

# The creation of a new saline lagoon as part of a flood defence scheme at Freiston Shore RSPB Reserve, Lincolnshire, England

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## SUMMARY

A 15 ha saline lagoon was created in 2002 as part of a flood defence scheme at a site on the east coast of England. It has subsequently been used by a range of wintering and breeding waders and waterfowl.

## BACKGROUND

Saline lagoons are a priority habitat in the UK and support a range of specialist species, with 25 (four plants, one bird and 20 invertebrates) that are restricted to coastal lagoons in Britain. Centuries of coastal management and sea defence construction has led to the decline of natural lagoons and has reduced the quality of those remaining. There are only about 1,600 hectares of saline lagoon in the UK, distributed disjunctly around the coast.

Much of vulnerable coastline is now protected from erosion by sea defences so new lagoons no longer naturally form. They need to be created artificially, although occasional sea breaches may create lagoons behind sea walls. Lagoons can only be created where land close to the sea can be inundated with both seawater and freshwater at the same time. The balance of salinity imposes a unique character upon each lagoon and influences the variety of plant and invertebrate life found within.

The Wash (a large estuary in eastern England) is the most important area in the UK for wintering and migrating waterbirds (especially waders) holding in excess of 300,000 birds, and has multiple nature conservation designations (SSSI, SPA, SAC, Ramsar). 'The Wash Shoreline Management Plan' recommended maintaining the current line of sea defence for the entire Wash, but included some areas of managed retreat (Bradley & Allcorn 2006). As part of the Freiston Shore realignment site, where 66 ha of salt marsh was to be created by realignment, a 15 ha saline lagoon was created through excavation of material to construct the new seawall. This project was undertaken in partnership with the

Environment Agency (lead partner), English Nature and Her Majesty's Prison Service.

## ACTION

**Site:** Freiston Shore (National Grid ref: TF 410420), Lincolnshire, eastern England, was identified as a suitable realignment site as part of the Gibraltar Point to Hobhole Strategy (within the Wash Shoreline Management Plan).

**Preparations:** Following community and statutory consultations, and a survey of the site, preparations were begun to re-inundate the area:

Approximately 500 m of new cross wall were built using material taken from the landward side of the realignment.

More than 1,000 m of the secondary wall were reinforced to 1 in 200 year standard again using material won from the landward side of the secondary wall.

The resulting borrow pit was profiled to create a 15 ha saline lagoon which includes a central landmass connected to the mainland and a series of islands for breeding and roosting birds. The central area was left connected to the mainland to enable cattle and vehicular access to control the vegetation.

Shingle was imported to create two low-lying islands more suitable for nesting terns. These islands can be either partially or completely flooded in winter when they are not required by nesting birds to assist with vegetation control.

Late summer cattle grazing has been introduced to try to maintain appropriate sward foraging conditions, primarily for wintering brent geese *Branta bernicla* and wigeon *Anas penelope*.

The target salinity was 20 – 30 parts per thousand (ppt), which is slightly below that of sea water (35 ppt), was determined to appeal to the greatest range of saline lagoon invertebrates. The lagoon salinity is managed by the controlled exchange of lagoon water with the sea through a culvert and sluices in the sea wall. The only freshwater input is precipitation. Salinity tends to decrease in winter and increase in summer and so needs to be regularly monitored.

The lagoon varies from being a few centimetres to 1.5 m deep. There is a deep 1 – 1.5 m channel around the perimeter of the lagoon to help dissuade foxes *Vulpes vulpes* and other mammals from accessing the central area or islands. The lagoon was finished in 2002.

**Monitoring:** Counts are made of the birds using the lagoon area throughout the year. Two counts were made each month from vantage points around the lagoon. All species within the lagoon area are recorded. A full breeding bird survey is also conducted between April and June. Salinity is monitored every two weeks and water level readings are taken on a weekly basis. Lagoon invertebrate and fish densities are monitored annually.

## CONSEQUENCES

**Salinity:** The salinity has remained more or less within the desired target range. During 2005/06 it varied between 21 and 34 ppt.

**Birds:** Peak numbers of wintering birds and numbers of breeding birds are shown in the Tables 1 and 2. Following the wetting up of the lagoon, it was used by a wide variety of passage waders. Up to 27 species of wader have been recorded on site on a single morning.

Many of the original islands are considered too high and too topographically similar for the lagoon to realise its potential for nesting waders, smaller gulls and terns. Being too high, most of the islands do not flood, even when the water level within the lagoon is raised in the winter. This allows certain grass species and rank vegetation, which would

**Table 1.** RSPB Freiston Shore Reserve maximum winter (September - March) counts of waterbirds on saline lagoon area.

Species	Winter	Winter
	2003/04	2004/05
Little grebe	6	9
Great crested grebe	0	6
Cormorant	3	0
Grey heron	1	1
Little egret	1	1
Mute swan	2	0
Greylag goose	9	10
Canada goose	341	393
Dark-bellied brent goose	1000	578
Shelduck	60	48
Wigeon	246	176
Teal	321	192
Mallard	24	44
Pintail	0	22
Shoveler	0	2
Pochard	2	7
Tufted duck	8	24
Scaup	0	10
Goldeneye	8	8
Oystercatcher	12	9
Avocet	29	32
Ringed plover	5	8
Grey plover	1	800
Lapwing	300	405
Knot	1	6
Little stint	2	1
Dunlin	5	8
Ruff	0	3
Snipe	19	7
Black-tailed godwit	17	116
Bar-tailed godwit	1	16
Curlew	4	12
Redshank	7	20
Greenshank	0	2
Common sand	0	2
Turnstone	27	1
Black-headed gull	77	63
Common gull	4	0

ideally be drowned, to survive and dominate the island tops, lessening their usefulness as nest sites. With better knowledge and control of water tables and bird activity, some of the large islands will be reshaped to optimize them for breeding gulls, terns and waders. A mixture of topographical shapes and levels will ensure that a dynamic mosaic of island conditions can be maintained to improve the diversity of

**Table 2.** Numbers of pairs of breeding waterbirds as RSPB Freiston Shore

Year	Canada goose	Shelduck	Mallard	Tufted duck	Lapwing	Oyster-catcher	Avocet	Little ringed plover	Ringed plover	Redshank	Black headed gull	Common tern
2000	0	0	0	0	0	0	0	0	0	?	0	0
2001	0	1	1	0	0	1	2	2	1	?	0	0
2002	1	2	5	2	0	3	17	4	5	1	0	0
2003	1	3	4	2	0	3	21	2	3	1	0	0
2004	2	4	4	1	0	4	31	0	4	2	0	0
2005	4	1	4	1	0	3	31	0	8	1	3	2
2006	5	0	4	1	0	4	31	0	8	1	38	14

nesting opportunities available. Furthermore, the original banks have eroded and collapsed badly so require re-profiling.

**Human visitation:** The number of visitors prior to the saline lagoon creation and the reserve opening is difficult to ascertain, however, it is believed to have been in the region of 11,000 people/year. Since opening, a the Freiston Shore RSPB Nature Reserve, a more robust method of counting has been implemented. In the 2002 calendar year, there were 51,142 visitors and in 2005, there were 57,586. This makes it one of the top ten RSPB

reserves visited by members of the public in the UK.

## REFERENCES

Badley J. & Allcorn R.I. (2006) Changes in bird use following the managed realignment at Freiston Shore RSPB Reserve, Lincolnshire, England. *Conservation Evidence*, 3, 102-105.

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