

Regulated tidal exchange as part of a broader strategy for managing marsh habitat, Goosemoor - UK

1. Policy Objective & Theme

- ADAPTATION TO RISK: Preventing and managing natural hazards and technological (human-made) hazards
- SUSTAINABLE USE OF RESOURCES: Preserving coastal environment (its functioning and integrity) to share space

2. Key Approaches

- Participation
- Socio-economic
- Technical

3. Experiences that can be exchanged

A regulated tidal exchange system has been used to create 6ha. of standing water and saltmarsh habitat.

4. Overview of the case

Using a self-regulating tidal gate, water has been allowed to flow into an enclosed, poor grassland area converting it into a species rich wetland which has added to the UK's Biodiversity Action Plan and provided a new recreational area.

5. Context and Objectives

a) Context

Goosemoor was a six hectare grass field site on the edge of the Exe Estuary in Devon, south west England. It is owned and managed by the Royal Society for the Protection of Birds (RSPB) and part of their Exe Estuary Reserve. The site is bounded on three sides by the river Exe, situated in a horseshoe bend, and on the fourth side by an embanked railway line. Although designated as part of the Exe estuary SSSI/SPA, the site has no catchment contributing to the water balance and is therefore difficult to manage optimally as a freshwater, wet, grassland habitat. Bird usage within the area has, as a consequence, been low. It was felt by the RSPB to be typical of sites where Regulated Tidal Exchange (RTE) could be considered with an inland infrastructure vulnerable to flooding, ecologically poor habitat and where intertidal recreation would represent an enhancement.

RTE is a form of saltmarsh creation that allows the controlled inundation of previously defended land with saline water, using a combination of pipes and sluices. It enables an area behind a sea defence to be gradually converted to saltmarsh and/or mudflats. The pipes, sluices or tide gates allow a regulated tidal flushing by seawater to create saline or brackish conditions behind the defence. This is a slow process that allows the land and local species to adjust their soil chemistry to the more saline conditions required by saltmarsh and the siltation to proceed gradually. Not all techniques are suitable at all sites since some are more suitable for creating mudflats than saltmarsh. There are several techniques used to control the flow of sea water for saltmarsh creation and include:

- An open culvert, with no tidal flap through the sea wall. Tidal water will flow in and out on every tide as long as the invert level is around the mean low water mark. A variation on this method is to have a drop board on the landward side to prevent water flowing out of the culvert, creating a permanently flooded area.
- Culverts with manually operated flaps that let water through into an impoundment at high tide over several high tides,

until the desired water level is reached.

- Self regulating tide gates (SRTs) have one moving part and an adjustable float system, allowing the SRT to stay open and float on flooding and ebbing tides until the specified desired water level has been reached, at which point the SRT will close and stay closed. When the tide recedes on the outside of the site, the SRT automatically re-opens, allowing the impounded water to flow out.
- Electronically operated tide gates. Flow is regulated by a vertical lift, rectangular tide gate on the seaward side that opens and closes electronically at the desired water levels. They are triggered by pressure sensors. The gate is normally open for a short period on each rising and falling tide.

RTE is a potentially valuable tool in two particular scenarios: where coastal defences are likely to remain in place for the foreseeable future; and as the first phase of a longer term realignment strategy. In the case of Goosemoor, SRT was the chosen option.

b) Objectives

The primary objectives of the Goosemoor RTE site were: to build an understanding of the potential uses of RTE in the UK in those cases where managed realignment is not feasible; to demonstrate the flood defence/management benefits of RTE as a cost-effective source of compensatory habitat;

to improve the biodiversity of a potentially important area; and to develop the project in partnership with the Environment Agency, Defra, English Nature, and other coastal decision makers.

6. Implementation of the ICZM Approach (i.e. management, tools, resources)

a) Management

The site is fully managed by the RSPB, an NGO.

b) ICZM tools

It is the first site in the UK where a self-regulating tide-gate, specifically imported from the USA (manufactured by Waterman Industries Inc.) has been used. The SRT works on simple principles of floats and is flexible in how it can be set. At low tide, the flap gate is open to allow drainage out of the site. As the tide rises, the floats open the gate allowing water in. Eventually the strength of the tide will start to close the gate to restrict water entrance and, at high tide, the gate is fully closed. On the falling tide, the water pushes open the gate releasing it back into the river.

Local authority Planning Consent, Environment Agency Land Drainage Consent and Environment Agency Consent for Work in Rivers were all required before any work at Goosemoor could proceed. Work then commenced on the site to make it more suitable for tidal inundation. This included:

- Excavation of existing drains and ditches to create the new creek system.
- Re-profiling of ground levels to create the intertidal habitat areas.
- Creation of a secondary bank along the foot of the railway embankment.
- Installation of a 1.0m internal diameter pipe through the sea wall with a self regulating tide-gate on the seaward side, and a sluice in the inland side, to retain on-site water.
- Excavation of a channel to link the river with the SRT and pipe.

The on-site work took a total of 2 months and was officially opened on 17th December 2004.

The habitat design was to result in permanent water saline lagoons and channels (0.75ha at between 0.0 and 0.6m (all figures are above mean sea level), mudflats (0.75ha at between 0.6 and 1.0m), lower saltmarsh (1.0ha at between 1.0 and 1.5m), upper saltmarsh (3.25ha at between 1.5 and 1.6m) and banks and higher ground (0.5ha of land over 1.6m). An extensive monitoring programme has been planned to include baseline monitoring of ground levels, vegetation, invertebrates, bird usage, water levels, salinity, changes in vegetation and invertebrates, accretion and erosion. The site is being managed

through grazing.

7. Cost and resources

The costs of the project were £72,000 and borne by the RSPB, Environment Agency, Defra and English Nature. The SRT, including transport from the US, cost £22,000 and all the ground works £50,000.

8. Effectiveness (i.e. were the foreseen goals/objectives of the work reached?)

The site has contributed to the UK's Biodiversity Action Plan targets for saline lagoon, mudflat and saltmarsh. Within the first year, winter bird counts increased with lapwing, wigeon and curlew numerically dominant. Now it is used as breeding habitat for up to 5 pairs of redshank, 3 pairs shelduck and 10pairs of avocet as well as being a wintering habitat (feeding and roosting) for several thousand dark-bellied Brent geese, wigeon, teal, shelduck, black-tailed godwits and other waders.

9. Success and Fail factors

The Goosemoor Project was devised in close collaboration with the Environment Agency and English Nature. Potential habitats were estimated and agreed and extensive discussions undertaken with English Nature in view of the existing designation of Goosemoor as part of the Exe Estuary SPA. It was their view that this project would help deliver favourable conditions by increasing the saltmarsh habitat on the estuary. Extensive liaison was also undertaken with the Environment Agency, especially regarding potential flood risk and liability issues. Apart from this, full consultation was undertaken with County Council archaeologists, Crown Estates Commission, Defra, the Exe Harbour Master, the Local Parish Council, neighbours, and other interest groups.

There are several essential requirements of potential sites for RTE:

- An existing sea defence such as a seawall into which a pipe, sluice or tide-gate can be integrated;
- An area that can be flooded without flooding adjacent (farm)land (this may require an embankment to be constructed behind the primary defence);
- A near-by source of sea water to permit saltwater flushing. Sea water should ideally have enough suspended sediment to enable accretion at a higher rate than sea level rise;
- The site must be no less than 0.1m lower than sea level at the highest part of the tidal cycle;
- The site must have a tidal range of at least 3m;
- Impermeable underlying geology is not prone to erosion (i.e. not peat or chalk);
- Gradients of at least 1-6% which will determine the ratio of saltmarsh to mudflat.

10. Unforeseen outcomes

It is anticipated that, in future, SRT structures will be manufactured nationally and will not have to be imported.

11. Prepared by

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12. Verified by

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13. Sources

- Goosemoor Regulated Tidal Exchange Project (undated) RSPB
- www.english-nature.org.uk
- www.rspb.org.uk
- www.saltmarshmanagementmanual.co.uk



Goosemoor regulated tidal exchange project (561.46 KB) 