NatureScot
Scotland's Nature Agency
Buidheann Nàdair na h-Alba

INSH MARSHES SPECIAL AREA OF CONSERVATION (SAC)

CONSERVATION ADVICE PACKAGE

Image: Lynchat fen, Insh Marshes ©Anne Elliott/NatureScot

Site Details

Site name:	Insh Marshes
Map:	https://sitelink.nature.scot/site/8274
Location:	Highlands and Islands
Site code:	UK0019812
Area (ha):	1,157.04
Date designated:	17 March 2005

Qualifying features

Qualifying feature	SCM assessed condition	SCM visit date	UK overall Conservation Status
Clear-water lakes or lochs with aquatic vegetation and poor to moderate nutrient levels (Oligotrophic to mesotrophic standing waters with vegetation of the *Littorelletea uniflorae*and/or of the *Isoëto-Nanojuncetea*) [H3130]	Favourable Maintained	30 July 2010	Unfavourable-Bad
Very wet mires often identified by an unstable 'quaking' surface (Transition mires and quaking bogs) [H7140]	Favourable Maintained	4 October 2002	Unfavourable-Bad
Alder woodland on floodplains* Alluvial forests with Alnus glutinosa and Fraxinus excelsior Alno-Padion Alnion incanae Salicion alvae [H91E0]	Unfavourable Recovering	19 May 2009	Unfavourable-Bad

Notes:
Assessed condition refers to the condition of the SAC feature assessed at a site level as part of SNH's Site Condition Monitoring (SCM) programme.
Conservation status is the overall condition of the feature throughout its range within the UK as reported to the European Commission under Article 17 of the Habitats Directive in 2019.
***** Habitats Directive priority habitat

Overlapping Protected Areas

River Spey - Insh Marshes Site of Special Scientific Interest (SSSI), River Feshie SSSI, River Spey - Insh Marshes Special Protection Area (SPA), River Spey – Insh Mashes Ramsar site, and River Spey SAC

Key factors affecting the qualifying features

Background

Insh Marshes is a major wetland between Kingussie and Kincraig, and is bisected by the River Spey. It is situated on a flood plain upstream of Loch Insh. Loch Insh is retained by a glacial and post-glacial accumulation of sediment from the River Feshie, known as the Feshie plug.

The hydrology of the site is complex. Water flows into the flood plain from the River Spey, River Tromie and other minor streams which drain the surrounding land. High water levels in the River Spey, especially when combined with high water in the River Feshie, can result in Loch Insh being high, and water can back up from Loch Insh into the marshes upstream. There are also upwellings of groundwater at Insh/Coull and Balavil.

Many efforts were made historically to drain the marshes and manage flooding. The River Spey has riverbank protection in places. Most of the River Spey through Insh Marshes, plus some other streams, have man-made flood banks. There is a network of ditches, and flap-valves are used where the water in the ditches flows out through the flood banks. The marshes were agriculturally improved and at one time, grew hay and crops. Over time the flood banks have breached, the ditches filled with vegetation and the marshes become wetter. The flood banks still influence both the flow of water from the river to the marshes, and the outflow of water back into the river, holding water on the marshes after the river levels drop.

The site is currently mostly grazed by cattle and sheep and there is also a small herd of Konik ponies which graze the wetter areas. Highland ponies graze on part of the site. There is also a herd of red deer and roe deer also occur.

Clear-water lakes or lochs with aquatic vegetation and poor to moderate nutrient levels

This habitat type comprises both oligotrophic (nutrient-poor) and mesotrophic (moderate nutrient levels) waters, and more rarely may include intergrading types. The dominant substrates of both oligotrophic and mesotrophic waters are silt, sand, gravel, stones and boulders. The clear soft water, which characterises this habitat type, contains low to moderate levels of plant nutrients and supports characteristic assemblages of plant species. The vegetation community is characterised by amphibious short perennial vegetation, the marginal components of which can be exposed on the lake shores during summer.

At Insh Marshes SAC, the flood-plain supports many waterbodies that are excellent representatives of both poor and moderate nutrient levels. The waterbodies range from the relatively large Loch Insh, to the much smaller Lùb Mhàiri, Loch Lùb Mhàiri, Lochan Dubh Mòr, Loch na Deal-eich, and Loch a'Chrom-raoin. There are also approximately 18 other small lochs and lochans on the site, including an ox-bow lake.

Loch Insh is an example of a mesotrophic, species-rich loch supporting populations of shoreweed *Littorella uniflora*, water lobelia *Lobelia dortmanna* and quillwort *Isoetes lacustris*. It is noted for its exceptionally rapid water turnover, as the River

Spey flows through the loch. Other lochs and lochans are more static apart from in flood conditions.

Loch Insh has a moderate water quality as measured by SEPA under the Water Framework Directive. There have been high measurements of total dissolved phosphorous in Loch Insh. Canadian pondweed has been known to be present in Loch Insh since 1985. In 1985 Loch Insh had seven species of *Potamogeton* recorded: *P. alpinus, P. berchtoldii, P. gramineus, P. natans, P. obtusifolius, P. perfoliatus* and *P. polygonifolius*), but only two were recorded in a survey in 2004, P. perfoliatus and P. alpinus. The 2004 survey was much smaller than 1985, with less survey effort, which may explain the difference, but it could be a real change of water characteristics.

Filamentous algae are indicative of high nutrient levels. In high densities they can form dense blankets, reducing light and which can cause problems when they die and decay. Filamentous algae has been recorded at Loch Insh and there have been algal blooms.

The River Spey is one of the largest and least polluted river systems in Britain and the smaller lochs and lochans have a high degree of naturalness.

Key management issues include changes to hydrology including the Feshie plug, ditch management, or flood bank management, plus invasive non-native species, surface water pollution, pollution from sewage treatment works or individual septic tanks, and air pollution.

<u>Very wet mires often identified by an unstable 'quaking' surface</u>
This feature is also known as transition mires and quaking bogs. The term 'transition mire' relates to vegetation that in floristic composition and general ecological characteristics is transitional between acid bog and alkaline fens, in which the surface conditions range from markedly acidic to slightly base-rich.

Transition mires and quaking bogs can occur in a variety of situations, related to different geomorphological processes. Insh Marshes is the largest transition mire in the UK. This site is representative of the flood plain mire type.

The water table is often close to or above the surface of the substrate giving rise to characteristic floating mats of vegetation. This means that key factors affecting this habitat type are alterations to the hydrology. It is particularly sensitive to any over and undergrazing, invasive non-native species or disturbance to the surface i.e. trampling or use of ATVs or other vehicles.

<u>Alder woodland on floodplains</u>
On this site, the largest alder woodland on floodplains occurs alongside the River Feshie, the River Tromie, and fringing the marshes or the River Spey.

This habitat of riverine woods are often narrow strips or lines of trees due to clearance of woodland, leaving just fragments, many of which are relatively recent in origin. As such these residual alder woods on floodplains frequently occur in association with other woodland types or with other wetland habitats such as fens.

Alder woodland on floodplains comprises woods dominated by alder *Alnus glutinosa* and willow *Salix* spp. on flood plains in a range of situations from islands in river channels to low-lying wetlands alongside the channels. The habitat typically occurs on moderately base-rich, eutrophic soils subject to periodic inundation.

As this woodland habitat is dynamic in nature the structure and function are best maintained within a larger unit that includes the open communities, mainly fen and swamp, of earlier successional stages.

On this site, floods regularly impact on the habitat especially at the Feshie or Tromie, where trees are uprooted or damaged by flood water, sediment movement, and other trees carried by the water. These are natural processes and no intervention is necessary.

Alder suffers from disease including Phytophora, alder dieback. Alders have been affected in the Spey catchment.

Grazing of alder is mainly by deer, either roe or red deer. Adult alder are not much affected, but in places, alder regeneration is grazed. As a result, natural regeneration of young trees has been reduced in some locations. On the Feshie fan, grazing by cattle has been an issue.

Non-native trees occur in places, for example a small number of mature European Larch occur on the Feshie fan, but in 2017 no non-native regeneration was seen close to these trees. Scattered non-native regeneration (European larch and Sitka spruce) was recorded on stabilised shingle on the eastern edge of the site. Browsing is preventing this regeneration from becoming established at present. Sycamore is present at one location.

The feature has been assessed through NatureScot's site condition monitoring programme as being in unfavourable condition at this SAC due to a lack of structural diversity (different age classes of trees), a lack of regeneration and incursion by non-native trees. It was thought that the feature would become favourable with time and appropriate control of grazing, including by deer.

Key management issues are grazing levels, invasive non-native species, changes in local and catchment hydrology and disease.

Conservation Priorities

The key potential conflict on this site would be alder woodland, a priority habitat, expanding at the expense of the mire and fen habitats. Natural succession could result in the whole area being covered in alder woodland and willow carr (wet woodland). This risks damaging the transitional mire feature, by trees drying out the mire and shade also reducing the number and frequency of light demanding plants, mosses and lichens. Any expansion of trees onto the transitional mire may be removed, to protect this feature. The area of alder woodland habitat must not

however, be reduced below the figure at the time of designation. Alder woodland on floodplains is a priority qualifying habitat.

This site has other overlapping designations and the features of these sites need to be taken into account when making decisions on Insh Marshes SAC. Overlapping SPA features are the breeding populations of osprey, spotted crake, wigeon and wood sandpiper, wintering populations of whooper swan and hen harrier.

The River Spey SAC has Atlantic salmon, otter, sea lamprey, and freshwater pearl mussel.

The SSSI features are the floodplain mire and loch habitats, assemblage of flowering plants, assemblage of breeding birds and exceptional assemblage of flies associated with wetland and woodlands, plus breeding population of osprey, arctic charr and otter, and wintering whooper swan.

The River Feshie SSSI is designated for fluvial geomorphology of Scotland and Quaternary of Scotland. The natural operation of the sediment in the Feshie fan is critical to maintaining the water levels on Insh Marshes SAC.

The River Spey – Insh Marshes Ramsar site was identified for a large, high-altitude slow-flowing river, a mesotrophic loch (a type that is uncommon in Britain and is also notable for its exceptionally high turnover rate), a floodplain mire and a gravel fan. It also supports a large assemblage of nationally-rare and nationally-scarce aquatic plants and invertebrates (including species with a boreal pine distribution), and is one of the best freshwater sites in Britain for otter *Lutra lutra*. There is also a nationally important genetic resource for floodplain mires, and it supports an assemblage of breeding birds indicative of high wetland value and diversity.

None of these other features are prioritised over any of the Insh Marshes SAC features, nor vice versa. Management for these features is largely compatible.

Conservation Objectives

Overarching Conservation Objectives for all qualifying habitats

1. To ensure that the qualifying features of Insh Marshes SAC are in favourable condition and make an appropriate contribution to achieving favourable conservation status.
Favourable Conservation Status (FCS) is considered at a European biogeographic level. When determining whether management measures may be required to ensure that the conservation objectives for this site are achieved, the focus should be on maintaining or restoring the contribution that this site makes to FCS. When carrying out appraisals of plans and projects against these conservation objectives, it is not necessary to understand the status of the feature in other SACs in this biogeographic region. The purpose of the appraisal should be to understand whether the integrity of the site (see objective 2) would be maintained. If this is the case then its contribution to FCS across the Atlantic Biogeographic Region will continue to be met. Further details on how these appraisals should be carried out in relation to maintaining site integrity is provided by

objective 2 (including parts a, band c). If broader information on the feature is available then it should be used to provide context to the site-based appraisal.

Note that "appropriate" within this part of the conservation objectives is included to indicate that the contribution to FCS varies from site to site and feature to feature.

2. To ensure that the integrity of Insh Marshes is restored by meeting objectives 2a, 2b and 2c for each qualifying feature.

The aim at this SAC is to maintain, or where appropriate restore, the qualifying habitats in a favourable condition as a contribution to their wider conservation status. Therefore any impacts to the objectives shown in 2a, 2b or 2c below must not persist so that they prevent the achievement of this overall aim. When carrying out appraisals of plans or projects the focus should be on restoring site integrity, specifically by meeting the objectives outlined in 2a, 2b and 2c. If these are met then site integrity will be restored. Note that not all of these will be relevant for every activity being considered. Any impacts on the objectives shown in 2a, 2b or 2c below must not persist so that they prevent the restoration of site integrity. Temporary impacts on these objectives resulting from plans or projects can only be permitted where they do not prevent the ability of a feature to recover and there is certainty that the features will be able to quickly recover.

This objective recognises that the qualifying habitats are exposed to a wide range of drivers of change. Some of these are natural and are not a direct result of human influences. Such changes in the habitats' extent, distribution or condition within the site which are brought about by natural processes, directly or indirectly, are normally considered compatible with the site's conservation objectives. An exception to this is when the favourable condition of a habitat is dependent on halting or managing natural succession. An assessment of whether a change is natural or anthropogenic, or a combination of both, will need to be looked at on a case by case basis.

Conservation Objectives for clear-water lakes or lochs with aquatic vegetation and poor to moderate nutrient levels (oligotrophic to mesotrophic standing waters with vegetation of the *Littorelletea uniflorae* and/or of the *Isoëto-Nanojuncetea*)

2a. Maintain the extent and distribution of clear-water lakes or lochs with aquatic vegetation and poor to moderate nutrient levels within the site

The extent of clear-water lakes or lochs with aquatic vegetation and poor to moderate nutrient levels habitat feature has been estimated at 127.27ha. The area figure has been taken from the Standard Data Form and is made up from a number of lochs and lochans.

Fundamentally there should be no measurable net reduction the extent of the habitat unless it occurs by natural succession. Most importantly, the distribution throughout the site and the number of sites should be maintained. In cases of loss of open water due to natural succession, the default position will be to allow natural processes to occur, even if this may result in the loss of area of this habitat in the long term.

This should take into account the total surface area, depth of water and type and distribution of loch substrate sediments. As well as natural succession, changes to surface area can indicate man-made pressures on the structure and function of lochs. Man-made changes to surface area and the associated change to depth can adversely affect the character of the loch, particularly the edge vegetation. Changes to the surface area may indicate a number of pressures such as abstraction, regulation, construction, excessive sediment deposition

and natural succession which may occur in the catchment.

This conservation objective is considered to be met if the conditions to ensure the habitats' long-term existence are in place, other than changes due to natural succession which would be allowed to operate unhindered.

2b. Maintain the structure, function and supporting processes of clear-water lakes or lochs with aquatic vegetation and poor to moderate nutrient levels

The structure and function of lochs are strongly influenced by activities within their catchment. Changes in land management or development can affect the integrity of the feature which will manifest itself in changes to the lochs.

Physical Attributes

-Hydrological regime

The hydrology of the lochs should be maintained as this affects both water level fluctuations and annual and within year flushing patterns. Flushing is important as it is strongly related to dilution and removal of nutrients and plankton. Changes to the flushing pattern can be caused by factors similar to those affecting area; abstraction, regulation, construction, excessive sediment deposition and natural succession which may occur in the catchment.

-Loch substrate character

The type and distribution of sediment particles within the lochs should be maintained as this will affect the biology of the lochs and the availability of habitats. Changes to the substrate character may also be indicative of changes to the area and hydrological regime. Reduction in area or flushing may affect the substrate character as finer sediments become trapped and there is increased input of leaf-litter from scrub encroachment.

-Natural sediment load

Accumulation of nutrient-rich sediment may have a strong effect on the water quality and biology of the lochs. Release of nutrients bound to silt can increase enrichment. Increases in sediment loading from both changes in land management practice in the catchment or on the shoreline and short term events such as construction should be avoided. Evidence is growing that an increase in storm events associated with climate change may increase the amount of sediment deposited in lochs. This should be minimised by avoiding having large areas of bare ground close to the lochs.

-Connectivity between the loch and the surrounding area

While a loch is often perceived as a discrete entity the connections between it and the surrounding area are vital to its functioning as part of a natural system. These natural connections can be reduced or changed by, for example, hard engineering works on the shoreline or loch bed and anything that impedes the exchange of water either on the surface or with the underlying water table.

Water Quality

-Dissolved Oxygen

Dissolved oxygen in loch water is vital for respiration of all aquatic animals, including fish, as well as for aquatic plants. An artificially high biomass caused by increased loadings of organic matter or algal blooms should be avoided as this can create a heavy demand which causes low levels of dissolved oxygen. Dissolved oxygen is likely to be lowest in July and August. The target for Insh Marshes is dissolved oxygen >7.0mg/l when classified as at Good Ecological Status (GES) under the Water framework Directive (WFD) or >9.0 Mg/l when classified as High Ecological Status (HES) during July and August. Loch Insh is currently at Moderate Ecological Status, so movement towards Good and then High Status would be desirable.

-pH
This influences many of the chemical processes in lochs such as the binding of phosphorus. Oligotrophic lochs should have pH of 5.5 to 7 and Mesotrophic 6.5 to 8. Artificial changes through eutrophication or acidification should be avoided as these can have a significant effect on pH.

- Nutrients
In general issues with nutrient levels are inferred from effects upon the vegetation. Phosphorus is one of the main nutrients required for plant growth and there is strong correlation between Total Phosphorus (TP) concentration and phytoplankton biomass. The level of TP in Insh Marshes should remain below a maximum annual mean of 15ugP/l.

Nitrogen is the other main nutrient important in loch ecosystems. It is generally less likely to be limiting than phosphorus because of the ability of some organisms to fix Nitrogen from the atmosphere. The target for Insh Marshes is that annual mean Total Nitrogen should not exceed 1.5mg/l.

Measurements of Chlorophyll are used as a proxy for algal growth. Phytoplankton is an important part of the processes of a loch ecosystem affecting light penetration and oxygen demand. Excessive chlorophyll a should be avoided as this is usually associated with nutrient enrichment. Dense floating rafts of filamentous algae (or thick algal coatings on aquatic plants) should also be avoided as these are a negative indicator associated with high nutrient levels.

2c. Maintain the distribution and viability of typical species of clear-water lakes or lochs with aquatic vegetation and poor to moderate nutrient levels

Typical species of clear-water lakes or lochs with aquatic vegetation and poor to moderate nutrient levels, recorded at Loch Insh include:

Lobelia dortmanna, Litorella uniflora, Isoetes lacustris, Pilularia globulifera, Nymphaea alba, Callitriche hamulata, Fontinalis antipyretica, Nuphar pumila and *Carex aquatilis*.

The viability of the characteristic species is determined by water quality and other conditions that support the plant community such as water clarity. Loss or reduction in population of species' may therefore be an indicator of deteriorating or changing water quality or some other adverse impact.

Non-native species can have direct effects upon the natural plant communities through competition. They may also have more subtle effects as the niche they fill is different and this may directly or indirectly affect the rest of the ecosystem. A list of high impact species has been agreed as part of the Water Framework Directive. *Elodea canadensis* has been recorded from Loch Insh. Other species that would also affect the integrity of the site, if found, include *Elodea nutallii* and *Crassula helmsii*.

The habitat is also used by Atlantic salmon and otter.

Osprey, spotted crake, wood sandpiper and wigeon use the habitat during the breeding season and whooper swan plus hen harrier during the winter.

Conservation Objectives for very wet mires often identified by an unstable 'quaking' surface (transition mires and quaking bogs)

2a. Maintain the extent and distribution of very wet mires often identified by an unstable 'quaking' surface within the site

The extent of transition mires and quaking bogs at Insh Marshes has been estimated as 416.53ha. This should be maintained.

Accurate measurement of the extent of the transition mires and quaking bogs habitat is hard to achieve due to gradual transitions in vegetation to adjacent habitats. The area figure has been taken from the Standard Data Form and is therefore used as a guide only. There should be no measurable net reduction in the extent of the habitat and its distribution throughout the site should be maintained.

This habitat is transitional with other adjacent wetland habitats so current baseline estimates may not be precise and any changes in extent estimates as a result of new survey may not represent real change but greater precision.

On River Spey – Insh Marshes this habitat is found amongst other fen and mire habitats, within the floodplain of the River Spey between Loch Insh and Kingussie.

2b. Maintain the structure, function and supporting processes of very wet mires often identified by an unstable 'quaking' surface

This habitat is usually present as a mosaic with other wetland habitats. The term "transition mire" relates to vegetation that, in floristic composition and general ecological characteristic, is transitional between acid bog and alkaline fens, in which the surface conditions range from markedly acidic to slightly base-rich.

The maintenance of appropriate hydrology is important to retain the structure and function of this habitat. This habitat has developed here due to the ground being close to the water table. Natural fluctuations in water level (in the river and the site) need to continue to support the long-term existence of the habitat. The site should be damp or wet all year, with a higher water level when there is more water in the river in winter, and temporary flooding following heavy rain. Management to prevent or reduce detrimental effects of drainage, including in the wider surrounding area, is key to retain an appropriate water table and to avoid the habitat drying out or suffering from cycles of extreme high and low water levels. Management to prevent or reduce detrimental effects of drainage, including in the wider surrounding area, is key.

Colonisation of this habitat by vigorous native species, tree or scrub growth or invasive non-native species could led to irreversible habitat loss in the longer term, through shading, drying out of the habitat and possible conversion to other open-ground habitats or woodland. Trees should be no more than scattered, cover should be <10% on open fen and saplings/ seedlings should be no more than rare. The site should be too wet for tree regeneration over most of the extent. Where trees are colonising the habitat, priority is given to the wetland, and trees may be removed.

Non-native invasive species should not be present.

One vigorous native species on this site is Common reed *Phragmites.* The change in frequency and extent of common reed may be in response to a higher water table and/or lower grazing, both of which favour this species. Common reed is very susceptible to summer grazing and would largely have been absent when Insh Marshes was used as a

grazing marsh for cattle.

Grazing at appropriate levels is essential, helping to maintain species-richness and prevent succession. Under-grazing will lead to scrub encroachment and benefit vigorous species such as Tufted hair-grass *Deschamsia cespitosa* at the expense of less dominant vegetation. Cattle, sheep and ponies are all used to achieve an appropriate grazing regime at Insh Marshes. Conversely, over-grazing and excessive poaching can result in disturbed bare ground although this is not currently a problem at Insh Marshes.

Topping is another way of reducing the vigour of the most dominant species and can be used on the dryer parts of this habitat.

2c. Maintain the distribution and viability of typical species of very wet mires often identified by an unstable 'quaking' surface

Insh Marshes has a complex and varied suit of swamp and mire communities and the transitional mire is found amongst these other wetland habitats.

On Insh Marshes the transitional mires and quaking bogs habitat has the following NVC types;

M5 *Carex rostrata – Sphagnum squarrosum* mire
S27 *Carex rostrata – Potentilla palustre* tall-herb fen.

The vegetation is a relatively uniform area of S27 Carex rostrata – Potentilla palustris tall-herb fen in which Sphagnum is found locally.

Typical/indicator species for each community are given below:

The M5 Carex rostrata – Sphagnum squarrosum mire has frequent constant species: marsh cinquefoil *Potentilla palustris*, Black sedge *Carex nigra*, spiky bog-moss *Sphagnum squarrosum* and bottle sedge *Carex rostrata*

The S27 *Potentillo-Caricetum rostratae* tall-herb fen can be variable, but has the constant species bottle sedge *Carex rostrata*, marsh bedstraw *Galium palustre*, marsh cinquefoil *Potentilla palustris* and *bogbean Menyanthes trifoliata*.

Insh Marshes is one of only two sites in the UK where string sedge *Carex chordorrhiza* is known.

In the long term, the typical species will benefit from topping and cattle grazing which is low enough to avoid excessive poaching resulting in disturbed bare ground but sufficient to control vigorous species such as common reed and tufted hair-grass and non-native invasive species, as well as prevent scrub encroachment.

The habitat also supports osprey, spotted crake, wood sandpiper and wigeon during the breeding season and whooper swan plus hen harrier during the winter.

Conservation Objectives for alder woodland on floodplains (alluvial forests with *Alnus glutinosa* and *Fraxinus excelsior* (*Alno-Padion*, *Alnion incanae*, *Salicion albae*)

2a. Maintain the extent and distribution of alder woodland on floodplains within the site
The extent of the Alder woodland on floodplains habitat, taken from the Standard Data Form, has been estimated at 57.85ha and represents the amount of often complex, yet limited, mosaic of several individual stands of habitat. This should be maintained. There should be no measurable net reduction in the extent of the habitat and its distribution throughout the site. This will include the avoidance of effects that could lead to a permanent reduction in the extent or distribution of the habitat, such as felling, conversion to plantation, agricultural reclamation, minimising the risk of fire and preventing the dumping of waste. This conservation objective is considered to be met if the conditions to ensure the habitats' long-term existence are in place.

2b. Restore the structure, function and supporting processes of alder woodland on floodplains
In order to restore the structure, function and supporting processes of alder woodland on floodplains, the structural diversity needs to be improved, natural regeneration of native tree species needs to occur and non-native trees, need to be removed. The structural diversity will improve with time as over-mature and veteran trees occur. These trees should be retained. Natural tree regeneration will occur if grazing levels are low enough, in places where there is enough light. Grazing by both domestic stock and deer needs to be kept low. Non-native trees, including their regeneration, should be removed. This habitat depends on hydrological conditions that lead to a high water table, wet conditions and sufficient variation to allow channel dynamics and vegetation succession to occur. This should allow for an abundance of key tree species that have the functional characteristics of alder and willows. These characteristics are: • Can colonise the floodplain substrate (wet, unstable) and thrive (tolerance of high water table) pioneer species recolonising riparian habitats after disturbances. • Can create important habitat for breeding and wintering wetland birds. • Can create important habitat for freshwater invertebrates and fish. • Can support a wide variety of terrestrial invertebrates, whilst overhanging the water surface (providing food for fish and other aquatic predators). • Can provide leaf litter with a rapid decomposition rate, high levels of nitrogen, moderate levels of phosphorous and low levels of refractory carbon. • Provide moderate shade, especially over the water surface for fish. • Can capture or fix nitrogen and make it accessible to other parts of the ecosystem. Hydrological conditions should be maintained, i.e., sites should not be drained. It is noted that alder dieback is present in the Spey catchment and may in future have an impact on these alder woodlands.

2c. Maintain the distribution and viability of typical species of alder woodland on floodplains

Many Alder woods on floodplains are dynamic, being part of a successional series of habitats. On this site, this Annex I habitat falls mainly within the following NVC type:

W7 *Alnus glutinosa – Fraxinus excelsior – Lysimachia nemorum* woodland

The key tree species found in this habitat are alder (*Alnus glutinosa*), ash (*Fraxinus excelsior*) and willow (*Salix* spp). On the drier margins of these areas other tree species, notably birch *Betula spp*., may become abundant. In other situations the alder woods occur as a stable component within transitions to surrounding dry-ground forest.

These transitions from wet to drier woodland and from open to more closed communities provide important ecological variation. The ground flora is correspondingly varied. Many of the stands on this site are growing on river banks, old river banks or backwater channels, or on active gravel banks. The field layer tends to be dominated by grasses due to past grazing pressure.

Regeneration of young trees of all the species mentioned above should be encouraged where ground conditions permit across the site. The site should contain seedlings, saplings, mature trees and standing deadwood, rather than being dominated by mature trees.

Non-native trees and their regeneration should not be present.

The alder woodland habitat also supports osprey during the breeding season and hen harrier during the winter.

Conservation Measures

Insh Marshes SAC is notified as a Site of Special Scientific Interest and management changes described on the SSSI list of Operations Requiring Consent must have prior consent from SNH (NatureScot).

Current and recommended management for

- **Clear-water lakes or lochs with aquatic vegetation and poor to moderate nutrient levels**
- **Very wet mires often identified by an unstable 'quaking' surface**
- **Alder woodland on floodplains**

Issue	Measure	Responsible party
Water management	Maintain current hydrological/ flushing regime or improve where man-made constraints exist. The main regulatory mechanism is the Controlled Activities Regulations, CAR.	SEPA, NatureScot, Land manager
	Very wet mires often identified by an unstable 'quaking' surface - Aim to increase naturalness of flood plain where possible, by blocking or not clearing out ditches, and removal of flood banks, subject to assessment of effects on neighbours' land,	Landowners, NatureScot

	legal and practical considerations.	
Water quality	Implement and maintain monitoring of key water quality parameters.	NatureScot/SEPA
	Any development proposals in the catchment should include appropriate measures to minimise sediment run-off and prevent pollutants from entering the marshes.	Highland Council
	Tackle water quality issues if they should arise, especially eutrophication.	SEPA Landowners
Grazing	Very wet mires often identified by an unstable 'quaking' surface - Ensure that herbivores graze the habitat adequately but don't over graze resulting in significant poaching or trampling impacts. Applies to ponies, cattle, sheep and deer. Topping with machinery provides an alternative method of control.	Land managers, NatureScot, Deer Management Groups
	Alder woodland on floodplains - Control of deer to a level which allows tree regeneration and survival of seedling trees. Should stock grazing be introduced, manage at a low level within the alder woodland to allow natural regeneration.	Land manager
Habitat Management	Maintain plans as required, for example National Nature Reserve plan; deer management plan, AECS etc.	NatureScot, Landowners, Land managers.
Avoidance of introduction of known pathogens – alder woodland on floodplains	Alder dieback is already known from the Spey catchment and there is currently no way to treat it although coppicing may extend the life of affected trees.	Land manager, NatureScot
Invasive species	Very wet mires often identified by an unstable 'quaking' surface - Ensure colonisation of this habitat by vigorous native species, such as tree or scrub growth or invasive non-native species is minimal to prevent loss of indicator species and conversion to other open ground habitats or woodland. Remove trees and shrubs if required.	Land managers, NatureScot
	All anglers and other water users (such as canoeists or researchers) should follow the Check, Clean, Dry biosecurity procedures to help prevent the spread of problem non-native species.	All
	Action to control invasive non-native species by physical removal should be implemented as soon as possible, subject to available resources/funding. Alder woodland on floodplains - Non-native trees and their regeneration should be removed.	All

	There is no reasonable measure which can remove Canadian pondweed from Loch Insh. Monitor to track long term effects	SEPA, Landowner

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Approved on 10 April 2023 by:

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