



A future for wetland wildlife in the Alde-Ore Estuary, Suffolk

↑ Avocet, spoonbill and black-tailed godwit on the restored marshes at Orford Ness, in summer 2012, less than nine months after this site was created. *Matthew Guillatt/National Trust*

The National Nature Reserves in the Alde-Ore Estuary, Suffolk, are of international importance for their breeding and wintering waders. In recent years, the water levels on the marshes have dried out in spring, affecting the breeding success of the waders. Dave Mason, Grant Lohoar and Aaron Howe describe the major programme of works to improve water management on the reserves.

National Trust Orford Ness and RSPB Havergate Island form the Orford Ness-Havergate National Nature Reserve on the Suffolk Coast. Orford Ness is a 10-mile-long vegetated shingle spit that runs parallel to the River Alde-Ore. The exposed shingle of the seaward side of the spit shelters a mosaic of grazing, reed and saltmarsh, with scattered shallow scrapes, connecting ditches and numerous saline lagoons bounded by river walls. Havergate is Suffolk's only island and lies within the River Ore. It is managed as a series of semi-tidal shallow lagoons and mudflats, with nesting islets bounded by river walls and salt marsh. The reserves form part of a complex of Natura 2000 sites (SPA and SAC) within the estuary and are important for a range of breeding and wintering birds, including avocet, redshank, marsh harrier, lapwing, black-tailed godwit and spoonbill. They hold significant populations of saline lagoon invertebrates, such as the starlet sea anemone and lagoon sand shrimp.

In recent years, after a series of dry springs and summers, it was felt that there was a need to counter the effects of these dry periods on habitats and associated wildlife, and to adapt to perceived climate change. Increasingly ineffective water management infrastructures were focusing attention on the need to upgrade or install new

systems, thus improving water management and control, and in turn benefiting the wildlife.

In 2010, the National Trust (as co-ordinating partner) together with the RSPB were awarded a 50% European Union LIFE+ Nature grant to support the 'Alde-Ore Estuary – securing a sustainable future for wildlife' project (working title Alde Ore Future for Wildlife). Some match-funding was subsequently secured from the SITA Trust, Biffaward, Environment Agency and the Neptune Coastline Campaign. The aim of the project was to sustain and enhance habitats and species of European importance on these Natura 2000 sites. Key objectives were to establish functional, efficient and sustainable systems of water management in order to maintain and improve the quality of the coastal lagoons and marshes and to carry out sustainable management to create and improve habitat for breeding and wintering birds on these two exceptional reserves.

Background

Havergate Island became an RSPB nature reserve in 1948, and is famous for being one of the sites where avocets returned to the country after being absent for over 100 years. The site has a number of shallow saline lagoons, which provide an important habitat for wildfowl and wading birds. Sea-water

Orford Ness and Havergate Island National Nature Reserves

Surface area: 883ha

Protected status: Alde-Ore Estuary SPA; Orford Ness – Shingle Street: SAC; Alde, Ore and Butley Estuaries: SAC; Alde-Ore Estuary, Site of Special Scientific Interest (2,554ha); Orford Ness-Havergate, National Nature Reserve (910ha); Alde-Ore Estuary, Ramsar Site, designated 1996 (2,547ha)

Ownership: Orford Ness – National Trust (NT); Havergate Island – Royal Society for the Protection of Birds (RSPB)

Wildlife and geological interest: The scientific interests of the sites are outstanding and diverse. There is a variety of habitats, including intertidal mud-flats and sand-flats, salt marsh, saline (coastal) lagoons, wetland marshes and vegetated shingle. Orford Ness is the second-largest and best-preserved area of vegetated shingle in Britain and the land form is geomorphologically unique within the UK, combining a shingle spit (the longest in Europe, at 16km) with a cusped foreland. A complex sequence of shingle ridges deposited over thousands of years demonstrates and records stages in the evolution of this coastal landform. It has highly specialised and important flora communities, much of which grow away from the shore and only on the shingle ridges. The area has the most extensive sea campion/false oat-grass and moss/lichen swards anywhere on the UK east coast and the least disturbed of anywhere in the UK. The shingle habitats on the sites are important for breeding species such as the little tern and sandwich tern.

The diversity of wetland habitat types present is of particular significance to the birds occurring on the SPA, as these provide a range of opportunities for feeding, roosting and breeding within the site complex. At various times of the year, the sites support Nationally and EU notable assemblages of wetland birds, including seabirds, wildfowl and waders, several of which are Annex 1 species (Birds Directive).

The National Nature Reserves of Havergate

Island and Orford Ness are the most important wildlife sites within the Alde-Ore Estuary. Together they provide the most significant areas of breeding habitat in the SPA for over 50 species of seabird, wader and raptor. There are 16 regularly occurring and five breeding Annex 1 bird species (Birds Directive) and significant areas of five Annex 1 habitats (Habitats Directive). In addition to birds, these two National Nature Reserves support a large number of scarce and Red Data Book plants and invertebrates.



There is a regular wintering population of short-eared owls on Orford Ness.
Dave Crawshaw

flushing of the lagoons is a key feature of the site's hydrology. At times of high evaporation in summer and low rainfall, salinity levels in the lagoons can

rise to more than twice that of sea water, leading to declines in the invertebrate food for waders.

The profile of the existing islets and banks on



← Re-profiling nesting islets on Havergate Island, allowing occasional flooding to control vegetation and rats, and to create better visibility for visitors. Smaller equipment was used here because of the size and weight constraints of the vehicle ferry used for transport.
Kieren Alexander/RSPB

➔ At Orford Ness, large machinery was used to create scrapes and to construct storage lagoon walls using the clay from the excavations. Within the Airfield Marshes, low earth bunds (less than 1m high) now hold water in c. 4ha deepened scrapes between 20cm and 50cm deep, linked by a 2.6km network of new ditches, with 18 water-control structures. Grant Lohoar/NT



the island did not provide suitable feeding habitat for the breeding and wintering birds and made survey work and viewing by visitors very difficult. In addition, the cliffed edges made very good homes for a large colony of brown rats.

On Orford Ness, part of the grazing marsh was drained and levelled in 1913 to produce grass airfields and had several military buildings, structures and roads added. The Airfield Marshes were originally heavily drained to keep them dry, but since the National Trust purchased the site in 1993 they have been progressively flooded from the autumn onwards. This provided deeper pools

and shallow washlands for wintering wildfowl and wading birds. However, during the mid to late 1990s, and in more recent years, there have been periods of very dry summer weather, with rainfall as low as 320mm a year, which has caused the marshes to dry out. Winter water levels have had to be increased to allow water to be stored for the summer months, but this has had a detrimental effect on some areas and species. The dry weather, together with high evapotranspiration rates at this windy coastal site, have resulted in the water rapidly disappearing in the late spring, just when the breeding birds and their chicks need lots of wet, muddy margins. Once dry, the marine clay soil baked rock hard. A consequence has been the high rate of failure of successfully fledged wader chicks.

↓ New evacuation pumping system on Orford Ness, incorporating some original structures – two 15cm electric submersible pumps, manual/automatic controls, generator and ductile iron pipes. Grant Lohoar/NT



Planning and design

Initially, hydrological assessments and water-level management plans were commissioned to identify the features and locations required to create the new and improved water-management systems and habitats. Based on the recommendations of these plans, consulting engineers were employed to design the structures, including storage lagoons, banks and bunds, inlet sluices and water controls. At this point, the reality of the potential costs became apparent and adjustments had to be made to designs, work programmes and scale of work, and extra funding found. This is inevitable, to some extent, with any project but undoubtedly it would have been beneficial to carry out a more detailed feasibility study as part of the project planning phase rather than as part of the project.

The consultants also helped with the contract management process, creating tender documents, interviewing contractors and carrying out some

site supervision of the works. Some flexibility and adjustment of designs was required during the contract as the works progressed. A CDM (Construction (Design and Management)) co-ordinator was also appointed to review and collate health and safety files, as the works fell within the parameters of the CDM Regulations. The concept had been discussed with the relevant authorities, but the necessary permissions for the final designs had to be obtained from Natural England to protect the habitat, from the local planning authorities for structures and from the Environment Agency regarding flood risk and structures close to the river. Following a request for letters of expression of interest and a tendering process, two construction contractors were interviewed and the successful contractor appointed. The same design engineers, CDM coordinator and principle construction contractor were employed on both sites, but under separate contracts. This produced considerable savings in administration time, logistics and contract costs, especially in mobilisation.

Logistics

The earth-moving and water-control installation work began on both sites in October 2011 and a procession of diggers and dumpers began to rapidly transform them. At Orford Ness, these were brought on to the site via an access track on top of the narrow 5-mile-long shingle bank that forms a link to the mainland. During early 2013 and again in December this track was washed away by severe storms. This phase of the project would have cost considerably more if the equipment had to be brought onto site by ferry. A larger ferry would have been needed as the local one has a

↓ Flooding and erosion of a river wall at Orford Ness in December 2013. *Grant Lohoar/NT*



limited capacity. The sustainability of the access track is in doubt for future works. Havergate Island, already being an island in a tidal river, presented some challenges in managing a large construction project. The constraints of transport meant that smaller machinery was used than at Orford Ness. All materials and machinery were transported to site by ferry and personnel travelled down river to site by boat each day. The work programme here was scaled down somewhat and condensed into one year rather than spread over two to reduce costs and overall impact on the site.

Fortunately, the work benefited from one of the driest autumns in recent years, which made machinery movements relatively straightforward and did not damage the heavy marine clay soils,

↑↑ Two 600mm penstock tidal inlet sluices with concrete headwalls on the river wall, linked with electro-fusion welded polyethylene pipe and gabion or rock roll protection for the bank. Steps, Kee clamp rails and GRP mesh flooring aid safe operation. *Kieren Alexander/RSPB*

↑ An internal inlet sluice structure on a new storage lagoon, with marine-grade gate and flap valves at Orford Ness. The concrete-filled sandbag headwall and stone-filled Maccaferri Reno Mattress cages prevent erosion. *Grant Lohoar/NT*

→ Stock-piling topsoil during construction of a storage lagoon on Orford Ness. Re-laying this helped with the rapid re-establishment of vegetation and stabilisation of the banks.
Grant Lohoar/NT



consequently reducing down-time for stuck vehicles. Despite the challenges of working in exposed coastal winter conditions, the majority of the work was completed on time for spring 2012 and fulfilled the objectives and targets of the LIFE project.

Outcomes

Sluices have been built through the river walls on both sites so that river water can be drawn at high tide into the marshes and from there into the network of new ditches, scrapes and lagoons to maintain water levels and balance salinity.

Whilst the outlet sluices on Havergate Island can operate under gravity, the fields on Orford Ness are well below the level of the river and act like a bowl, which fills with winter rain. Pumping is required to remove water from the site during the winter to prevent flooding and maintain optimum levels. The next stage of the operation was to replace the old pumping system on Orford Ness, originally built in 1916, which no longer functioned properly. Two new submersible 15cm pumps, pipework and a generator completed the water-control system.

The benefit of being able to control water levels and keep the areas wet was immediately seen in the summer and autumn of 2012, with some of the highest wader and wildfowl numbers recorded for both sites. Ironically, the first spring and summer season after construction was one of the wettest on record, and the main issue on Orford Ness was that of too much water. The newly installed extraction pumps proved their worth. Following a cold, wet spring, 2013 brought more typical hot, dry summer weather. The deepened scrapes and new ditches have functioned as expected, holding water in some

places into September. Water has been brought in through the new sluices to refresh the marshes, reducing issues with hyper-salinity and improving the invertebrate food resource for birds.

On Havergate Island, approximately 20,000m³ of spoil was moved and rearranged to form 6ha of new nesting islets. The new islet layout and improved ditch network, designed by the site warden, aids the flow of water around the existing lagoon system. The islet heights are less than 30cm above the base level of the lagoon, with gently sloping edges. This allows them to be easily inundated with saline water, encouraging lower to middle saltmarsh plants and avoiding concentrations of long grass and thistles. This has removed the need for time-consuming mechanical brush-cutting and improved nesting conditions for key species. All the islands were shaped to enhance a feeling of naturalness and incorporate gently sloping sides to allow easier access to the feeding resource for small and large waders alike. As well as improving water flow they are orientated to allow visitors and species' surveyors the best possible view across the lagoons and its wildlife from the network of hides.

A large colony of brown rats occupied the old spoil banks, taller islands and river walls. These had a significant effect on the breeding success of resident birds. The re-profiling of the islands and spoil banks exposed these colonies and removed a large amount of their burrows.

Additional work was carried out on Orford Ness in late summer 2013 to install a further 3.9km network of shallow 'footdrains', using a spoil spreader to enhance the breeding and feeding



← Orford Ness in 2013. Improved monitoring, water controls and pumps allow better management of water levels. The effects of five months of heavy earth-moving on heavy clay soil could barely be seen by the following summer. Grant Lohar/NT

opportunities within the grassland areas for species such as lapwing and redshank. The effects of this work will be monitored during the spring and summer of 2014.

A flock of mixed rare breed sheep are successfully cropping the vegetation on Orford Ness. It is hoped to increase the flock size over the next few years to enable more grazing to take place. Currently, the grazing is supplemented with some mowing and haymaking on the more level areas, using machinery purchased by the project. The cutting provides sward and habitat variation and the hay is used, if required, as supplementary fodder for the sheep when they are wintered off site because of the risk of sea inundation at that time of year.

Project management

The National Trust appointed a Project Manager and Warden to manage the whole LIFE project. Staff time for other key personnel was also budgeted for within the project finances. Consultant engineers were engaged but only for specific elements of the project works, as their services are expensive. Relatively major contracts, such as this, require a lot of background work, with specialist and local input, so a great deal of assistance has been required from site and other support staff from both organisations in planning and design, reviewing documents, on-site liaison, logistics and mapping.

Working with the contractors closely on the ground, establishing rapport and understanding, is an important part of ensuring a successful outcome. Digger drivers working in the construction industry are generally used to straight lines and uniformity.

This is excellent for the more engineered structures, but nature conservation usually requires a less rigid approach to achieve a naturalistic landscape, with the creation of sinuous lines and varied edges. This optimises the habitat niches available, while maintaining the function of water movement from a to b. This approach takes time, but once the drivers have got the idea, they usually enjoy it. Construction processes often compartmentalise work into individual streams for perceived efficiency, moving across a site carrying out one type of job at a time. Encouraging a more holistic view of the final outcome during the planning stage and pre-work meetings can be beneficial and is likely to reduce double working and multiple passes over the same ground. This may reduce costs and working time as well as potential damage to soil structure, especially in more inclement weather conditions.

The quick recovery of the habitat is also an important consideration. There is an element of luck involved with the weather conditions, as heavy clay can easily become a quagmire. Some disturbed ground can be beneficial for certain species but a good tip is to separate and store topsoil and turf at the digging stage and then relay it over the exposed subsoil at the final stage. This will reduce the amount of bare ground, reduce excessive weed growth and allow quicker recovery of the sward.

David Mason is LIFE Project Manager (david.mason@nationaltrust.org.uk), Grant Lohar is NT Countryside Manager East Suffolk (orfordness@nationaltrust.org.uk), and Aaron Howe is RSPB Senior Site Manager South Suffolk Coast (havergate.island@rspb.org.uk); website: www.liféaldeore.org.