

## ESTUARY ACTION PLAN

### HABITAT PROFILE

**Habitat Description:** An estuary is defined as a partially enclosed body of water, open to saline water from the sea and receiving fresh water from rivers, land run-off and seepage.

**Habitat Name:** Estuary.

**UK Biodiversity Status:** Saltmarsh and Mudflat, part of the estuarine habitat are Priority Habitats.

**Associated Priority Species:** Reed bunting *Emberiza schoeniclus*, otter *Lutra lutra*, allis shad *Alosa alosa* and twaite shad *Alosa fallax*.

**Statutory Protection:** Alloa Inches SSSI. "Atlantic Salt Meadows" is listed as a habitat type in Annex 1 of the EC Habitats Directive. This area is also a Special Protection Area and RAMSAR site, for its wintering bird populations.

### BIODIVERSITY CONTEXT

Mudflats are highly productive areas, which together with other intertidal habitats, support large numbers of predatory birds and fish. They provide feeding and resting areas for internationally important populations of migrant and wintering waterfowl and are also important nursery areas for flatfish.

Saltmarshes are an important resource for wading birds and wildfowl. They act as high tide refuge for birds feeding on adjacent mudflats, as breeding sites for waders, gulls and terns and as a source of food for passerine birds, particularly in autumn and winter. Areas with high structural and plant diversity, particularly where freshwater seepages provide a transition from fresh to brackish conditions, are particularly important for invertebrates.

Approximately 80% of the area of saltmarsh in Great Britain has been notified as SSSI.

#### UK saltmarsh action plan objectives.

1. Maintain existing resource of 45,500 Ha.
2. Restore the area of saltmarsh to 1992 levels. Requiring restoration of approximately 600 Ha.
3. Maintain the quality of the existing resource in terms of community and species diversity and, where necessary, restore the nature conservation interest through appropriate management.

#### UK mudflats action plan objectives.

1. Maintain at least the present extent and regional distribution of the UK's mudflats.
2. Create and restore enough intertidal area over the next 50 years to offset predicted losses to rising sea level in the same period. Predicted losses in the next 15 years should be offset in the next 10 years.

3. Restore estuarine water quality to ensure that existing mudflats fulfil their important ecological and conservation role.

## OBJECTIVES

**Objective 1** Where possible improve water quality in the estuary and safeguard against any further deterioration.

Target By 2005, have over 80% of the estuary's water quality rated good or excellent.

**Objective 2** Introduce policies to protect the remaining area of saltmarsh and mudflats in the Stirling Council Area.

Target Consider, carefully, development that will destroy or reduce the area of existing area saltmarsh and mudflats.

**Objective 3** Expand the area of mudflat and saltmarsh in the Stirling Council Area.

Target As they arise, seek suitable opportunities for increasing the amount of mudflat and saltmarsh in development bordering the Forth estuary, through managed realignment.

**Objective 4** Raise awareness of the importance of the Forth Estuary locally.

Target Were appropriate improve access to the shore of the estuary.

Target Run events to celebrate the Forth estuary and its related species and habitats.

## CURRENT STATUS AND DISTRIBUTION

The tidal portion of the Forth in the Stirling Council Area extends from the M9 road bridge down to Manor Powis on the north bank of the Forth then along the centre of the estuary to Poppletrees on the south bank of the Forth.

8 hectares of saltmarsh and mudflat have been identified in the Stirling Council Area Biodiversity Audit. The total UK estuarine resource has been estimated as c588,000 ha of which 55% is intertidal area, mostly mud and sandflats with a lesser amount of saltmarsh. Intertidal flats cover about 270,000ha. The UK has approximately 15% of the North West Europe estuarine habitat.

Since medieval times many saltmarshes have been reduced in extent by land reclamation. Between 45% and 53% of the intertidal area in the Forth estuary has been lost since 1600 due to land claim. The most recent saltmarsh survey of the UK has Scotland with 6747 hectares (ha) of this habitat, 3% of the coastline.

Very little of the intertidal zone in this area has been unmodified. Field extension and ploughing have decreased the area of intertidal vegetation and mudflat. Flood embankments are also present in some fields. From the old port of Riverside westwards much of the banking was stone pitched, further reducing the extent of intertidal habitat.

# F&WH 2

Past pollution from sewage disposal has created a reservoir of sediment enriched with organic matter, this is constantly disturbed and suspended by the tidal action of the estuary. This, along with high sediment loading arising from the predominantly agricultural catchment of the Old Forth create, particularly in summer months, an area of low oxygen water that moves up and down the estuary with the tide. In recent years this area has been reducing in size and increasing in oxygen content due to pollution control measures.

Although the water quality in the estuary has been improving it is unlikely that it would reach the standard required for classification as excellent, even if all human inputs were removed. This is due to the high, naturally occurring, levels of suspended solids found in the estuary.

## CULTURE, ETYMOLOGY AND FOLKLORE

The use of estuary was first noted in the 16<sup>th</sup> century. The word derives from the Latin *aesruarium* a marsh, channel. This word is itself derived from *aestus* meaning a tide or billowing movement.

Firth comes from the Old Norse *fjorthr*, which is related to the modern Norwegian *fjord*.

The name Forth is interesting, as it is not known in modern Gaelic, indicating it is an old name. In common with the Teith there is no loch, strath or confluence named after these rivers.

According to Watson (1926), the name *Foirthe* comes from the Old Gaelic, *V<sup>o</sup>-rit-ia* from the Irish root *ri<sup>th</sup>* running. The name means the slow running one.

## ECOLOGY AND MANAGEMENT

Estuaries are formed where freshwater rivers flow into the sea. An estuary stretches from its head, the highest point up the river where the water still contains salt (the M9 Motorway Bridge), to its mouth where the water is pure seawater. Throughout the estuary the levels of salinity will vary depending on the amounts of freshwater and seawater mixing together. Estuaries do not just consist of the water; they also include a high sediment load. This can lead to the deposition of large areas that are exposed at high tide and areas of shoreline above high tide mark and can including a complex mosaic of different habitats, wide expanses of mudflats and saltmarshes to sand dunes.

A variety of fish species travel through the estuarine portion of the Forth on their way to spawn in freshwater and to head out to the open sea to feed. Salmon *Salmo salar*, river lamprey *lampetra fluviatilis* and sea lamprey *Petromyzon marinus* are all found in the estuarine portion of the Forth, all these species are of international importance. Allis and twaite shad are suspected to be found here.

Birds are the most visible species that use out mudflats and saltmarsh, waders and wildfowl such as, redshank *Tringa totanus*, lapwing *Vanellus vanellus*, curlew *Numenius arquata*, goldeneye *Bucephala clangula*, teal *Anas crecca* and wigeon *Anas penelope* will use these areas in the winter to feed and rest on. Otters also use this habitat for hunting.

## **Saltmarshes.**

Coastal saltmarshes are comprised of the upper, vegetated proportions of intertidal mudflats lying approximately between high water neap tides and mean high water spring tides. For the purposes of this plan, the lower limit of saltmarsh is defined as the lower limit of pioneer saltmarsh vegetation and the upper limit as one meter above the level of highest astronomical tides to take in transitional zones

Saltmarsh vegetation consists of a limited number of halophytic (salt tolerant) species adapted to regular immersion by the tides. A natural saltmarsh system shows clear zonation according to the frequency of inundation. At the lowest level the pioneer glassworts *Salicornia* spp. can withstand immersion by as many as 600 tides per year, while transitional species of the upper marsh can only withstand occasional inundation.

The communities of stabilised saltmarsh can be divided into species poor low-mid marsh and the more diverse communities of the upper mid-marsh. At the upper tidal limits, true saltmarsh communities are replaced by drift line, swamp or transitional communities which can only withstand occasional inundation. Saltmarsh communities are additionally affected by differences in climate, the particle size of the sediment and, within estuaries, by decreasing salinity in its upper reaches.

## **Mudflats.**

Mudflats are sedimentary intertidal habitats created by deposition in low energy coastal environments, particularly estuaries and other sheltered areas. Their sediment consists mostly of silts and clays with a high organic content. Mudflats are intimately linked by physical processes to, and may be dependent on, other coastal habitats such as soft cliffs and saltmarshes. They commonly appear in the natural sequence of habitats between subtidal channels and saltmarshes.

The mud surface also plays an important role in nutrient chemistry. In areas receiving pollutants, organic sediments sequester contaminants and may contain high concentrations of heavy metals.

Mudflats are characterised by high biological productivity and abundance of organisms, but low diversity with few rare species. In areas of lowered salinity, the macro invertebrate fauna is predominantly of the Petersen *Macoma* community, characteristic species being: common cockle *Cerastoderma edule*, sand-hopper *Corophium volutator*, laver spire shell *Hydrobia ulvae*, ragworm *Hediste diversicolour* and when salinity is low, large numbers of oligochaete annelids (principally *Tubificoides* spp.).

The surface of sediments are often apparently devoid of vegetation, although mats of benthic microalgae (diatoms and euglenoids) are common. These produce mucilage (mucopolysaccharides) that binds the sediment. Under nutrient-rich conditions, there may be mats of the macroalgae *Enteromorpha* spp. or *Ulva* spp.

## **CURRENT FACTORS CAUSING LOSS OR DECLINE AND FUTURE THREATS**

- Piecemeal, small scale land claim for a variety of developments. In the 1980's Fallin Marsh was developed into the Polmaise landfill site. The Marsh had been one of the

# F&WH 2

three most important sites for wintering wildfowl in the Upper Forth (Easterbee 1979).

- Erosion and “coastal squeeze”. Flood defences maintain a fixed landward limit to the estuary, if the seaward edge erodes the estuary can not spread inland to compensate. This reduces the area of mudflat and saltmarsh. The predicted sea level rise in the long term will result in loss of intertidal habitats unless these flood defences are altered.
- Grazing, can have a marked effect on the structure and composition of saltmarsh vegetation by reducing the height of vegetation and the diversity of plant and invertebrate species. Intensive grazing creates a sward attractive to wintering and passage wildfowl and waders, whilst less intensive grazing produces a tussocky structure which favours breeding waders.
- Agricultural improvement (re-seeding and draining) has affected the upper edge and transition zones of some saltmarshes in the past.
- Eutrophication has caused local problems of algal growth on saltmarshes. This can destabilise mudflats
- Land claim has removed about 25% of the GB estuarine intertidal flats. Although land claim has slowed considerably in recent years, it has not stopped.
- Within estuaries, mudflats deposited in the past may erode due to changed estuarine dynamics and remobilised sediment may be redeposited elsewhere in the same littoral sediment cell. Higher sea level and increased storm frequency, resulting from climate change, may further affect the sedimentation patterns of mudflats and estuaries.

## OPPORTUNITIES AND CURRENT ACTION

- **Clackmannanshire and Stirling Structure Plan Policy ENV 1 and ENV 5.**
- **Stirling Council Policy E56 – The Council will, as part of an overall strategy to strengthen and enhance the network of undeveloped green areas and “green corridors” in Dunblane and Bridge of Allan – Stirling – Bannockburn, seek to implement the agreed “Urban Nature Conservation Strategy”.**
- **Stirling Council Policy E57 – Development will not normally be permitted which may destroy or have a significant adverse effect upon the integrity of the wildlife/ green corridors identified in the Local Plan.**
- **Stirling Council Policy E59 – In relation to derelict, contaminated or vacant land the Council will:**
  - a) **seek means to achieve beneficial use, management (including wildlife habitat creation) or reclamation of these areas.**
  - c) **encourage management of vacant and unused land attached to business and other premises for the benefit of landscape and nature conservation.**
- Potential areas suitable for saltmarsh/ mudflat creation identified in an SNH report (1999) to the Forth Estuary Forum (FEF).
- FEF – Multi agency group looking to the sustainable development of this estuarine resource. It has produced the Forth Integrated Management Strategy (1999) and Nature Conservation Topic Paper (1996).
- Feasibility and Implications of managed Realignment at Skinflats, Forth Estuary, Scotland. A study commissioned by FEF in 2001.
- Flood Appraisal Group – A multi agency group looking at flooding issues in the Stirling Council Area.

# F&WH 2

- English Natures publication in 1995 - Managed retreat.
- The National Rivers Authority (now the Environment Agency) – A Guide to the Understanding and Management of Saltmarshes (1995).
- Recent work led by the EA has promoted the role that saltmarshes have in reducing wave energy. Flood defence costs can, therefore, be reduced in the long term by setting back lines of defence and by allowing saltmarsh development seaward of the defences.
- National Planning Policy Guidelines 13 – Coastal Planning.
- DETR Coastal zone management – Towards Best Practice.
- Ongoing Wetland Birds Survey (WeBS) along the shore of the Forth.

## BIBLIOGRAPHY

- Babtie Group. 2001. **Feasibility and Implications of managed Realignment at Skinflats, Forth Estuary, Scotland.** SNH. Edinburgh.
- Easterbee, N. 1979. **Habitat Survey of the Upper Forth.** NCC. Edinburgh.
- Henderson, P. 1999. **The Natural History of British Estuaries.** British Wildlife Vol. 10, No. 6, p403-411.
- Watson, W. 1926 (reprinted 1993). **The Celtic Placenames of Scotland.** Birlinn. Edinburgh.

## ACKNOWLEDGEMENTS

This plan was written by Jonathan Willet, Stirling Council Area Biodiversity Officer, on behalf of the Freshwater and Wetland working group, November 2001.