intertidal mudflats that support high densities of marine invertebrates, with extensive intertidal sandflats with rocky outcrops and sand-and-shingle along the outer shore. To the north of the estuary the foreshore consists of a series of intertidal limestone reefs or ledges and the sheltered, shallow waters of Priory Bay, has beds of *Zostera* eelgrass. This diversity of hard and soft coastal features support a rich flora and diverse marine invertebrate fauna.

The small sand and shingle spit of the Duver has developed from the northern bank of the estuary and has open shingle vegetation and dune grassland. Behind the sea wall there are low dunes with hollows containing small stands of saltmarsh vegetation. The dunes of St Helen's Duver are an ancient stabilised system which is botanically very rich, with 250 flowering plants recorded here.

Several lagoons are associated with the estuary including lagoons which formed in the brackish marshes that resulted from land-claim. Several lagoons have a high species diversity that includes rare and specialist lagoonal species.

Wildlife features

Coastal habitats

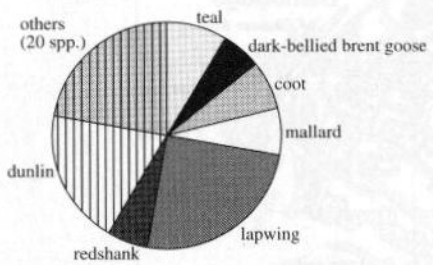
	Subtidal	Saltmarsh	Sandflats	Mudflats	Sand dunes	Rocky shores	Shingle	Lowland grassland	Lagoon	Other
	●	◍	●	●	●	●	●	●	●	
Area (ha)	28		130							

● = major habitat ◍ = minor habitat

Birds

Wintering birds 1989/90 – 1993/94 data

Total waterfowl: 3,000



Wintering species assemblage
(Spp. forming >5% assemblage shown separately)

Aquatic estuarine communities

Soft substrate

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
							●					●		●	

Hard substrate

17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33
		●									●					

Additional wildlife features

The nationally rare foxtail stonewort *Lamprothamnium papulosum* has been recorded in one of the lagoons and the lagoons are known to support several specialist lagoonal species including the shrimps *Corophium insiduosum* and *Palaemonetes varians* and large populations of the RDB 3 starlet sea anemone *Nematostella vectensis*. A number of scarce or uncommon benthic species are found on the shores around Bembridge, including the nationally rare bryozoan *Epistomia bursaria.*

The terrestrial invertebrate fauna recently recorded on the estuary includes the RDB 1 beetle *Paracymus aeneus,* the RDB 2 bee-wolf wasp *Philanthus triangulum* and a further 22 Notable species.

Conservation status

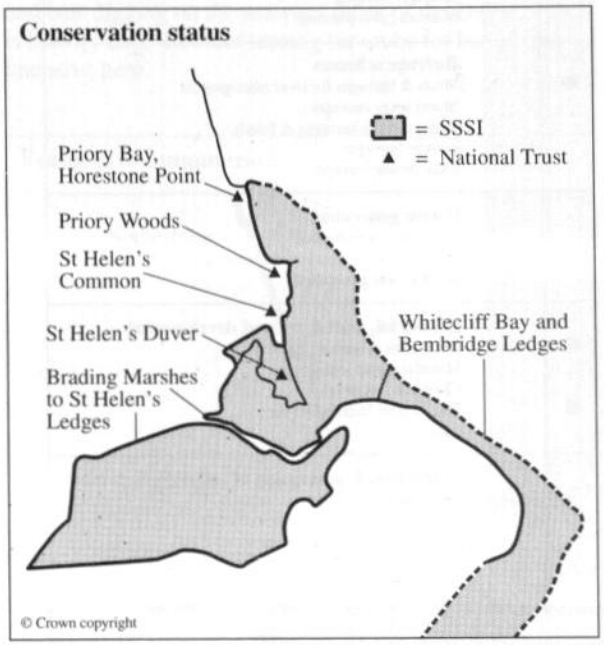
● = designated ● = proposed

	NCR	GCR	SSSI (B)	SSSI (G)	SSSI (M)	NNR	LNR	Ramsar	SPA	SAC	AONB	CWT	RSPB	ESA	NP	WWT	NT	NSA	HC	Other
		●			●			●	●	●							●			●
No.		3			2			1	1	2							4			1

Much of the estuary lies within the Brading Marshes to St Helen's Ledges (488 ha) Site of Special Scientific Interest which was designated for its biological and geological interest. Part of the outer estuary lies within the Whitecliff Bay and Bembridge Ledges (132 ha) mixed SSSI. These SSSIs contain three Geological Conservation Review sites: St Helen's, Priory Bay and Whitecliff Bay.

Bembridge Harbour forms part of the Solent and Southampton Water proposed Ramsar site and Special Protection Area and lies within the Solent and Isle of Wight Sensitive Marine Area. The lagoons within Bembridge Harbour form part of the Solent and Isle of Wight Lagoons proposed Special Area of Conservation and Whitecliff Bay and Bembridge Ledges are part of the South Wight Maritime proposed SAC.

The National Trust own land at Priory Bar, Horestone Point; Priory Woods; St Helen's Common and St Helen's Duver.



The seaweed *Fucus serratus* on the shore of Bembridge Harbour. (MNCR, JNCC)

Human activities (in 1993)

Present	Proposed	
●	●	**Coast protection & sea defences** Linear defences
●	●	Training walls Groynes
		Brushwood fences *Spartina* planting Marram grass planting
●		**Barrage schemes** Weirs & barrages for river management Storm surge barrages Water storage barrages & bunds Leisure barrages Tidal power barrages
		Power generation Thermal power stations Import/export jetties (power generation) Wind-power generation
●		**Industrial, port & related development** Dock, port & harbour facilities Manufacturing industries Chemical industries
●		Ship & boat building/repair Others
		Extraction & processing of natural gas & oil Exploration Production Rig & platform construction Pipeline construction Pipeline installation Import/export jetties & single-point moorings Oil refineries Mothballing of rigs & tankers
		Military activities Overflying by military aircraft Others
●		**Waste discharge** Domestic waste disposal
●		Sewage discharge & outfalls Sewage treatment works Rubbish tips Industrial & agricultural waste discharge
●		Thermal discharges (power stations) Dredge spoil Accidental discharges Aerial crop spraying Waste incinerators Others
●		**Sediment extraction** Capital dredging
●		Maintenance dredging
●		Commercial estuarine aggregates extraction
●		Commercial terrestrial aggregates extraction
●		Non-commercial aggregates extraction Hard-rock quarrying
●		**Transport & communications** Airports & helipads Tunnels, bridges & aqueducts
●		Causeways & fords Road schemes Ferries Cables
●		**Urbanisation** Land-claim for housing & car parks
●		**Education & scientific research** Sampling, specimen collection & observation Nature trails & interpretative facilities Seismic studies & geological test drilling Marine & terrestrial archaeology Fossil collecting

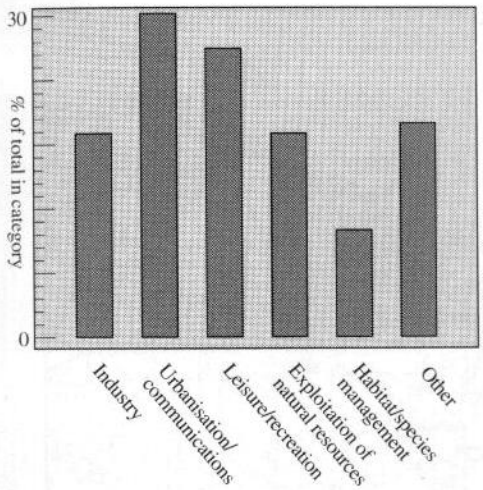
Present	Proposed	
		Tourism & recreation Infrastructure developments
●		Marinas
●		Non-marina moorings Dinghy & boat parks Caravan parks & chalets Leisure centres, complexes & piers Aquatic-based recreation Power-boating & water-skiing Jet-skiing
●		Sailing
●		Sailboarding & wind-surfing SCUBA & snorkelling Canoeing Surfing Rowing Tourist boat trips/leisure barges
●		Angling Other non-commercial fishing
●		Bathing & general beach recreation Terrestrial & intertidal-based recreation
●		Walking, including dog walking
●		Bird-watching Sand-yachting 4WD & trial-biking Car sand-racing Horse-riding Rock-climbing Golf courses Clay-pigeon shooting Others Airborne recreation Overflying by light aircraft Radio-controlled model aircraft Others
●		**Wildfowling & hunting** Wildfowling Other hunting-related activities
●		**Bait-collecting** Digging & pumping for lugworms & ragworms
●		Hydraulic dredging for worms Others
●		**Commercial fisheries** Fish-netting & trawling Fyke-netting for eels Fish traps & other fixed devices & nets Crustacea Molluscs – Hand-gathering Dredging Hydraulic dredging
		Cultivation of living resource Saltmarsh grazing Sand dune grazing Agricultural land-claim Fish-farming Shellfish farming Bottom & tray cultivation Suspended cultivation Crustacea farming Reeds for roofing *Salicornia* picking Others
		Management & killing of birds & mammals Killing of mammals Killing of birds Adult fish-eating birds Adult shellfish-eating birds Gulls Geese
		Wildlife habitat management *Spartina* control Habitat creation & restoration Marine Intertidal Terrestrial
●		Habitat management
		Others

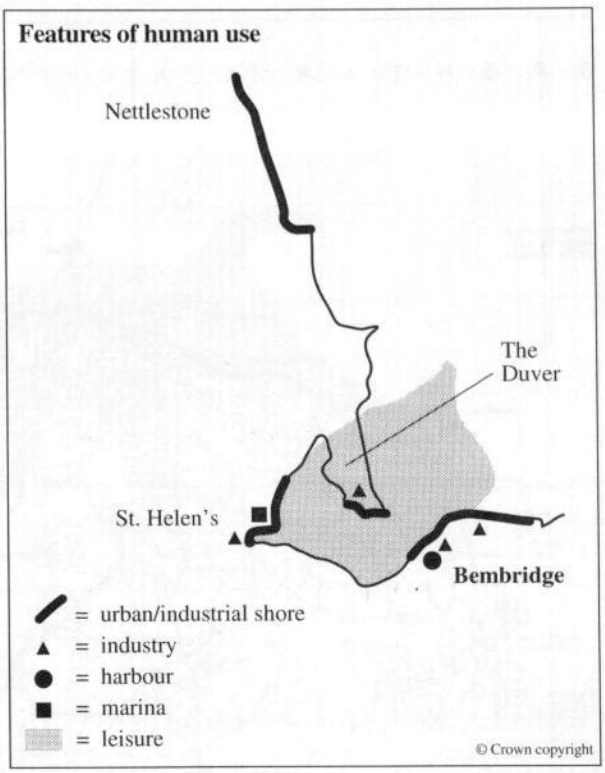
Features of human use

Leisure activities are the most numerous form of activity and include a marina and around 300 moorings across the south of the harbour. There are several sailing clubs in the area and sailing occurs in the harbour and out to sea. Beach recreation is intensive on the seaward side of the Duver, which is a focus for walkers.

Industrial activity includes the use of Bembridge Harbour by commercial fishing and sailing boats and there are three boat-building/repair yards around the harbour. Dredgings are disposed of in a lagoon behind the old railway embakments. Exploitation of the natural resources includes gathering cockles and winkles by hand, and bait-digging on the seaward shore of the Duver, which is heavily dug. Boulder turning for crabs for bait is also intensive here.

Categories of human use





Further reading

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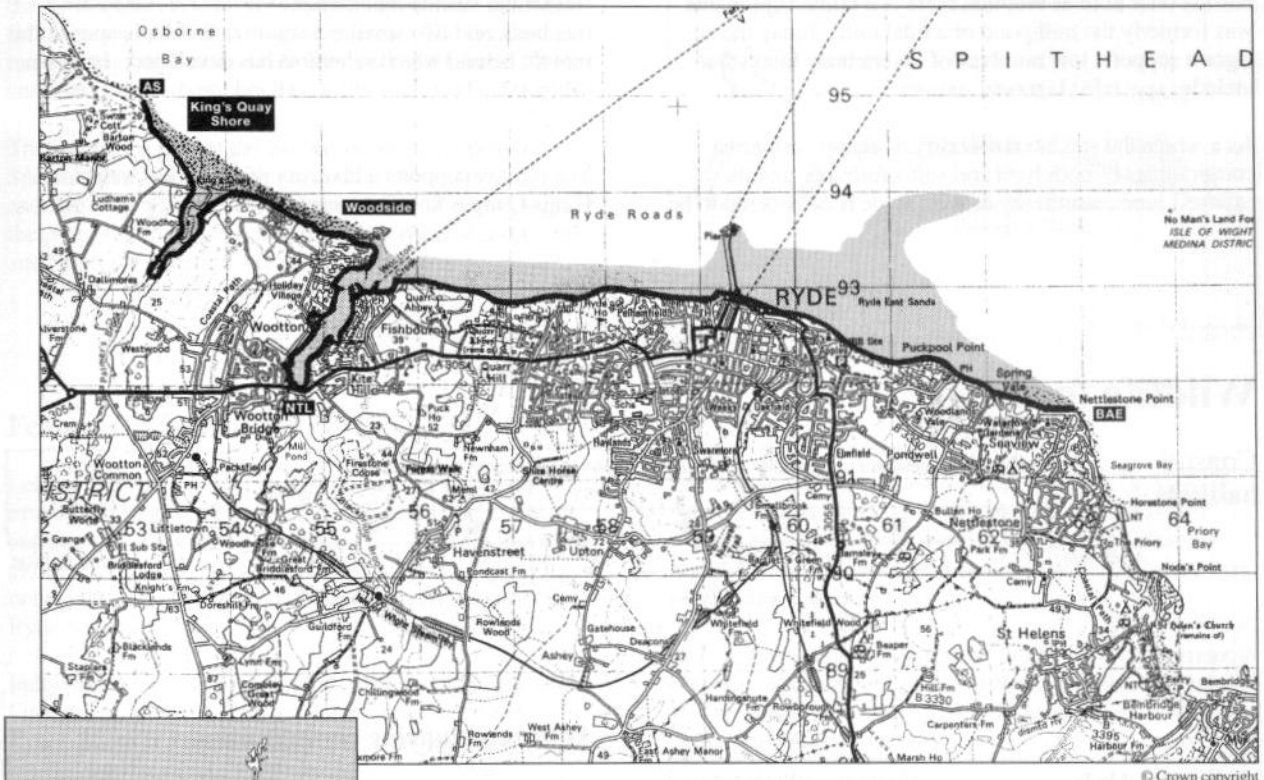
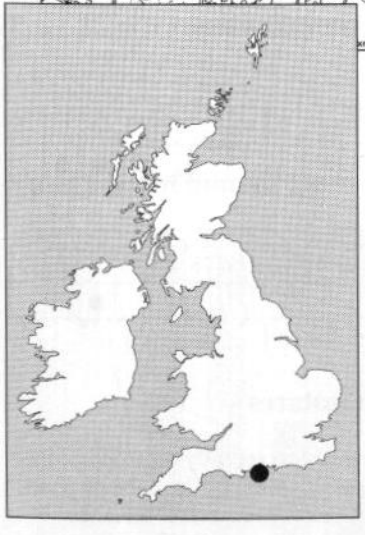
135 Wootton Creek and Ryde Sands

Centre grid: SZ5592
County: Isle of Wight

EN area: Hampshire & Isle of Wight

Review site location





NTL = Normal tidal limit AS = Along shore

BAE = Between adjacent estuaries = Core site

Total area (ha)	Intertidal area (ha)	Shore length (km)	Channel length (km)	Tidal range (m)	Geomorph. type	Human population
475	466	18.5	1.8	3.8	Coastal plain	19,000

Description

This site comprises the small estuary of Wootton Creek with the large intertidal foreshore that reaches from west of King's Quay (including the small estuary of Palmer's Brook) to Nettlestone Point, where it is adjacent to the Bembridge Harbour site. The water quality of the estuary has been classified as grade A.

Wootton Creek is the estuary of Blackburn Brook, where an area of mudflat is exposed at low tide. Upstream of the normal tidal limit at Wootton there is a saline lagoon that was formerly the mill pond of a tidal mill. Today the lagoon supports low numbers of invertebrate fauna, but includes specialist lagoonal species.

As a whole the site has a diversity of aquatic estuarine communities of both hard and soft substrates, and the exposed sand community at West Ryde is considered to be the best developed example in the Isle of Wight. In addition there are beds of *Zostera* eelgrass on the lower intertidal muds at King's Quay Shore.

Wootton Creek and Ryde Sands has a large area of intertidal foreshore, which to the west is a mixture of mud, shingle and sand. At King's Quay Shore the flats are predominantly muddy and the small estuary of Palmer's Brook has a great diversity of habitats including freshwater swamp that grades to extensive brackish reedbeds, and two small but significant shingle spits at the mouth, behind which saltmarsh has developed. In places, saltmarsh adjoins ancient woodland, producing a rare transitional habitat type.

The estuary supports a diversity of wintering waterfowl. Kings Quay is known to support a large curlew roost.

Wildlife features

Coastal habitats

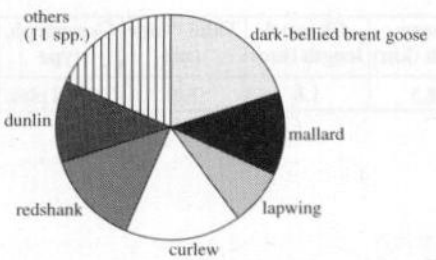
	Subtidal	Saltmarsh	Sandflats	Mudflats	Sand dunes	Rocky shores	Shingle	Lowland grassland	Lagoon	Other
	●	●	●	●		◉	●		●	
Area (ha)	9	14	452							

● = major habitat ◉ = minor habitat

Birds

Wintering birds 1989/90 – 1993/94 data

Total waterfowl: 750



Wintering species assemblage
(Spp. forming >5% assemblage shown separately)

Aquatic estuarine communities

Soft substrate

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
		●										●	●	●	

Hard substrate

17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33
		●		●										●		

Additional wildlife features

The terrestrial invertebrate fauna recently recorded on the estuary includes four Notable species. The old mill pond lagoon supports the tentacled lagoon worm *Alkmaria romijni* which is protected under the Wildlife and Countryside Act (1981), and a specialist lagoonal species, the shrimp *Palaemonetes varians*.

Conservation status

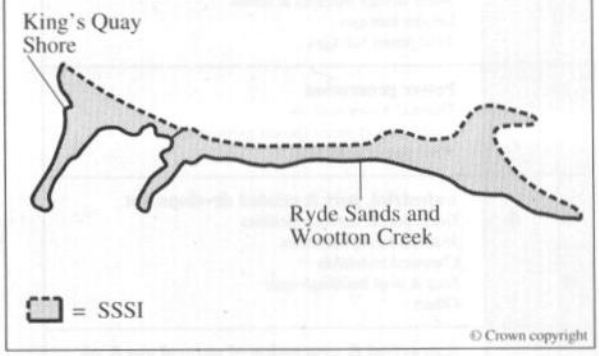
● = designated ● = proposed

	NCR	GCR	SSSI (B)	SSSI (G)	SSSI (M)	NNR	LNR	Ramsar	SPA	SAC	AONB	CWT	RSPB	ESA	NP	WWT	NT	NSA	HC	Other
		●	●		●			●	●	●										●
No.		2	1		1			1	1	1										1

The site lies within the Ryde Sands and Wootton Creek (424 ha) biological Site of Special Scientific Interest and the King's Quay Shore (97 ha) SSSI which was notified for its biological and geological interest. The site contains two Geological Conservation Review sites, Chapel Corner and Kings Quay.

The site forms part of the Solent Maritime proposed Special Area of Conservation, and lies within the Solent and Isle of Wight Sensitive Marine Area. It is also within the proposed Solent and Southampton Water Ramsar site and Special Protection Area.

Conservation status



Features of human use

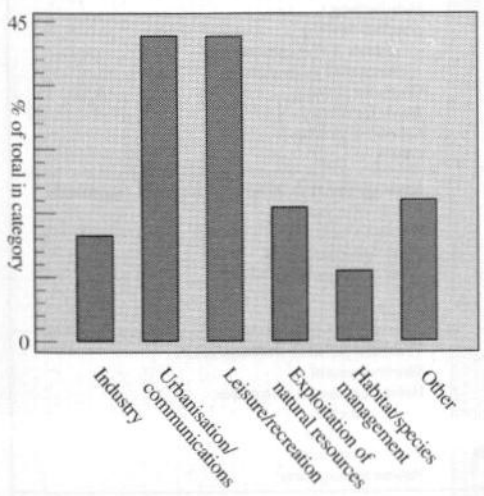
Leisure activities are the dominant form of activity on the estuary, with power-boating and sailing and there is an outdoor activities centre at Woodside. There are moorings along both shores of Wootton Creek, where sailing is the only significant water sport. Beach recreation occurs on Ryde Sands and Woodside.

Industrial activity is very limited, with port facilities at the Fishbourne ferry terminal and a hovercraft terminal at Ryde. There is a small boat yard at Wootton Bridge.

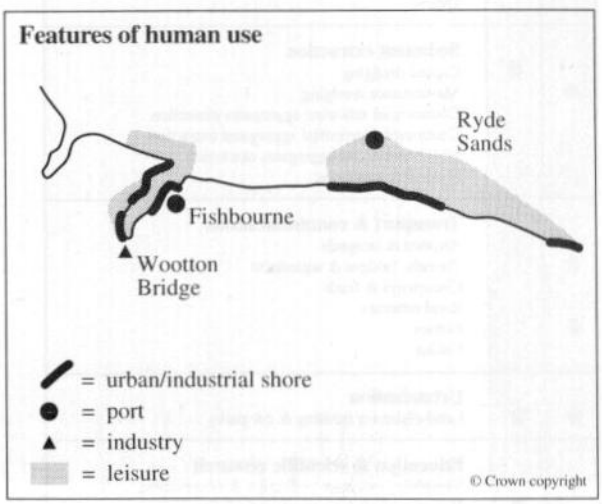
Exploitation of the natural resources include large-scale collection of winkles, bait-digging at Ryde Sands and boulder turning for crabs for bait which is not intensive. Some wildfowling is known to occur in the upper reaches of Wootton Creek.

In 1991 there was a proposal for holiday redevelopment at Wootton which would involve habitat creation, a nature trail and conference centre. In 1996 these were still under consideration.

Categories of human use



Features of human use



Human activities (in 1991)

Present	Proposed	
		Coast protection & sea defences
●		Linear defences
		Training walls
●		Groynes
		Brushwood fences
		Spartina planting
		Marram grass planting
		Barrage schemes
●		Weirs & barrages for river management
		Storm surge barrages
		Water storage barrages & bunds
		Leisure barrages
		Tidal power barrages
		Power generation
		Thermal power stations
		Import/export jetties (power generation)
		Wind-power generation
		Industrial, port & related development
●	●	Dock, port & harbour facilities
		Manufacturing industries
		Chemical industries
●		Ship & boat building/repair
		Others
		Extraction & processing of natural gas & oil
		Exploration
		Production
		Rig & platform construction
		Pipeline construction
		Pipeline installation
		Import/export jetties & single-point moorings
		Oil refineries
		Mothballing of rigs & tankers
		Military activities
		Overflying by military aircraft
		Others
		Waste discharge
●		Domestic waste disposal
●		Sewage discharge & outfalls
		Sewage treatment works
		Rubbish tips
		Industrial & agricultural waste discharge
		Thermal discharges (power stations)
		Dredge spoil
		Accidental discharges
		Aerial crop spraying
		Waste incinerators
		Others
		Sediment extraction
●	●	Capital dredging
		Maintenance dredging
		Commercial estuarine aggregates extraction
		Commercial terrestrial aggregates extraction
		Non-commercial aggregates extraction
		Hard-rock quarrying
		Transport & communications
●		Airports & helipads
		Tunnels, bridges & aqueducts
		Causeways & fords
		Road schemes
●		Ferries
		Cables
		Urbanisation
●	●	Land-claim for housing & car parks
		Education & scientific research
●		Sampling, specimen collection & observation
	●	Nature trails & interpretative facilities
		Seismic studies & geological test drilling
		Marine & terrestrial archaeology
		Fossil collecting

Present	Proposed	
		Tourism & recreation
		Infrastructure developments
●		Marinas
●		Non-marina moorings
●		Dinghy & boat parks
●		Caravan parks & chalets
●	●	Leisure centres, complexes & piers
		Aquatic-based recreation
●		Power-boating & water-skiing
		Jet-skiing
●		Sailing
●		Sailboarding & wind-surfing
●		SCUBA & snorkelling
●		Canoeing
		Surfing
		Rowing
		Tourist boat trips/leisure barges
●		Angling
		Other non-commercial fishing
●		Bathing & general beach recreation
		Terrestrial & intertidal-based recreation
●		Walking, including dog walking
●		Bird-watching
		Sand-yachting
		4WD & trial-biking
		Car sand-racing
●		Horse-riding
		Rock-climbing
		Golf courses
		Clay-pigeon shooting
		Others
		Airborne recreation
		Overflying by light aircraft
		Radio-controlled model aircraft
		Others
		Wildfowling & hunting
		Wildfowling
		Other hunting-related activities
		Bait-collecting
●		Digging & pumping for lugworms & ragworms
		Hydraulic dredging for worms
●		Others
		Commercial fisheries
		Fish-netting & trawling
		Fyke-netting for eels
		Fish traps & other fixed devices & nets
		Crustacea
●		Molluscs – Hand-gathering
		Dredging
		Hydraulic dredging
		Cultivation of living resource
		Saltmarsh grazing
		Sand dune grazing
		Agricultural land-claim
		Fish-farming
		Shellfish farming
		Bottom & tray cultivation
		Suspended cultivation
		Crustacea farming
		Reeds for roofing
		Salicornia picking
		Others
		Management & killing of birds & mammals
		Killing of mammals
		Killing of birds
		Adult fish-eating birds
		Adult shellfish-eating birds
		Gulls
		Geese
		Wildlife habitat management
		Spartina control
		Habitat creation & restoration
		Marine
●		Intertidal
●	●	Terrestrial
		Habitat management
		Others

Further reading

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