

LOCH FADA SPECIAL AREA OF CONSERVATION (SAC)

CONSERVATION ADVICE PACKAGE



Loch Fada. The Isle of Colonsay. ©Lorne Gill/SNH

Site Details

Site name:	Loch Fada
Map:	https://sitelink.nature.scot/site/8296
Location:	Highlands and Islands
Site code:	UK0030191
Area (ha):	79.96
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 <i>Littorelletea uniflorae</i> and/or of the <i>Isoëto-Nanojuncetea</i>) [H3130]	Unfavourable No change	13 August 2009	Unfavourable - Bad
Otter (<i>Lutra lutra</i>) [S1355]	Favourable Maintained	1 July 2012	Favourable
Slender naiad (<i>Najas flexilis</i>) [S1833]	Favourable Maintained	13 August 2009	Unfavourable – Inadequate

Notes:

Assessed condition refers to the condition of the SAC feature assessed at a site level as part of NatureScot'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.

Overlapping Protected Areas:

[Loch Fada Site of Special Scientific Interest \(SSSI\)](#)

Key factors affecting the qualifying features

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. Loch Fada SAC consists of oligotrophic and meso-oligotrophic lochs. 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.

Loch Fada SAC is comprised of a string of three shallow interconnected lochs extending over two miles from north-east to south-west across the centre of the island of Colonsay. The lochs are notable in having a relatively nutrient poor water chemistry and are rich in aquatic plant life with a range of submerged, emergent and floating species. Of particular interest are the rare slender naiad *Najas Flexilis* and six stamened waterwort *Elatine hexandra*.

The site includes areas of loch shore which are seasonally inundated. This inundation has led to the evolution of fen and wet meadow habitats which support diverse plant communities and good numbers of wildfowl and waders. Irish Ladies Tresses *Spiranthes romanzoffiana*, a nationally scarce orchid, has also been recorded in this locality.

Key management issues at Loch Fada SAC include surface water pollution and the invasive non-native Canadian pondweed.

The feature has been assessed through NatureScot's site condition monitoring programme as being in unfavourable condition at this SAC due to the high abundance of Canadian pondweed in Loch Fada Middle loch and the raised nutrient levels in Loch Fada East.

Otter

The lochs together with their marshes, streams and ditches, and the coast, provide ideal feeding, resting and shelter areas for otter *Lutra* and support a good population. There is wide prey availability, with populations of fish, frogs, toads and other prey.

Otter require continued proximity to unpolluted open water. There should be a plentiful food supply and habitats for providing shelter for both resting and breeding. They are wide ranging and normally occur at low densities. At this site, otter associated with the SAC are likely to have holts or resting places outside the site boundary as well as within the site itself. Recreational disturbance can have an effect but they have large ranges and can largely avoid people.

The otter population on Colonsay, utilising Loch Fada SAC, is considered to be in good health. Otters are sighted regularly.

Previous population declines in otters were primarily due to pollution and persecution. However, these are not impacting on the otter population at Loch Fada SAC.

Otters can be trapped and drown in disused equipment such as eel traps. They are regularly killed on roads by traffic, although Colonsay is a small island with low levels of road use.

Slender naiad

Slender naiad is an aquatic plant that spends its entire life cycle completely submerged. It can grow to approximately 30cm and is usually found at depths of 1.5m or more, rooted in a particular silty, organic, flocculent sediment. In the UK the population is restricted to lochs in Scotland.

The species occurs extensively on the bottom of Loch Fada Middle loch.

First recorded in Loch Fada middle in 1902, two discrete populations of slender naiad *Najas flexilis* were found in 2004. The habitat of Loch Fada middle was assessed as being in Favourable Condition in 2009 although the high frequency of Canadian Pondweed *Elodea Canadensis*, an invasive non-native species (INNS) was of concern. Overall, the aquatic macrophyte community of Loch Fada middle was indicative or associated with oligo-mesotrophic conditions.

Key factors affecting this species at Loch Fada include eutrophication arising from agricultural diffuse pollution and septic tank discharges, and competition from Canadian pondweed. Water abstraction can also affect this species.

Further information about these [habitats](#) and [species](#) can be found on the JNCC website.

Conservation Priorities

There are no priority qualifying features within the site and no apparent management conflicts between the qualifying features. If any conservation management conflicts between the qualifying features were to arise consideration should first be given to, slender naiad the primary reasons for site selection. However, the impact of any proposed management measure on all the qualifying features should first be considered as part of a Habitats Regulations Appraisal.

All qualifiers rely on good water quality, and appropriate water levels and hydrological functioning.

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*)

1. To ensure that the qualifying feature of Loch Fada SAC is in favourable condition and makes 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 Loch Fada SAC is restored by meeting objectives 2a, 2b and 2c for the qualifying feature.

The aim at this SAC is to restore the clear-water lakes or lochs with aquatic vegetation and poor to moderate nutrient levels habitat to a favourable condition as a contribution to its 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 habitat is 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.

2a. Maintain the extent and distribution of the clear-water lakes or lochs with aquatic vegetation and poor to moderate nutrient levels habitat 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 39.98ha. The area figure has been taken from the Standard Data Form and is made up of a number of lochs.

Fundamentally there should be no measurable net reduction the extent of the habitat and, most importantly, its distribution throughout the site and the number of sites should be maintained.

This should include the total surface area, depth of water and type and distribution of loch substrate sediments.

This conservation objective is considered to be met if the conditions to ensure the habitats' long-term existence are in place.

Loch Fada East and Middle both seem to have the same surface area as at the time of designation.

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

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

-Surface Area

Changes to surface area can indicate pressures on the structure and function of lochs. The surface area of a loch may fluctuate slightly naturally. However changes to surface area and the associated change to depth can adversely affect the character of the loch, particularly the edge vegetation. Artificial fluctuations to depth found in controlled water bodies such as reservoirs can adversely affect the vegetation.

Changes to the surface area may also indicate a number of pressures such as abstraction, regulation, construction, excessive sediment deposition and natural succession which may occur in the catchment.

-Hydrological regime

The hydrology of the lochs 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.

At Loch Fada SAC water levels are all natural apart from a small dam on an interconnecting stream to maintain appropriate water levels for the slender naiad SAC feature.

-Loch substrate character

The type and distribution of sediment particles within a loch will affect the biology of the loch 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.

The substrate of Loch Fada East ranges from cobble to peat and silt. In Loch Fada Middle the substrate is predominantly peat in the shallow waters with silt in the deeper areas.

-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.

The 2009 survey of Loch Fada SAC recorded no evidence of any accelerated sediment loading at the survey locations.

-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

Nutrient levels were found to be high in Loch Fada East in the 2009 survey (Total Phosphorus); this may indicate agricultural runoff is entering the loch and further surveys will monitor this further. The agricultural land surrounding the loch is more improved than others in the wider area; some land managers have entered into AECS contracts supporting lower input options. Water and habitat quality was otherwise good and the aquatic macrophyte community as a whole was indicative of oligo-mesotrophic conditions. Canadian pondweed comprises around 10% of the aquatic macrophyte community in Loch Fada Middle loch and is also known to be increasing in Loch Fada East. The presence of this invasive non-native species will impede use of the habitat by slender naiad and other typical species through competition for suitable areas both in terms of space and availability of CO₂ for respiration. Canadian pondweed cover should be reduced and the species removed if possible to restore habitat availability for the typical species of this habitat.

-Dissolved Oxygen

Oxygen is vital to respiration. An artificially high biomass caused by increased loadings of organic matter or algal blooms 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 is dissolved oxygen >7.0mg/l for lochs classified as at Good Ecological Status (GES) under the Water framework Directive (WFD) or >9.0 Mg/l for lochs classified as High Ecological Status (HES) during July and August.

-pH

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

-Chlorophyll a

Chlorophyll a is a good measure for phytoplankton abundance. Phytoplankton is an important part of the processes of a loch ecosystem affecting light penetration and oxygen demand. A high biomass is usually associated with nutrient enrichment and sedimentation

of organic matter. Target Chlorophyll a can be calculated for each loch based on site specific targets related to alkalinity and depth. Where a site is in favourable condition current Chlorophyll a can be used to set a baseline.

-Total Phosphorus

Phosphorus is one of the main nutrients required for plant growth and there is strong correlation between TP concentration and phytoplankton biomass. The target for TP is based on an annual mean; for deeper lochs (mean depth >3m) 15ugP/l maximum annual mean TP, very shallow (Mean depth <3m) 20ugP/l. Site specific targets may also be set where there are good records.

-Total Nitrogen

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 all lochs in Loch Fada SAC is that Annual Mean Total Nitrogen should not exceed 1.5mg/l. with no deterioration from baseline. For Nitrogen limited lochs consideration may be given to setting site based targets.

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

Loch Fada SAC consists of oligotrophic and meso-oligotrophic lochs with species reflecting this.

Typical species of mesotrophic lochs found at Loch Fada SAC include:

<i>Elatine hexandra</i>	six-stamened waterwort
<i>Isoetes echinospora</i>	spring quillwort
<i>Isoetes lacustris</i>	lake quillwort
<i>Littorella uniflora</i>	shoreweed
<i>Lobelia dortmanna</i>	water lobelia
<i>Najas flexilis</i>	slender naiad
<i>Potamogeton alpinus</i>	red pondweed
<i>Potamogeton gramineus</i>	various-leaved pondweed
<i>Potamogeton perfoliatus</i>	perfoliate pondweed
<i>Sparganium angustifolium</i>	floating bur-reed
<i>Utricularia</i> sp (each species)	bladderworts
<i>Potamogeton natans</i>	broad leaved pondweed
<i>Potamogeton polygonifolius</i>	bog pondweed
<i>Potamogeton berchtoldii</i>	fine leaved pondweed

Typical species of oligotrophic lochs found at Loch Fada SAC include;

<i>Littorella uniflora</i>	Shoreweed
<i>Lobelia dortmanna</i>	water lobelia

The viability of the characteristic species is determined by water quality and other conditions that support the plant community such as water clarity. Nutrient levels were recorded as high in Loch Fada East in 2009. Loss or reduction in frequency 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. Other species that may also affect the integrity of the site include *Elodea nutallii*, *E.canadensis* and *Crassula helmsii*. A high abundance of *Elodea Canadensis*, Canadian pondweed has been recorded in Loch Fada Middle and East lochs, together with the high nutrient levels in Loch Fada East this has resulted in this feature being in unfavourable condition. The focus of this objective will therefore be to control the population of Canadian pondweed. Higher water quality will need to be provided all the time.

A variety of ducks, geese and swans such as shelduck, greenland white-fronted geese and whooper swan often roost on Loch Fada in the non-breeding season. These and other birds may have an impact on the nutrient balance in the loch. The lochs also support a native brown trout fishery.

Overarching Conservation Objectives for all species qualifiers

1. To ensure that the qualifying features of Loch Fada 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 Loch Fada SAC is restored by meeting objectives 2a, 2b and 2c for each qualifying feature

The aim at this SAC is to maintain the qualifying species 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 species are exposed to a wide range of drivers of change. Some of these are natural (e.g. population fluctuations/ shifts or habitat changes resulting from natural processes) and are not a direct result of human influences. Such changes in the qualifying species' distribution and use of the site, which are brought about by natural processes, directly or indirectly, are normally considered compatible with the site's conservation objectives. 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 otter (*Lutra lutra*)

2a. Maintain the population of otter as a viable component of the site

The conditions for the long-term existence of the otter at the Loch Fada SAC should be maintained.

An estimate of the number of otter occupying the site is not available and therefore there is no numerical baseline that can be given for the site.

This conservation objective is considered to be met if the conditions for the species' long-term existence are in place. This includes:

- Avoiding effects that could lead to a permanent reduction in the otter population through mortality, injury, or impacts caused by disturbance or displacement. This includes for example the effects caused by development, river engineering, water pollution, roads without adequate crossing provision for otters or suitable culverts, or entanglement in fishing gear. Otters can drown in unprotected or disused fishing gear such as eel traps or fyke nets, so these should be removed, or if active, an otter guard fitted.
- Maintaining the species' ability to use all areas of importance within the site (to be considered under conservation objective 2b).
- Maintaining access to, and availability of, undisturbed resting places.
- Maintaining access to, and availability of, supporting habitats and prey (to be considered under conservation objective 2c).

Otter is a wide-ranging and highly mobile species. The population at Loch Fada SAC is reliant on suitable habitat in the surrounding countryside, it is unlikely to be viable (capable of being self-sustaining) in isolation. The home range of an otter will vary depending on their sex, habitat quality and food availability. It will also vary between freshwater and coastal environments. At this SAC some otters that have parts of their territories within the site may also feed in coastal waters that lie outwith the boundary of the site (for example in Port Mor or Port Olmsa). In coastal areas otter densities may be as high as 0.5 - 0.7 animals/km. Males living in rivers and streams can have a mean linear range size of around 40km and females living in the same habitat can have a linear home range of around 20km. Males have been known to range as far as 80km.

When assessing the effects of any plan or project consideration should be given to whether impacts outwith the SAC could affect achievement of this conservation objective.

Otter is a European protected species (EPS) and it is an offence to deliberately or recklessly capture, injure, kill, harass or disturb them in certain circumstances, or to damage or destroy their breeding or resting places anywhere in Scotland unless a licence has been issued to do so. A licence can only be issued for particular purposes which the law allows. Further, there must be no satisfactory alternative and no detrimental impact on the contribution to the maintenance of otter at a favourable conservation status for a licence to be issued. This assessment considers impacts on the otter population at a local and regional level. The licensing requirement is in addition to considering whether a plan or project will result in any

impacts (including incidental impacts) to the otter population within the SAC.

2b. Maintain the distribution of otter throughout the site

The spatial extent of otter within Loch Fada SAC should be maintained.

The ability for otter to use and access all areas of importance within the SAC should be maintained.

Distribution of otters within the site can be affected by disturbance originating both within and outwith the site. Plans and projects that cause displacement and barrier effects to the species can also affect species distribution. Examples include use of night-time floodlighting of watercourses, road and bridge construction works and general disturbance from human activity (and dogs) by watercourses especially at dusk/night-time.

The isolated nature of the lochs that make up Loch Fada SAC means there is fairly low disturbance. In addition although the lochs are adjacent to the island roads and agricultural land, the otters will be habituated to the day to day movements around them.

2c. Maintain the habitats supporting otter within the site and availability of food

The distribution and extent of otter habitat within Loch Fada SAC should be maintained, together with the structure, function and supporting processes of the habitat.

Sufficiently high water quality and natural flow conditions should be maintained to provide the necessary conditions for otter and their prey.

Otters require suitable habitat for foraging, breeding and resting. Due to the geography of Colonsay, otters here use both freshwater and coastal habitats. Abundant boulders, crevices and/or peat, or other cavity-forming features such as tree root systems are needed to provide secure holt sites above high water. Dense scrub is also valuable for providing lie-ups and couches. Suitable areas supporting a healthy fish population within a nearby watercourse or still water body are required within each otter's home range, to enable foraging for key prey species such as salmonids and eels. Access to ponds, ditches, reedbeds and wetlands where amphibians may breed is also important. In coastal areas their preferred habitat is rocky shore with gently-shelving shallow inshore waters with good habitat for inshore fish species and crustaceans. Otters which forage along the coast as well as using the SAC also need freshwater within the SAC to remove salt from their fur.

Changes to water flow and water quality can adversely affect otter habitat and prey on which they depend. Otters' food supply is normally associated with good water quality and therefore the water quality standards for Good Ecological Status (GES) under the Water Framework Directive should be met. These targets are intended to support a healthy, naturally functioning riverine ecosystem which protects the whole biological community and individual species to a degree characteristic of the loch.

Conservation Objectives for slender naiad *Najas flexilis*

2a. Maintain the population of the slender naiad as a viable component of the site

Slender naiad has been noted to grow in a particular silty, organic sediment. It is a first colonist and has been noted to thrive in disturbed areas. Removal of sediment, smothering or physical changes such as temporary or permanent alterations to the lochs level may therefore have an adverse impact.

An estimate of the population of slender naiad on Loch Fada SAC is not available, survey data is limited to occurrence/distribution, there is therefore no numerical baseline that can be given for the site.

The key factors likely to affect the population of the species are eutrophication, acidification, changes to the substrate of the lochs and competition from non-native species. A reduction in pH is known to reduce the ability of the plant to produce seed and can affect the plant itself.

Activities which lead to an increase in nutrient inputs are a major concern. This covers both short term releases and more chronic inputs. Raised nutrient levels have been recorded in Loch Fada East. Once released into the loch excess nutrients can contribute to internal loading which may take a long time to recover. Control of nutrients is also important as it is one of the few things that we can do to increase resilience to non-native species.

The introduction of invasive non-native species (INNS), notably *Elodea sp.* can result in competition reducing or removing the slender naiad population. *Elodea canadensis* has been recorded in high abundance in Loch Fada Middle and East lochs. Because it is difficult or often impossible to remove this species it is important to avoid lochs becoming colonised through avoiding transfer of material between lochs and strongly promoting measures such as check, clean, dry for boats and equipment.

Objective 2c above, for clear-water lakes or lochs with aquatic vegetation and poor to moderate nutrient levels habitat, of which slender naiad is a typical species, addresses the need to provide higher water quality all the time and control the population of Canadian pondweed.

Slender naiad is an annual plant and is therefore dependent on seed production, and the successful germination of these seeds, for the population to survive. Paleolimnology and work on germination suggests that seed may be able to persist in a viable state for some years.

When assessing the effects of any plan or project consideration should be given to whether impacts outwith the SAC could affect achievement of this conservation objective.

Slender naiad is a European protected species (EPS) and it is an offence to deliberately or recklessly pick, collect, cut, uproot or destroy plants or seeds anywhere in Scotland unless a licence has been issued to do so. Licences can only be issued for specific legal purposes. There must be no satisfactory alternative and no detrimental impact on contribution to the maintenance of favourable conservation status for the species, at a local and regional level. The licensing requirement is in addition to considering whether a plan or project will result in any impacts (including incidental impacts) to the slender naiad population within the SAC.

2b. Maintain the distribution of the slender naiad throughout the site

The species occurs extensively on the bottom of Loch Fada Middle loch. First recorded in Loch Fada middle in 1902, two discrete populations of *Najas flexilis* were found in 2004. The populations were found growing in the eastern side of Loch Fada Middle at the north and south shore.

The dispersal of pond and loch species between habitats is intrinsically difficult because standing water bodies are effectively aquatic islands in a terrestrial sea. Localised movement of seeds through interconnected water bodies is likely.

Slender naiad under favourable conditions produces large numbers of seeds which it

disperses widely across an entire lake basin using a rafting mechanism (i.e. carrying seeds on plant fragments that float on currents just below the water surface.) Distribution within each loch is therefore mainly dependant on suitable habitat and conditions for germination as outlined in Objective 2c.

Presence of invasive non-native species may preclude use by slender naiad through competition for suitable areas both in terms of space and availability of CO₂ for respiration. Nutrient enrichment, in addition to encouraging invasive non-native species, may also reduce the penetration of light by encouraging growth of algae in the water column and so reduce depth of water suitable for growth.

Water quality appears to be mostly good (raised nutrient levels only recorded in Loch Fada East) and the *Najas* populations appear to be extensive in Loch Fada Middle loch. However the presence of Canadian pondweed is of concern, apparently increasing in both the east and middle lochs. Both of these issues will need to be closely monitored and action taken where necessary.

2c. Maintain the habitats supporting the slender naiad within the site

In Scotland the species occupies lochs influenced both by the base-rich input of sedimentary rocks and sands, and the water run-off from the catchments of acidic peatlands or hard igneous rock. The plant utilises phosphorus overwhelmingly from the sediment. However phosphorus in the water is still important as it affects competition. Slender naiad grows in particularly silty, organic, flocculent sediment with loch shape, depth and size dictating where these occur and at what depth. It is a disturbance tolerator and interaction between exposure and water clarity will primarily determine the location of slender naiad within a loch.

It is an obligate carbon dioxide utiliser and may be at a competitive disadvantage with bicarbonate using species such as *Elodea* in hard water conditions. It is therefore found in circumneutral pH6-9 Alkalinity 6-307.7 mg/l conditions. Seed production has been shown to decrease under reduced pH. Canadian pondweed *Elodea canadensis* cover in Loch Fada SAC should be reduced to maintain habitat availability for the slender naiad.

Germination is greatest in light, deoxygenated conditions at warm temperatures (a temperature of 16°C is sufficient). If dark conditions prevail germination is greater at cooler temperatures (11°C).

Habitat quality should meet either the targets for Common Standards Monitoring or at least Good status under the Water Framework Directive (2000/60/EC). Because it is dependent on factors affecting water conditions slender naiad is sensitive to changes both within the lochs and the catchment. Loch Fada East is experiencing raised nutrient levels. Natural levels of nutrients should be promoted to maintain the growth and viability of slender naiad. Further survey work will indicate if agricultural runoff is impacting water quality.

Eutrophication is an important threat to slender naiad. Any point or diffuse sources increasing the flow of nutrients, particularly phosphorus but also nitrogen, into the lochs are therefore a major concern. New development and in particular proposals not on mains sewerage, relying on septic tanks, can increase the nutrient inputs to the catchment. Changes in land use to more fertiliser dependant models may also increase the amount of nutrients released into the lochs. Sediment can both be a significant source of nutrients, particularly phosphorus, and can cause physical changes to the substrate in the lochs.

Because slender naiad relies upon the distribution of sediment and the depth of light penetration activities which result in changes to the physical characteristics of the lochs particularly water depth can have an effect.

Conservation Measures

Loch Fada 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, otter and slender naiad

Issue	Measure	Responsible party
Water management	Maintain current hydrological regime, including the seasonal inundation of the loch shores, or improve where man-made constraints exist. The main regulatory mechanism is the Controlled Activities Regulations, CAR.	SEPA, NatureScot, Land manager
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 lochs.	Argyll and Bute Council
	Tackle water quality issues, especially eutrophication in Loch Fada East.	SEPA, NatureScot, Landowners
	Raising awareness of the importance of maintaining septic tanks, and upgrading existing systems to tackle point source pollution.	SEPA, NatureScot, Argyll and Bute Council
	Water quality to be addressed through NatureScot Management Agreements and Agri-environment schemes. Some owners are already in schemes to manage habitats which are lower in nutrient requirements and outputs.	NatureScot SEPA SGRPID Land managers
Grazing	Soil erosion should be prevented by ensuring grazing avoids poaching of edges of streams that flow into the lochs and of the lochs themselves. Avoid supplementary feeding of livestock close to the lochs as this could concentrate livestock close to the water leading to excess nutrient or sediment entering the lochs from poaching, heavy dunging or uneaten fodder.	Land Manager
Sediment load in lochs from un-forested land	Ensure minimal poaching, tracking, or trampling by red deer, livestock, visitors and vehicles to prevent an unnatural sediment load from being washed into the lochs.	Land managers, NatureScot, SGRPID (GEAC)
Ongoing species protection – otter, slender naiad	Otter and slender naiad are European protected species' and therefore the species protection provisions of the Habitats Regulations apply.	All
Road mortality-otter	Any upgrading or bridges or culverts, or widening of roads such as the B8085, B8086 and B8087 or other work on roads, should be assessed and adequate allowance made for otters to safely use	Transport Scotland, Argyll and Bute Council, NatureScot

	underpasses or culverts, so they are not forced to cross the road.	
Water-based recreation	Recreational use of the lochs should be managed effectively as damage may be caused to fringe vegetation. Investigate opportunities to promote responsible access.	Land manager, Third parties, Argyll and Bute Council, NatureScot
	Fishing - stocking and feeding can cause enrichment. Introduction of some fish species could also affect the ecosystem of the loch. Fishery to be managed in sympathy with SAC features.	NatureScot, Land managers, SEPA
Habitat management	Maintain plans as required, for example the RSPB reserve for corncrake at Balnahard.	NatureScot, Landowners, RSPB
Disturbance - otter	Avoid promotion of new paths which risk leading to new disturbance in quiet areas used by otter for holts or resting places.	NatureScot, Land managers, RSPB
By-catch – otter	Disused eel or fyke nets should be removed when found, and any active nets should use otter guards.	Land managers
	Advise on setting creels in deeper water (>10m) in the adjacent coastal waters.	NatureScot
Invasive species	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 such as the Canadian pondweed.	All
	Action to control invasive non-native species by physical removal should be implemented as soon as possible, subject to available resources/funding – Canadian pondweed	All
	Although there is no reasonable measure which can totally remove Canadian pondweed from the SAC monitor to track long term effects.	NatureScot, SEPA, Landowner
Research – slender naiad	Development of methods to tackle control of invasive and non-native species	SEPA

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