



Scotland's
National Nature
Reserves

The Story of Forvie National Nature Reserve 2nd Edition



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Scottish Natural Heritage
Dualchas Nàdair na h-Alba

All of nature for all of Scotland
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Scotland's
National Nature
Reserves
Magical places, amazing wildlife.



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The Story of Forvie National Nature Reserve

Foreword

Forvie National Nature Reserve (NNR) is one of our natural treasures. A place of stark beauty its superb coastal scenery greatly appeals. Forvie NNR is on the East Coast of Scotland 20 kilometres north of Aberdeen. It occupies a roughly triangular area, bound along the eastern side by the sea, to the south by the estuary of the River Ythan and the west and north by rich agricultural land. Covering almost 1,000 hectares (ha) of coastal habitats the reserve is a significant part of one of the most extensive sand dune systems in Britain.

Every stage in the formation of a dune system is represented here, from foreshore and bare sand, through yellow dune to lichen rich heath. These are supplemented by a range of coastal habitats from rocky and sandy shores through cliffs and grassy slopes to a variety of estuarine and freshwater habitats. Coastal communities of such extent and diversity are rare in Britain.

The southern end of the reserve is the most dynamic, the bare dunes shifting and changing with the action of the wind and tide. Vast dunes develop and in the hollows between them, damp slacks. Where tussocks of marram grass are able to take hold their roots bind the shifting grains. Gradually, flowering plants and low shrubs cover this more stable ground, creating coastal heathland: another environment for which Forvie is one of the best sites in Scotland.

The other important habitat in the reserve is the estuary and tidal waters of the River Ythan. Like the dunes, it's one of the most natural examples of this habitat in Britain. The reserve reaches inland from the narrow channel where the River Ythan meets the North Sea through the wide tidal basin and upstream as far as the tidal flow reaches. At low tide vast areas of mud and sand are exposed which are rich in invertebrates; these areas provide key feeding habitat for the many bird species breeding and overwintering in and around the estuary.

Forvie is particularly renowned for its birds. In the summer months this includes one of the largest breeding colonies of eiders in Britain and four species of breeding terns. Throughout the year the muds of the estuary provide a rich food source for many species of waders and wildfowl. Numbers peak around the autumn and spring migration periods when many species use Forvie as a resting and fuelling stop, with large numbers remain throughout the winter. In recent years the estuary has become

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a popular site for viewing grey seals, which haul out on the sandbanks at the mouth of the estuary.

Forvie is one of more than forty-five National Nature Reserves (NNRs) in Scotland. Scotland's NNRs are special places for nature, where some of the best examples of Scotland's wildlife are managed. Every NNR is carefully managed for both nature and people, giving visitors the opportunity to experience and enjoy our rich natural heritage.

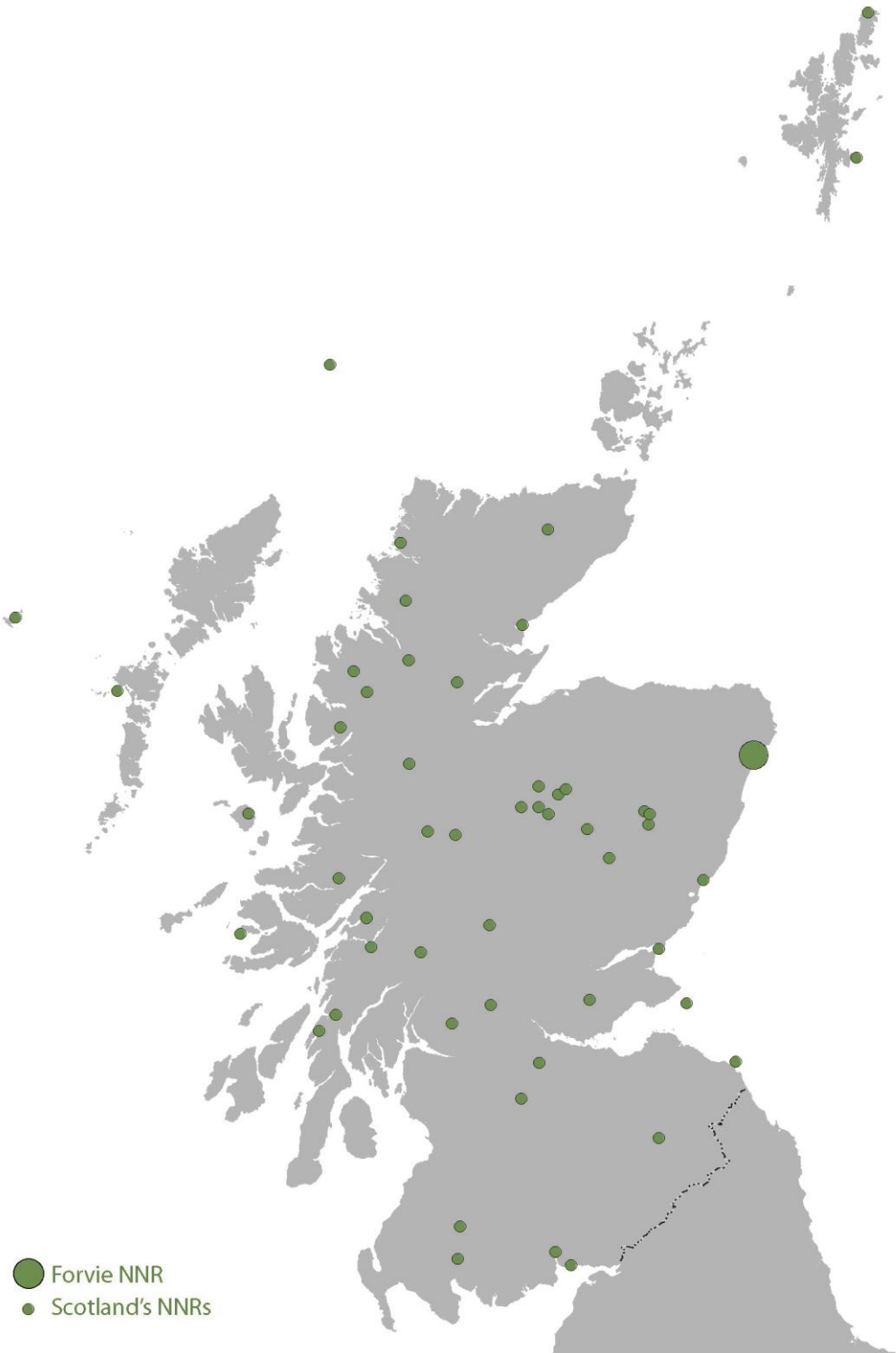
This document contains background information about the reserve, describing its wildlife interest, land use history and management since it became a reserve. Future management of the reserve is outlined in the Forvie NNR Management Plan.

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Maps of Forvie National Nature Reserve¹

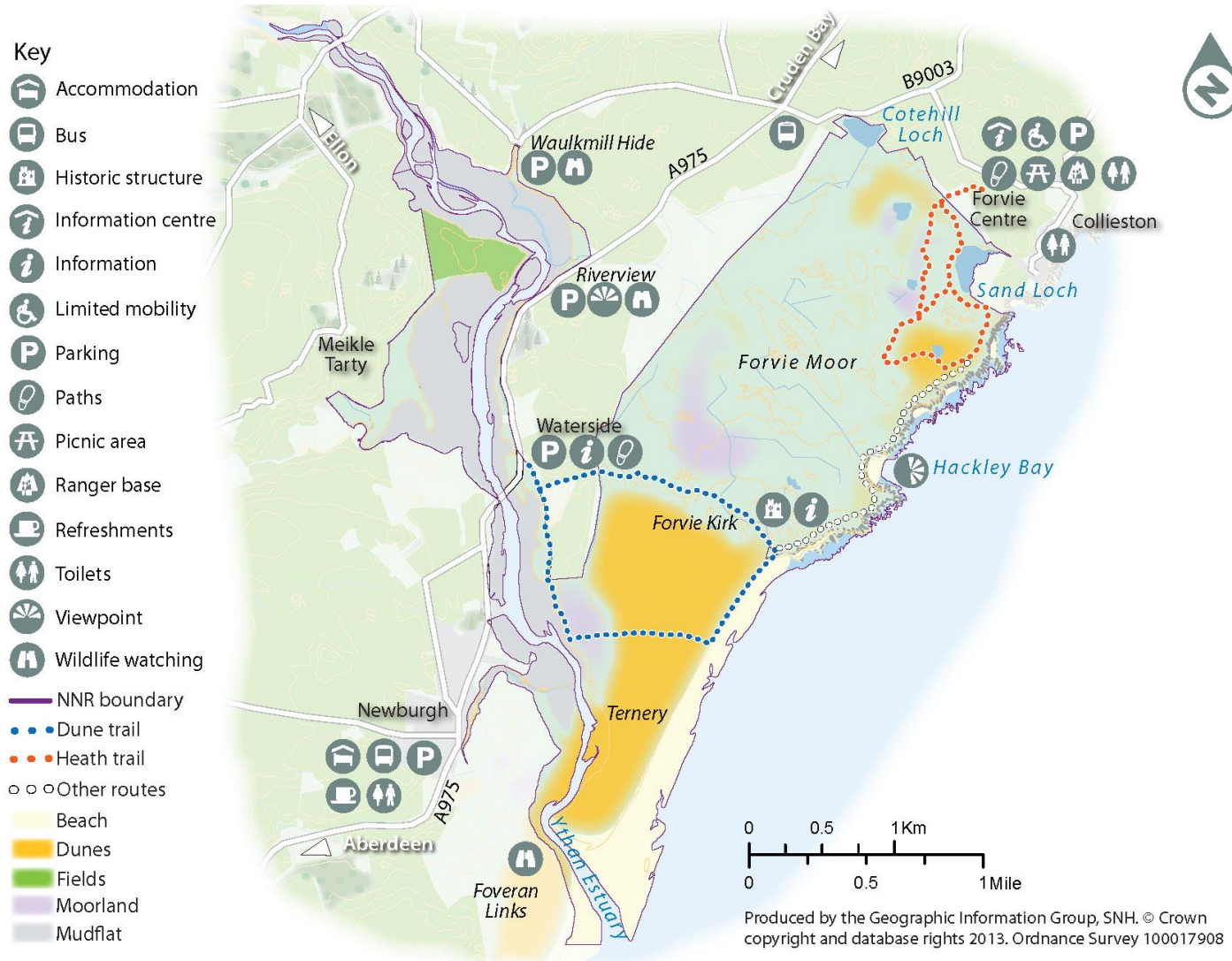
Location map



¹ Map correct at Jan 2014

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Reserve map



1 Introduction to Forvie NNR

Forvie NNR is located on the northeast coast of Scotland between Newburgh and Collieston, some 20km north of the city of Aberdeen. Coastal dunes stretch in a continuous line for 24km along this coastline broken only by the Rivers Don and Ythan. The east side of the reserve is bound by the North Sea, the southern boundary follows the high tide line of the Ythan Estuary and the west side abuts farmland. The tidal zone of the River Ythan, which extends northwards from the mouth of the estuary 7km inland to Mains of Waterton, is also in the reserve. Although the Foveran Links to the south of the river are out with the reserve, the boundary follows the high tide mark up to the village of Newburgh.

Stretching inland from the estuary are the Sands of Forvie; an extensive area of mobile sand with the appearance of a desert in places. There are vast mobile dunes and damp hollows called dune slacks. As you move both north and inland the dunes become more stable, turning to dune heath. Following the coast northwards from the mouth of the estuary the landscape changes from sandy beach to rocky shore with sea cliffs towards Collieston.

The climate in this area is cool, with an average annual temperature of 10.9°C, a summer average of 14°C, and a winter average of 3.2°C. Annual rainfall is a relatively low 800mm and snow is uncommon, but in summer, haar (sea mist) is frequent and can last for days. This relatively mild climate makes Forvie a haven for winter feeding when further inland the ground and water bodies are frozen.

On average there are fewer than five days per year without wind, and winds in excess of Force 5 (strong enough to make small trees sway and create foamy tops on waves) occur on 80 days. The constant winds are an important factor in sculpting and shaping the landscape of Forvie.

The south of the reserve is dominated by the Ythan estuary. This is an important feeding ground for birds throughout the year. Tens of thousands of waders and wildfowl use the estuary; some are resident throughout the winter and others pass through on migration. In the summer colonies of breeding terns and gulls favour the hollows and gravel areas amongst the dunes. Eiders breed on the heath close to shore, taking advantage of the rich water and mussel beds of the estuary as a source of food.

Forvie is such an important site for wildlife that it is protected by international, European and domestic legislation. It is included in the European Natura 2000 network of protected areas, both for its bird life (i.e. a Special Protection Area or SPA) and its habitats (i.e. a Special Area of Conservation or SAC). Such sites are strictly protected, with legal obligations to prevent deterioration or disturbance to the features of interest. It is also listed as a wetland of international importance under the Ramsar Convention, commonly known as Ramsar sites. The features for which Forvie has been selected are summarised in Table 1.

On NNRs, management for wildlife is the highest priority, but they are also managed so that people can enjoy the wildlife in a responsible way.

Table 1: Protected areas and features of Forvie NNR

	Site of Special Scientific Interest	Special Protection area	Special Area of Conservation	Ramsar
	Sands of Forvie and Ythan Estuary	Ythan Estuary, Sands of Forvie and Meikle Loch	Sands of Forvie	Ythan Estuary and Meikle Loch
Feature				
Breeding bird assemblage	✓			
Eider, breeding	✓			
Arctic tern, breeding	✓			
Little tern, breeding	✓	✓		
Common tern, breeding	✓	✓		
Sandwich tern, breeding	✓	✓		✓
Eider, non-breeding	✓	✓		
Pink-footed goose, non-breeding	✓	✓		✓
Lapwing, non-breeding		✓		
Redshank, non-breeding		✓		
Waterfowl assemblage, non-breeding		✓		✓
Coastal Geomorphology of Scotland	✓			
Saltmarsh	✓			
Sand dunes	✓			
Vascular plant assemblage	✓			
Lime-deficient dune heathland with crowberry			✓	
Humid dune slacks			✓	
Shifting dunes			✓	
Shifting dunes with marram			✓	

2 The Natural Heritage

The dune complex at Forvie is largely natural; it is constantly moulded by natural forces but has been relatively little modified by man. These natural processes have created the array of coastal landforms found here, some of which are unique in Britain. This section describes how the dune habitats at Forvie have developed, and describes the important species found on the reserve.

Geomorphology

The dune system

The Sands of Forvie are one of the largest areas of blown sand in Scotland. Following the melting of the last Scottish glaciers, approximately 10,000 years ago, vast quantities of sediment were transported by rivers to the coast where they were deposited offshore. When the Scandinavian and North American ice sheets melted (the rate of melt peaking approximately 4,000 years ago) and sea levels rose, these sediments were reworked by marine action. Slowly the sediments were transported onshore by waves and wind to provide the foundations for the sand dune systems at Forvie and Foveran.

Forvie is a triangular area of extensive and complex dune systems, with three distinct parts. At the north end of the reserve the sand has been deposited on top of a high rock plateau, with varying depths of glacial deposits sandwiched between the rock and the sand. Along the Forvie peninsula, the sand rests on raised beach terraces and buried ridges of glacial origin. At the most southern tip of the reserve, where the River Ythan meets the North Sea, there is a dynamic spit and bar formation. Today natural processes including winds, waves and tides continue to shape the dunes.



Aerial shot of Forvie NNR looking north

Habitats

Estuary – the Ythan estuary is one of the least modified estuaries in Britain. It is tidal almost as far inland as Ellon. These extensive intertidal areas, exposed when the tide is out, are an essential food source for the rich bird life of the reserve. Living in the mudflats are large numbers of shellfish and invertebrates, a vital food source for waders and wildfowl. The coarser gravels support mussel beds, a vital food supply for the eiders.



Mudflats – rich feeding for waders such as Curlew.

Saltmarsh – pockets of saltmarsh found around the seaward reaches of the estuary make up the largest area of this habitat in Aberdeenshire. Lower saltmarsh is covered by most high tides, and has a typical mix of sea arrow grass, sea milkwort and salt marsh rush, while higher saltmarsh is flooded only by the very highest tides and is mainly grassy, with creeping bent, red fescue and a little sea club rush. Further inland, where the saltwater has less influence, the banks of the River Ythan are fringed with reed beds rather than saltmarsh.

Dunes – Forvie is an exceptionally mobile dune system compared to other UK dune systems. A large area of bare sand and shifting dunes dominate the southern end of the reserve, which has been compared in appearance to the Sahara Desert! One particularly striking dune sheet, once 20m high, is almost devoid of vegetation. The dunes here have been built from sand carried onshore by the sea and wind. On these unstable dunes, where the sand is constantly shifting, marram grass is usually the dominant plant. Marram is a robust plant adapted to dry conditions and thrives on being buried by sand.

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The dunes become fixed as the marram grass roots bind the sand grains together and trap water and nutrients, leading to more stable conditions suitable for other grasses like sheep's fescue and flowers like harebells. Over time more organic content develops and other grasses and crowberry begin to dominate creating fixed dunes. A large number of mosses, liverworts and lichens also grow.

Among the dunes are wet areas known as dune slacks. Slacks are low-lying areas between dune ridges that are seasonally flooded. They are mainly found in the larger dune systems in the UK, especially in the west and north, where the wetter climate favours their development, and are less common in the warmer and drier dune systems of continental Europe. In the wet slacks at Forvie, plants like common sedge and marsh pennywort are usually found, while damp slacks have crowberry, cross-leaved heath and occasional creeping willow. In the north of the reserve, the vegetation on the oldest, most stable dunes has developed into dune heath. Here there is an extensive area dominated by heather, although crowberry remains abundant along with heath mosses and lichens.



Looking across mobile dunes towards the North Sea.

Sea cliffs – along the coast the sea cliffs rise from about 10m high at Rockend to 40m high at Collieston. The cliffs are greatly influenced by sea spray; so here typical plants include the salt tolerant thrift and sea plantain. Stretches of cliff with less acidic soils have a rich flora, including plants like primrose, cowslip, meadow saxifrage, with grass of Parnassus and northern marsh orchid in wetter areas. The cliffs are home to a number of small seabird colonies with gulls, kittiwakes and fulmars.

Wildlife and plants

The diverse habitats at Forvie support a rich flora and fauna. The birds are most significant, with the breeding terns and the wintering waders and wildfowl rated as internationally important. The flora is typical of coastal habitats found on the east coast of Scotland with one or two more unusual species.

Birds

Tern colonies – there are records of terns at Forvie going back over 150 years. Four species of tern breed here regularly: sandwich, arctic, common and little tern. A fifth species, the roseate tern, is sometimes seen in the breeding season, but breeding has only been recorded once, in 1963. The success of different species has varied markedly over the years.

Terns often choose to nest at different locations. At Forvie today the terns nest among the dunes and on the beach at the southern end of the reserve, but in the past they also nested on Forvie Moor, the beach and the island of Inch Geck. The little terns and arctic terns prefer to nest on the foreshore and raised beach areas, while the sandwich and common terns prefer to nest within black-headed gull colonies among the marram tussocks in the dunes. The breeding success of the terns is influenced by predation, disturbance by visitors, fish availability and weather conditions. Terns are not site specific in where they breed. The populations at Forvie can vary greatly over successive years if the terns move to alternative breeding locations.



Tern colony

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The black-headed gulls are the first birds to return each season, in early March and are important as they attract terns into the ternery. Sandwich terns are the first of the four tern species to arrive each spring, in late March, followed by little terns, arctic terns and lastly common terns in late April or early May.



Sandwich tern

Little terns are uncommon in Britain, although widespread elsewhere in the world. They breed in scattered colonies around the coast of Britain and Ireland; Forvie has up to 30% the Scottish population. Breeding success over the last 30 years has shown wide fluctuations because little terns are particularly vulnerable to predators, human disturbance, wildlife crime and the effects of high tides and blown sand. Since 2005, the population has increased from 19 pairs to 40 pairs on average.

A significant proportion of the British common tern population breeds in Scotland, mostly in the Northern and Western Isles and on the west coast, but with sizeable colonies also along the east coast firths. In the early 1990s the Forvie population was more than 2% of the UK total. However, from a peak of 1,500 pairs in 1963, numbers have dropped to the extent that during the early 2000s there were just over 10 pairs of common terns with correspondingly low numbers of fledged young. In the years since, numbers have fluctuated greatly and some years no birds have bred at all, while around 100 pairs nested in 2013.

Arctic terns were first recorded at Forvie in 1954, when they were discovered nesting on the heathland. They have been present ever since, usually numbering somewhere between 50 and 150 pairs, climbing to over 200 pairs for the first time in 2001. Complete nest failures were observed in the mid 1990s, then more than 100

young fledged in 2001 and 2002. Over 1200 arctic terns nested at Forvie in 2013, producing more than 1500 chicks. It can be difficult to predict numbers due to this wide variation.

British colonies of sandwich tern are very scattered and mostly confined to coastal shingle beaches, sand dunes and offshore islets. At Forvie they breed in association with black-headed gulls. Numbers plummeted in the 1990s with no young fledged between 1992 and 1998, probably because of predation by crows, gulls and foxes. After an apparent recovery to nearly 900 nests in 2007 numbers have declined but stabilised at around 600 pairs.

As can be seen from the descriptions above the breeding success of the terns has fluctuated widely. There was particular concern in the mid-1990s when breeding numbers and success of all four species was very poor. Research carried out for SNH by Aberdeen University indicated that crow, gull and fox predators were partly responsible for the poor breeding success. SNH carries out various management activities to help improve the terns breeding success – these are described further in section 5.

Waders and wildfowl – the UK is of outstanding international importance for its waterfowl populations. In the UK there are 57 SPAs for waterfowl populations, most of which hold important numbers of birds during the winter months. The Ythan Estuary is also part of a Ramsar site, which is a worldwide list of important wetland areas for birds. At Forvie the peak number of wintering birds was 22,175 during the period from 1994–1999. Between 2007 and 2012, the winter average was 32,181 birds.

The most numerous species are wigeon, oystercatcher, golden plover, lapwing, dunlin, curlew and redshank. During the winter months, there are large fluctuations in the numbers of some of the most abundant species on the estuary. Many of the fluctuations are the result of large scale movements e.g. cold weather effects, migration, or post breeding dispersal and may not be related to conditions on the estuary itself.

Geese – up to three-quarters of Britain's wintering pink-footed geese are found in Scotland, with strongholds in Aberdeenshire, Perth & Kinross, Stirlingshire, the Lothians, and, in late winter, the Dumfries coast of the Solway. The number using the Ythan Estuary, Sands of Forvie and Meikle Loch SPA is estimated at 9% of the UK total. Although high numbers of pink-footed geese use Meikle Loch, which is out with the NNR, around 15,000 geese may be seen on the Ythan Estuary in spring.



Eider duck on Ythan Estuary

Eider colony– The eider colony at Forvie is one of the largest in Britain. Between 1991 and 1995 there were around 4,000–5,000 birds, with some 1,500 breeding pairs at Forvie. More recently, the breeding population has halved with no more than 800 pairs counted in spring. In winter some birds remain while the rest of the population over winters further south on the Tay Estuary. The breeding success of the colony has been mixed. In 1971 and 1976 as many as 1,200 fledglings were counted on the estuary, but in more recent years breeding has been less successful.

The number of fledglings was so low in the early 1990s that Aberdeen University predicted the colony would decline dramatically unless remedial management action was taken. As a result SNH introduced more active management in 1995, as explained in section 5. This improved the situation, with 614 ducklings counted in 1999, 143 in 2000, 222 in 2003 and 104 in 2004. Breeding success has reduced again but the reasons are not fully understood and may not be related to factors specific to Forvie.

It is thought that over the years the eiders have been driven to nest in a smaller area at high density because of predation by foxes. They now nest close to the estuary whereas they used to spread out more widely across the heathland. Nesting like this makes them vulnerable to crow and gull predators because it is easier for the crows and gulls to find a large number of nests in a short time.

Seabirds – seabirds breed on the sea-cliffs at the north of the reserve and include fulmar, shag, cormorant, kittiwake and razorbill. The colony numbers fewer than 2,000 birds, so it is dwarfed by much larger colonies along the east coast such as the Buchan Ness to Collieston SPA to the north, which has more than 83,000 breeding birds.

Other birds - such as short-eared owls, kestrel, sparrowhawk, osprey and buzzard are regularly seen and may breed on or close to the reserve; hen harriers are seen during migration periods, and peregrine are seen hunting from time to time. Snow buntings are usually seen among the dunes in winter. In all 225 species have been

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recorded here, while breeding birds such as skylark, stonechat and shelduck are also features of the site.

Mammals – mammals typical of this part of northeast Scotland are found on Forvie, including roe deer, foxes, badgers and stoats. Water voles have been recorded in burns adjacent to the reserve. The more unusual species include a healthy population of otters on the River Ythan and the grey and common seals that haul out at the mouth of the estuary. Offshore there are regular sightings of bottlenose dolphins.



Seals hauled out beside Ythan Estuary

Reptiles, amphibians and fish – Forvie is not noted for reptiles and amphibians; in fact no lizards or snakes have ever been recorded here. Frogs and toads are abundant, but newts are scarce. Perch and pike are suspected to be found in Sand Loch at Collieston, while the flounder is an important fish species for the Ythan estuary, which is also a renowned sea trout fishery.

Invertebrates – certain groups of invertebrates are better recorded than others at Forvie. Fifteen species of butterfly and 240 species of moth have been recorded. There are also records for 107 species of spider and 148 species of beetle. The butterflies on the reserve have been recorded annually since 1978 as part of the UK Butterfly Monitoring Scheme. Species range from the common blue, the most widespread blue butterfly in Britain and Ireland, to the small pearl-bordered fritillary, a priority UK BAP species.

Vascular plants – the range of habitats at Forvie supports more than 300 plant species. This includes three nationally scarce species – seaside centaury, creeping lady's tresses and curved sedge. The sand-dunes and the estuary support a number of locally significant species, including crowberry (one of very few coastal sites for this arctic-alpine species in Grampian), adder's tongue fern, common twayblade, early purple orchid, frog orchid, heath dog violet and moonwort in the dunes, and sea club-rush and greyish bulrush in the estuary.



Crowberry

Lichens – the lichens (129 species) are of particular interest, with a combination of coastal and upland species. Coastal species include *Caloplaca verruculifer*, which is associated with maritime rocks, and *Lecidea erratic*, which is adapted to growing on shingle. The dunes support *Cladonia uncialis subsp biuncialis*, *Cetraria islandica* and the rare *Cladonia zoppii*, all species more commonly associated with moorland and upland areas. There is also a record of the very rare *Cladonia mitis* (although it was not found again in a survey carried out in 2000).

Mosses and liverworts – dry dunes do not provide ideal conditions for mosses or liverworts, but the wet dune slacks contain some interesting species. Sixty-one species of moss have been recorded, including the rare slender green feather-moss, a species associated with fens which is protected under both British and European legislation. Twenty-six species of liverwort have been recorded including two national scarce species associated with dune slacks *Riccardia incurvata* and *Haplomitrium hookeri*. Fungi (140 species) are also of interest.

3 History of Forvie

The dune system at Forvie covers an older landscape, which was used by our early ancestors. At the end of the last Ice Age, Scotland's first settlers lived as hunter-gatherers around the coast because the sea was both a source of many different types of food (fish, shellfish, sea mammals, birds, coastal plants, nuts and berries), and a highway that linked the different communities. Six thousand years ago sea level was up to 4.5m higher than the current height. The estuary was much wider and it slowly deposited sand and mud across the area. As the sea level has fallen raised beaches have been left exposed.

The earliest evidence of human presence in the north east of Scotland dates from 8,000 years ago and survives in the form of minute flakes of flint, found by rivers or on the coast. These flakes were tools (and the waste from making tools) used to manufacture bone spears for fishing and weapons for hunting. Excavations at Forvie have discovered flint working sites and the remains of midden mounds consisting of mussel shells.

The first farmers appeared in Britain around 4,000 BC, marking the beginning of the Neolithic (new stone age) period. At this time people began to bury their dead in cairns, leaving behind traces such as the small circular foundations which at Forvie, are now mostly buried by sand. During the Bronze Age, about 3,000 BC, kerb cairns were built to hold cremation sites.



Kerb cairn at Forvie NNR

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At Forvie three of these cairns lie on land that had previously been farmed. One particular cairn had only a limited section of the outer kerb left, but an almost complete inner cairn contained large quantities of burnt bone. Shards of Late Bronze Age pots have also been discovered along with sections of a quern, for grinding flour, fragments of coarse pottery, and a piece of metal slag.

A settlement of 31 huts discovered within the dune heath dates to about 700 BC. The hut floors were sunk into the sand underlying the heathland surface, and covered with red clay or paving stones; the walls were formed by banking up the excavated sand and stabilising it with clay and turf to support a stone kerb. Inside, wooden posts supported the roof timbers. Outside the huts, amid a scatter of fire-cracked stones, traces of working places were discovered with small finds scattered around. Artefacts from the area include jet beads, bracelets, querns and pottery.

The cairns, hut circles and Forvie church and deserted ancient village are all Scheduled Monuments. The church, dedicated to St Adamnan, is first mentioned in the 13th-century records of the Chartulary of Arbroath. Excavations date the church to the 12th-century but burials inside the church suggest that it had become ruinous by the 15th-century. Sometime in the 15th-century, the area was smothered in sand, possibly in August 1413, when legend has it that a nine-day storm moved huge quantities of sand. Excavations in 1953 near the church revealed the foundations of medieval square huts, built of roughly shaped stones and red clay. Further excavations in 1955 revealed a paved floor and yielded 13th/14th-century pottery. The font from the church is on loan from the Church of Scotland and can be seen at the Forvie Visitor Centre. For the next 400 years, the historical record shows a gradual population decline in Forvie parish and various records and of sand blowing over agricultural land.



Archaeologists excavating a midden

4 Land Use at Forvie

Forvie used to be part of Slains Estate, owned successively by the Errolls, Catchcarts, Walker-Okeovers and the Suttons. For at least the 150 years immediately before Forvie became a NNR in 1959, the land and estuary were used for a number of purposes, from farming to collection of shellfish and some of these continue today. Management of the NNR is detailed in section 5.

Farming – the land has never been intensively farmed although some agricultural evidence is present in the soil profile going back to medieval times. The movement of sand and the poor soils discouraged land improvements except at the fringes where the sand was shallow and could be worked into the underlying glacial till. Areas of heathland on the estuary side were worked for agriculture in the 1950s, sheep and cattle were grazed and attempts were made to improve grazing by draining parts of the moor.

Fishing – salmon were netted along the north east coast of Scotland for many years. As early as the 1640s the records indicate the Ythan had important stock of migratory fish – salmon and trout. Numbers have declined in recent years, and some fisheries have been bought out by river angling interests. The salmon netting station at Rockend ceased operations in 2000 and is now owned by the Ythan District Fishery Board, which has a general duty to ensure the protection and enhancement of the fishery within the Ythan catchment. Angling in the River Ythan is popular, both from the shore and boats and three separate estates own angling and fishing rights within the NNR. The River Ythan Trust was formed in 2010 and aims to protect and enhance the river catchment through fishery management and biosecurity measures.



Angling on the Ythan Estuary

Shellfish harvesting – in the past mussels were collected commercially from the estuary, but this ceased in the 1960's. The right to collect winkles, for personal use, from the foreshore still exists although it is seldom seen at Forvie. Bait digging for worms takes place by private individuals for sea fishing but cockles are few and rarely removed.

Shooting – for a number of years there was game shooting at Forvie, mainly of grouse and partridge, and this continued for a few years after the reserve was established. Heather was burned to provide young shoots for grouse to feed on. In 1979 a fire spread out of control; this resulted in burning being stopped. There has been no grouse shooting or burning on the reserve since. We made the decision to stop management for grouse to allow the heath at Forvie to be managed naturally. It is now one of the few large areas where this coastal habitat is managed this way.

Wildfowling continues on the foreshore in the reserve where it is a legal right between 1st September and 20th February, although there is a voluntary refuge area below the A975 road bridge at Newburgh. SNH has worked with local wildfowling to produce a code of good practice for wildfowling at the Ythan Estuary. In 2013, the Ythan Estuary Wildfowling and Conservation Association formed to control shooting on land at Tarty on the west side of the estuary, which, although privately owned is within the NNR. In the winter of 2013/14, a total of 53 pink-footed geese, 12 Greylag geese, 18 mallards, 13 widgeon and 6 teal were shot. In Scotland, the use of lead shot over wetlands to shoot any species is illegal in a bid to eliminate deaths of waterfowl from lead poisoning.

Military use – in the past Forvie was used by the Gordon Highlanders as an artillery range. During the Second World War, local people were only allowed access on Sundays when no firing took place and they were restricted to paths. Mortar bombs can still be occasionally found and must be reported to police and the army bomb disposal unit. The most prominent wartime evidence is the long row of tank traps built during World War II from Rockend to Johns Hole Point, where there is also a pillbox. These concrete blocks are frequently covered or re-exposed by sand movement.

Recreation – visitors have been drawn to Forvie for quiet recreation for many years attracted by the coastal habitats, the sea and relatively natural character of the place compared with its intensively managed surroundings. More active pursuits that take place on the reserve are orienteering events, fun runs and windsurfing on the estuary.

Land ownership -SNH now owns the majority of the land above the high water mark. Originally the reserve was established as a NNR by agreement with the previous owner, Slains Estate, an arrangement that lasted for 40 years. In 1998 SNH took the opportunity to lease the land and in 2003 SNH purchased 653ha amounting to 67% of the reserve. Since then a further 29 ha have been purchased. SNH leases a further 273ha of the intertidal mud flats from the Crown Estate Commissioners. Some land at Tarty on the west side of the Ythan Estuary is privately owned, while the upper reaches of the estuary are also owned by Auchmacoy Estate, a private individual and an angling association. The Crown Estate retains ownership of the intertidal foreshore at Forvie, although SNH leases this area to maintain some management influence. The Ythan District Fishery Board owns a small piece of land and the salmon bothy at Rockend.

5 Management of Forvie NNR

Forvie has been managed as a NNR for over fifty-five years. The history of the reserve since it was established in 1959 is recorded in many files and annual progress reports. The following is a brief summary of the milestones.

Key events in the history of Forvie NNR

1957	Culterty Field Station built, followed by intensive research use of the reserve by students and staff from Aberdeen University.
1959	Forvie NNR declared by agreement with the landowners.
1961	First Management Plan produced by J Grant Roger, then the Regional Officer of the Nature Conservancy.
1961	First electric fencing erected to reduce disturbance to breeding birds.
1967	First Forvie NNR leaflet produced.
1968	F E Coull appointed as Honorary Warden to take visitors around the Reserve, which he continued to do until he retired in 1983.
1978	Purchase of Little Collieston Croft as reserve office.
1978	In the late 1970s weekend wardening was introduced.
1979	The NNR was extended to include the intertidal mudflats of the Ythan estuary.
1981	The Reserve Handbook published by the Nature Conservancy Council.
1982	First Forvie Open Day held.
1986	In the mid-1980s a full time warden was appointed for the first time.
1994	SNH introduced a predator control programme following several years with very few young eiders produced.
1998	The new Stevenson Forvie Centre was opened, housing a visitor centre, public toilets, classroom and offices.
1998	Forvie was classified as a Special Protection Area, and proposed as a Special Area of Conservation.
2001	Culterty Field Station was redeveloped as the Aberdeen University Deep Ocean Research Centre changing the emphasis of some of the research carried out.
2003	SNH bought 653ha at Forvie, some 65% of the reserve.
2005	Sands of Forvie SAC designated.
2005	Scottish Outdoor Access Code is published, which leads to increased focus on NNR management for people
2009	Forvie celebrates its 50 th anniversary with many public events
2012	SNH bought the remaining land within the NNR still owned by Slains Estate

Since 1959 there have been many changes. The wildlife management on the reserve has to take account of the new obligations arising from national and international legislation, especially the European Directives for Natura 2000 sites. SNH's revised policy for NNRs in Scotland changed too, requiring greater attention be paid to using reserves to raise public awareness of Scotland's rich natural heritage. Like all landowners, SNH must meet other legal requirements arising from the Land Reform Act, the Disability Discrimination Act and other relevant legislation.

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Previous management plans

The first management plan was written in 1961 and had the following objectives:

- to ensure that the area with its native vegetation and animals will persist and develop naturally, subject to any necessary control of pests
- to provide opportunities for research
- to survey the flora and fauna
- to protect the archaeological remains.

From 1978 onwards, a number of monitoring programmes were established. Forvie became a site in the National Butterfly Monitoring Scheme; breeding seabirds were counted annually and other bird surveys were undertaken.

In 1981, the four objectives of the first plan were carried forward to the second plan. A fifth objective was added 'to increase the educational interest of the reserve as far as was compatible with the other objectives'. In 1995, the third plan continued in broadly the same direction. Although it now had 12 objectives, which were more precisely defined, the only completely new ones were those relating to monitoring the interest of the site and public recreation. The reserve has carried on with management for these objectives to the present day.

The 2006-13 plan continued with 12 objectives, set out around the policy for NNRs, they related to heritage, people and property management. The general direction of heritage management continued to focus on keeping the coastal features, breeding and wintering birds in good condition and protecting the biodiversity of the reserve. The people-related objectives focused on creating a high quality visitor experience, compatible with the wildlife interest of the reserve, for tourists, education users and the local community. Property management was about keeping the site well maintained and increasing the use of renewable energy.



Forvie Centre and wind turbine

Habitat management

The dune habitats on the NNR are largely natural, and management aims for minimal intervention. In 1979 we erected a perimeter fence around the reserve and locked gates were put on vehicular access points to prevent visitors driving across the dune system. From 1979 until 1983 sections of the fence were opened up for six weeks during May and June to allow eider ducklings to move from the heathland to the estuary. This practice ceased in the early 1980s when the eider ducks stopped nesting in the heathland.

Small-scale remedial management has been carried out as necessary, for example when trampling alongside footpaths requires action to stem erosion. At times rabbits have been controlled by various means, both to prevent excessive damage to the dunes and to reduce their impact on neighbouring farmland. When the rabbit population is very low however, the dune habitats can become overgrown with long grass, while small trees and gorse can take hold. Rosebay willowherb is regarded as an invasive species on semi-fixed dunes and may have to be controlled.

The river and estuary habitats are rather different. There is a problem with pollution but this arises beyond the Reserve and cannot be tackled by reserve management alone. The River Ythan is 40km long and drains a catchment of 680km², most of which is farmland. In recent years the build-up of nutrients, mainly nitrates and to a lesser extent phosphates, in the river has caused concern. The enhanced levels of nutrients cause a rapid growth of algae, which blankets the mud flats and the number of the invertebrate *Corophium volutator* (mud shrimp) is drastically reduced under these weed mats. *Corophium* is a major food item for some of the waders and wildfowl, especially redshank and shelduck, and research by Aberdeen University raises concern that this may lead to a long-term decline in numbers of such birds using the estuary.

In May 2000, the Ythan Catchment was declared a Nitrate Vulnerable Zone (NVZ) under the EU Nitrates Directive. The Action Plan for the NVZ introduced limits on the amount and timing of nitrogen fertilizer inputs (organic and inorganic) used by farmers throughout the catchment. The Ythan Project was set up in 2001 to look at the issues within the catchment. The aim of the project was to take a community based approach to developing sustainable land management practices in the catchment. The project encouraged farmers to undertake nutrient budgets to reduce leaching of fertilisers into the river and its tributaries, and river restoration and habitat enhancement. The project involved local people in decisions and actions designed to limit the environmental deterioration of the area and aimed to achieve more wide ranging results than could be achieved by NVZ legislation or agri-environment schemes alone. It will be several years before we know whether this project and the other NVZ measures have reduced pollution and decreased the weed mats on the reserve.

Species management

Since the creation of Forvie NNR the focus of management has included the breeding birds. Over the years we have tried various techniques to enhance the breeding success of the eiders and terns. These birds nest on the ground making their nests

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vulnerable to trampling, disturbance and predation, as well as natural events like bad weather and flooding.

In the early years we introduced some innovative management practices, many are still used today. Tern nesting areas were marked off for the first time in 1961 to reduce disturbance by restricting public access. In 1974 we used electric fencing to try to restrict foxes moving into the southern part of the dunes favoured by ground nesting birds. Each year we erect temporary fencing to protect the terns during the breeding season. The fence prevents people, dogs and predators such as foxes and otters from entering the tern nesting area. Dogs can eat the eggs or scare away the adult birds exposing eggs and chicks to predators like gulls and crows, or death from the cold. Notices explain the reason for the fence and request people to keep out.



Erecting an electric fence to protect nesting terns

Weekend wardening was introduced in the late 1970s to limit disturbance by visitors and their dogs; the wardens from Aberdeen Bird Club were on site for 20 hours each weekend. It was not until the 1980s that a full time summer warden replaced the volunteers.

In the early 1990s the eiders suffered catastrophic breeding failures. Research indicated predation by foxes, gulls and crows was the likely cause. Therefore, since 1995, we have employed a contractor to control foxes in the southern part of the reserve during the breeding season. The gulls and crows that have learned to target the eggs and chicks of eiders or terns are selectively controlled, but the numbers are

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small. When these measures were introduced, the breeding success of the eiders improved.

We have experimented with other techniques too. We tried putting out sections of drainpipe to provide shelter and cover for the tern chicks from flying predators, but the terns preferred to hide beside the pipes rather than go inside them. Wooden box shelters have been more effective. Tern decoys, usually made of clay by local children, are also put out in spring to attract little terns into the fenced area. We clear the dead nettle and rosebay willowherb stems from the nest site each spring, to make the site more appealing to nesting sandwich terns that prefer open ground for their nests. These efforts have made a difference. The breeding success of both terns and eiders has improved since SNH adopted more pro-active predator control measures. But there will always be years when natural factors like the weather take a toll or predators get past the “defences” and fewer young are raised.

The other important birds are the wildfowl and waders that feed and roost in and around the estuary; the most numerous species include wigeon, oystercatcher, golden plover, lapwing, dunlin, curlew and redshank. There is little active management for the waterfowl, but we do run an education programme to inform people how they can help the birds’ chances of survival by reducing disturbance. This is especially important in winter when the cold and lack of food make it more difficult to survive. If birds constantly have to fly away from disturbance, their energy reserves are quickly used up and they can die, so we encourage dog owners to keep their dogs under control to help prevent disturbance. There is also a guidance leaflet for wildfowlers that encourages leaving a refuge area in the lower estuary.

Visitors’ facilities

NNRs are key areas for raising awareness and increasing knowledge of Scotland’s rich natural heritage. However, the challenge for SNH in managing Forvie is to ensure that wildlife on the reserve comes first, but that there are also opportunities for people to enjoy the reserve.



Visitor centre

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Forvie has always been a popular place, receiving on average up to 35,000 visits each year. Visitors include bird watchers, local people out for a day trip or a walk along the beach, tourists and educational groups. The reserve is well used by natural history groups, walking and hiking groups, scout, beaver and guide groups.

Forvie has a range of facilities for visitors. The visitor centre was first developed in the 1980s. It was substantially upgraded in 1998 funded by a bequest and by Shell Exploration and Production, when it was renamed the Stevenson Forvie Centre, in memory of the generous benefactor, Mrs Margaret Stevenson. The centre houses the display area, a classroom, toilets, an office and garage, with a pond and picnic tables outside. There are several footpaths on the reserve which we maintain; for example we replaced the steps into Hackley Bay in 2002. In 2000 we created three new way marked trails; these were carefully routed to allow visitors to enjoy the reserve without harming the wildlife.

The visitor centre is managed according to SNH's environmental standards, and holds the Gold award under the Green Tourism Business Scheme, an environmental accolade awarded by Visit Scotland. Power and heat for the building is generated by a wind turbine and ground source heat pump.

In 2008 we upgraded the path from the visitor centre to Sand Loch to ensure it is suitable for wheelchairs and buggies and installed seating looking over the loch. In 2010/11 we replaced the hide at Waulkmill providing a viewing point on the upper section of the estuary. Interpretive panels providing an introduction to the reserve and images with identification of the main bird species were installed below the viewing windows.



Waulkmill wildlife viewing hide

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In 2011, a Visitor Management Plan was produced which recommended creating the Dune and Heath trails from the previous three marked trails and introducing improved signs on the reserve. The signs, installed in 2012, are of a consistent style used across Scotland's suite of NNRs.

In 2012 we began an upgrade of the facilities at the Waterside entrance to the reserve. We landscaped and upgraded the car park, making the parking area safer for coaches turning on and off the main road and improving the layout to allow more cars to park. It is also easier for the public bus service to stop at Waterside.

In 2014 we built a new shelter looking out over the estuary with interpretation on the cultural and natural heritage of the reserve. This project was made possible by funding from the Aberdeenshire European Fisheries Fund. It is intended as an information place for visitors but also designed to provide a focal point and shelter for the many education groups visiting the reserve. The main access track from the car park to the eider nesting zone was resurfaced and the area landscaped with seating and new information boards provided.



Shelter at Waterside, Forvie NNR

We provide Information about the reserve in leaflets and on interpretation boards. These describe the interest of the reserve and explain how visitors can behave

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responsibly to help protect the wildlife and habitats on the reserve, for example by not lighting fires, by keeping dogs under control so they don't disturb the birds and other visitors, and by avoiding sensitive areas. Social media is also used, while the leaflet is available in braille, foreign language and audio versions.

Education

Forvie is a good place for education groups, and we encourage and support visits to the reserve. There is a classroom in the visitor centre for educational purposes. More than 20 primary and secondary schools groups visit the reserve each year; our staff assist some of these groups but other groups prefer to visit independently. We ensure our outdoor learning provision is built around the experiences and outcomes of Curriculum for Excellence, including literacy and numeracy.



Forvie Kirk being used by school groups

There are strong links with Aberdeen University and students regularly use the site for study programmes and field visits. Many students and staff have carried out research here and their work has contributed greatly to our knowledge. We have links with other universities and academic institutions throughout the UK, many of whom use Forvie for field studies, particularly in the study of coastal and estuarine processes. We operate a permit system for research projects such as dissertations, in order to maintain a record of all academic reports that are produced.

Volunteers

Volunteers make a great contribution to the reserve and we really appreciate their help and support. Their survey and monitoring work has contributed to our knowledge of the site and provided valuable information on the biodiversity of the reserve and on specific species. Volunteers also help us to ensure the visitor centre is open as often as possible, and help us by providing more people on the ground who can talk to

visitors about the importance of the tern and eider colonies and why we restrict access. They regularly support reserve staff on practical tasks. SNH has produced a Guide to Working with Volunteers for staff and a Volunteer Handbook which provides a framework and structure to volunteering on NNRs.

Property management

SNH maintains the trails and associated boardwalks, bridges, signs, waymarkers and fences on the reserve. The bird hide at Waulkmill is owned by SNH and we have responsibility to care for the Scheduled Monuments on the reserve. Aberdeenshire Council owns part of the car park at Waterside and the two lay-bys at Riverview. Like every land manager, SNH has obligations and responsibilities in managing its property. We maintain the land, buildings, tracks, boardwalks, signs, fences, vehicles and equipment in good order. Regular checks are undertaken to ensure that the property is safe for visitors and staff, in compliance with Health and Safety legislation and SNH's standards of best practice. There are non-routine tasks too, for instance in August 1999 600 gallons of diesel oil were spilled in the river at Ellon from a construction site, requiring staff to act quickly to protect the wildlife on the reserve.

Staffing

The number of staff working here has changed over time. The first honorary warden was appointed in 1968, and the first full time warden in 1974. At present there is a full time Reserve Manager, a full time Site Management Officer, a part-time tern warden and some further part-time input.

Forvie panel

The Forvie Advisory Panel was established in 1975 to offer advice and comment on the management of the reserve. The independently chaired Panel meets with SNH staff twice a year to discuss a range of matters of mutual interest. The Panel includes representatives from the local communities of Collieston and Newburgh, local landowners and a variety of user and interest groups including Aberdeen University, shooting, fishing and other recreation interests. The name was changed to the 'Forvie Panel' in 2008, when a Role and Function document was also written.

6 Conclusion

The wildlife on the NNR at Forvie is fascinating. Staff and volunteers are kept busy managing the reserve taking care of the habitats and species, some of which are internationally important. Management for people enables visitors to enjoy their visit to the reserve whilst preventing irresponsible behaviour harming wildlife or spoiling the enjoyment of other visitors. Staff also carry out the many everyday tasks required to keep the property in good and safe condition. There have been ups and downs in the years that Forvie has been managed as a NNR, but overall management has succeeded in maintaining and enhancing the wildlife and allowing people to enjoy and appreciate the wildlife at this very special place.

7 Document Properties

References

Ritchie, W. (1992) The Geomorphology of the Sands of Forvie in The Ythan, a festschrift for George Dunnet. University of Aberdeen

Photographs & maps

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Links

For information about reserves in general and further information about Forvie NNR please visit the [Scotland's National Nature Reserves website](#).

For information on the protected areas associated with Forvie NNR please visit [SNHi](#).

Other useful links:

Scottish Natural Heritage www.snh.org.uk

Joint Nature Conservation Committee www.jncc.gov.uk

Ythan Estuary research <http://www.oceanlab.abdn.ac.uk/research/ythan.php>

Facebook

<https://www.facebook.com/pages/Scotlands-National-Nature-Reserves/125227577507847>