CHANGES IN RYE BAY

A REPORT OF THE INTERREG II PROJECT

TWO BAYS, ONE ENVIRONMENT
a shared biodiversity with a common focus

THIS PROJECT IS BEING PART-FINANCED BY
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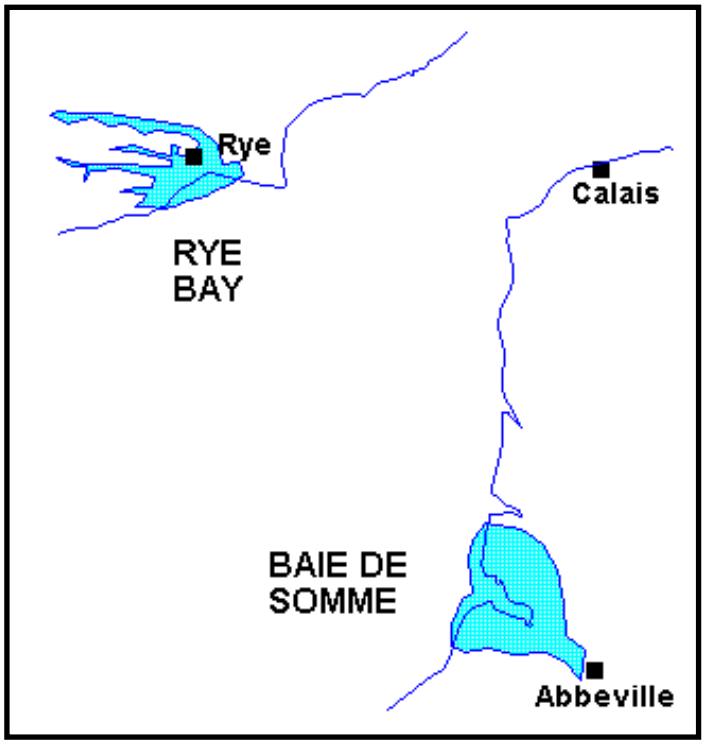

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Introduction

This is a report of the Two Bays, One Environment project which encompasses areas in England and France, adjacent to, but separated by the English Channel or La Manche. The Baie de Somme (50°09'N 1°27'E) in Picardy, France, lies 90 km to the south east of Rye Bay (50°56'N 0°45'E) in East Sussex, England.

Previous reports of this project are ……

- A Preliminary Comparison of the Species of Rye Bay and the Baie de Somme. 1998
- Conservation of Natural Environments and their opening to the Public. 1999
- A Workshop on Countryside Management in Rye Bay and the Baie de Somme. 1999
- The Habitats of Rye Bay. 2000

Rye Bay has undergone enormous changes in pre-historic and historic times and even within living memory. This report aims to summarise the information available so that there is a common understanding of how man has modified natural processes. A "timeline" has been used to put the events in chronological order and a selection of maps is given later in this report.

We are fortunate that the project area is part of the Romney Marshes because that larger area has a wealth of published material and it has been the focus of interest by the Romney Marsh Research Trust which has generated many detailed reports and papers. These have been produced in three monographs.

Romney Marsh: Evolution, Occupation, Reclamation (Oxford University Committee for Archaeology 24) Edited by Jill Eddison and Christopher Green 1988.

Romney Marsh: The Debatable Ground (Oxford University Committee for Archaeology 41) Edited by Jill Eddison 1995.

Romney Marsh: Environmental Change and Human Occupation in a Coastal Lowland (Oxford University Committee for Archaeology 46) Edited by Jill Eddison, Mark Gardiner and Antony Long 1998.

The most recent summary of the current knowledge is the book "Romney Marsh – survival on a frontier" by Jill Eddison 2000.

The changes in the Baie de Somme have been examined in the project report Les Amenagements littoraux et leurs impacts en Plaine Maritime Picarde by S. Hamiot 1999 which shows similar patterns to the changes of Rye Bay.

The content of this report is not complete and some may be considered inaccurate. If you have any notes of errors or omissions I would welcome your input for an updated version.

Thank-you.

Barry Yates
December 2000

Location

Rye Bay occupies the river valleys and the coast around the Cinque Port town of Rye and corresponds to the East Sussex part of English Nature's "Romney Marshes Natural Area", see slide 1. The priority area is limited by the East Sussex / Kent County boundary, the extreme low water mark and the 10 metre contour line - covering some 91 km^2, see slide 2.

The "Romney Marshes" is a well known name for one of the largest coastal marshes in England. It extends for 32km from the cliffs at Hythe in Kent to the cliffs at Fairlight in East Sussex, going inland to the old cliff line and up the valleys of several rivers – covering some 270 km^2 in total. The coast is dominated by great shingle ridges and the levels are drained by a complex of ditches that flow into the Royal Military Canal, the rivers and eventually the sea.

The project area has several national wildlife designations, Sites of Special Scientific Interest shown on slide 4, Area of Outstanding Natural Beauty (shown on slide 5) and Sites of Nature Conservation Importance (shown on slide 6).

The changes in the coastline have been dramatic and I have tried to summarise them in slides 7 to 11, and previous suggestions are given in slides 12 to 17.

The area has been repeatedly mapped from 1579 and a selection of the most informative ones are given in slide 21 to 46.

Geography

A full and very detailed analysis of the area's geology is given by the British Geological Survey in Lake and Shephard-Thorn (1987), on which the following is based.

The high ground surrounding Rye Bay is the eastern extremity of the High Weald which is made up of much faulted strata of the Hastings Beds. Rye Bay is characterised by the wide expanse of reclaimed coastal marshland (approx. 3m. above OD – Ordnance Datum) with shingle ridges (approx. 5m above OD) and sand dunes (approx. 10m. above OD) rising only a few metres above them.

The higher ground is mainly composed of the relatively older Ashdown and Purbeck Beds, whereas the lower areas on its flanks are underlain by Wadhurst Clay and Tunbridge Wells Sand. The major river valleys have broad alluvial floodplains up to 1km wide, but in contrast, the headwaters and lateral streams of the rivers tend to have short, steep watercourses. Outcrops of hard sandstones, limestones and ironstones in these streams give rise to miniature gorges and waterfalls.

Offshore, the submarine relief appears to be very gentle, with the sea bed sloping gently to 18 m (10 fathoms) across a broad shelf up to 10km wide. Beyond the 10 fathom line the depth increases more rapidly. The cuspate shingle foreland of Dungeness extends to the edge of the shelf and it appears that the eastward growth has been limited by the deeper water. The bedrock of Ashdown Beds in Rye Bay forms an undulating surface at 25m. and 35m. below OD. There are a number of bifurcating channels (to 45m. below OD) incised into the bedrock lying north-west to south-east up to 500m wide which may be extensions of the river valleys of Rother, Tillingham, Brede and Pannel. (Dix, Long and Cooke98)

Rye Bay is a regional centre of sediment deposition in the eastern English Channel. **There is no reworked shingle** in the seabed of Rye Bay; the bed is a seaward prograding shelf sand body (layers of sand dipping down away from the land) in excess of 30m. deep. The morphology of the bay appears to be controlled by this sand body that has subsequently been truncated as the shingle foreland developed and migrated east under the influence of waves from the south-west. Rye Bay lies at the eastern end of the English Channel, one of the stormiest seas in the Europe, and experiences the type of high-energy wave conditions required for shelf sand body development. (Dix, Long and Cooke, 1998).

There was a westward movement of shingle along the coast of Sussex and eastward from Dungeness, filling in the Bay (Eddison, 1998).

Changes in Sea Level

During the last Ice Age the permanent ice did not extend as far south as Rye Bay. The water locked up in the Ice Age glaciers produced, about 25,000 years ago, a sea level at least 100m lower than the present. Later the melting of the ice raised the sea level to its present mark, and the ecologically important land bridge across the Strait of Dover finally was submerged about 8,000 years ago. As the "North Sea" filled, there was a breakdown (that has been termed catastrophic) in the land bridge which gave rise to the mass of shingle deposits in the English Channel.

Towards the end of the last Ice Age, some 10,000 years ago the last great ice sheets thinned, retreated, and disappeared. The water locked up in the ice was returned to the oceans which therefore increased in level. The rapid sea level rise about 12,000 years ago may represent the major decay of the Scandinavian Ice Sheet. However, not all of the sea level rise can be explained by ice sheet decay. Thermal expansion of ocean waters and isostatic uplift of the shallow North Sea and Hudson Bay (spilling their water into the larger oceans), are the most likely explanations.

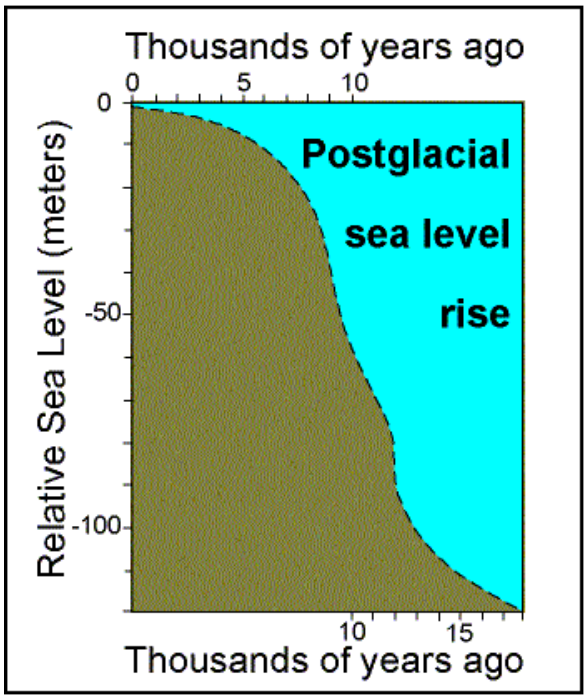
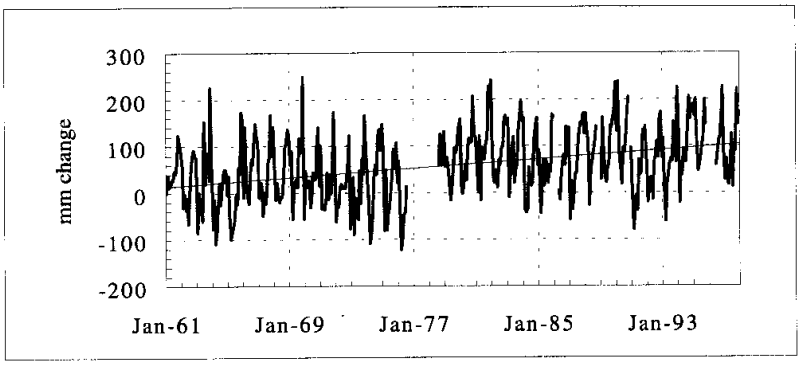


Fig 1. Postglacial sea level rise. Radiocarbon dating of drowned reefs, swamps, coastal features, and river channels allows the reconstruction of both the rapid decay of ice sheets and the gradual climb to present sea level. by: Josh Robino & Adam N. Pedone Chandler at www.gemini.oscs.montana.edu/~geol445/hyperglac/eustasy1/

The relative rise in sea level (that is the local relationship between the land and the sea) has continued because there has been a subsiding of the land in south-east Britain. From 5000 BP until now, the south-east Britain has been subsiding at the rate of 1.2mm. a year as northern Britain has continued to rise following the release of the mass of the ice sheet of the last glaciation.

Relative sea level rise is rapid (2.2 mm.year^{-1} 1961-98) as continued subsidence is combined with climate warming, influenced by man's activities, which will release further water from the ice sheets and the sea water expands on warming.



Source: Proudman Oceanographic Laboratory

Fig. 2 Sea level at Dover (EA, 1999)

A Timeline of Rye Bay.

270 million - 1 million years before present (BP)

The contemporary English Channel is probably the result of a complex structural downfolding dating from the mid-Tertiary (about 40 million years ago), although signs of a downwarp tendency occur as early as 270 million years ago. The direct ancestor of the channel may well have been a sea occupying the downfold one to two million years ago, with a sea level 200m. higher than the present level.

450,000-25,000 years BP

The greatest influence on Rye Bay is the sea and its changing levels. Great changes in climate with a series of alternating cold *glacial* and warmer *interglacial* periods. Although the permanent ice itself never reached as far south as East Sussex, it was not far away and had a profound effect. During the warmer interglacial periods the melting of the ice resulted in sea-level rising, sometimes to levels much higher than today.

Before the Anglian glaciation (about 450,000 years ago), East Sussex was joined to France by a substantial land-bridge. This was eventually breached by water overflowing from an ice-dammed lake in the southern North Sea. As this lake filled there was a breakdown (that has been termed catastrophic) in the land bridge which gave rise to a mass of shingle deposits in the English Channel.

The rivers of Rye Bay originally flowed into an embayment, south-west of the early land bridge, and later into a “Channel river”, flowing south of the present Sussex coastline (Smith 1989, Hamblin 1992).

25,000 – 10,000 years BP

The withdrawal of water by the Pleistocene glaciers produced, about 25,000 years ago, a sea level at least 100m. lower than the present and there was an ice sheet over a kilometre thick over Scotland and north-west England The rivers from the High Weald deeply eroded the bedrock of Ashdown Beds, so that today in the Rother Valley at Blackwall the river is some 28m. above the bedrock. The rivers also extended further, so that today out in the bay there are a number of channels (to 45 m. below OD) incised into the bedrock lying north-west to south-east up to 500m wide.

With warming climatic conditions, Britain once more became suitable for more plants and animals (including man) which crossed the bed of the North Sea, now left largely dry by low sea-levels.

10,000 – 5,000 years BP

As the sea level continued to rise the ecologically important land bridge was finally submerged about 8,000 years ago. This halted the colonisation of East Sussex by plants and animals from France, unless they could swim, fly, float or be transported by man.

Rising sea-levels (but still some 10-50m. lower than today) would have flooded the lower reaches of the rivers, leading to the growth of peat in these locations. The study of these peat deposits has provided a picture of the vegetation, and the nature and chronology of sea-level rise and coastal change. One of the deepest sequences, so far investigated, has been at Pannel Bridge (Waller, 1993), on Pett Level near Winchelsea. Here there are over 11 metres of organic sediments, extending back over 10,000 years, and providing an unparalleled record of the vegetational history of the area. The Pannel valley slopes were wooded with Pine (*Pinus*) and deciduous trees particularly Hazel (*Corylus*), Oak (*Quercus*) and Lime (*Tilia*). In the narrow floodplain the marsh alternated between Alder (*Alnus*) and Sedges (*Cyperacea*) responding to changes downstream where estuarine environment (Waller, 1988).

5,000 - 2,000 years BP

In the high energy environment of Rye Bay the wave action built up a protective shingle barrier from Fairlight to Hythe, enclosing the Bay. As sea level rose quickly, up to 4,000 years BP, the waves brought up shingle from what is now the seabed. The shingle material was derived from the south-west and the barrier migrated landwards under the rising relative sea level. (Eddison 1998).

Behind the great shingle barrier the Rye Bay area became a fresh water marsh, protected from the marine environment. This freshwater marsh led to the formation of peat (see below). The exit for freshwater would have been near Romney. For the barrier to survive for this period there must have been a good supply of material, sufficient to replace that migrating eastward, producing the promontory of Dungeness.

The peat that formed in the freshwater marsh still exists beneath the land of much of Rye Bay, but can only be seen today as the exposed “drowned forest” on the foreshore at Pett Level. Under these freshwater conditions peat started to be deposited as far west as Scotney Marsh by 3,900 BP, but by 3,200 BP marine conditions had returned there due to expansion of the tide inlet from the east.

In the lower Rother valley freshwater fen carr, dominated by Alder (*Alnus* sp.) prevailed on the valley floor. Sedimentation in the Rother valley indicates marine inundation there occurred about 2,300 BP (Long and Waller, 1998).

In late Iron Age the area was cut off from the main centres of innovation (Cunliffe, 1988).

1st – 5th Century

The rivers Brede, Rother, Tillingham and Pannel would have flowed eastwards into a broad expanse of small islands and a network of tidal creeks and salt-marsh channels, (Tooley, 1990). The Roman roads, that skirt this area, cross the rivers and their smaller tributaries, at points close to their tidal limit. A good example of this is the Roman settlement and river crossing point at Bodiam.

140 - 430 AD

The sea returned to the back barrier marshland, probably through inlets to the barrier at Hythe and Romney.

6th – 10th Century

The tides flowed many miles inland to Newenden. Rectangular excavations in the exposed peat of Pett Level shore may represent the remains of Medieval peat digging (see plate 5 in Eddison, 2000).

11th Century

Settlements were growing along the coast and rivers as trade with France was carried by boat. One such settlement was Old Winchelsea (perhaps just south of present day Rye Harbour) which developed on the shingle barrier. There was erosion of the coastline as shingle in the linear barrier migrated eastward and out towards what is now the Dungeness headland. This left a thinning barrier of shingle from Fairlight.

1031

The Saxon manor of *Ramelsie*, which extended eastward from Hastings, was granted by King Canute to the Abbey of Fécamp in Normandy.

1086

The Domesday Book recorded an exceptional number of 100 salt-works around Rye and Old Winchelsea demonstrating the level of human activity.

12th Century

There was a rapid growth in the population of England which generated a demand for land and the supply of food and clothing. This was a period of colonisation encouraged by the protection of the barrier shingle. Large areas of marshes (behind the shingle barrier) were enclosed by a process called “inning”. These innings were created by building up earth banks on the relatively sheltered saltmarshes.

1100

Walland Marsh was a vast expanse of saltmarsh, a backwater protected by the shingle barrier from Cliff End to Lydd with the sea gaining entry from near Romney.

1190

Rye and Old Winchelsea had joined the Cinque Ports and their prosperity further increased from 1200 - both towns were centres of shipbuilding and until 1243 both had royal dockyards with Rye being the smaller.

1197
The marshes (part of Pett Level) between Old Winchelsea and Clivesend (Cliff End) was granted to Robertsbridge Abbey and in 1210 the Abbey received further land below Rye.

1199
The Hope Marsh in the Brede Valley was inned.

13th Century

The calm period from 1100 – 1230s, was followed by 60 years of extreme weather conditions with storms events in 1236, 1250-2 and 1287-8 which completely changed the situation.
At the beginning if the century all seemed well, with the Doleham valley land improved and in the Brede Valley the land below Udimore was improved, drained land (Gardiner, 1995).

1206
Ellis de Rye had drained land at Broomhill and inned land in Brede valley. John de Guestling was enclosing land on the south of the Brede valley, to Old Winchelsea and beyond to Jury's Gut in Broomhill. (Gardiner, 1995). A road linked Old Winchelsea with Broomhill and Romney (Eddison, 1998) .

1222
A large area of Broomhill was claimed by the Battle and Robertsbridge Abbeys inning a further 570ha.

1234
Robertsbridge monks were allowed to reclaim the saltmarshes east of Rye (described as pasture and land, fresh and salt from the road by the chapel of Broomhill to the port of Old Winchelsea between the arable and shingle to the sea) Eddison, 1998.

1236
There was concern about the strength of sea defences at Old Winchelsea.

1240
At Seddlescombe ditching drained the Brede Valley and a mill was installed near the bridge. (Gardiner, 1995).

1244
At Old Winchelsea levies were imposed on imports to pay for improvements to the sea defences.

1247
Henry III took Old Winchelsea back into English control after more than 200 years.

1249
The Crown granted funds to repair the sea wall - Old Winchelsea £86 and Rye £46.

1250
There was concern about the strength of sea defences of the eastern Brede Valley, which was described as an open estuary as far west as Guestling.
Old Winchelsea was described by Matthew Paris as "*a very necessary town to England and especially London*" as it did much trade with France and landed much fish. He described a significant storm…….. *"On the first day of October, 1250, the moon upon her change, appearing exceeding red and swelled, began to show tokens of the great tempest of wind that followed, which was so huge and mighty both by land and sea, that the like had not been known, by men then alive. The sea, forced contrary to his natural course, flowed twice without ebbing, yielding such a roaring, that the same was heard (with great wonder) a far distance from the shore. Moreover, the same sea appeared in the dark on the night to burn as*

it had been on fire, and the waves to strive and fight together after a marvellous sort, so that the mariners could not devise how to save their ships where they lay at anchor. At Winchelsey, besides other hurt that was done in bridges, mills and banks, there were 300 houses and some churches drowned with the rising of the water.' (Luard 1872-83, 1880)"

1251

In March two officials were sent by the Crown to determine if Old Winchelsea and surroundings (ie Pett Level and Brede valley) could be saved from flooding. (Eddison, 1998)

1252

On 15th January there was a second storm, again described by Matthew Paris *"A raging east wind and an angry south-westerly wind occasioned much damage…….At the harbour of (Old) Winchelsea,……the waves of the sea……..covered such places adjacent to the shores and drowned many men."*

1253

There was further flooding and crops failed.

1258

Sea water was running up to Appledore and was diverted to sea at Romney. (Eddison, 1998)

1261

The sea had breached between Old Winchelsea and Lydd (the journey now involved a sea crossing) (Eddison, 1998)

1262

The sea constantly threatened Old Winchelsea.

1271

Old Winchelsea church was carried away in flood after the sea defences beside it were carried away by a storm.

1280

Old Winchelsea was part submerged by the sea in November. With this gradual demise of Old Winchelsea there was time to plan. In 1280 the new town of Winchelsea was founded near the village of Iham by Edward I on a hilltop nearby and by 1283 the layout was planned, with most building completed by 1292. There was a new harbour for the town on the river Brede.

1287

A great storm altered the course of the River Rother. The river no longer entered the sea near New Romney, but emerged near Rye. This broke through the great spit of shingle on which stood Old Winchelsea and isolated it.

1288

On 4th February the sea rose to cover all of the land up to the Great Wall which extended from Appledore to Broomhill. Most of the land to the south and west would have been tidal and this would have allowed deposit of sediments and thereby raised the level of the ground. Further serious flooding in the Brede and Rother valley and Walland Marsh. (Eddison, 1998)
The marsh of Whitefleet, south of Cadborough cliff was flooded for 15 years until 1302 when John Thomas reinclosed it. (Gardiner 95)
Tenancies were granted for land providing that walls, sluices and ditches were maintained. The loss of the shingle barrier allowed the sea to cover much of the reclaimed land.

1290

In the Rother valley a dispute over bank maintenance and flooding by the sea described the "*sea shore"* between Maytham and Newenden! By 1332 some 260 ha had been "*swallowed by the sea*" and more was likely to be submerged.

14th Century

In the early part of century Robertsbridge Abbey had lost a lot of marsh land in Winchelsea, Rye and Broomhill level to the sea. Similarly Battle Abbey land at Broomhill had “sunk beneath the sea”.

1300

Broomhill church was built when most of Walland Marsh was salt marsh; a bank of shingle probably protected it. (Eddison, 1998)

1309

By this date an embankment had been built across the Brede Valley.A great wall (the Damme) was constructed for 1km. across the valley south of Float Farm (float = a dock). It protected over 400ha. of farmland and excluded the sea by controlling the water with a sluice operated by pulleys. However, it was blamed for the silting of the port of new Winchelsea (because of reduced scouring). It was also a causeway and the tolls raised £5 a year in 1360s. The dock at the Damme loaded Wealden wood destined for London and the Continent. This structure may have been dismantled in 1357 by order of the king because of its implication in the silting of Winchelsea harbour. The reduced scouring of the tides caused by the Damme on the River Brede was causing the silting of the port of New Winchelsea. (Gardiner, 1995)

1330s

In the Rother Valley the Knelle Dam was constructed for 2.7km to exclude the sea, but by 1347 600a of Wittersham Level was under fresh water which could not find its way out to sea. This ensured that the tidal Rother flowed to the north of the Isle of Oxney where Smallhythe and Reading were centres of shipbuilding until the mid 1500s.

1341

Land at Cadborough and Lidham was submerged (Gardiner, 1995)

1344

Further flooding in the Brede valley and the tithes from wheat were reduced. (Gardiner, 1995)

1348-9

The Black Death reduced the population by about 40% and consequently the demand for food and land diminished.

1357

Quays for loading boats were noted at Reading Street, Maytham, Newenden, Bodiam and the Knelle Dam.

1362

Much of the land in Brede valley to east of Winchelsea was under water and paid no rent. Gar95

1360-76

This was a time of great agricultural prosperity and much money was spent on drainage, gates and pulleys for sluices. (Gardiner, 1995)

1371

Rising price of grain led to more arable crops. There was 100 acres of arable crops on the marsh below Cadborough. A greater acreage of wheat and winter barley sown. Costs incurred in drainage, gates and pulleys for sluices. River valley farms worth 10 times High Weald land in 14th century. But pasture at Udimore was lost due to “ingress of water” (Gardiner, 1995)

1374

At Broomhill there was a threat of flooding from the north and west ie Wainway channel (Eddison, 1998).

1376
The sea wall at Winchelsea broke and the marsh at Padham was submerged. (Gardiner, 1995)
1386
Rother was diverted near Udiam Farm (Ewhurst) for a mill dam. (Gardiner, 1995)

15th Century

1400
There were problems of silting at Winchelsea's new harbour on the Brede.
1404
Further flooding in the Brede Valley, with Whitefleet marsh added to submerged lands there. (Gardiner, 1995)
1419 to 1442
A new embanked Channel in the river Brede was constructed upstream of the Damme to aid scouring. It was 150m wide and 7.5km long. The old channel, the Ee, was abandoned. The intention was to allow more seawater to encourage scouring and access to the port of new Winchelsea and free drainage of the adjacent land. This new channel also allowed boats further up the valley to Brede Bridge.
1478 to 1497
The Guldeford family bought over 1600 ha. of saltmarsh from Robertsbridge Abbey and had inned it by 1600. This left 2 channels either side, Appledore Water and the Wainway channel. Sir Richard Guldeford started to build a tower (the precursor to Camber Castle) on a shingle spit building out from the south west. It must have stood on or near the shingle headland overlooking the entrance to the harbour of Rye. (Eddison, 1998)
The safe haven known as the Camber or La Chambre was capable of harbouring many ships in the shelter behind the Camber castle shingle spit.

16th Century

The port of Rye was, at the height of its development in the middle of the 16th century, the largest and wealthiest town in Sussex and bigger than any other south coast port. At this time there was a threat of invasion from Henry VIII's recurrent wars with France, so Camber Castle was developed. By 1530 the increasing population led to greater demand and profit from animal husbandry on marshland, this led to increasing attempts to inn the salt marshes
1535
The tides at Broomhill were flowing up to the Kent Wall which needed continual repair. Two weaknesses in the barrier (Old Breach and New Breach) were being continually breached.
1561
An enquiry determined that innings had been taking place over the previous 30 years "*on ground on every side (of the Rother) up at least 12 miles and more*". This inning became widespread for the rest of the century.
By 1562 the River Rother was changing - 2400 ha was flooded every winter from Reading to Robertsbridge.Ed95- between Reading and Rye the river had narrowed from 60-90m feet to 5-7m according to Rye fishermen. And the safe harbouring of the Camber had gone.
Much of the Rother valley was "summer lands" or permanently "drowned lands".

1564
Armigal Wade 357ha innings at Broomhill, but in October 1570 a great tide washed away some of the walls.

1570
The River Rother between Reading and Rye had narrowed from 200-300 feet to 16-24 feet according to Rye fishermen. And the safe harbouring of the Camber had gone. (Hipkins, 1995)

1576
Commission of sewers "for the preservation of Rye haven" had powers to intervene in matters affecting the harbour, including Innings and sluices, but often the culprits were, or related to, powerful voices on the commission! (Hipkins, 1995).

1585
Richard Smith of London walled in (inned) 268ha of Broomhill, with most of the walls still surviving today (Eddison, 1998).

1589
There was an inlet of the sea at Jury's Gut (Gardiner, 1995).

1594
An early map of the decayed harbour at Rye by Philip Symondson, dated to 1594 is one of our earliest pieces of cartographic evidence. The map shows a substantial shingle bank in front of the Pett Levels, in the lee of the Fairlight Cliffs, swinging inland in a series of shingle ridges. The distance between the two headlands was 2km. The shingle barrier extended 4.5km.

1596
There were predictions that "*the (*Rother*)channel will shortly swarve up…. And become so shallow that no ship, bark or boat will or can be harboured there*."
The Rother was diverted through marshland to the north of the Rye into the Tillingham. This was very expensive and failed in 1610.

1597
An enquiry determined 719 acres of marsh enclosed plus another 600 acres near unto Lydd. In addition 13 dams recently erected. (Hipkins, 1995).

17th Century

During the century a succession of 6 walls across the Wainway was to claim 420ha.

1600
Rye's population was reduced to 2,000 by 1600 (4,000 in 1580 and 5,000 in 1560's) as trade declined, aggravated by silting. By 1619 few ships were using the harbour.
By 1600 the Jury's Gutt (the outfall of the sewer at Broomhill) was laid through the shingle barrier, which itself was strengthened with clay, timber and faggots.
In 1600 the Knelle dam gave way with the pressure of flood water in the Rother valley. But since the structure gave benefit to the Wittersham levels it was repaired.

1609
A Commission of Sewers was set up to manage the river from Bodiam down to Rye. Several projects to drain the valley failed costing over £11,000 and £6,000 by 1621.
Early in the century the Rother levels 1200ha were described as deeply drowned see and 800ha were summer lands and in 1609 the Commission for the Upper Levels of the Rother set up to draining the deeply drowned land.

1613
A massive programme of work started in the Rother. 4 years of channel widening and deepening. Storing of floodwater to scour out the channel. Building of temporary dams to enable excavation. In 1623 a second phase of work included sluices at Peening and Thorney and widening around Appledore.

1627
A great flood overflowed Broomhill and Walland Marsh (Eddison, 1998).

1632
The first corporate sea defence was formed, the Commissioners of Sewers for Walland Marsh. Jury's Gutt was set in the shingle as an exit for water. It was a wooden structure. Ed 98

1635
The Rother was diverted south of the Isle of Oxney to improve navigation, but it was not effective. Hip 95.Also in that year Sir Kenhelm Digby estimated that 20,000 acres (not considered accurate) of land was claimed from the sea out of the King's channel. It is as good land as any in Sussex. He also wrote that "something must speedily be done for the preservation of the port, else in a few years it will be quite choked up".

1636
In the harbour booms, buoys and lights were set up to aid navigation around a great bar of sand which had risen 4 feet in 4 years, (Hipkins, 1995).

1637
Camber Castle was abandoned in 1637 because so much shingle had accumulated that the cannons could not reach the sea. only 100 years separated the development of Camber Castle and its abandonment and this ties in with the economic collapse of Rye.
There is evidence of early sea defences at Castle Water in the form of a low embankment that corresponds with the shoreline of 1695 described by Lovegrove (1953).

1646
The Camber marshes (east of the Rother)were first inned, but there was regular breaching with a major loss in 1734.

1638
There was much dispute about the impact that inning the land had on the siltation of the harbour. For example, "*The inning of salt marshes from time to time, for private men's gain and profit, hath been the utter decay of the harbour of Rye, which had certainly been good to this day if the salts had never been inned."* (Hipkins, 1995).

1646
At Broomhill, west of Smith's innings, another 200 acres was inned, but with mixed success. Lost in 1656, but regained in 1658, lost in 1662, regained in 1680s, lost 1734.

1648
Shingle was being lost and sea water was getting into the marsh at Jury's Gutt (Eddison, 1998)

1652
The harbour could not accommodate half the ships of a century earlier and it could no longer protect ships during storms. (Hipkins, 1995).

1680s
Rother was moved to the Craven channel and directed to Scots Float (Eddison, 1998)

c.1690
A large area of Walland and East Guldeford marshes was managed with a sluice called White Kemp Gutt. This wooden structure let freshwater out to the tidal Appledore Channel without

allowing the seawater in. This structure led to the silting up of the Appledore Channel (Draper, 1998).

1693

Shingle moved west and was deposited as a headland (at Northpoint), this weakened the defences in front of Broomhill, the distance between the two headlands at the mouth of the Rother was then just 375m.

1698

The Lords of the Admiralty commissioned a report on the Harbour at Rye, which stated '*We take this Harbour to be almost entirely lost, and at best in no condition to be preserved for any purpose of the Navy*' (Sloane MSS 3233 - British Museum).

1699

800ha of Wittersham Level and 250ha of the former Appledore water had been reclaimed.

18th Century

1724

The Harbour of Rye was silting up. In 1724 the commissioners of Rye Harbour embarked on a doomed project to construct a new Harbour for Rye (now known as Smeaton's Harbour) by forcing a new exit for the three rivers at Winchelsea beach. It was served with a system of dams and sluices to maintain water levels and scour out the harbour mouth and keep the entrance open.

By 1734 there were two pier heads of Portland Stone (they can still sometimes be seen at TQ918160 when the shingle is scoured away) and the channel was lined with timber.

By 1743 the project was well underway but for various reasons, both political and financial, remained uncompleted. In 1762, after financial problems, the sea was let in and the channel started silting up! In 1763 Smeaton was commissioned to make recommendations. Although his proposals for an improved harbour were never fully acted upon, the harbour was eventually opened some 25 years later, in June 1787. It had to be abandoned by November since the movement of shingle had already begun to block the entrance. By 1807 the harbour entrance had been diverted a kilometre to the east, by the formation of a long thin shingle bank. The harbour entrance coincides with the present sea defences at Dog's Hill and it probably formed the starting point to the shingle ridge that is now the Beach Reserve, owned by the Environment Agency.

1730

The Rother channel to the north of the Isle of Oxney was useless and all of the river was directed to the outfall at Scots Float sluice where it is today.

A sea wall was developed at Broomhill Ed 98

1736

The Scots Float Sluice (or Star Lock) was completed to provide navigation and flood control. In 1806 it was described by John Rennies as "very inconvenient and ill adapted for the present vessels which navigate the River" (Vine, 1989).

1734

There was a breach of the Broomhill wall, which was taken in by the Guldeford commissioners and the breach was closed December 1735 (Eddison, 1998).

There was regular breaching of the Camber walls with a major loss of the marshes in 1734.

1747

There was continuing dispute between land developers, the latter blamed the inning and reclamation activities of the former, which prevented the scouring effects of the reflux of the tides.

From 1747 barges came up the river from Rye, loaded with iron ore for the furnaces of Brede and groceries for the village, returning laden with guns. In 1770 the iron furnace at Brede was converted to gunpowder mills which ended in 1825 after several explosions! (Vine, 1989).

1747 - 1754

Several severe storms weakened the wall at Broomhill, which by May 1754 was reported as ruinous. The clay reinforced wall at Broomhill gave way during an exceptionally stormy period so by 1760s it was replaced with a new clay wall some way inland. (Eddison, 1998).

1763

Shingle was building up rapidly at the mouth of Rye Harbour. The Outer West Point (see map) had built up in the previous 10 years and a body of shingle (marked A on the map, see slide 34) was moving north-west. (Eddison, 1998).

1767

At Broomhill a new wall was built behind the old one, extending between the gutt and the high level shingle beyond Waysend (Midrips), and remains as the wall today! (Eddison, 1998).

1786

The Union Sluice was constructed at (TQ931220) to manage the outward flow of fresh water into the tidal Rother (Draper, 1998).

On the River Tillingham a navigational sluice was constructed above Strand Quay, near the windmill, to prevent the tide flowing up and improving the scouring of the channel. Wharves were established at Ferry Bridge, Leasam Farm, Marshall's Farm and Marley Farm (2 miles from Rye) for coal and agricultural produce (Vine, 1989).

1787

The new "Smeaton's Harbour" was opened in June 1787, but closed by November, because of the movement of shingle!

19th Century

Camber sands started to accumulate from about 1800 due to the shelter afforded by the developing shingle at the mouth of the Rother

1804-09

There was an increasing threat of invasion by the French armies, led by Napoleon Bonaparte. The British Government devised a plan to construct a defensive barrier along the length of Romney Marsh, from Hythe to Pett Level. This was to be a wide canal that served as a physical barrier and a means to convey troops and supplies to threatened points. Building commenced in 1804, intending to be complete the following year, but difficulties meant that the project lasted until 1809. It took much longer than planned because of harsh winter weather and severe flooding. Turner's painting "Rye, Sussex" – Hastings Museum – shows the dam at the joining of the Brede as a high tide engulfs the workers. Iden Lock was opened in September 1808, linking the canal with the River Rother. The section between Rye and Winchelsea is part of the River Brede (for more detail see Hutchinson 1995).

A further defence against invasion at this time was a series of bomb-proof gun towers, erected along the coast from Aldeburgh in Suffolk to Seaford in East Sussex. There were 73 of these Martello Towers built between 1805-08 from Dover to Seaford. There were 11 towers between

Rye and Cliff End, but only two survive: Rye, No.30 (near the junction of Harbour Road and New Winchelsea Road) and Rye Harbour, No.28 (near the car park). There was another, No.29, 5-600m. south-west of Rye Harbour that collapsed in 1822. (for more detail see Hutchinson 1994).

1807

The new spit formed from the entrance to Smeaton's Harbour was now 2km long. This material was probably derived from the reworking of the shingle deposit along the Pett frontage and in front of the cliffs. 800m of the Royal Military Canal were dug in front of the cliffs and there was still marshland between it and the shingle barrier.

1812

High spring tides damaged Scots Float and the tidal flow reached Bodiam. It was rebuilt in 1813 (Vine, 1989).

1845

Rye harbour commissioners approached by South Eastern Railway for permission to build a bridge across the Rother. This generated £10,000 of harbour improvements. At the same time there was a contract for the development of Dover harbour. Concrete blocks were manufactured in Rye Harbour and floated by barge round the coast. The blocks were loaded at the quay just south of Lime Kiln Cottage at TQ946185 which itself is made of the blocks. The work lasted 50 years and generated much income for the harbour which paid for a dredger to keep the entrance clear. (Harries, 1997).

There were three main boat builders in Rye, one of them, Hoad Bros and Phillips built 14 vessels of over 150 tons between 1852 and 1855, the largest was the 326 ton *Chrysalis* for the Australia trade. (Harries, 1997).

1854

A railway line from Rye to Rye Harbour opened in March 1854. It served the chemical and shingle industries, but it closed in February 1960, when the bridge over the River Brede needed considerable repair. The course of the track can still be seen at the eastern edge of Castle Farm and now forms the route of a footpath. Several culverts carry the drainage water under the line and each has a numbered iron post.

1860's

A tar distillery was established to process the tars produced by Battle, Hastings and later Rye gas works. To help purify the distillate, lime was required and a small lime burning kiln was set up, the Lime Kiln Works (now SMR ltd.). The distillate produced paint solvent, petrol, phenol (the first disinfectant) and cresols for textile dye manufacture. The residues were heavy pitches used as protective coatings.

This industry has left a legacy of some 25ha of grossly polluted land adjacent to and in the Rye Harbour SSSI.

1873

The shingle at Pett Level was on average 120m wide and stood well out from the cliffs. Ordnance Survey maps show a large deposit of shingle in the lee of the cliffs. The existence of peat at low tide at Pett Level indicates that this has only recently been revealed to the sea. The existence of this peat within 55m of the cliffs at Cliff End also indicates that the cliff has only recently been exposed to the sea. (Eddison, 1998).

1880

Rye's maritime trade was less than a third of what it was in 1845 and it continued to fall. (Harries, 1997).

1882

After a bad storm in 1882 the harbour entrance was practically blocked. (Harries, 1997).

1883
Heavy floods reported at Robertsbridge Water Mill. (Stidder and Smith, 1997).

20th Century

1900's
Several railway tracks were constructed to assist with the extraction of shingle throughout the Rye Harbour SSSI.

1903
The Hastings and St Leonards Waterworks at Brede was built, pumping water from the Brede valley. Coal was brought up the river to a wharf just above Brede Bridge. This fell into decay by 1928, so coal was brought by rail from Doleham Halt. (Vine, 1989).

1913
There was extensive flooding of Pett Level.

1920's
Axell (1992) described "*A small colony of Little Terns nested .....on the shingle.....at Rye Harbour. Common enough then, these birds, forty years later, were to become Britain's second rarest breeding sea bird when beaches....became overrun with people seeking peace in such places. Without being conscious of it, we boys from Rye were already helping the demise of this species. It was a challenge for us to find their eggs, so similar were they to the stones on which they laid and they were just large enough to fry*." He also described the different fortunes of the Common Tern "*...at Rye Harbour, in the 1920's and 30's, terns were having much better luck - actually from man's interference with their breeding site. Early gravel workings there had left deep lakes with islands.....and Common Terns nested there successfully.....These birds were safe behind a wide barrier of water.....(it was a long time before foxes, excellent swimmers, invaded the marsh*)."

1928
On the Tillingham river major improvements to the Harbour included replacement of the Tillingham sluice with a pinnock, ending the navigation of the river. (Vine, 1989).

1930's
By the 1930's Rye bay was experiencing a period of erosion. After 500 years of the rapid development of shingle ridges there now followed a net loss of which led to some serious flooding in 1930s. It may be that the programme of groyne construction at Hastings and further west, together, in particular with the Hastings Harbour arm in the 1890s caused, or contributed to, the reduction of the normal beach flow into Rye Bay.

Shingle extraction began at Castle Water in 1934 with suction pumps on barges. This created a deep pit, with steep margins. The shingle had much sand in it and washings were dumped beside, or back in the pit. This sand was to become an important habitat for several rare plants and animals.

Around the Castle there was a 9-hole golf course. The remains of the club house are visible today as the concrete foundation blocks and there are the remains of tees, greens and bunkers on the ridges around the Castle (see Murray 1953, p.119). In 1950 the clubhouse was described as old and shattered (Wilkins, 1950).

In the centre of the Rye Harbour SSSI there is a brick building that was the site of a rifle range. To the north-east and south-west are large embankments and at their base the remaining metal supports for the targets. The building has now collapsed because of a large Badger sett beneath.

1930

The shingle at Pett Level that was 120m wide in 1873 was now very thin and vulnerable, because of the efforts further west to reduce erosion. (Roberts, 1988).

1931

The Ship Inn at Winchelsea Beach was washed away; the sea broke into the Nook, and flooded the whole of what is now Harbour Farm and much of Rye Harbour village. This left a scour hole, which remains as the Horseshoe Pool (TQ921164). The breach was not closed until June 1933, so there were 18 months of regular inundation that created a saltmarsh (Chater, 1934).

1933

The Brede navigation was effectively closed for land drainage , but in October 1935 L A Vidler described river barges still using the wharves of Winchelsea, Snailham and Brede Bridge. (Vine, 1989).

1933-1936

A timber breastwork 6.5km long was built to form a solid crest to the beach with groynes to reduce littoral drift eastward. A timber pile wave screen was built in front of the groynes to reduce the impact of the waves on the beach. (Roberts, 1988).

The timber barrier was filled with shingle was built along much of the length of the Beach from Pett level to Rye harbour. A timber Box (parallel with the shore) was constructed with a railway on top which filled the box. Shingle was dug by hand from what is now Ternery Pool, loaded into wagons and transported westward.

1938

Diesel pumps 1.37 cumec installed at Kenardington to lift water into Royal Military Canal (Roberts, 1988).

1940's

During World War II many parts of Rye Harbour SSSI were ploughed up to provide much needed food. The renewed threat of invasion resulted in the old military defences of Camber Castle and the Martello towers being used defensively and the blockhouses that are scattered throughout the area were built. There are two near the River Mouth, three (two are derelict) near Watch Cottage, one in the Caravan Site at Rye Harbour, one along the front ridge at Winchelsea Beach and another on the north side of the river Brede near Winchelsea Beach. The Beach Reserve and Harbour Farm were extensively mined and fenced.

1942?

The sea wall at Pett Level was breached to allow flooding by the sea. This was to reduce the ease of invasion during World War 2. Sea water extended as far as the banks of the Royal Military Canal.

1947

The wildlife conservation status of the area dates from at least 1947 when it was part of the large area considered in the Government publication, Command 7122 (1947).

> ***Scientific Area 25. DUNGENESS, Sussex and Kent (50 sq. miles)***
> *The area of coast, shingle and marshland between Hastings in Sussex and New Romney in Kent embraces 24 miles of coastline, a classic sequence of shingle-banks (recommended as a Conservation Area (Geological), sand dunes and the cliffs near Hastings and Fairlight Glen. Dungeness is distinguished by its large areas of loose shingle arranged in ridges or "fulls", much of which has not been interfered with by man and provides by far the best example of a cuspate shingle foreland in the British Isles. The shingle, shingle-sand and saltmarsh-sand successions are better developed here than elsewhere. The area is also the best in south-eastern England for migratory birds, as well as containing a number of uncommon breeding species. The insect fauna, both*

resident and migratory, is very rich and there are also rare and uncommon plants, including mosses. Coterminous with the Conservation Area 43.

1947 – 1952

The present concrete sea wall was constructed between 1947 and 1950, extending for 5 kilometres from Pett Level to the western end of the Beach Reserve. From here it gives way to a renewable shingle ridge. It is now maintained by the Environment Agency with shingle feeding and timber groyne works. from the Old Lifeboat House to the River Mouth there is a more natural storm crest.

A steel pile, concrete block and asphalt wall was constructed along 5km of this shoreline with a crest of 7.31m OD. The continuing erosion led to the start of beach recharge to prevent the toe of the wall from being undermined. Pett, Rye harbour, Broomhill and Jury's Gap are all maintained by beach feeding. (Roberts, 1988).

1949

The National Parks and Access to the Countryside Act 1949

The government's approach to nature conservation in Great Britain has, since the establishment of the Nature Conservancy in 1949, been to identify and protect prime areas of scientific interest as representative of the remaining natural and semi-natural biological, geological and physiographical areas in the country. The National Parks and Access to the Countryside Act 1949 enshrined the philosophy of habitat conservation through site designation; it did not incorporate earlier ideas of integrating nature conservation within the broader framework of emerging rural policy.

1950's

With the discovery of natural gas in the late 1950's the Lime Kiln Works (now SMR ltd) were rebuilt to recycle waxes and resins and the chemical works was converted to carry out simple distillation of solvents. This development has had some impact on the wildlife of the area. There is a history of dumping oily wastes and material from the Battle Gasworks that has left a legacy of chronic pollution at the margin of Castle Water.

Along the Beach Reserve there are several sorted piles of large blue flints or boulders. These once provided a modest living to those who collected them for the manufacture of high-grade pottery. Hundreds of tons of these flints were shipped to the Stoke-on-Trent area, either by sea to Runcorn or Selby. The trade petered out in the early 1950's purely for economic reasons. In some places on the shore it is still possible to see some of the sorted piles of the "blue boulders" that were not collected.

Bert Axell (1992) described "*The flooded gravel workings at Nook Beach....,which were begun in 1934, were still (in 1954) demonstrating the value of such safe habitat, with many young terns and gulls fledging from islands left....without design."* He also described the last nesting of Kentish Plovers in Britain in 1955 *"...in 1949, when another pair was found definitely nesting.....on Rye Harbour's Nook Beach. In May 1955, a pair was seen again....I found the plovers' clutch of three eggs,.....three chicks...hatched, ...one disappeared.....a pair of carrion crows take both of the remaining chicks*."

By 1950s most of the shingle at Broomhill had been washed away, so the replacement of shingle was started to protect the sea wall.

Further recognition of the areas wildlife value came with the SSSI notifications.

1951

The Dungeness SSSI was designated under the 1949 act.

1953

The Rye Harbour SSSI and the Hastings Cliffs to Pett Levels SSSI was designated under the 1949 act.

1954
The Camber Sands SSSI was designated under the 1949 act.

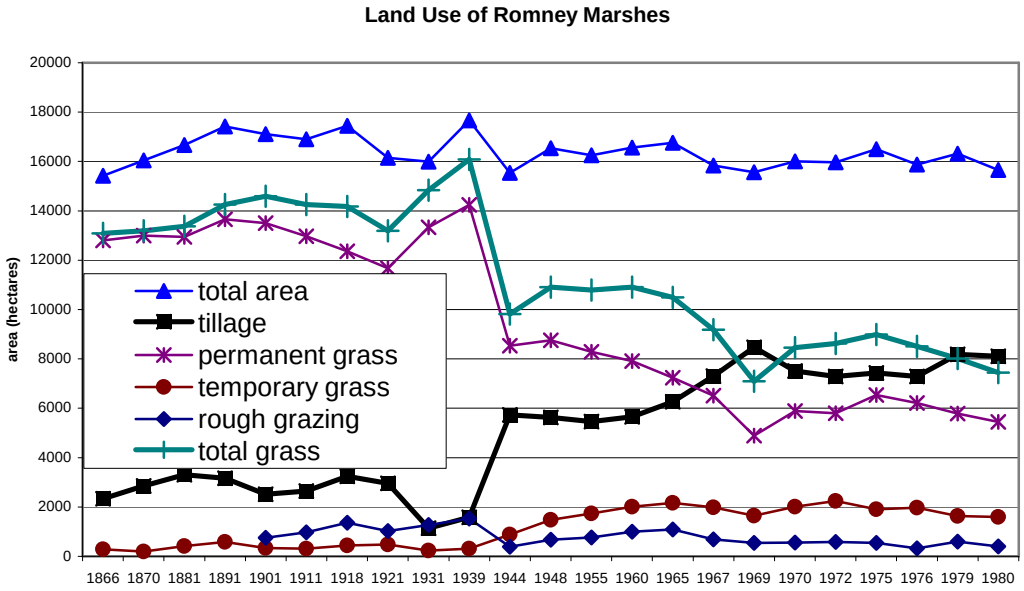
1966
The Leasam Heronry Wood SSSI was designated under the 1949 act.
153,000m^3 was dug from Nook Point to add to the Pett frontage to establish a beach profile that absorbs the wave energy. and about 20-30,000m^3 a year is recycled annually to keep pace with the continued erosion to this day. (Roberts, 1988).

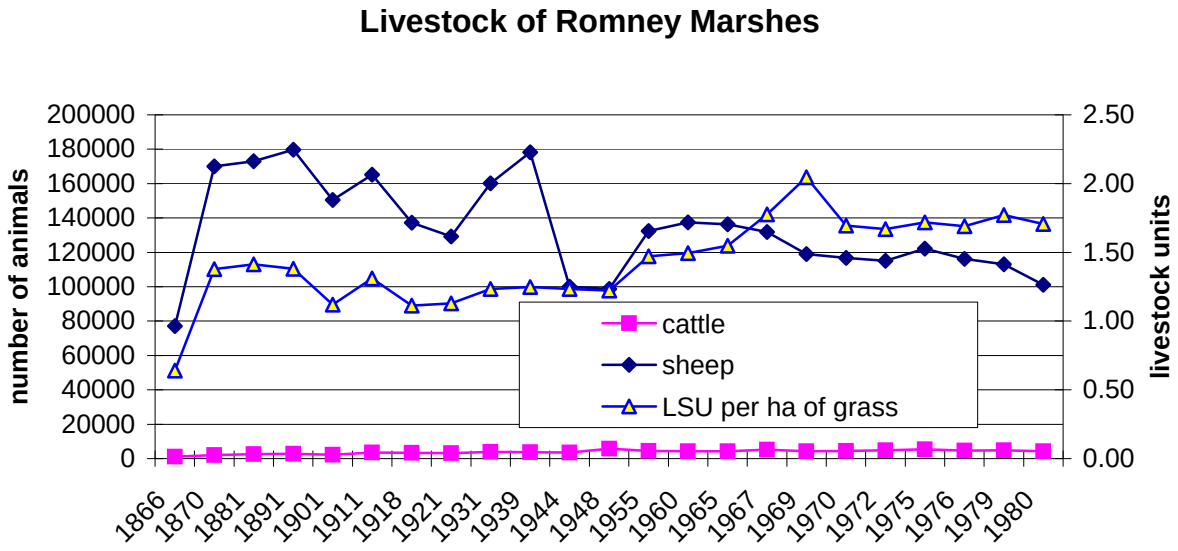
1960 – 80
Until the 1950s some parts of the Rother levels were unproductive and referred to as "duck country". In November 1960 the entire Rother levels were flooded which led to the Rother Area Drainage Improvement Scheme. In 1969 a 7.14 cumec pumping station near Union Sluice drained Walland Marsh into the tidal Rother. By 1980 the banks of the Rother were raised so they would not be overtopped and 20 Archimedian screw electric pumping stations were installed to drain the marsh areas and deal with the upland water. Some 245ha are set aside as the "wet level" for flood storage. (Roberts, 1988).Even so there is occasional flooding such as December 1999 and October 2000.

1967
The timber firm J Alsfords Ltd won an appeal against the County Council's refusal of permission for a new wharf. This was constructed on saltmarsh immediately north west of Rye Harbour village.

1970
In 1970 the 84.6ha. of shingle beach owned by Southern Water Authority (now Environment Agency) was declared a Local Nature Reserve (LNR) by the County Council, pursuant to the National Parks and Access to the Countryside Act 1949. The County Council also appointed a Management Committee to administer the Reserve. This was the beginning of Rye Harbour Local Nature Reserve, which has since grown as other Management Agreements have been made.

up to 1980
The land use of Romney Marshes has changed over the last 120 years as agriculture has become more intensive (Mountford, 1982). Although the number of sheep has declined from the pre-war levels the intensity of grazing has increased because of the reduction of grassland at the expense of tilled land. See also the table under 1997 which clearly shows the dramatic decline in the agricultural workforce.





Nature Conservancy Policy 1950-1980

The principal function of the Nature Conservancy Council under the 1949 Act was to identify and establish by agreement, lease or purchase a series of National Nature Reserves. These reserves served the dual function of protecting the most important habitats and of providing an opportunity for detailed scientific research. In addition, a national network of Sites of Special Scientific Interest (SSSIs) was designated. Unlike the reserves where nature conservation is generally the primary land use, the conservation interest defined by the SSSIs has to co-exist with other land uses; the assumption was that agriculture and forestry were compatible with nature conservation objectives.

The main threat to the conservation interest was perceived to be land development in the sense in which that term was used in the Town and Country Planning (Scotland) Act 1947. In consequence, local planning authorities were only required to consult the Nature Conservancy before determining a proposal for development affecting a National Nature Reserve or SSSI. No such consultation was considered necessary in respect of proposals for agricultural improvement and afforestation. These activities were presumed to be environmentally benign. Landowners were perceived to be the true custodians of the countryside and trust was placed in them to maintain the conservation value of the countryside. It was not even thought necessary to notify landowners of the conservation interest in an SSSI. Such notions of `inherent stewardship' remained unchallenged until the late 1960s.

The relationship between conservation and agriculture, which depended on the continuation of traditional land use practices, eroded as government policy encouraged increased output through the use of grants and subsidies which at that time took no account of nature conservation objectives. The integrity of the extensive SSSI system (covering 1,366,067 ha or 6% of Britain's land surface by the early 1980s) weakened as land use in rural areas intensified. The Nature Conservancy Council was in a difficult position, unable to exert much influence on the rapidly developing farming and forestry sectors except in National Nature Reserves. Major destruction of the conservation interest in SSSIs followed as they were largely unprotected. SSSIs in areas of intensive production became fragile `habitat islands' increasingly reliant on the species reservoir contained within their boundaries.

From the 1970s it became increasingly obvious that significant habitat loss was taking place. Figures gathered by the Nature Conservancy Council highlighted the erosion of the SSSIs, particularly in lowland areas. This forced a reappraisal of policies for nature conservation. There were calls for the development control system to be extended to cover all forestry and agricultural activities in designated areas as well as in the wider countryside. Such radical

proposals were not favoured by those land-owning interests which had a deep-rooted belief in their role as stewards and their traditional freedom to manage land without interference.

1981

Wildlife and Countryside Act 1981

In 1981the Government introduced legislation to address the problem of species protection and habitat loss. The Wildlife and Countryside Bill was initially drafted in consultation with the farming lobby without the involvement of the Nature Conservancy Council or the wider conservation movement and a large number of amendments were proposed. Part II of the Wildlife and Countryside Act 1981 which deals with habitats retains the central philosophy of the National Parks and Access to the Countryside Act 1949. The conservation of areas with a specific scientific interest continues to rest upon the belief that the future of the countryside "lies in the natural feel for it, possessed by those who live and work in it". The Nature Conservancy Council had no means of prohibiting land use change. However, the 1981 Act through a combination of regulation and financial incentives places the Council in a stronger position to persuade landowners not to proceed with land use change which would damage nature conservation interests. The 1981 Act also strengthened species protection, bringing the legislation for bird protection into line with the recent EEC Directives.

1983

The Leasam Heronry Wood SSSI was notified under the Wildlife and Countryside Act 1981.
On 2nd February 1983 a “tidal surge” added 1.16m. to the predicted height of a tide, so the high tide was higher than predicted and reached 5.03m aOD and caused extensive flooding of Rye Harbour Nature Reserve.

1984

The Rye Harbour SSSI was notified under the Wildlife and Countryside Act 1981.

1986

The Walland Marsh SSSI was notified under the Wildlife and Countryside Act 1981.
The Camber Sands and Rye Saltings SSSI was notified under the Wildlife and Countryside Act 1981.
The modern Scots Float Sluice on the Rother was opened in 1986 and the earlier one, a little upstream was demolished in 1987 (Vine, 1989).

1988

The Dungeness SSSI was notified under the Wildlife and Countryside Act 1981.

1989

The Pett Level SSSI was notified under the Wildlife and Countryside Act 1981.

1991

By 1990 there was very little shingle beneath the cliffs at Cliff End, rocks and boulders were clearly visible (personal observation), but by December 1999 there was sufficient to cover all of the previously exposed rocks. This followed the deliberate breaching of the Hastings Harbour arm in 19??
There was extensive flooding by the sea at Rye Harbour.

1997

From 1975 to 1997 there was a considerable change in agriculture of the area over the previous 22 years. The cattle had declined by 60%, pigs had almost gone, the workforce had been reduced by 23%, permanent grassland declined by 10% and set a side was about 10% of tilled land. (Source MAFF Agricultural Census Data for Rye Bay 1975-1997 from 16 parishes, totalling 150km^2, which includes project area.)
Several Sites of Nature Conservation Importance (SNCI) in Rye Bay were designated by Rother District Council.

	1975	1980	1985	1995	1997
Total Cattle & Calves	10,580	8,674	8,102	4,711	4,288
Total Sheep & Lambs	108,485	109,918	126,385	117,191	115,910
Total Pigs	2,904	1,142	807	26	54
Full-Time Workforce	532	490	465	350	344
Part-Time Workforce	176	168	184	178	189
Seasonal or Casual	167	383	255	150	143
Total Agricultural Workforce	875	1,041	904	678	676
Grassland < 5 years	1,855 ha	1,725 ha	1,956 ha	1,350 ha	1,833 ha
Grassland > 5 years	7,676 ha	7,157 ha	6,961 ha	7,107 ha	6,068 ha
Rough Grazing	398 ha	438 ha	474 ha	434 ha	253 ha
Crops & Fallow	4,639 ha	4,920 ha	5,264 ha	4,208 ha	5,066 ha
Farm Woodland	900 ha	1,019 ha	889 ha	981 ha	999 ha
Other Land	177 ha	212 ha	296 ha	290 ha	304 ha
Set-Aside	0 ha	0 ha	0 ha	716 ha	410 ha
Total Agricultural Area	15,645 ha	15,471 ha	15,840 ha	15,086 ha	14,933 ha

1999

Shingle had once more accumulated in front of the cliffs at Fairlight and covered most of the loose rocks and boulders seen there ten years earlier (personal observation).
In December storms breached the shingle defences at the MOD ranges.

2000

Right across England the high rainfall in the autumn caused significant and repeated flooding. The Rother Valley was severely affected and further highlighted the problems of management of water in our countryside.

On 31 May 2000 the secretary of State included the Dungeness to Pett Level Special Protection Area in the Register of European sites compiled by him and maintained by him under regulation 11 of the Habitat Regulations. This SPA was classified under the EC Birds Directive 79/409/EEC by the Secretary of State on 2nd August 2000.

The European Marine Site was drafted under Regulation 33(2) of the Conservation (Natural Habitats) Regulations 1994.

The Department of the Environment is currently considering the following two designations.

- The Dungeness to Pett Level candidate RAMSAR site following the Convention on Wetlands of International Importance, 1971.

- The Dungeness candidate Special Area for Conservation under the EU Habitats Directive, 1992.

The Future

As we have seen Rye Bay is naturally an area of constantly changing landscape. Man has influenced the area's character for the last 500 or more years. The fate of its countryside in the new Millennium will depend upon Government policy, climate change and a significant element of chance.

Government Policy

Sea defences
During the 1980s and 1990s there was renewed concern about the sea defences and many studies were made. Some flooding occurred on several occasions, but none of the plans were put into practise. Consultants continue to produce reports, but the balance between cost and differing public perception of the many problems will make a decision difficult. It may be that in Rye Bay there is some managed realignment of the coast which could offer great opportunities for the recreation of saltmarsh habitats.

Flood plains
In the autumn of 2000 there was heavy rainfall across much of Britain that caused extensive and repeated flooding in river valleys, including the Rother. This raised the profile of flood management in river valleys and the outcome may see some changes to policies of development in and around flood plains and to the approach of managing river systems. It may be that in Rye Bay there is some restoration of the natural function of the flood plain. This could also offer great opportunities for the recreation of wetland habitats.

Agriculture
During the last 50 years agriculture has been encouraged by Government to maximise production with increasing inputs of fertilisers and pesticides. As the global market develops and the subsidies of British and European agriculture are changing there is a great opportunity in Rye Bay. By switching support from "maximum production" to "stewardship of the countryside" there should be a recovery of some of our wildlife and a restoration of some of the damaged habitats. This could greatly benefit some of our shingle, saltmarsh and marsh wildlife.

Industrial pollution
During the last 100 years there has been a significant abuse of some land in Rye Bay. There is about 25 ha. of land at Rye Harbour which is contaminated with pollutants such as oil, phenols, cadmium, arsenic and others. This pollution is adjacent to and partly encroaching into some land with the highest wildlife quality in Rye Bay, it is designated LNR, SSSI, SPA, candidate Ramsar and candidate SAC. There is a long term threat to this wildlife and the current studies and proposals may not resolve the problem.

The health of the sea
The important seabirds and shorebirds of Rye Bay depend upon a clean and healthy sea with good fish stocks. Without improvements in many aspects of the sea we cannot expect our maritime wildlife to thrive. The four most important factors are sea water quality (agricultural run off and sewage), disposal of rubbish at sea, oil pollution and management of fish stocks.

Climate Change

Recognizing the problem of potential global climate change the World Meteorological Organization (WMO) and the United Nations Environment Programme (UNEP) established the Intergovernmental Panel on Climate Change (IPCC) in 1988. It is open to all members of the UNEP and WMO. The role of the IPCC is to assess the scientific, technical and socio-economic information relevant for the understanding of the risk of human-induced climate change. It does not carry out new research nor does it monitor climate related data. It bases its assessment mainly on published and peer reviewed scientific technical literature.

IPCC Special Report on The Regional Impacts of Climate Change An Assessment of Vulnerability

Executive Summary

Climate Change. *Climate model projections suggest a general increase in temperature, greatest in northerly latitudes. Precipitation changes are considerably more uncertain, but one could expect generally wetter conditions in the north, drier conditions in the south, and increasingly drier conditions from west to east. Winter precipitation may be greater than today, while summer precipitation is likely to decrease.*

Sensitive Regions*. As water is one of the main integrating factors for many environmental and economic systems in Europe, currently sensitive areas in terms of their hydrology include the Mediterranean region, the Alps, northern Scandinavia, certain coastal zones, and central and eastern Europe. A changing climate is likely to enhance water-related stresses in these already sensitive regions.*

Vulnerability and Potential Impacts

Hydrology, Snow and Ice, Water Supply and Demand

Evapotranspiration will increase in a warmer climate, with potential reductions in water availability; however, the response of hydrological systems depends on the distribution of precipitation (highly variable, as suggested above) and storage capacity.

Many regions in the southern and interior parts of Europe could experience a general decrease in runoff, though the change in runoff may range between -5% and +12%.

More droughts could be expected in southern Europe, and the potential for winter and springtime flooding could be greater in northern and north-western Europe. However, this pattern is not the same for all general circulation models (GCMs).

Intrusion of saline waters into coastal aquifers and the expected reduction in precipitation could aggravate the problem of freshwater supply in some areas.

Snow and ice are likely to decrease in many places, with consequences for the timing and amount of runoff in river basins, as well as winter tourism.

Demand for water could increase in summer. Supply could decrease, though there may be regional differences in which storage capacity plays an important role.

Pollution is a major stress factor for many European rivers, and a decrease in discharge would increase pollutant concentrations, leading to reductions in water quality.

Current national and international policies and practices for water resources management will be put under stress by climate change.

Coastal Zones

Sea-level rise will place additional stress on coastal zones already stressed by other factors (urbanization, coastal developments, pollution, etc.).

The level of impact will depend on the adaptation capacity (e.g., the ability of systems to move inland) and policies of individual countries (e.g., trade-offs between lands that are not considered important and those that need to be protected).

Sensitive zones include areas already close to or below mean sea level (such as the Dutch and German North Sea coastlines, the Po River delta, and the Ukrainian Black Sea coast), areas with low intertidal variation (such as the coastal zones of the Baltic Sea and the Mediterranean), and coastal wetlands.
Changes in the nature and frequency of storm surges, particularly in the North Sea, are likely to be of considerable importance for low-lying coastal areas.

There is no doubt that we are experiencing a change in climate which, in the long term, will affect the future of Rye Bay and its countryside.

There are predictions of increased storminess associated with climate warming and this may lead to increased pressure on the managed sea defences of Rye Bay. Without a natural supply of new shingle, because of sea defences further west, the present line of sea defences will tend to migrate inland under the predicted and observed rise in sea level.

The Element Of Chance

The actual height of a tide depends on a combination of the following factors;

- tidal cycle,
- atmospheric pressure,
- wind direction,
- the movement of weather fronts.

In extreme circumstances a “tidal surge” can add more than a metre to the predicted height of a tide, for example on 2nd February 1983 the high tide was 1.16m higher than predicted and reached 5.03m OD. (Eddison, 1998).

The timescale of further change in the coastline of Rye Bay will be dependent on chance – a combination of the factors listed above could result in major changes during the next month, year, decade or century. The timing may be delayed by man’s attempts at defending the coast, but this will probably not prevent the inevitable reclaiming by the sea of large areas of the land of Rye Bay during the next 500 years.

Rye Bay Bibliography

Not all of the listed references are used in this report, but it was thought useful to list all of those relevant to Rye Bay. Please let us know if you know of others.

Allen, P. 1958. Geology of the Central Weald: The Hastings Beds. Geologists Association Guide, 24, 28pp.

Allen, J.R.L. 1996. The sequence of early land-claims on the Walland and Romney Marshes, southern Britain: a preliminary hypothesis and its implications, Proceedings of the Geologists' Association 107, 271-80.

Andrews, J.H. 1956. Rye Harbour in the Reign of Charles II. Sussex Archaeological Collection, 94, 35-42.

Axell, H. 1992. Of Birds and Men. A.Rowe Ltd

Baillie Reynolds, D.H. 1986. Dungeness, its shingle ridges and what lies under them, Geographical Journal 152, 81-7.

Barty-King, H. 1985. The county maps and history of Sussex. Quiller Press Ltd.,London.

Beck, D. 1995. Drainage of Romney Marsh and maintenance of the Dymchurch Wall in the early 17th century, in J. Eddison (ed.) Romney Marsh: The Debatable Ground (Oxford University Committee for Archaeology 41), 164-8. Oxford.

Bendall, S. 1995. Enquire 'When the same platte was made and by whome and to what Intent': sixteenth-century maps of Romney Marsh, Imago Mundi 47, 34~8.

Boer. D. G. & Carr. A. P. 1969. Early maps as historical evidence for coastal change. The Geographical Journal. Vol. 135. pp18-39.

Brentnall, M. 1972. The Cinque Ports and Romney Marsh. Cox, London.

Brooks, N.P. 1988. Romney Marsh in the Early Middle Ages, in J. Eddison and C. Green (eds), Romney Marsh: Evolution, Occupation, Reclamation (Oxford University Committee for Archaeology 24), 90-104. Oxford.

Burrin, P.1988. The Holocene floodplain and alluvial deposits of the Rother valley and their bearing on the evolution of Romney Marsh, in J. Eddison and C. Green (eds), Romney Marsh: Evolution, Occupation, Reclamation (Oxford University Committee for Archaeology 24), 31-52. Oxford.

Chater, E.H. 1930. Changes in the Coastline near Rye. Selected Engineering Papers 96. Institution of Civil Engineers, London.

Clements, W.H. 1999. Towers of Strength. The Story of Martello Towers. Leo Cooper

Collard, J.A. 1985. A Maritime History of Rye. Collard, Rye.

Cunliffe, B.W. 1988. Romney Marsh in the Roman Period, in J. Eddison and C. Green (eds), Romney Marsh: Evolution, Occupation, Reclamation (Oxford University Committee for Archaeology 24), 83-7. Oxford.

Dickinson, A. 1989. Around Rye in old photographs. Sutton.

Dix, J., Long, A. and Cooke, R. 1998. The Evolution of Rye Bay and Dungeness Foreland: the Offshore Seismic Record. In Romney Marsh: Evolution, Occupation, Reclamation (Oxford University Committee for Archaeology 24), 1-12. Oxford.

Dobson, M.J. 1997. Contours of Death and Disease in Early Modern England. Cambridge.

Draper, G.. 1998. The Framers of Canterbury Cathedral Priory and All Souls College Oxford on Romney Marsh c.1443-1545. In Romney Marsh: Evolution, Occupation, Reclamation (Oxford University Committee for Archaeology 24), 109-128. Oxford.

Eddison, J. 1983. The evolution of barrier beaches between Fairlight and Hythe, Geographical Journal 149, 39-53.

Eddison, J. 1983. The reclamation of Romney Marsh: some aspects reconsidered, Archaeologia Cantiana 99, 95-110.

Eddison, J. 1983. An intensive ditching system in the Wicks, south-west of Lydd, Archaeologia Cantiana 99, 273-6.

Eddison, J. 1983. Flandrian barrier beaches off the coast of Sussex and south-east Kent, Quaternary Newsletter 39, 25-9.

Eddison, J.1985. Developments in the lower Rother valleys up to 1600, Archaeologia Cantiana 102, 95-110.

Eddison, J.1988. 'Drowned Lands': changes in the course of the Rother and its estuary and associated drainage problems 1635-1737, in J. Eddison and C. Green (eds), Romney Marsh: Evolution, Occupation, Reclamation (Oxford University Committee for Archaeology 24), 142-63. Oxford.

Eddison, J.1995. Attemps to clear the Rother channel, 1613-1624, in J. Eddison (ed.), Romney Marsh, the Debatable Ground (Oxford University Committee for Archaeology 41) 148-63. Oxford.
Eddison, J. and Draper, G. 1997. A landscape of medieval reclamation: Walland Marsh, Kent, Landscape History 19, 75-88.
Eddison, J.1998. Reclamation of Walland Marsh, 12th - 18th centuries: the interaction between marine processes and human intervention, in J.B. Murton et al. (eds), The Quaternary of Kent and Sussex: Field Guide. (Quaternary Research Association) 82-6. London.
Eddison, J.1998. South Walland Marsh: l7th-l8th century AD reclamation, in J.B. Murton et al. (eds), The Quaternary of Kent and Sussex: Field Guide. (Quaternary Research Association) 1014)3. London.
Eddison, J.1998. Catastophic Changes: the Evolution of the Barrier Beaches of Rye Bay. In Romney Marsh: Environmental Change and Human Occupation in a Coastal Lowland (Oxford University Committee for Archaeology 46), 65-88. Oxford.
Eddison, J. 2000. Romney Marsh, Survival on a Frontier. Tempus.
English Nature 1997. Folkestone to Selsey Bill Natural Area Profile. English Nature Lewes.
English Nature 1997. Romney Marsh Natural Area Profile. English Nature Kent Team.
Firth, F.M. 1984. The Natural History of Romney Marsh. Meresborough.
Gallois, R.W. 1965. The Wealden District. HMSO, London, 101pp.
Gardiner, M. 1988. Medieval settlement and society in the Broomhill area, and excavations at Broomhill church, in J. Eddison and C. Green (eds), Romney Marsh: Evolution, Occupation, Reclamation (Oxford University Committee for Archaeology 24), 112-27.
Gardiner, M. 1994. Old Romney: an examination of the evidence for a lost Saxo-Norman port, Archaeologia Cantiana 114, 329~5.
Gardiner, M. 1995. Medieval farming and flooding in the Brede Valley, in J. Eddison (ed.), Romney Marsh: The Debatable Ground (Oxford University Committee for Archaeology4l), 127-37. Oxford.
Gardiner, M. 1996. A seasonal fishermen's settlement at Dungeness, Kent, Medieval Settlement Research Group Annual Report 11, 18-20.
Gardiner, M. 1998. Broomhill, in J.B. Murton et al. (eds), The Quaternary of Kent and Sussex: Field Guide. (Quaternary Research Association) 9~101. London.
Gibbons, R. 1999. Reserve Focus. Rye Harbour Nature Reserve, East Sussex. British Wildlife vol.11 no.2. British Wildlife Publishing.
Godwin, F. & Ingrams, R., 1980. Romney Marsh and the Military Canal. Wildwood House London.
Green, C.P. 1988. Palaeogeography of marine inlets in the Romney Marsh area, in J. Eddison and C. Green (eds), Romney Marsh: Evolution, Occupation, Reclamation (Oxford University Committee for Archaeology 24), 167-74. Oxford.
Green, R.D. 1968. Soils of Romney Marsh. Soil Survey of Great Britain. Bulletin No.4. Harpenden.
Gross. A. and Butcher, A. 1995. Adaptation and investment in the age of the great storms: agricultural policy on the manors of the principal lords of the Romney Marshes and the marshland fringe, in J. Eddison (ed.), Romney Marsh: the Debatable Ground (Oxford University Committee for Archaeology 41), 107-17. Oxford.
Hamblin, R. J. O., Crosby, A., Balson, P. S., Jones, S. M., Chadwick, R. A., Penn, I. E. and Arthur, M. J. 1992 The Geology of the English Channel (British Geological Survey, United Kingdom Offshore Regional Report) London H.M.S.O.
Hamiot, S. 1999. Les Amenagements littoraux et leurs impacts en Plaine Maritime Picarde. SMACOPI.
Harding, P.A. 1985. The Rye and Camber Tramway. Harding, Woking.
Harries, D. 1997. Maritime Sussex. S.B. Publications, Lewes.
Hipkin, S. 1995. The impact of marshland drainage on Rye Harbour, 1550-1650, in J. Eddison (ed.) Romney Marsh: The Debatable Ground (Oxford University Committee for Archaeology 41), 138-47. Oxford.
Hipkin, S. 1995. Closing ranks: oligarchy and government at Rye, 1570-1640, Urban History 22, 319-40.
Hipkin, S. 1995. Buying time: fiscal policy at Rye, 1600-1640, Sussex Archaeological Collections 133, 241-54.
Holgate, R. and Woodcock, A. 1988. Archaeological and palaeoenvironmental investigations at Pannel Bridge, near Pett Level, East Sussex, in J. Eddison and C. Green (eds), Romney Marsh: Evolution, Occupation, Reclamation (Oxford University Committee for Archaeology 24), 72-6. Oxford.

Holman, W. 1938. The Marshes between Hythe and Pett. Sussex Archaeological Collections 79, 199-223.

Hutchinson., G., 1993. The Mary Stanford Disaster. Hastings.

Hutchinson., G., 1994. Martello Towers. A Brief History. Hastings.

Hutchinson., G., 1995.The Royal Military Canal. A Brief History. Hastings

Innes, J.B. and Long, A.J. 1992. A preliminary investigation of the 'Midley Sand' deposit, Romney Marsh, Kent, UK, Quaternary Newsletter 67, 32-9.

Kirkham, J. 1992. Bygone Rye Harbour. Rye Memories Vol 18. Thomas Peacocke School Local History Group.

Lake, R.D. and E.R.Shephard-Thorn. 1987. Geology of the country around Hastings and Dungeness. HSMO.

Leslie, K. & Short, B (eds). 1999. An Historical Atlas of Sussex. Phillimore.

Lewis, W.V. 1932. The Formation of Dungeness Foreland. Geogr. J. 80, 309-324.

Lewis, W.V. & Balchin, W.G.V. 1940.Past sea-levels at Dungeness. The Geographical Journal. 96:257-285.

Long, A.J. 1998. Dungeness Foreland, in J.B. Murton et al. (eds), The Quaternary of Kent and Sussex: Field Guide. (Quaternary Research Association) 88-94. London.

Long, A.J. and Hughes, P.D.M. 1995. Mid- and late-Holocene evolution of the Dungeness Foreland, United Kingdom, Marine Geology 124, 253-71.

Long, A.J. and Innes, J.B. 1993. Holocene sea-level changes and coastal sedimentation in Romney Marsh, southeast England, UK, Proceedings of the Geologists' Association 104, 223-37.

Long, A.J. and Innes, J.B. 1995. The back-barrier and barrier depositional history of Romney Marsh and Dungeness, Kent, Journal of Quaternary Science 10, 267-83.

Long, A.J., Waller, M.P., and Innes, J.B. 1996. Holocene coastal sedimentation in the Eastern English Channel: new data from the Romney Marsh region, United Kingdom, Marine Geology 136, 97-120.

Long, A.J. and Waller, M.P. 1998. Introduction: the Romney Marsh depositional complex, in J.B. Murton et al. (eds), The Quaternary of Kent and Sussex: Field Guide. (Quaternary Research Association) 61-4. London.

Lovegrove, H. 1953. Old Shore Lines Near Camber Castle. The Geographical Journal. 119, 200-207.

Luard, H. R. 1880 Matthaei Parisiensis Chronica Majora V London: H.M.S.O.

May, V.J. 1985 Geomorphological aspects of Dungeness. In Ferry, B. and S.Waters. 1985. Dungeness - Ecology and consevation. Focus on nature conservation No. 12. NCC, Peterborough.

Mountford, J.O. & Sheail, J. 1982. The Impact of Land Drainage on Wildlife in the Romney Marsh: The availability of baseline data. ITE project 718 report to NCC.

Moutzouris. C. I. 1995. Shoreline Structures for Coastal Defence. In Directions in European Coastal Management. Healy & Doody (eds). 1995. Samara Publishing limited, Cardigan. pp153-159.

Murray, W.J.C. 1953. Romney Marsh.. Hale, London.

Murton, J.B., Whiteman, C.A., Bates, M.R., Bridgeland, D.R., Long, A.J., Roberts, M.B. and Waller, M.P. (eds) 1998. The Quaternary of Kent and Sussex: Field Guide. Quaternary Research Association. London.

Plater, A.J. and Long, A.J. 1995. The morphology and evolution of Denge Beach and Denge Marsh, in J. Eddison (ed.) Romney Marsh: The Debatable Ground (Oxford University Committee for Archaeology 41), 8-36. Oxford.

Plater, A.J., Long, A.J., Spencer, C.D. and Delacour, R.A.P. in press. The stratigraphic record of sea-level change and storms during the last 2000 years: Romney Marsh, south-east England, Quaternary International

Plater, A.J., Spencer, C.D., Delacour, R.A.P. and Long, A.J. 1995. The stratigraphic record of sea-level change and storms during the last 2000 years: Romney Marsh, south-east England, Terra Nostra, Schrijten der Alfred-WegenerStiftung 2/95, 248.

Pratt, M. 1998. Winchelsea. A port of Stranded Pride. Author's Publishing Guild.

Ratcliffe, D.A. 1977 'A Nature Conservation Review'. Cambridge.

Rhoden, I. & Peak, S. 1987. George Woods. Photographs from the 1980's. Midnight Press.

Roberts, G. 1988. Sea defence and land drainage of Romney Marsh, in J. Eddison and C. Green (eds), Romney Marsh: Evolution, Occupation, Reclamation (Oxford University Committee for Archaeology 24), 163-6. Oxford.

Rye Harbour Nature Reserve 1970 - 1999. Annual Reports. RHNR Management Committee.

Smith, A. J. 1989 'The English Channel - Geographical Design or Catastrophic Accident?' Proc. Geologists' Assoc. 100, 325-37.

Spencer, C.D. 1997. The Holocene evolution of Romney Marsh: a record of sea-level change in a back-barrier environment (unpublished Ph.D. thesis, University of Liverpool).

Spencer, C.D., Plater, A.J. and Long, A.J. 1998. Rapid coastal change during the mid- to late-Holocene: the record of barrier estuary sedimentation in the Romney Marsh region, southeast England, The Holocene 8(2), 143-63.

Stidder, D. & Smith, C. 1997 Watermills of Sussex. Vol. 1 East Sussex. Baron Birch

Tooley, M.J. 1990. Sea level and coastline changes during the last 5000 years, in S. McGrail (ed.), Maritime Celts, Frisians and Saxons (Council for British Archaeology Research Report 71), 1-16. London.

Tooley, M.J. and Switsur, R. 1988. Water level changes and sedimentation during the Flandrian Age in the Romney Marsh area, in J. Eddison and C. Green (eds), Romney Marsh: Evolution, Occupation, Reclamation (Oxford University Committee for Archaeology 24), 53-71. Oxford.

Vine, P.A.L. 1989. Kent and East Sussex Waterways. Middleton Press.

Waller, M. 1993. Flandrian vegetation history of south-eastern England. Pollen data from Pannel Bridge, East Sussex, New Phytologist 124, 345-69.

Waller, M. 1994. Flandrian vegetation history of south-eastern England. Stratigraphy of the Brede valley and pollen data from Brede Bridge, New Phytologist 126, 369-92.

Waller, M.P. 1998. An investigation into the palynological properties of fen peat through multiple pollen profiles from south-eastern England, Journal of Archaeological Science. 25, 631-42.

Waller, M.P. 1998. Wealden vegetational history: the Brede and Pannel valleys, in J.B. Murton et al. (eds), The Quaternary of Kent and Sussex: Field Guide. (Quaternary Research Association) 103-15. London.

Waller, M.P., Burrin, P.J. and Marlow, A. 1988. Flandrian sedimentation and palaeoenvironments in Pett Level, the Brede and lower Rother valleys and Walland Marsh, in J. Eddison and C. Green (eds), Romney Marsh: Evolution, Occupation, Reclamation (Oxford University Committee for Archaeology 24), 3-30. Oxford.

Waller, M.P., Long, A.J., Long, D.J. and Innes, J.B. 1998. Walland Marsh: wetland dynamics, sea level change and coastal evolution, in J.B. Murton et al. (eds), The Quaternary of Kent and Sussex: Field Guide. (Quaternary Research Association) 7081. London.

Waller, M.P., Long, A.J., Long, D. and Innes, J.B. in press. Patterns and processes in the development of coastal mire vegetation: multi-site investigations from Walland Marsh, south-east England. Quaternary Science Reviews.

Wass, M. 1995. The proposed northern course of the Rother: a sedimentological and microfaunal investigation, in J. Eddison (ed.), Romney Marsh, The Debatable Ground (Oxford University Committee for Archaeology 41), 51-77. Oxford.

Wilkins, 1950. Birds at Rye Harbour. Spiral bound report.

Yates B.J. 1994. Rye Harbour Nature Reserve Management Plan 1994-98. East Sussex County Council.

Yates B.J. 1996. Rye Harbour Nature Reserve. A 25 Year Review. Part 1: A History and Description. East Sussex County Council.

Yates B.J. and **P. Triplet**. 1998. A Preliminary Comparison of the Species of Rye Bay and the Baie de Somme. First Report of the Two Bays One Environment Project. East Sussex County Council.

Yates B.J. and **P. Triplet**. 1999. Conservation of Natural Environments and their opening to the Public. Second Report of the Two Bays One Environment Project. East Sussex County Council.

Yates B.J. and **P. Triplet**. 1999. A Workshop on Countryside Management in Rye Bay and the Baie de Somme. Third Report of the Two Bays One Environment Project. East Sussex County Council.

Yates B.J. 2000. Rye Harbour Nature Reserve Management Plan 2000 - 2004. East Sussex County Council.

Rye Bay Maps

The following maps have been prepared as a Powerpoint presentation and are attached to this report as a CD ROM as well as printed at small scale. They are labelled as slides.

Slide 1: Rye Bay, East Sussex, England. A location map.
Slide 2: Rye Bay Ordnance Survey in 2000. The project area is shown outlined in black.
Slide 3: Rye Bay towns. The major towns of the area are shown.
Slide 4: Rye Bay SSSIs. The main Site of Special Scientific Interest are shown in green.
Slide 5: High Weald AONB. The Area of Outstanding Natural Beauty is shown in blue.
Slide 6: Rye Bay SNCIs. The Sites of Nature Conservation Importance are shown in yellow.
Slide 7: Rye Bay coastline today
Slide 8: Shoreline 400 years coastline before present
Slide 9: Shoreline 2,000 years before present
Slide 10: Shoreline 5,000 years before present
Slide 11: Shoreline 10,000 years before present
Slide 12: Former Shorelines after Lewis
Slide 13: Shorelines at Rye Harbour
Slide 14: Lewin's 55 BC map
Slide 15: Lewin's 14th Century map
Slide 16: Lewin's 17th Century map
Slide 17: Stages of reclamation
Slide 18: Early innings of Romney Marshes
Slide 19: Floyd's map of 13th Century
Slide 20: Saxton's map of 1579
Slide 21: Norden's map of 1580's
Slide 22: Eddison's map of 1590, 1693 and 1990 coastline at Broomhill
Slide 23: Symondson's map of 1594
Slide 24: Symondson's map of 1594
Slide 25: Symondson's map of 1594 and Prowze's 1572
Slide 26: Symondson map of 1599
Slide 27: Part of Symondson's 1599 map
Slide 28: Speed's map of 1610
Slide 29: Blaeu's map of 1645
Slide 30: Dugdale's map of 1662
Slide 31: Holloway's version of Dugdale's map of 1662
Slide 32: Collins map of 1682
Slide 33: Budgeon's map of 1724
Slide 34: Smeaton's map 1763
Slide 35: Smeaton's 1763 text
Slide 36: Bellin's map of 1764
Slide 37: Yeakell's map of 1778
Slide 38: Jackson's map of 1797
Slide 39: Sutherland's map of 1801
Slide 40: 1807
Slide 41: Allason's map of 1819
Slide 42: Thomas Moule's map of 1838
Slide 43: Ordnance Survey 1891
Slide 44: Rye Harbour and East Guldeford Ordnance Survey 1891
Slide 45: Pett, Brede and Tillingham Ordnance Survey 1891

Slide 46: Rother Valley Ordnance Survey 1959
Slide 47: Proposed Land Drainage of 1961
Slide 48: Arable land west of the Rother
Slide 49: Arable land west of the Rother
Slide 50: Arable land west of the Rother
Slide 51: Arable land west of the Rother
Slide 52: Arable land west of the Rother