

ACTIONS Benthic Zone	TO BE ACTIONED BY		YEAR (TO BE COMPLETED OR IN PLACE BY)					
	lead	partners	2001	2002	2003	2004	2005	2010
<b>Policy and Legislation</b>								
Designate benthic sites as merited by their content.	SNH							•
Ensure that in planning proposals, all aspects of coastal works are examined in relation to their potential impact to the benthos in the immediate area and the possibility of remote effects are considered.	ALA SNH				•	•	•	•
<b>Site Safeguard and Management</b>								
Regulate and monitor operational activities which are detrimental to the structure and content of benthic sites which have been identified as of particular importance.	SFPA	SNH						•
Involve local communities in the formulation of management plans and proposed designations.	SNH ALA				•	•	•	•
<b>Advisory</b>								
Advise local fishermen of the location of susceptible areas and attempt to gain their co-operation.	SNH SFPA				•	•	•	•
Develop and publish information packs regarding the susceptibility of benthic organisms.	SNH	UMBS			•	•	•	•
<b>Research and Monitoring</b>								
Review biology of benthic environment throughout Ayrshire and collate to centralised database.	SNH ALA	ABRC						•
Monitor delivery of this plan annually and review on five yearly basis.	ABG			•	•	•	•	•
<b>Communications and Publicity</b>								
Raise public and industry awareness about importance of benthic habitats by involvement in management plans, availability of material and activities relating to this.	SNH ALA	RSPB			•	•	•	•

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# Pelagic zone



## Definition

The pelagic zone of open sea is essentially everything that the benthic zone isn't. When considering this habitat it is the water column itself which we regard as well as the interaction of organisms in it. The pelagic zone does have a number of subdivisions, but for the purposes of this document we will consider it as a whole.

## Nature Conservation Importance

The phytoplankton (microscopic plants) of the pelagic zone are responsible for all of the primary production in this habitat (i.e. they fill the ecological niche of crops on land). These are in turn fed on by zooplankton (microscopic animals, often the juvenile species of commercial fish stocks) and small fish. Again these contribute to the diet of larger pelagic species as well as benthic species when they die and sink to the bottom. From these complex interactions we can predict that any adverse ecological effect within the pelagic zone will have a knock-on effect to littoral sediments, benthic fauna and possibly seabird populations.

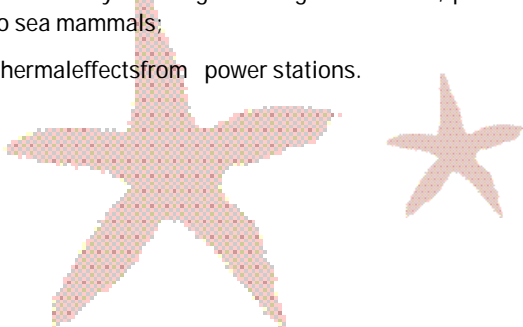
In the early 1900's the Clyde pelagic zone supported a major herring fishery which has since collapsed. This illustrates how poor management of a pelagic resource can have disastrous consequences on a social and economic as well as ecological basis.

## Biodiversity Context

There is a UK Habitat Statement for Oceanic seas (Tranche 2 Vol 5) which can be applied to this habitat, although the importance of some pelagic species is raised under the inshore sublittoral sediment section.

## Current factors affecting the habitat

- Effluent discharge into sea;
- Seacat ferry crossings causing disturbance, particularly to sea mammals;
- Thermal effects from power stations.



## Key Sites

It would be impractical to identify individual areas of this habitat as there are no natural boundaries to separate areas. Therefore, we are inclined to consider this habitat largely as a whole. There are seasonal occurrences which can be identified over particular areas, and changes in content of the communities in the pelagic zone which may aid us in defining the species present and some distinction of important sea areas.

## Key Species

### Fish

- Mackerel (*Scomber scombrus*)
- Herring (*Clupea harengus*)
- Basking shark (*Cetorhinus maximus*)

### Mammals

- Bottlenose whale (*Hyperoodon ampullatus*)
- Harbour porpoise (*Phocoena phocoena*)
- Risso's dolphin (*Grampus griseus*)
- Pilot whale (*Globicephala melas*)
- Common seal (*Phoca vitulina*)

### Birds

- Gannet (*Morus bassanus*)

### Invertebrates

- Zooplankton- mixture of juveniles of many marine taxa and copepods

### Lower Plants

- Dinoflagellates
- Diatoms

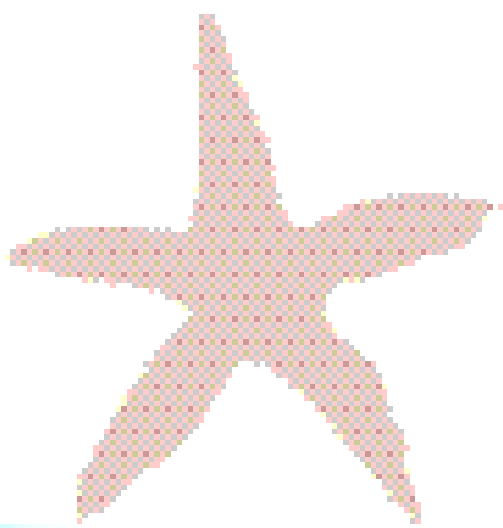


## Opportunities and Current Action

There exists a great deal of legislation which provides some degree of protection to the pelagic environment. This includes:

- The prohibition of dumping of plastics at sea;
- Minimum distances from land for the dumping of glass, food and metals;
- Control of operational discharges of oil at sea;
- Minimum standards for waste water (treated sewage) which are discharged at sea.

Although these legal frameworks are in place, there is always room for improvement via the promotion of good practice.



## Habitat Objectives

### Main Objective

Within the planning context seek to conserve and enhance the biodiversity value of the pelagic zone.

### Target

Establishment of cross organisational monitoring database to facilitate effective monitoring of habitat quality

### Work Objectives

#### Objective 1

Undertake survey work for the pelagic zone within the area.

#### Target

Obtain survey data for a cross section of pelagic habitats.

#### Objective 2

Propose exceptional or susceptible sites identified from survey sites for legislative protection through designation.

#### Target

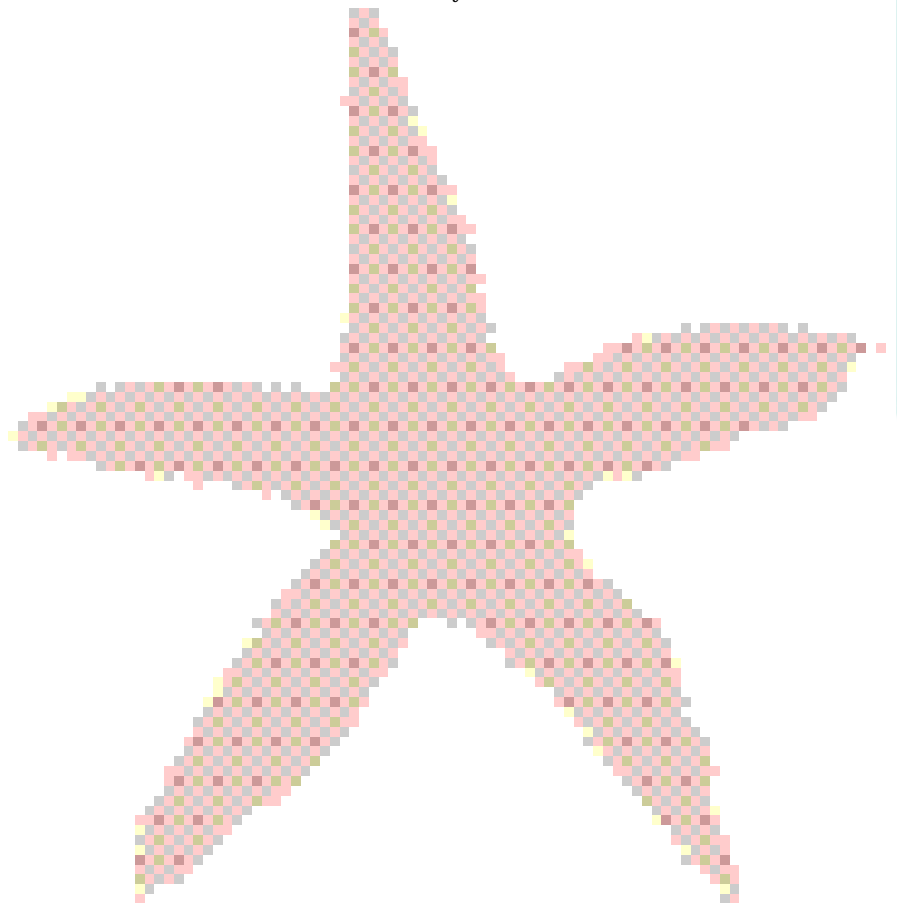
Designation of sites identified by Objective 1 by 2005.

#### Objective 3

Promote the marine environment through educational programmes aimed at all sectors of the community

#### Target

All schools to be aware of educational resources related to this habitat by 2003.



ACTIONS Pelagic Zone	TO BE ACTIONED BY		YEAR (TO BE COMPLETED OR IN PLACE BY)					
	lead	partners	2001	2002	2003	2004	2005	2010
<b>Policy and Legislation</b>								
Designate pelagic areas as merited by their content.	RSPB FRS SNH	ALA UMBS					•	
Ensure that in planning proposals, all aspects of coastal works are examined in relation to their potential impact to the pelagic zone in the immediate area and the possibility of remote effects are considered.	ALA	SWT SNH			•	•	•	•
<b>Site Safeguard and Management</b>								
Regulate and police operational activities and discharges which are detrimental to the communities of the pelagic zone which have been identified as of particular importance.	SFPA	ALA SNH					•	•
<b>Advisory</b>								
Advise local fishermen of the location of susceptible areas and attempt to gain their co-operation.	SNH SFPA				•	•	•	•
Develop and publish information packs regarding the diversity and complexity of the pelagic community.	SNH				•	•	•	•
<b>Research and Monitoring</b>								
Review biology of pelagic zone throughout Ayrshire and collate to centralised database.	SNH ABG	ABRC ALA					•	
Monitor seabird numbers.	GLAS. UNIV.	SNH		•	•	•	•	•
Monitor delivery of this plan annually and review on five yearly basis.	ABG			•	•	•	•	•
<b>Communications and Publicity</b>								
Raise public and industry awareness of the pelagic habitat through publications and education opportunities.					•	•	•	•

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# Inlets and enclosed bays

## Definition

Inlets and enclosed bays include fjords and sea lochs, which are closed to the sea at one end, as well as sounds and straits. These latter categories are formed where the sea passes between two land features, and may have a strong tidal current associated with them. As with other categories of the marine and coastal environment, all of these features may contain a great number of variations within habitats.

## Nature Conservation Importance

Within the coastal and marine environment, this habitat type contributes little physical area. However, it creates a number of suitable environments for species which are of considerable conservation value. Amongst these species are the coralline algae *Lithothamnion corallioides* and *Phymatalithon calcaerium*. These algae form calcareous gravel deposits known as maerl beds, whose interlocking algal fragments form a mixed sediment which provides shelter for a rich assemblage of invertebrates, unusual seaweeds, and juveniles of commercially exploited species of fish. Maerl beds can be found almost worldwide, but require clean, coastal waters to grow. As with most coastal species, they are relatively easy to exploit, being extracted via a suction dredge to be used as a source of lime and trace elements for agricultural fertiliser. In addition to this the maerl beds face increased sedimentation which effectively smothers them as well as sustaining damage from vessels dredging for scallops sheltering amidst the maerl beds. This habitat is protected by the EC Habitats Directive, and is included as a key habitat in the UK Biodiversity Action Plan.



## Biodiversity Context

There is a UK Habitat Statement (Tranche 1, Vol 2) which addresses the maintenance and enhancement of the extent and quality of habitats, communities and species of inlets and enclosed bays. This is also taken to include improving areas that have been damaged or degraded. Measures appropriate to Ayrshire could include integrated coastal zone management, avoidance of reduction in water quality from direct and indirect discharges and run-off, and minimisation of risk of introduction of non-native species through quarantine and ballast regulation.

## Key Sites

- Tidal rip between Arran and Pladda
- Loch Ranza
- Channel between Arran and Lady Isle
- Channel to the south of Little Cumbrae
- Loch Ryan

## Key Species

### Birds

- Red throated diver (*Gavia stellata*)
- Great crested grebe (*Podiceps cristatus*)
- Eider duck (*Somateria mollissima*)

### Invertebrates

- Devonshire cup corals (*Caryophyllia smithii*)

### Lower Plants

- Lithothamnion coralloides
- Phymatalithon calcaerium
- Scophyllum ead mackii

## Habitat Objectives

### Main Objective

Maintain and enhance quality of inlet and enclosed bay habitats.

### Target

Establish monitoring programme for sites outlined above.

### Work Objectives

#### Objective 1

Establish the quantity and quality of maerl habitat in the region.

### Target

Detailed survey of extent and quality of maerl habitat by 2005.

#### Objective 2

Identify baseline data on other species of conservation importance within the habitat of inlets and enclosed bays.

### Target

Complete baseline survey by 2005.

#### Objective 3

Seek to enter into agreements with user groups which will maintain and promote quality of the habitats.

### Target

Identify priority areas and develop management plans by 2005.

#### Objective 4

Promote awareness of these habitats.

### Target

Marine education resources to be identified and available to all schools by 2003.

## Current factors affecting the habitat

The main factor affecting these habitats is that of carelessness and ignorance. With this in mind, many activities are undertaken which may endanger the survival of species present. These include:

- scallop dredging across maerl beds;
- removal of free floating seaweed *Ascophyllum nodosum mackii*.

## Opportunities and Current Action

At present the current action for this habitat type is limited to statutory bans on dumping oil and refuse at sea, and a voluntary five day working week within the Clyde estuary. This latter action is currently under threat by incursion of vessels which normally operate further afield.

ACTIONS Inlets and Enclosed Bays	TO BE ACTIONED BY		YEAR (TO BE COMPLETED OR IN PLACE BY)					
	lead	partners	2001	2002	2003	2004	2005	2010
<b>Policy and Legislation</b>								
Seek to define sites as voluntary reserves, with legislative protection where possible.	SNH	SFPA Fishers Users					•	
Enter agreement on codes of conduct for user groups.	SNH	SFPA Users			•	•	•	•
Ensure that new developments, licensed practises and consented discharges do not result in any net loss of area and quality of habitat.	SEPA	SNH ALA		•	•	•	•	•
<b>Site Safeguard and Management</b>								
Set up areas as voluntary reserves with codes of conduct for different user groups.	SNH	SFPA Fishers Users					•	•
Within the planning context, ensure that full consideration is given to the value of this habitat when considering proposed developments which threaten loss or damage to the habitat. Where development is liable to proceed, endeavour to minimise any adverse effects through the use of planning conditions and agreements.	SNH ALA				•	•	•	•
Support appropriate management of Loch Ryan, through liason with management forum.	SNH	RSPB			•	•	•	•
<b>Advisory</b>								
Prepare information documents on the vulnerability of these species / habitats to disturbance and the areas of concern for dissemination to user groups.	SNH				•	•	•	•
<b>Research and Monitoring</b>								
Survey extent and quality of habitat within waters of concern. Maintain these records on combined database for biological reference for the area.	SNH ABG ABRC	UMBS					•	
Monitor seabird populations within these habitats.	SNH RSPB	WWT		•	•	•	•	•
Monitor delivery of this plan annually and review on five yearly basis.	ABG			•	•	•	•	•
<b>Communications and Publicity</b>								
Design and produce information packs on the fragile nature of the flora and fauna of these habitats, and make them available for school, public and tourism uses.	SNH ALA	STB SWT			•	•	•	•

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# Inter-tidal zone



Around the coast of Ayrshire the tides cover and reveal a thin strip of land twice every day. This strip of land is referred to as the inter tidal zone, and can be classified by the nature of its sediment i.e. sandy, muddy and rocky shores. These marine influenced habitats are perhaps those which people are most familiar with, and hence are the ones whose condition is the most readily identified.

## Estuaries

### Definition

Estuarine habitats are created at the confluence of rivers and the sea and can be defined as partially enclosed tidal areas with some composed of soft tidal shores, open to saline water from the sea and receiving fresh water from rivers, land run off or seepage. The mixture of saline and fresh water creates a unique, physiologically challenging environment. The shape of individual estuaries varies with river flow, tidal range, local coastline and other factors. They are highly dynamic environments, dependent on the balance between the accretion and erosion of sediments. As a result, estuaries are particularly vulnerable to sea level rise, a major cause for concern amongst conservationists.

Estuaries are made up of several different but inter-connected habitats that are extremely important for wildlife - turbid tidal waterways, inter-tidal mudflats, strandlines and saltmarsh (also called merse in Scotland). In general, the majority of Ayrshire's estuaries consist of tidal waterways and inter-tidal mudflats. In comparison, saltmarshes tend to occupy their upper portions only, between mean high water neap and mean high water spring tides. Nonetheless, saltmarshes are particularly productive ecosystems which often contribute a great deal of food value to other habitats. Due to their sheltered nature they are often used as nurseries for fish species, as well as representing a diverse plant community of their own. In estuaries, the inputs of nutrient-rich sediment and the mixing effect of the tides mean that they are extremely productive in biological terms. Therefore, as well as providing biodiversity benefits, estuaries are important for sustaining the productivity of nearshore fisheries.

Estuaries also provide a transport link between areas up-river and the open sea. Industrialisation, urbanisation, shipping and waste disposal have consequently tended to concentrate in estuaries. As a result, they have suffered considerable damage, most notably from in-filling and pollution.

### Key Sites

- Garnock/Irvine Estuary/Bogside Flats \*SSSI
  - Fairlie Sands
  - Doonfoot Estuary Wildlife site
  - Pow Burn\*
  - Brodick Bay\*
  - Stinchar
  - Kames Bay SSSI
  - Hunterston Sands
- \* denotes sites containing saltmarsh

### Key Species

#### Mammals

- Otter (*Lutra lutra*)

#### Birds

- Shelduck (*Tadorna tadorna*)
- Goldeneye (*Bucephala clangula*)
- Wigeon (*Anas penelope*)
- Golden plover (*Pluvialis apricaria*)
- Red-breasted merganser (*Mergus serrator*)
- Eider duck (*Somateria mollissima*)
- Teal (*Anas crecca*)

#### Fish

- Salmon (*Salmo salar*)
- Sea trout (*Salmo trutta* var.)
- Grey mullet (*Chelon labrosus*)
- Sea lamprey (*Petromyzon marinus*)

#### Invertebrates

- Nematode worm (*Psammamphiporous elongatus*), unique in UK
- Lugworm (*Arenicola defodiens*)

#### Higher plants

- Glasswort (*Salicornia* spp.)



## Habitat Objectives

### Main Objective

Maintain and enhance estuarine habitats subject to changes arising from natural processes.

### Target

No net loss of habitat and establish management agreements for major sites.

### Work Objectives

#### Objective 1

Seek to designate and appropriately manage the best examples of estuarine habitat under relevant legislative measures.

### Target

Apply conservation designations to estuarine habitats that meet international, national or local criteria for designation and ensure appropriate management by 2004.

#### Objective 2

Improve estuarine water quality by reducing and/or enhancing treatment of discharges into Ayrshire's estuaries in association with the Rivers and Streams habitat action plan.

### Target

Undertake survey and information programme among farming community.

#### Objective 3

Ensure appropriate level of information is available on the extent of estuarine habitats and the wildlife they support.

### Target

Re-survey the extent and condition of saltmarsh and mudflats in Ayrshire by 2004.

## Current Status

Given the dynamic nature of estuaries, estimates for the area they cover vary somewhat from source to source. Their total extent in the UK has nonetheless been estimated at somewhere near 581 000 ha, representing roughly 15% of the total in north-west Europe. Saltmarsh accounts for 45 500 ha of this, 6 747 ha of which is in Scotland. Within Ayrshire, by far the largest estuary is formed by the confluence of the River Irvine/Garnock (30 ha). It covers 204 ha, of which 30 ha is saltmarsh (a habitat that covers a total of 49 ha in Ayrshire). Remaining saltmarsh at Pow Burn covers 3 ha, much having been damaged in the past by quarrying and 2 ha at Brodick. Smaller (<1 ha) sites do exist but information on them is more limited as they were excluded from the GB saltmarsh survey. The inter-tidal area in the Irvine/Garnock estuary (almost all of which is mudflats) covers 161 ha. Whilst saltmarsh is absent from Fairlie Flats, the inter-tidal portion of the estuary covers 291 ha.

## Nature Conservation Importance

Ayrshire has two main estuary sites. The first has developed behind the Ardeer Peninsula, at the confluence of the Irvine and Garnock Rivers. This is one of the best examples of a bar-built estuary in the UK and is the only major estuary between the Solway and Inner Clyde. The majority of the estuary has been designated a SSSI, in recognition of its national importance for three bird species (eider, red-breasted merganser and goldeneye). It is also a nationally important feeding ground for thousands of migrating birds during the spring and autumn. Otters and water voles live on the estuary as well as numerous breeding birds, including water rail, grasshopper warbler and sand martin. The Garnock/Irvine estuary is also a Wildlife Site. The second of Ayrshire's major estuaries is known as Fairlie Flats. It has developed in the shelter of Brigid Point. Although much reduced by losses during the creation of port facilities at Hunterston, the remaining area supports locally significant numbers of waders and wildfowl.

## Biodiversity Context

The UK Habitat Statement (Tranche 1, Vol 2) addresses the maintenance and enhancement of the extent and quality of estuarine habitats. Measures to be considered which are relevant to Ayrshire include protection from development and other activities which cause environmental damage, promotion of the designation of estuaries as SACs, improvement of water quality via catchment management and other pollution control mechanisms, reduction of the environmental impact of fisheries, and development of plans to permit establishment of new estuarine habitats.

## Current factors affecting the habitat

Historically, estuaries have come under a great deal of pressure from man via their geographical importance, i.e. navigation from sea into safe anchorage promoting trade and development around estuaries. This trend has continued throughout the 20th century with continued usage of estuaries for the siting of industrial processes and land claim to facilitate this.

Factors that continue to threaten estuaries include:

- pollution from existing industrial sites;
- development of derelict industrial use to landfill;
- recreational pressures;
- collection of sediment dwelling animals exposed at low tide (e.g. lugworms, cockles etc.);
- land reclamation.

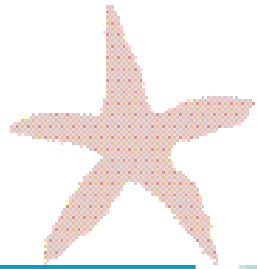
## Opportunities and Current Action

All discharges into estuaries are licensed, monitored and controlled by the Scottish Environment Protection Agency (SEPA). They have the authority to prosecute unlicensed discharges or those who breach discharge agreements. This is the mechanism governing industrial discharges into estuarine waters. West of Scotland Water (WoSW) are responsible for controlling disposal of domestic waste water. They are up-grading sewage and waste water treatment infrastructure to improve the quality of effluent being discharged into estuaries along the Ayrshire coast. It is envisaged that further opportunities will arise through the European Water Framework Directive. The work of the newly established Firth of Clyde Forum will also play a key role in this area.



ACTIONS Estuaries	TO BE ACTIONED BY		YEAR (TO BE COMPLETED OR IN PLACE BY)					
	lead	partners	2001	2002	2003	2004	2005	2010
<b>Policy and Legislation</b>								
Ensure all development proposals are fully appraised for impact on biodiversity including appropriate consultation processes, to prevent net loss of habitat.	ALA SNH SEPA	RSPB SWT			•	•	•	•
Ensure all consented discharges are continually maintaining quality, and that discharges are in line with European standards.	SEPA	Industry	•	•	•	•	•	•
Strive to improve on quantity and quality of consented discharges.	SEPA	Industry	•	•	•	•	•	•
Ensure that all new consents to discharge will have minimal effect on the environment.	SEPA			•	•	•	•	•
<b>Site Safeguard and Management</b>								
Within the planning framework, safeguard against developments or proposed activities which would result in losses of, or damage to, this habitat.	ALA	RSPB SNH ALA			•	•	•	•
Encourage relevant authorities to adopt estuary management plans, such as that of the Firth of Clyde Forum. These should not deal solely with biological factors, but take into account economic and recreational factors.	ALA SNH ABG SWT	SWT		•	•	•	•	•
Pursue the declaration of appropriate sections of the estuary as a Local Nature Reserve. Pending results of further ecological surveys, examine the scope for additions to the existing SSSI.	ALA	RSPB SNH ABG SWT				•		
Pursue the provision of coastal defences according to environmental best practice, including through the use of soft engineering approaches wherever possible. Where appropriate, achieve this within the framework of Shoreline Management Plans.	ALA SNH SEPA	RSPB					•	•
Implement best practice and sensitive working practices during the installation and operation of waste water treatment facilities.	WoSW	SEPA SNH			•	•	•	•
Ensure that correct provision is made for the protection of wildlife and habitats in oil spill and other pollution contingency plans affecting Ayrshire's estuaries.	SNH SEPA	RSPB		•	•	•	•	•
Survey sites that are particularly targeted for bait digging and assess whether some form of restriction is required.	SNH ALA					•		
<b>Advisory</b>								
Actively promote estuaries emphasising their biological attributes and biodiversity importance.	ALA SNH	RSPB ATB	•	•	•	•	•	•
Produce information guide on the importance of estuarine habitats for dissemination to planning authorities and potential developers.	SNH				•			
<b>Research and Monitoring</b>								
Undertake baseline survey of estuarine flora and fauna	SNH ALA	SWT NTS ABG				•		
Identify suitable parameters and a baseline from which to monitor possible impacts on Ayrshire's two main estuaries that are attributable to sea level rise.	SNH	Harbour Authorities					•	
Seek opportunities to enable roll-back of estuarine habitats through natural and/or managed realignment of the shoreline.	SNH RSPB	SEPA ALA					•	•
Support coastal bird surveys which are co-ordinated by national bodies (WWT, RSPB). Gather this information and collate onto regional database.	ABG SWT RSPB SOC	WWT ALA NTS ABRC		•	•	•	•	•
Monitor delivery of this plan annually and review on five yearly basis.	ABG				•	•	•	•
<b>Communications and Publicity</b>								
Provide interpretation boards at sites of high biological value, or sites which are heavily used for recreational purposes.	SNH ALA RSPB	WWT					•	
Increase profile of existing resources for education regarding the estuarine environment. (e.g. the Sea Chest) Supplement this with ranger/ RSPB education officer etc. visits to schools, and organised site visits.	ALA RSPB NTS	SWT WWT			•	•	•	•

# Sediment shore:



## Definition

Along long stretches of Ayrshire's coast, the shore is made up of the accumulated deposits of different sediments. Their size, and the amount of organic matter included, is the key to whether the resulting coast is made up from gravel, sand, muddy sand, just mud, or a mix of different sediment sizes.

Gravel and sandy beaches are the characteristic product of exposed coastlines open to the waves. Where conditions are more sheltered and wave energy is lower, the smaller clay and silt sediments, together with large quantities of organic matter, settle out to form mudflats.

In general, inter-tidal sediment shores are devoid of plant life because of regular tidal flooding and abrasion from the waves. However, they do harbour a range of animals in their upper layers, many of which are consumed by wading birds when the tide is out.



## Current Status

An overall area of 35 ha of saltmarsh has been identified in Ayrshire although other coastal sites are known to have very small saltmarsh components. Nationally, coastal saltmarsh has declined from 100 000 ha to 45 000 ha over the last 500 years.

## Nature Conservation Importance

The strandline offers protection from sunlight and predators for many invertebrates as well as an important food source of decaying organic material for filter feeding species that spend low tide buried beneath the sand.

This richness of invertebrate life is reflected by the number of shore dwelling and migrant bird species which we find around our shores. Amongst these are important populations of wintering waders such as redshank and ringed plover.

Saltmarshes occur in association with estuaries. They provide a suitable habitat for low growing plants and animals, providing an important year round feeding zone for coastal birds.

An important example of this habitat within Ayrshire is within Bogside Flats in the Garnock / Irvine estuary. This is the only extensive area of merse (saltmarsh) between the Clyde and Solway estuaries, and provides an important feeding and roosting area for waders and wildfowl.

Plant species in the area include glasswort, sea milkwort, sea plantain, and sea campion.

## Key Sites

- Troon Links SSSI
- Western Gales SSSI
- Maidens SSSI
- Hunterston Sands
- Doonfoot Wildlife Site
- Bogside Flats SSSI

## Key Species

### Birds

- Golden plover (*Pluvialis apricaria*)
- Ringed plover (*Charadrius hiaticula*)
- Lapwing (*Vanellus vanellus*)
- Eider duck (*Somateria mollissima*)
- Goldeneye (*Bucephala clangula*)
- Wigeon (*Anas penelope*)
- Whooper Swan (*Cygnus cygnus*)
- Redshank (*Tringa totanus*)
- Shelduck (*Tadorna tadorna*)

### Invertebrates

- Lugworm (*Arenicola defodiens*)
- Sand hoppers (*Gammaridae* and *Talitridae*)

### Higher Plants

- Glasswort (*Salicornia* spp.)

## Biodiversity Context

The UK Habitat Statement (Tranche 2, Vol 5) addresses the maintenance and enhancement of the extent and quality of littoral sediment habitats. Also applicable are Habitat Statements for Mudflats (Tranche 2, Vol 5) and Coastal Saltmarsh (Tranche 2, Vol 5). Measures appropriate to Ayrshire include the protection from damage through contamination or disturbance, e.g. oil spills, shellfish dredging, and marina/harbour development. This should include appropriate consideration of all coastal development above highwater mark.



## Current factors affecting the habitat

Due to the effects of the tides, all types of inter-tidal zone are subject to pollution from a number of sources. These include:

- Shipping wastes: operational oil losses, rubbish dumped at sea, chemical wastes, discarded fishing gear;
- Floating rubbish of terrestrial origin which finds its way to sea: livestock carcasses, paper and polystyrene cups/containers, industrial wastes (including incendiary devices).

In addition to these, there are a number of terrestrial practices which have a direct effect on this habitat:

- Mechanical cleaning of beaches/massive sand extraction/strandline removal;
- Sewage;
- Litter;
- Flytipping;
- Bait digging;
- Uninformed grazing regimes;
- Industrial developments;
- Levels of contaminants in water courses.

## Opportunities and Current Action

- Designation of Maidens shore as a Local Nature Reserve;
- Formulation of integrated oil spill reaction plan for whole of Firth of Clyde which would identify susceptible sites.



## Habitat Objectives

### Main Objective

Maintain and enhance the quality of sediment shore habitat in Ayrshire

### Target

No net loss of quality from baseline survey

### Work Objectives

#### Objective 1

Record extent, quality and biodiversity of habitat.

### Target

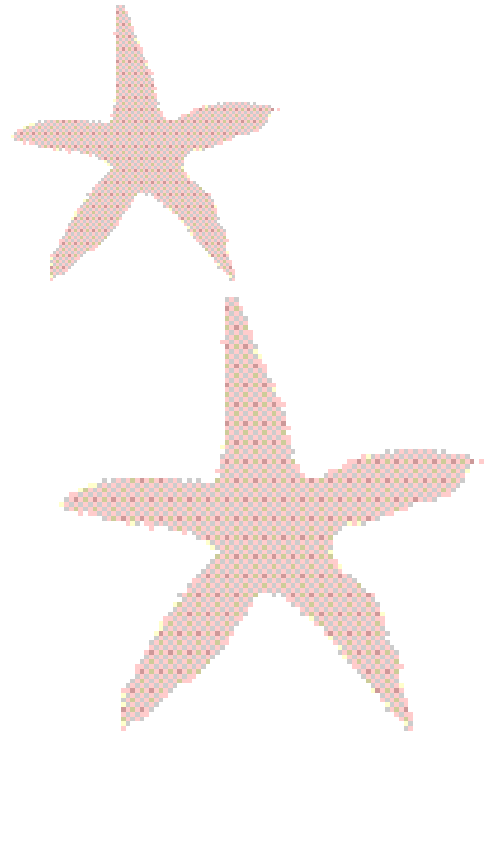
Baseline survey of sediment shores by 2003.

#### Objective 2

Achieve greater awareness and understanding of the habitat.

### Target

Promote use of habitat for educational visits.



ACTIONS Sediment Shores	TO BE ACTIONED BY		YEAR (TO BE COMPLETED OR IN PLACE BY)					
	lead	partners	2001	2002	2003	2004	2005	2010
<b>Policy and Legislation</b>								
Ensure that new proposals are appraised for their effect on sediment shores to avoid net loss of habitat.	SNH ALA	RSPB			•	•	•	•
Ensure that consented discharges are at a level which will not affect sandy shore assemblages.	SEPA			•	•	•	•	•
Strive to reduce the quantity and potency of consented discharges.	WoSW			•	•	•	•	•
Adopt beach cleaning policies which minimise the use of mechanical cleaning which results in removal of sand and strandline material.	ALA	SNH			•	•	•	•
Ensure protection of already designated sites by control of activities adjacent which may result in habitat destruction.	ALA	SNH		•	•	•	•	•
<b>Site Safeguard and Management</b>								
Reduce incidence of fly tipping on coastal areas.	ALA SEPA			•	•	•	•	•
Promote management of beaches via local communities.	ALA SNH	SWT			•	•	•	•
Within the planning context, ensure that full consideration is given to the value of the habitat when considering proposed developments which threaten loss or damage to the habitat.	ALA	SWT SNH RSPB			•	•	•	•
Ensure that management agreements are being adhered to and that prohibited practises are not being carried out on or near designated sites.	SNH	SWT			•	•	•	•
<b>Advisory</b>								
Ensure that all managers of coastal sediments are well placed to receive necessary ecological information about this habitat.	ALA SNH	RSPB			•	•	•	•
Ensure that literature on saltmarsh ecology and management is made available to relevant land managers and planners.	SNH ALA				•	•	•	•
<b>Research and Monitoring</b>								
Survey flora and fauna of sedimentary shores throughout Ayrshire. Continue with bird surveys / monitoring which have already been initiated.	SNH ALA RSPB SWT	WWT NTS UMBS SOC			•	•	•	•
Collate information from the above into coastal database.	ABG ALA ABRC						•	
Monitor delivery of this plan annually and review on five yearly basis.	ABG			•	•	•	•	•
<b>Communications and Publicity</b>								
Install interpretation boards near particularly good examples of this habitat.	STB ALA	SWT NTS SNH					•	
Highlight this habitat and the problems it faces through ranger led walks and events.	SWT ALA	NTS			•	•	•	•
Promote the use of the Sea Chest in schools.	SNH ALA				•	•	•	•

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# Rocky Shores

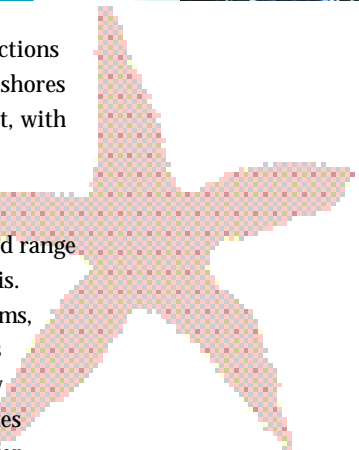
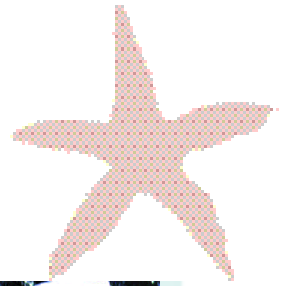
## Definition

This habitat accounts for long stretches of the Ayrshire coast consisting of rocky, gently sloping outcrops. Inhabitants must be especially tough, able to survive the transition from land to sea, from freshwater to saltwater and from a sheltered to wave-battered environment. Through a variety of adaptations, these organisms secure a niche along this gradient, forming a clearly visible transition from communities able to survive continual battering and flooding from the sea to the less robust inhabitants further up the shoreline, able to withstand the occasional deposition of salt spray carried up by the wind. The interactions along this environmental gradient combine to make rocky shores one of the most dynamic and adaptive habitats on the coast, with a broad range of plant and animal species to reflect this.

The range of habitats found is classified into different categories. Very exposed shores are characterised by a limited range of species, often including the red algae *Porphyra umbilicalis*. Moderately exposed shores support a wide range of organisms, often with many of the wrack family present. Sheltered sites again have a generous covering of wracks but may also show egg wrack (*Ascophyllum nodosum*), whilst more unusual sites such as Loch Ranza which is extremely sheltered with a lower salinity may have *Ascophyllum nodosum mackii* present.

## Nature Conservation Importance

Rocky shores are most important in Ayrshire as feeding areas for resident and wintering birds, notably cormorant, eider ducks, purple sandpiper and turnstone. They also provide hauling out areas for Ayrshire's grey seal population. Along sheltered stretches of rocky coast, such as Loch Ranza, it is possible that *Ascophyllum nodosum ecad mackii* is present. The ecad is a distinctive form of the species of a brown algae (*Ascophyllum nodosum*, known as egg or knotted wrack). In conditions of extreme shelter and regularly fluctuating salinity, fragments of the algae that break off develop into unattached, often bladderless, wig-shaped masses at upper or mid-levels of the tide line. The mats produced provide a sheltered and humid habitat for mobile mid-shore animals which would otherwise be unable to live on open shorelines. These factors combine to make rocky shores one of the most dynamic and adaptive habitats on the coast, with a broad range of plant and animal species to reflect this.



## Key Sites

- Portencross Clachlands Point to Corriegills SSSI
- Girvan to Ballantrae SSSI
- Bennane Head to Levenacoroch Burn SSSI
- Ballochmartin Bay SSSI
- Great Cumbrae
- Little Cumbrae (saline pool)
- Croy shore to Greenan SSSI

## Key Species

### Mammals

- Grey seal (*Halichoerus grypus*)
- Common seal (*Phoca vitulina*)
- European otter (*Lutra lutra*)

### Birds

- Eider Duck (*Somateria mollissima*)
- Cormorant (*Phalacrocorax carbo*)
- Turnstone (*Arenaria interpres*)
- Rock pipit (*Anthus petrosus*)
- Purple sandpiper (*Calidris maritima*)

### Invertebrates

- *Corophium insidiosum*

### Lower Plants

- *Mastocarpus stellatus*
- *Ascophyllum ecad mackii*

## Habitat Objectives

### Main Objective

Maintain and enhance the quality and extent of rocky shore habitat in Ayrshire.

### Target

No loss in quality of habitat from baseline survey

### Work Objectives

#### Objective 1

Establish the extent and characteristics of rocky shore in Ayrshire.

### Target

Complete survey of rocky shores by 2004.

#### Objective 2

Achieve greater awareness of the habitat.

### Target

Promote interpretation of sites for educational importance.

## Biodiversity Context

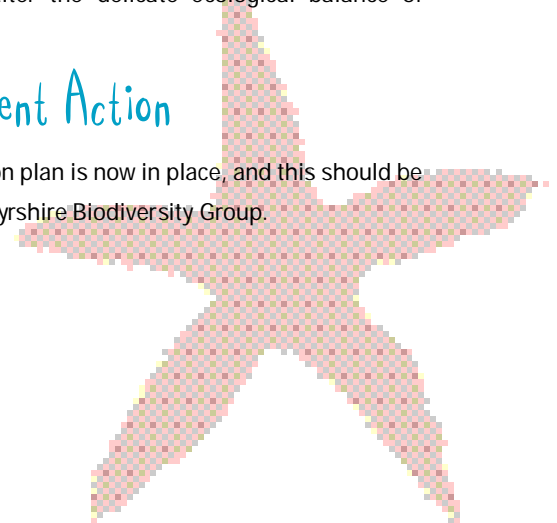
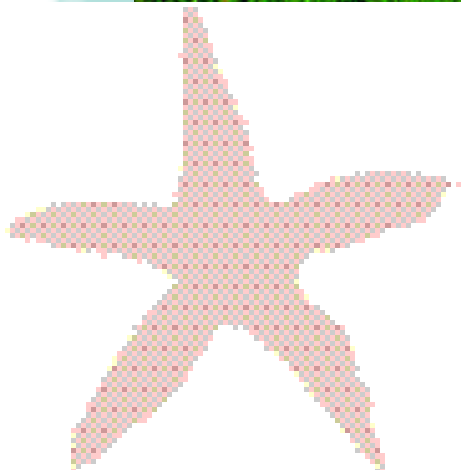
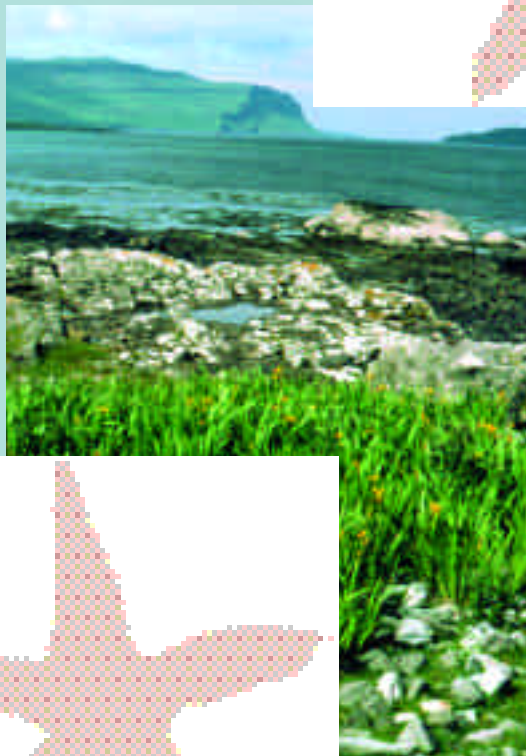
The UK Habitat Statement (Tranche 2, Vol 5) addresses the maintenance and enhancement of the extent and quality of rocky shores. *Ascophyllum nodosum ecad mackii* has its own Species Action Plan. Measures for consideration in Ayrshire include the protection of sites of conservation importance from damage through contamination and physical disturbance and the development of strategies for conservation and management. Species and habitat recovery programs should be developed

## Current factors affecting the habitat

Littoral rock habitats are generally quite robust in their nature, but their endemic communities can be susceptible to the same factors which affect littoral sediment. In addition to this the rocky shores also come under pressure from trampling of vegetation and collection of organisms on a recreational basis. This problem can be exacerbated if there is a large seasonal influx of tourists to one particular area. Accidental introduction of non-native species such as the vigorously growing algae *Sargassum muticum*, or the slipper limpet *Crepidula fornicata* may alter the delicate ecological balance of these habitats.

## Opportunities and Current Action

A detailed integrated oil spill reaction plan is now in place, and this should be kept under constant review by the Ayrshire Biodiversity Group.



ACTIONS Rocky Shores	TO BE ACTIONED BY		YEAR (TO BE COMPLETED OR IN PLACE BY)					
	lead	partners	2001	2002	2003	2004	2005	2010
<b>Policy and Legislation</b>								
Ensure that new proposals are fully appraised for their effect on littoral rock to avoid net loss of habitat.	SNH ALA SWT	RSPB			•	•	•	•
Ensure that consented discharges are at a level which will not affect littoral rock assemblages.	SEPA	UMBS	•	•	•	•	•	•
Strive to reduce the quantity and potency of consented discharges.	WoSW		•	•	•	•	•	•
Ensure protection of already designated sites by control of activities adjacent which may result in habitat destruction.	ALA SNH				•	•	•	•
<b>Site Safeguard and Management</b>								
Reduce incidence of fly tipping on coastal areas.	ALA SEPA			•	•	•	•	•
Promote management of shores via local communities.	ALA SNH	UMBS SWT			•	•	•	•
Within the planning context, ensure that full consideration is given to the value of the habitat when considering proposed developments which threaten loss or damage to the habitat.	ALA	SWT SNH RSPB			•	•	•	•
Ensure that management agreements are being adhered to and that prohibited practises are not being carried out on or near designated sites.	SNH	SWT UMBS			•	•	•	•
<b>Advisory</b>								
Ensure that literature on littoral rock ecology and management is made available to relevant land managers and planners.	SNH ALA	SWT			•	•	•	•
<b>Research and Monitoring</b>								
Survey flora and fauna of littoral rock throughout Ayrshire. Continue with bird surveys / monitoring which have already been initiated.	SNH ALA RSPB SWT	WWT NTS UMBS SOC			•	•	•	•
Collate information from the above into coastal database.	ABG ALA		•	•			•	
Monitor delivery of this plan annually and review on five yearly basis.	ABG				•	•	•	•
<b>Communications and Publicity</b>								
Install interpretation boards near particularly good examples of this habitat.	ALA STB	SWT NTS SNH					•	
Highlight this habitat and the problems it faces through ranger led walks and events.	SWT ALA	NTS			•	•	•	•
Promote the use of the Sea Chest in schools.	SNH ALA	AEEF			•	•	•	•

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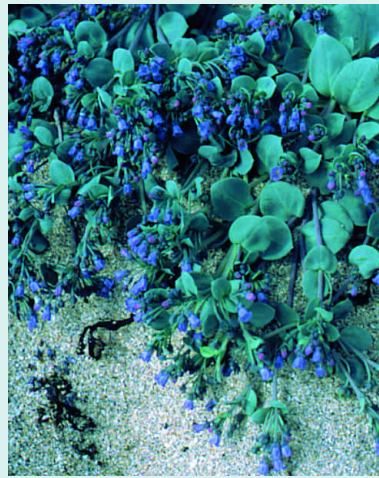
# Above the tide-line



## Shingle above high tide

### Definition

This habitat is simply defined as shores made up of sediment which are of greater grain size than sand, but smaller than boulders (i.e. within the range of 2-200mm in diameter). Shingle plant communities are distinctive, many being limited to particular areas or substrate type.



### Current Status

Coastal shingle is globally restricted with few occurrences outside north-west Europe, Japan and New Zealand. Shingle structures stable enough to support perennial vegetation are comparatively rare in the UK with less than 6000 ha identified in total. South west Scotland is one of five major areas in the UK for this habitat, and within Ayrshire the most important site is that at Ballantrae, with another small section at Torrinwaterfoot.



### Nature Conservation Importance

The shingle spit at Ballantrae is unique in Ayrshire. It is also part of the Stinchar rivermouth complex, the only one of Ayrshire's main rivermouths that remains undeveloped. The spit is inhabited by the oyster plant, a species scarce enough in Ayrshire and UK terms that it justifies its own Species Action Plan in this LBAP. Until the mid-1970s, the spit also played host to a colony of the scarce seabird, the little tern. Disturbance especially from dog walkers eventually led to abandonment by the birds and the species no longer breeds in Ayrshire.

### Biodiversity Context

The UK Habitat Statement (Tranche 1, Vol 2) and Action Plan (Tranche 2, Vol 5) gives the following conservation direction to maintain important shingle structures and processes by which these are formed. Measures applicable to Ayrshire could include discouraging disturbance and damage to important areas from inappropriate forms and levels of use including recreation. Avoidance of disruption of the dynamics of shingle beach processes by coastal defences is also important. Vegetated shingle is listed as a priority habitat under Annex 1 of the Habitats Directive.

### Key Sites

- South Coast of Arran SSSI (Torrylinwaterfoot in particular)
- Ballantrae SSSI and northwards to Pinbain burn SSSI
- West coast of Arran.

### Key Species

#### Birds

- Little tern (*Sterna albifrons*)
- Ringed plover (*Charadrius hiaticula*)

#### Higher Plants

- Oysterplant (*Mertensia maritima*)
- Isle of Man cabbage (*Rhynchosinapis monensis*)
- Sea sandwort - sea campion community



ACTIONS Shingle above high tide	TO BE ACTIONED BY		YEAR (TO BE COMPLETED OR IN PLACE BY)					
	lead	partners	2001	2002	2003	2004	2005	2010
<b>Policy and Legislation</b>								
Within the planning context, ensure that full consideration is given to the value of the habitat when considering proposed developments which threaten loss or damage to the habitat.	ALA	SWT SNH			•	•	•	•
Identify, and following consultation, designate worthy sites, and update management agreements on a regular basis.	SNH ALA SWT				•			
<b>Site Safeguard and Management</b>								
Attempt to renegotiate reserve agreement with landowner if sympathetic.	SWT RSPB				•			
Prevent shingle extraction.	ALA				•	•	•	•
Erect information / interpretation boards at designated sites explaining their fragile nature and providing code of conduct for visitors.	ALA	SNH					•	
Implement strand-friendly cleaning regimes.	ALA				•	•	•	•
<b>Advisory</b>								
Ensure that all land managers who have areas of this habitat under their control have easy access to information regarding sympathetic management of this habitat.	SNH FWAG RSPB				•			
<b>Research and Monitoring</b>								
Undertake full survey of those sites in Ayrshire which have a shingle habitat.	SNH ABRC SWT	ALA			•			
Monitor delivery of this plan annually and review on five yearly basis.	ABG			•	•	•	•	•
<b>Communications and Publicity</b>								
Publish codes of conduct for dissemination within communities which use the habitat as a recreational resource.	ALA SNH	CC			•	•		

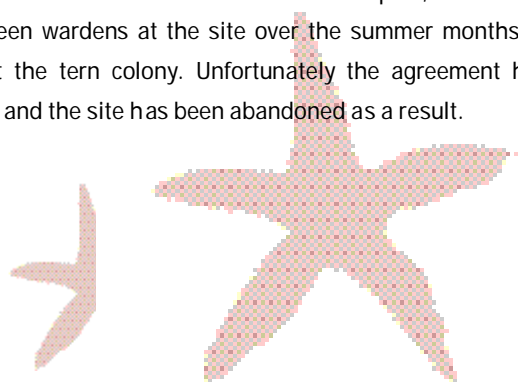
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## Current factors affecting the habitat

- disturbance to nesting birds by dog walking;
- trampling by recreational users;
- mechanical cleaning of the strandline;
- shingle extraction.

## Opportunities and Current Action

The Ballantrae site is designated as a SSSI, and in the past a nature reserve agreement has been negotiated by Scottish Wildlife Trust with the local farmer. In the past, there have also been wardens at the site over the summer months to protect the tern colony. Unfortunately the agreement has lapsed and the site has been abandoned as a result.



## Habitat Objectives

### Main Objective

Maintain and enhance the quality and extent of shingle habitat in Ayrshire.

### Target

No loss in quality of habitat. Improvement in quality through site management.

### Work Objectives

#### Objective 1

Undertake shingle shoreline survey for the Ayrshire coastline.

#### Target

Complete baseline survey by 2003.

#### Objective 2

Educate the public in the fragility of this habitat, and the threats that simple activities pose to it.

#### Target

Ensure local population is aware of fragility of habitat.

# Dune Systems

## Definition

Dune systems are created by the accretion of sand by upper shore plants, and as such are continually in a state of flux and exhibit a great deal of variation between and within systems. They are a key feature of significant parts of the Ayrshire coast, and they are particularly vulnerable because the natural processes which created them have largely disappeared so that they are doubly endangered.

Sand dunes represent a great diversity of habitat types and can be further subdivided into a number of categories including embryo dune, mobile and semi fixed dune, acidic fixed dune grassland, neutral and calcareous fixed dune grassland, dune heath and bracken, dune slack, as well as dune transition to other habitat types. However, for the purposes of this document all dune types will be considered together, and if their characteristics as any of the above makes them exceptional then this is acknowledged.

## Nature Conservation Importance

Sand dunes represent complex and dynamic systems. Due to their constant state of flux they are very susceptible to damage and interference.

The variety of habitats which exist within sand dunes provides a haven for all manner of wildlife. As well as being incredibly diverse in plant species, dunes are especially rich in invertebrate life, many species being at their northern limit in Ayrshire. These in turn provide a food source for lizards and birds such as the nationally declining skylark.

## Biodiversity Context

There is a UK Habitat Action Plan (Tranche 2, Vol 5) which includes conservation objectives for sand dune systems. Measures appropriate to Ayrshire could include protection from inappropriate uses and reduce introduction or invasion of inappropriate species. Appropriate levels of grazing should also be determined and encouraged.

## Key Sites

- Girvan Mains to Turnberry Castle SSSI
- Turnberry Dunes SSSI
- Culzean Bay
- Western Gailes SSSI
- Troon SSSI

## Key Species

### Birds

- Skylark (*Alauda arvensis*)
- Eider duck (*Somateria mollissima*)
- Shelduck (*Tadorna tadorna*)

### Amphibians and Reptiles

- Common lizard (*Lacerta vivipara*)

### Invertebrates

- Grayling (*Hipparchia semele*)
- Coleoptera and Diptera
- Fly (*Cumeris (paragopsis) sabulorum*)

### Higher Plants

- Scot's lovage (*Ligusticum scoticum*)
- Isle of Man cabbage (*Rhynchosinapis monensis*)
- Babington's orache (*Atriplex glabrivscula*)
- Alpine enchanters nightshade (*Circaea alpina*)
- Sea Holly (*Eryngium maritimum*)
- Sea Bindweed (*Convolvulus soldanella*)



## Current factors affecting the habitat

As with other coastal environments, sand dunes are under pressure from human activities which can be separated into three categories:

- Pollution: sewage, industrial outfall, litter left by visitors, debris washed up on shore and blown into dunes;
- Mismanagement: Mechanical cleaning of beaches often leads to removal of sand as an operational by-product. In some areas, sand is removed from the beach for other reasons (e.g. golf bunkers). Both of these practises remove the raw material for dune accretion. This can be seasonal, so that sand lost from the dunes naturally in winter storms is unavailable for dune replenishment in the spring;

- Recreation: Recreational activities such as off-road motorcycling, horse riding, and excessive trampling by walkers break up the vegetation which holds the dune together. This leaves the dune very susceptible to increased erosion by wind, rain and wave action.

## Opportunities and Current Action

A number of projects concerning dunes and their associated habitats are underway. At Culzean the NTS have been endeavouring to restrict vehicular access to areas of beach via dunes, whilst Stevenston Beach dune system has been designated as a Local Nature Reserve with dune stabilization work ongoing. SNH have recently commissioned a sand dune survey of SW Scotland, which may create opportunities to protect and enhance larger areas of coastal dunes and influence their management.

## Habitat Objectives

### Main Objective

Maintain and enhance the extent and quality of sand dune habitat in Ayrshire.

### Target

Monitoring policies in place for all key sites defined from faunal survey

### Work Objectives

#### Objective 1

Establish extent and quality of dune habitat in Ayrshire.

#### Target

Complete faunal survey of habitat by 2004.

#### Objective 2

Restore former dune habitat lost to other usage (e.g. recreation pressure, sand removal).

#### Target

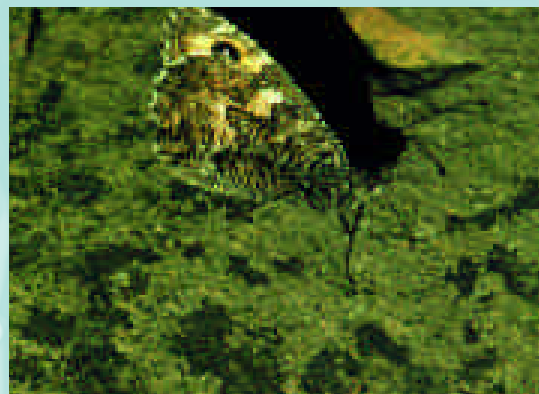
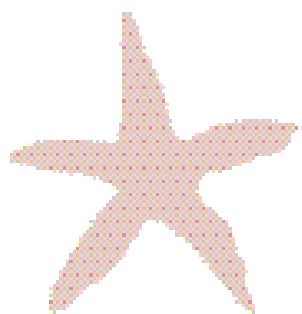
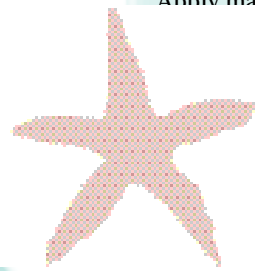
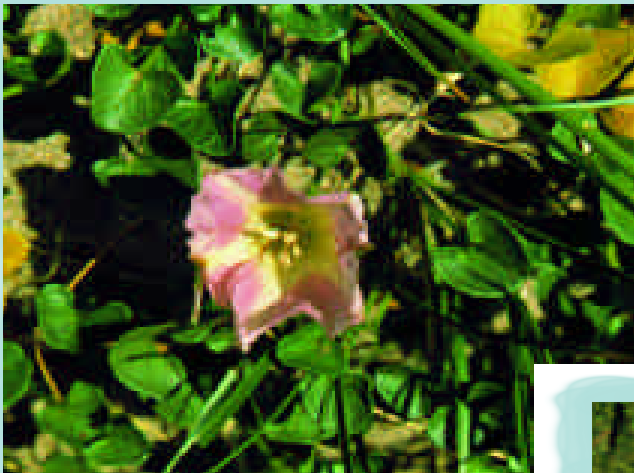
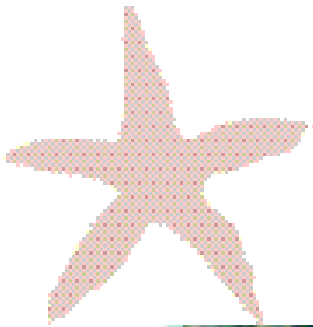
Undertake dune accretion work on selected sites.

#### Objective 3

Achieve local community involvement in dune management.

#### Target

Apply management plans to selected sites where practicable.



ACTIONS Dune Systems	TO BE ACTIONED BY		YEAR (TO BE COMPLETED OR IN PLACE BY)					
	lead	partners	2001	2002	2003	2004	2005	2010
<b>Policy and Legislation</b>								
Ensure that all policies and activities relating to sand dunes safeguard against reduction of the amount of sand within the system.	ALA SNH				•	•	•	•
Designate sand dune sites not already covered by SSSI status as merited by their content.	SNH ALA	SWT				•		
Ensure that in determination of planning applications, all aspects of coastal works are examined in their potential impact to sand dune systems.	ALA SNH	SWT			•	•	•	•
<b>Site Safeguard and Management</b>								
Regulate and monitor activities which may be detrimental to the structure of sand dunes.	SNH ALA			•	•	•	•	•
Involve local communities in the formulation of management plans and proposed designations.	SNH ALA	SWT			•	•	•	•
<b>Advisory</b>								
Develop generic management programme for sand dunes for dissemination to land managers.	SNH				•			
<b>Research and Monitoring</b>								
Review biology of sand dunes throughout Ayrshire and collate to centralised database.	SNH ALA	ABRC SWT				•		
Monitor kidney vetch colonies for relict small blue butterfly populations.	BC				•	•	•	•
Monitor delivery of this plan annually and review on five yearly basis.	ABG				•	•	•	•
<b>Communications and Publicity</b>								
Raise public awareness about importance of sand dunes by involvement in management plans, availability of material and activities relating to this.	SNH ALA	RSPB SWT			•			

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