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EAST ANGLIAN SALT MARSHES



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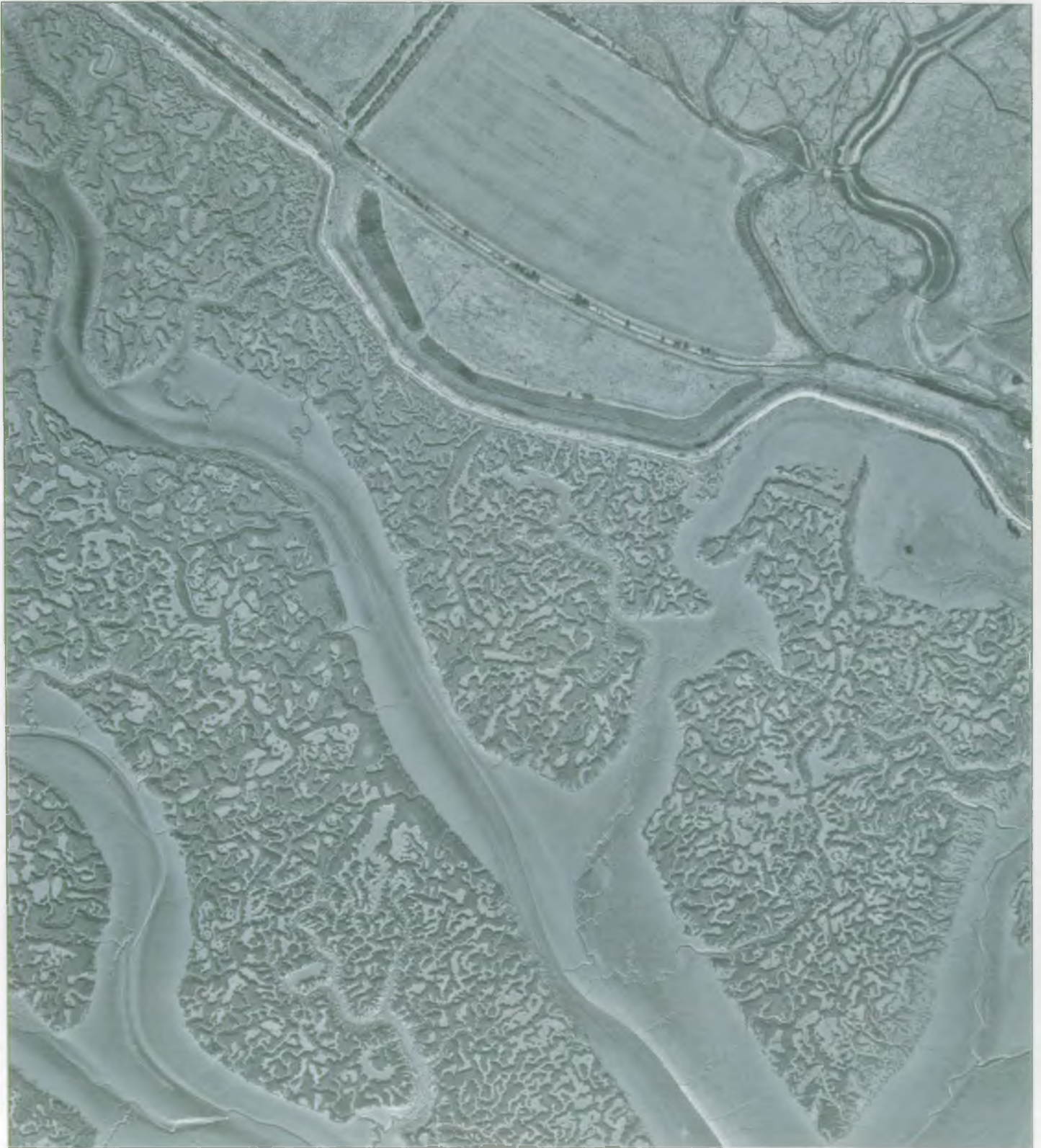
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SALT MARSHES IN EAST ANGLIA

Summary:

This pamphlet represents a glimpse only of the function, use and abuse of what is often called the last natural wilderness of Britain, and attempts to explain the role of the N.R.A. in salt marsh management.

Such fragile coastal belts are complex, ever changing areas, where tide, sediment, plants, sea creatures, birds and time all combine to create a self sufficient system that man has enjoyed since the first early settlements.



Salt marshes, Essex. A bird's eye view of the intricate drainage patterns

1. Where are they

Saltings in East Anglia cover 13,000 hectares representing 30% of the entire U.K. remaining area. Per County, Essex has 4,600 hectares; Suffolk 1,300 hectares; Norfolk 3,000 hectares and Lincoln has 4200 hectares.

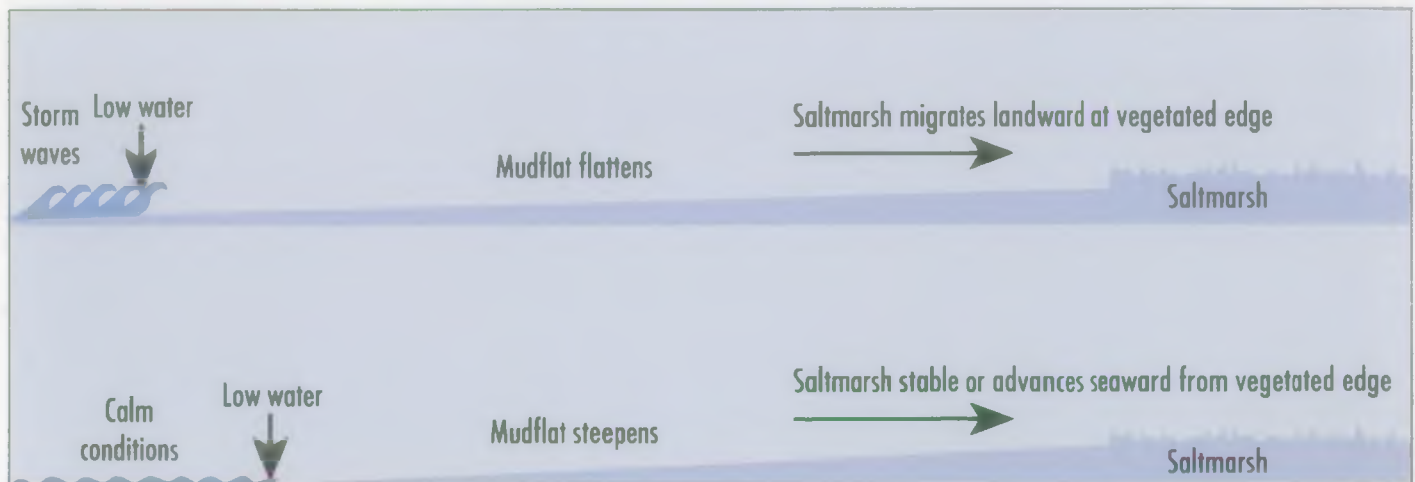
In comparison with the total U.K. salt marsh area of 44,400 hectares, there are 56,000 hectares of sand dunes; 1,300,000 hectares of peatlands and 350,000 hectares of ancient woodland.

2. What are they :

Salt marshes and their fronting mud flats are the only natural wilderness areas left in the U.K. They are formed by fine silts and sands being deposited in sheltered locations and colonised by specialist salt tolerant plants. The plants act as a buffer to tidal currents and waves encouraging more silts to settle.

As these young marshes gain in height so ebb and flood tidal currents form a maze of drainage patterns that act as the transport routes for sediments and help dissipate tidal currents.

The mud flats that front the saltings act in unison with the salt marsh; during on-shore gale attack the entire system widens and flattens, returning to a normal and relatively steeper profile during prevalent low energy waves, with sediment redistributed to build up the saltmarsh elevation.



3. Their importance in coastal defences :

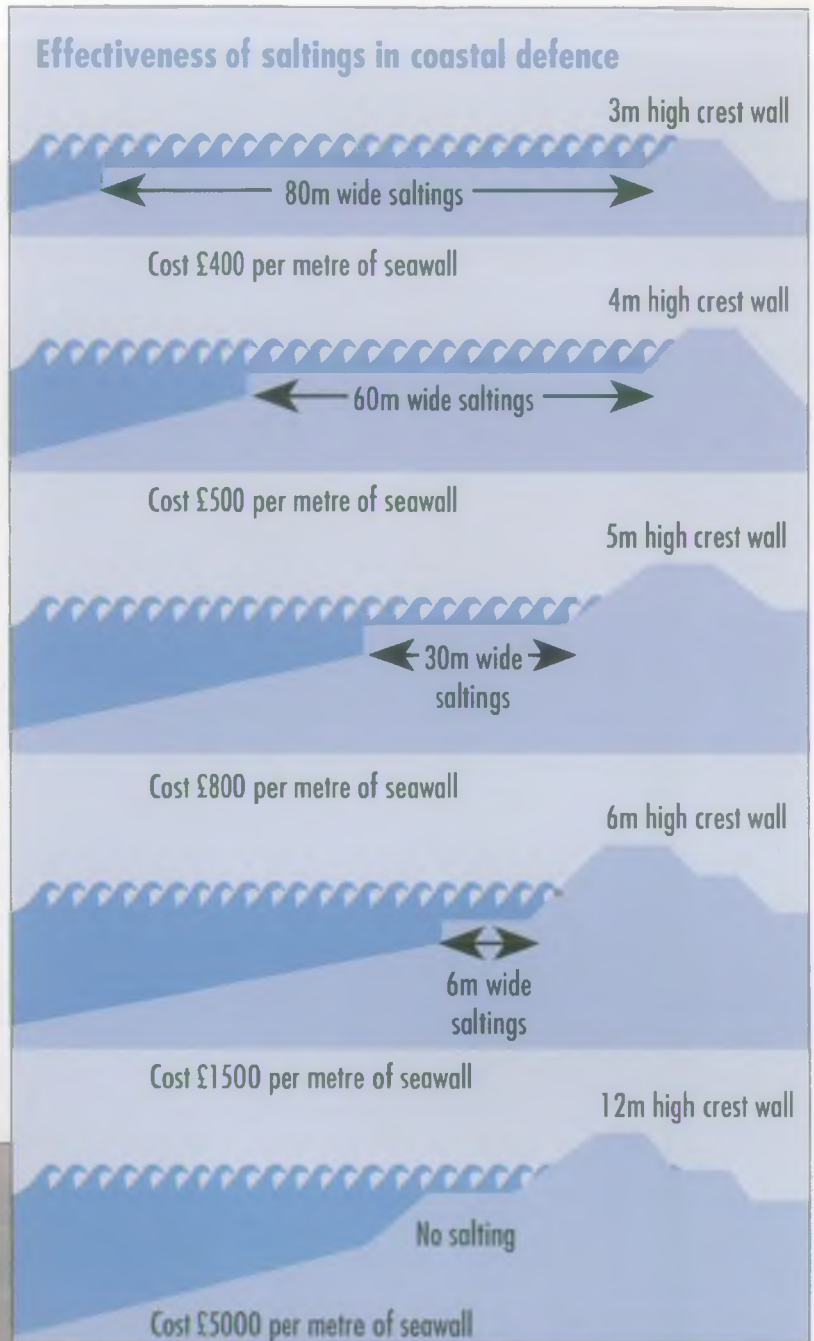
With a healthy salting fronting a sea wall the costs of building and maintaining an effective defence is comparatively low. If the salt marsh is eroded and lost, the cost dramatically increases. The marsh area acts as a dissipator to storm wave action and as a substantial weight to the seaward toe of the wall to give increased stability against water pushing against it. Complete wall failure, causing a breach in the defence line, could occur under storm conditions if the salting has been lost by erosion.

In Essex alone, of the 440km of sea walls maintained by the N.R.A. 300km rely on a salting as a 'first line' defence against the tide. If the salting were lost the additional cost for sea defences would be many hundreds of millions of pounds.

4. Their importance to recreation :

Traditionally the most extensive recreation on saltings was wildfowling, the skilled, lonely, winter pastime of goose and duck shooting. Since the second world war a growing national interest in boating has created the now familiar site of dinghies navigating the creeks and estuaries of East Anglia for the pleasure of racing, cruising or simply "messaging about in boats". Saltings create sheltered, shallow and safe conditions for boat users. In the last 20 years the enormous increase

Below: Learning to sail in a sheltered creek



in interests of bird watching and walking has created an unprecedented demand upon these remaining wilderness areas.

5. Their importance to conservation and fisheries :

5.1 PLANTS

All salt marsh plants are specialist adaptors at coping with varying frequencies of salt water immersion. On stable mud flats the now rare eel grass (*Zostera*) provides a binding root system which combined with the leaves aid accretion to the low mud areas. Fleshy stemmed samphire, spartina and puccinellia grass all colonise the fragile muds; purple sea lavender, sea purslane and many species of grass all colonise particular zones and sediment type creating a colourful and diverse habitat. All are rare plants that can be found nowhere else, all help toward sea defence stability.

Below: The rare Golden Samphire growing on a saltmarsh



5.2 INVERTEBRATES

Mud flats and saltings, with their incredible numbers of living invertebrates create the most protein rich and productive land in the U.K. The diversity of these small creatures that exist in such seemingly hostile conditions is considerable. A square metre of mud can hold 1,200 worms below the surface, whilst up to 15,000 hydrobia snails graze on its surface. It is not uncommon for over 30 different species of invertebrates to be found from the splash zone to half tide level in one straight line. This vast army of cockles, mussels, ragworm, snails, all process fine silts and the food it holds to produce a clay-



The bi-valve mollusc Baltic Tellin.

like 'soil' which has a direct benefit to the toe of sea walls. Many very rare (Red Data Book) insects survive on salt marshes only, from specialist spiders and wood lice to the fragile Essex Emerald Moth.

5.3 FISHERIES

Each year, each hectare of salting provides 1/2 tonne of nutrients in the form of rotted dead vegetation to go back into the estuary system. This natural food, combined with the shelter of the creeks, creates a huge nursery for millions of fish fry. The creek beds, provide the ideal conditions for bi-valve molluscs to feed and grow to maturity.

From pre-Roman times to the present, man has harvested this protein rich seafood source, cultivating oysters, dredging cockles, netting and trapping flatfish, bass, mullet and eels.

5.4 BIRDS

The East Anglian salt marshes are part of the Eastern Atlantic Flyway, a migration route for millions of birds covering a distance from Siberia to South Africa. Directly linked to the Wadden Sea saltings, these fertile areas are the main feeding grounds in the winter to enable survival between breeding seasons.

In Essex alone, the salt marshes and their fronting mud flats are the winter home to 35 thousand Brent Geese (half the entire British population), 12% of the Shelduck population; 14% of Redshank; 70,000 Dunlin and 32,000 Knot.



Brent geese



Left: Main wintering sites of waders along the European Atlantic coast, supporting over 20,000 waders. These 35 sites support a wintering population of 2.6 million birds, about 80% of the whole European Atlantic population (Boyd & -Pirou 1989).

Any loss of mud flat and salt marsh has a direct and instant impact on bird numbers; many species rely totally on these areas and cannot survive without them.

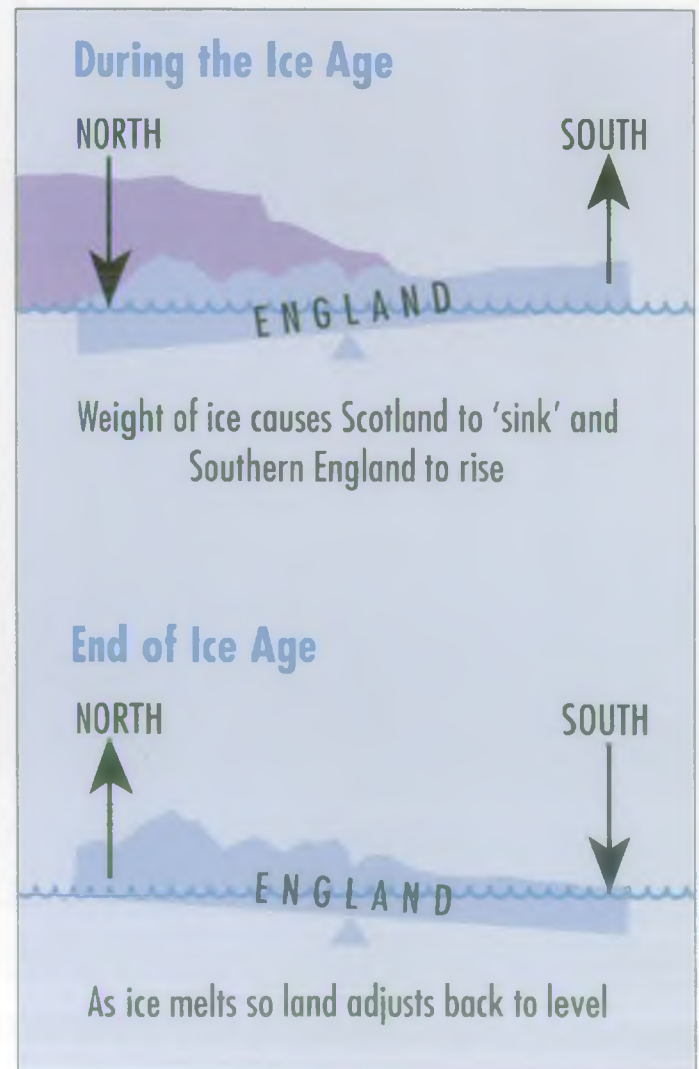
6. Salt marshes under Threat

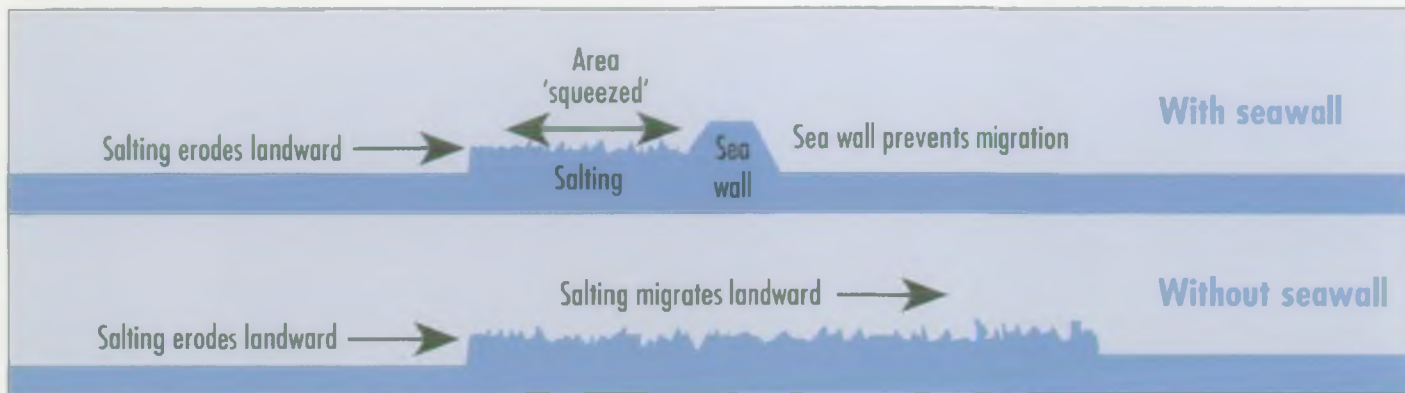
Since the end of the last ice age (10 thousand B.C.) salt marshes have advanced and retreated as relative sea levels have decreased or increased. If sea level is falling or rising slowly, the saltings have accreted and advanced forward; if sea levels are rising 'rapidly' they have migrated landward, providing a natural defence to higher level lands. At present in the Wash and North Norfolk the marshes are accreting, or stable; in Suffolk and Essex they are eroding and retreating as the relative levels between land and sea continues to adjust from the last ice age.

Between the c15th and c18th, a period of stable or advancing saltings, major sea wall building took place with 80% of the marsh being reclaimed, over 100,000 hectares in the Anglian region alone.

No. present Site	Country
430,000 Waddensee	The Netherlands
250,000 Delta	The Netherlands
210,000 Wattenmeer Niedersachsen	FRG
192,000 Essex sites combined	United Kingdom
179,000 Wash	United Kingdom
155,000 Morecambe Bay	United Kingdom
110,000 Wattenmeer Schleswig-Holstein	FRG
100,000 Basin d'Arcachon	France
83,000 Humber	United Kingdom
83,000 Dee	United Kingdom
80,000 Charente Maritime	France
66,000 Solway	United Kingdom
61,000 Alt/Ribble	United Kingdom
55,000 Baie de Mont St. Michel	France
54,000 Severn	United Kingdom
54,000 Tejo	Portugal
51,000 Orkneys	United Kingdom
50,000 Langstone/Chichester Harbour	United Kingdom
48,000 Strangford Lough	United Kingdom
44,000 Dundalk Bay	Ireland
40,000 Strathclyde coast	United Kingdom
40,000 N Adriatic and Po delta	Italy
37,000 Firth of Forth	United Kingdom
35,000 Burry Inlet	United Kingdom
33,000 Swale	United Kingdom
32,000 Mersey	United Kingdom
30,000 Vadehavet	Denmark
30,000 Shannon/Fergus	Ireland
30,000 Dublin Bay	Ireland
29,000 Medway	United Kingdom
29,000 Lindisfarne	United Kingdom
27,000 Golfe de Morbihan	France
22,000 Duddon	United Kingdom
21,000 Uists	United Kingdom

Numbers refer to average peak numbers (United Kingdom) and mean numbers (rest).





Right: Jet-ski's can cause damage to saltings and disturbance to birds

These same sea walls are now preventing marsh migration landward. Over 2% of the total remaining areas are eroded each year by natural forces. Saltings are being squeezed out of existence between a fixed sea wall and a rising sea level.

The natural progression from mud flats to low marsh to high marsh, has also been prevented, with very few areas of 'high' marsh now existing in East Anglia.

Other areas of salting are still being lost by direct land fill for use as marinas, car parks, boat storage and port facilities, with hundreds of hectares being destroyed each decade.

Recent research in Europe, America and the U.K. has shown significant levels of pollution in both muddy foreshores and saltings. Because of the nature of the fine silts that form a marsh, pollutants are able to 'stick' to the fine grains. Heavy metals like TBT from anti-fouling boat paints, mercury from industry, lead from car exhausts, P.C.B.'s from electrical waste goods, pesticides and fertilisers from agriculture are all concentrating in these fragile coastal belts; the saltings are acting like a sponge, soaking up the pollutants, holding them in place and preventing wider, potentially more harmful distributions. As they erode, the pollutants are released into the environment. The affect on marine life can be catastrophic, with the early use of weedkillers possibly causing vast losses to eel grass in the 1930s and the virtual elimination of North Sea porpoises being a result of P.C.B.'s in the food chain.

The thoughtless use by some speed boats and jet-ski users in confined creeks is creating an ever increasing problem of damage to the salt marsh and the creatures that use them. Localised erosion and large scale disturbance to birds and fish shoals are causing local environmental damage; the projected increase in jet-ski ownership and use, if left unrestricted, could cause total loss of some bird species over a wider area.



7. The work of the N.R.A. on Saltings

The N.R.A. and its predecessors have been involved in salt marsh management since 1978, financing scientific research, designing and constructing experimental sites and developing strategies for the preservation of saltings. The majority of this work has concentrated on the Essex Coast, the area most affected by erosion, creating serious tidal defence problems.

7.1 RESEARCH

An intensive study was undertaken over a five year period to monitor coastal processes affecting saltings, fronting mud flats and their interaction. The Institute of Coastal and Estuarine Studies of Hull University measured wave height, marsh and mud flat levels, suspended sediments in creeks, tidal currents and the affects of on-shore storms. Using this vital information the NRA have been able to modify potentially harmful past sea defence engineering practices and formulate policies for a more sympathetic solution.



Linked to the same five year period a separate study conducted by the Institute of Terrestrial Ecology investigated salt marsh plant growth, its importance in mud stabilisation, its comparative health and death in differing zones and locations and its potential for coping with a more rapid relative sea level rise. Should predictions of the 'Greenhouse Effect' become a reality the NRA will be better placed to take action to enable salting survival.

Essex University were commissioned to survey the coast at selected sites to produce a comprehensive report on small mammal, land and marine invertebrate use of salt marshes in the county. Of particular concern was the question "Are some marshes more important than others" for

Above: Mudflats can contain 1200 worms in a square metre

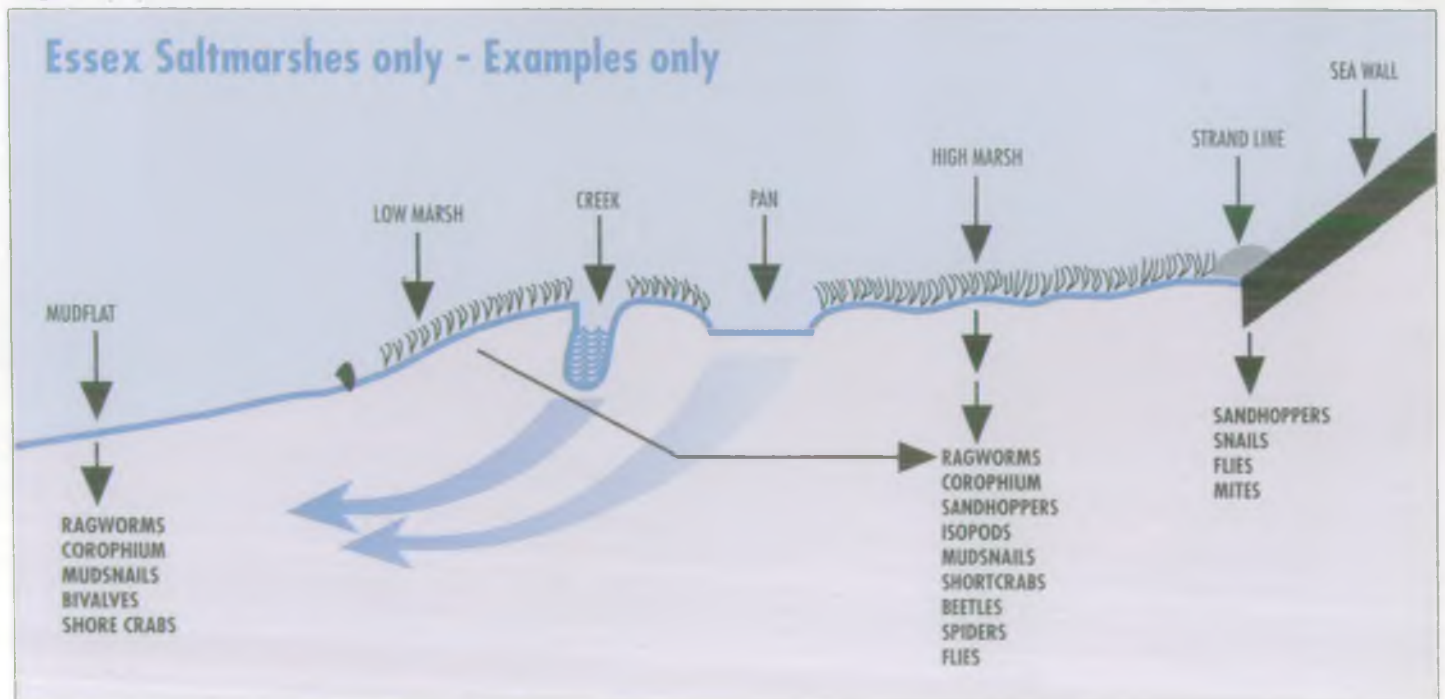
Right: Oystercatcher roost on a salting edge

these creatures. The survey revealed many rare species in sites previously thought species poor, and concluded that all saltings throughout the county have equal importance.

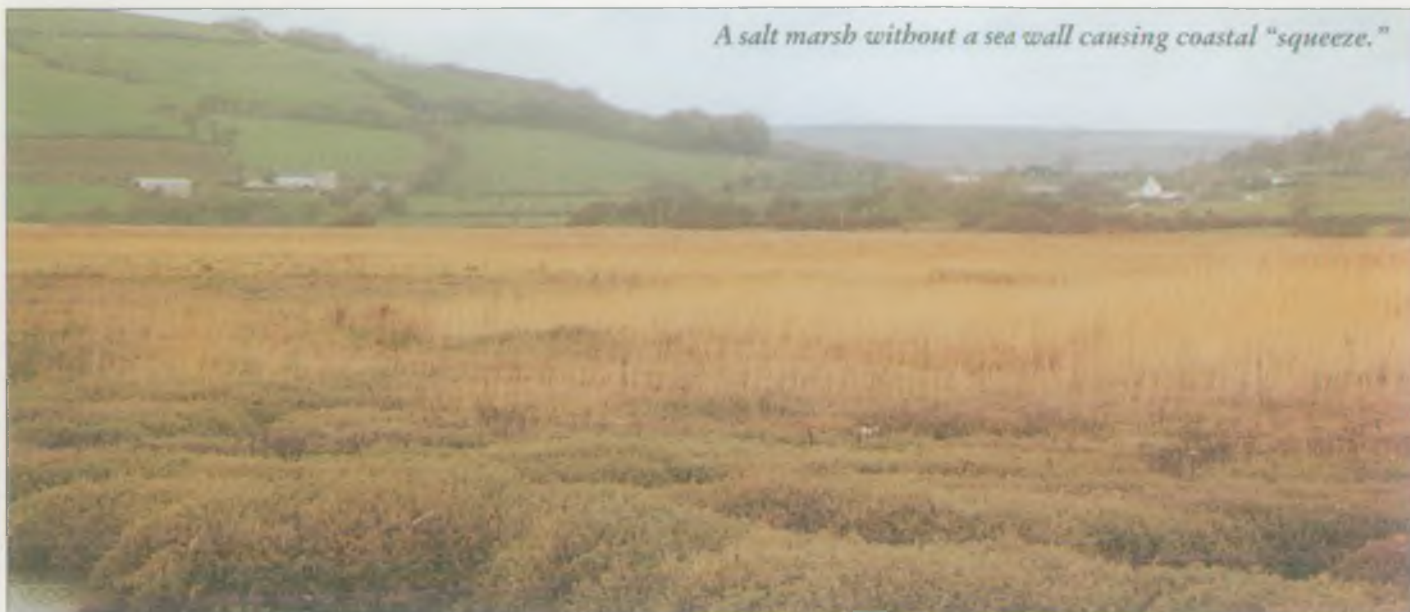
Bird use and numbers in Essex were surveyed by contract to the R.S.P.B., which looked at both past and present usage and future potential. An example of their findings is shown below :-

Species	Average Peak Count	% of British Population	% of European Population
Dark Bellied Brent Goose	44,785	50	34%
Shelduck	10,337	14	8%
Widgeon	16,124	8	3%
Teal	9,168	9	5%
Oystercatcher	13,685	5	2%
Redshank	10,199	14	5%

R.S.P.B. Summary of Birds Use for Essex Saltings



A salt marsh without a sea wall causing coastal "squeeze."



The research shows the possible loss of birds that will occur if marsh foreshores are eroded; future generations will not have the opportunities for viewing such spectacular numbers as this generation enjoys.

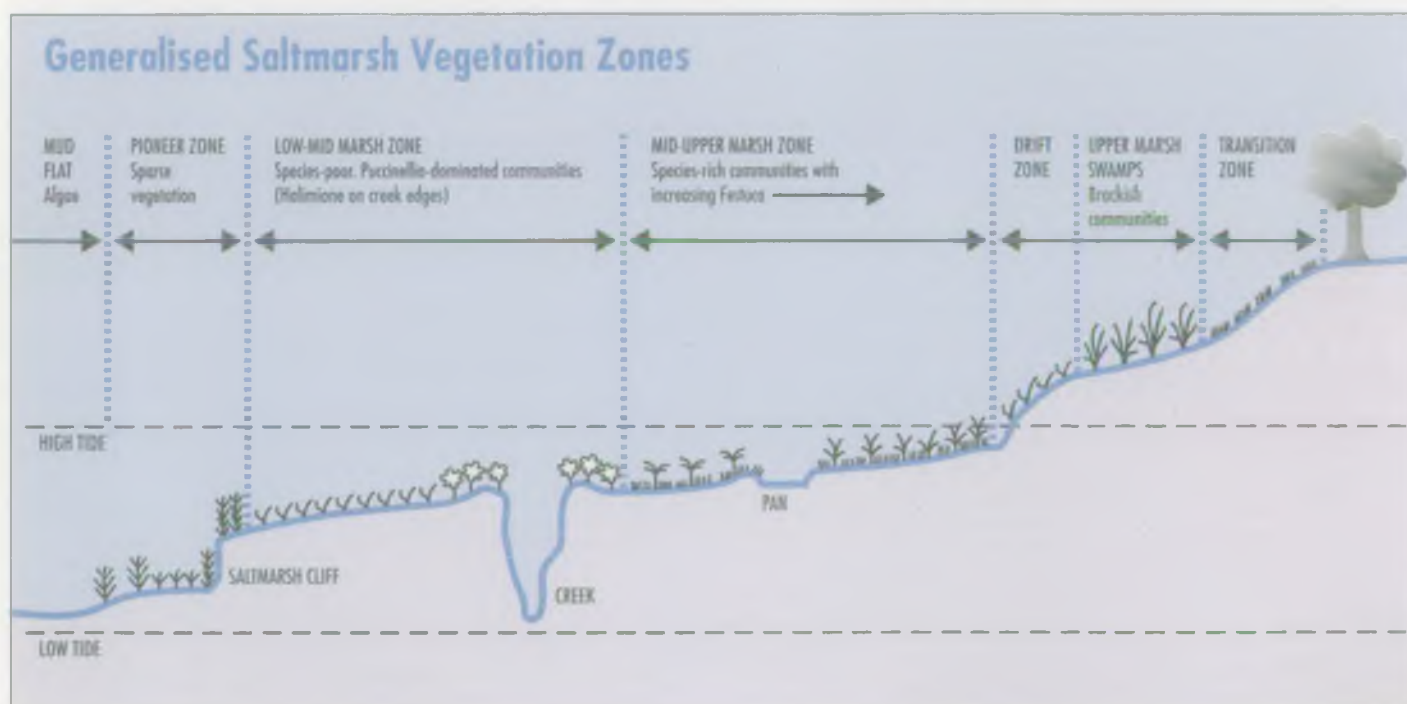
In 1990 Imperial College, London, were contracted to undertake an intensive survey of the Essex coastal fringing marshes and inter-tidal flats to ascertain the range and amounts of pollutants held. Six sites around the coast from the Thames to the Walton Backwaters were surveyed for heavy metals and chemical pollutants. The study has been extended to trace agricultural chemical and fertilizer run-off. It is not expected to produce final results and conclusions until 1994, but preliminary findings have revealed what appears to be only relatively small amounts of the majority of heavy metals, with some high counts of particular elements, but high concentrations of chemical pollutants.

It is noticeable that DDT's, PCB's and other man-made pollutants are persistent.

For more than a decade, until its use was restricted in the late 1980's, Organo-tin pesticide seriously damaged shellfish, especially molluscs and probably other invertebrates and plants in estuaries. Since it was banned from use in antifouling for small boats there has been a marked improvement perceived in many places. The significance of pollutants on saltmarsh systems is a complicated physical, chemical and biochemical process that is not yet well understood and requires continuing study and investigation.

7.2 EXPERIMENTAL WORK

A range of techniques are being developed on site to encourage growth of existing salt marshes, prevent or decrease erosion or create new saltings.



*Right: Brushwood Groyne
Below: Brushwood Polder
Bottom: Ex-Thames Lighters*



BRUSHWOOD POLDERS AND GROYNES

Developed in conjunction with the Essex Saltings Restoration Project, the methods used in Germany have been constructed at various locations in Essex. The low wooden stake and brushwood structures help to create areas where shelter is provided against waves or strong currents to encourage silt to settle.

WAVEBREAKS

Utilising redundant Thames lighters onshore waves are prevented from striking the coast; fine silts and sands accumulate in the lee of the wavebreak and foreshore levels raised to stabilise existing marshes.





FORESHORE RECHARGE

Pollutant-free harbour dredgings are brought inshore in shallow draught vessels and placed in front of eroding saltings. Wave energies striking the coast are dissipated on the recharged area, preventing further erosion of the marsh 'cliff'.

SET BACK

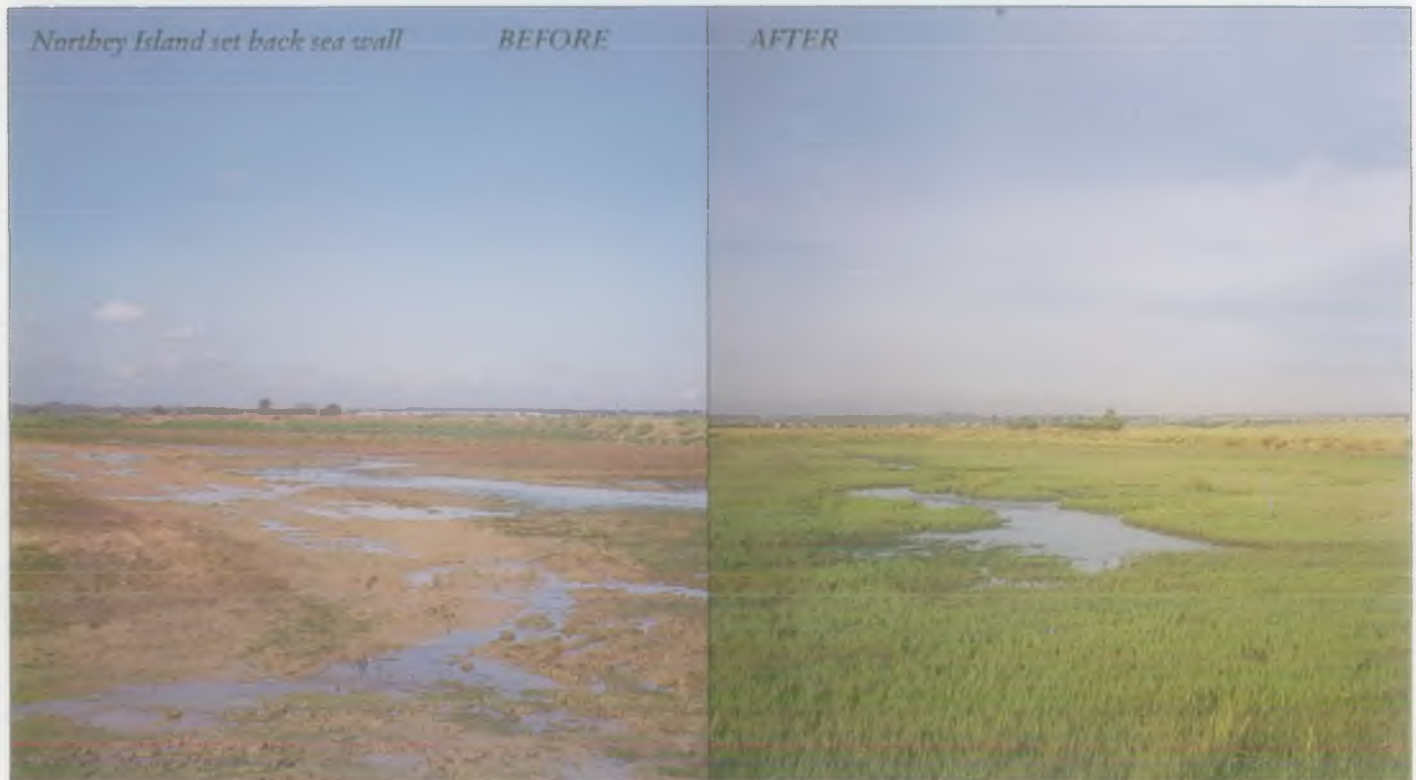
Removal of an existing sea wall to allow tidal inundation and conversion of existing agricultural land to salt or saline wetland. The defences at Northey site were removed less than 12 months ago but flora and fauna are already establishing themselves.

Each technique is site specific; a method that might be

beneficial at one location could be detrimental to another. For this reason the NRA continues to monitor its experimental sites to ensure no damage is caused and to better understand how this complex environment functions.

7.3 POLICY

The N.R.A., in conjunction with English Nature and the Ministry of Agriculture, Fisheries and Food are developing a strategy for salt marsh management in East Anglia. Existing use and erosion or accretion rates will need to be balanced against future demand and future pressures on the coast and the land protected by tidal and sea defences. In this way the continued existence of these wilderness areas will be assured for future generations.



The National Rivers Authority

Guardians of the Water Environment

The National Rivers Authority is responsible for a wide range of regulatory and statutory duties connected with the water environment.

Created in 1989 under the Water Act it comprises a national policy body coordinating the activities of 8 regional groups.

The main functions of the NRA are:

Water resources

- The planning of resources to meet the water needs of the country; licensing companies, organisations and individuals to abstract water; and monitoring the licences.

Environmental quality and Pollution Control

- maintaining and improving water quality in rivers, estuaries and coastal seas; granting consents for discharges to the water environment; monitoring water quality; pollution control.

Flood defence

- the general supervision of flood defences; the carrying out of works on main rivers; sea defences.

Fisheries

- the maintenance, improvement and development of fisheries in inland waters including licensing, re-stocking and enforcement functions.
- furthering the conservation of the water environment and protecting its amenity.
- navigation responsibilities in three regions — Anglian, Southern and Thames and the provision and maintenance of recreational facilities on rivers and waters under its control.



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24 April 06

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