

ARDVAR AND LOCH A' MHUILINN WOODLANDS SPECIAL AREA OF CONSERVATION (SAC)

CONSERVATION ADVICE PACKAGE



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Site Details

Site name:	Ardvar and Loch a' Mhuilinn Woodlands
Map:	https://sitelink.nature.scot/site/8192
Location:	Highlands and Islands
Site code:	UK0030231
Area (ha):	808.10
Date designated:	17 March 2005

Qualifying features

Qualifying feature	SCM assessed condition on this site	SCM visit date	UK overall Conservation Status
Western acidic oak woodland [H91A0]	Unfavourable Declining	2 March 2004	Unfavourable - bad
Freshwater pearl mussel (<i>Margaritifera margaritifera</i>) [S1029]	Unfavourable Declining	17 September 2014	Unfavourable - bad
Otter (<i>Lutra lutra</i>) [S1355]	Favourable Maintained	7 April 2014	Favourable

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

Ardvar and Loch a' Mhuilinn Woodlands Special Area of Conservation (SAC) is a four-part site. Three parts have the same boundary as Ardvar Woodlands Site of Special Scientific Interest (SSSI) <https://sitelink.nature.scot/site/83>. The other part has the same boundary as Loch a' Mhuilinn SSSI <https://sitelink.nature.scot/site/952>.

Key factors affecting the qualifying features

Western acidic oak woods

This complex of woods is found at the extreme north of the range of oak woodlands in Scotland. The site includes Ardvar Woodlands, which are mainly birch-dominated with some oak, and the woodland at Loch a' Mhuilinn which has some areas dominated by oak as well as more extensive areas of birch. On the more exposed headlands, some of the oaks at Loch a' Mhuilinn have adopted a creeping growth form in response to the westerly gales and also grow right down to the high tide mark. The oaks are of special interest because they are the most northern remnant of native oak woodland in the British Isles. All parts of the site are rich in oceanic bryophytes including the Lobarion lichen community.

A key factor that can affect this habitat is inappropriate levels of grazing. The habitat requires low but not zero grazing. High levels of grazing can distort the natural structure of the woodlands (by removing the preferentially browsed species such as oak and hazel) leading to woodland dominated by older trees and lacking normal representation of intermediate life classes and saplings as well as other characteristic woodland species. In the future new stresses to the feature, particularly from climate change and novel pests and pathogens, are anticipated.

This feature has been assessed through NatureScot's site condition monitoring programme as being in unfavourable declining condition at this SAC primarily due to the effects of high levels of grazing in the Ardvar Woodlands part of the site. Historically, some of the grazing impacts could be attributed to sheep, though currently the high impacts are largely due to red deer.

Further information about western acidic oak woods can be found [here](#).

Freshwater pearl mussel

Freshwater pearl mussels are long-lived freshwater molluscs that live in the gravel beds of clear, unpolluted rivers. For part of their lifecycle they are dependent upon a healthy population of salmonids (young salmon or trout) which act as host species. Trout are the host fish above any falls that are impassable to salmon. The mussel larvae attach to the gills of salmonid fish in mid to late summer and drop off the following spring. When they detach from their hosts they must land in sandy or gravelly substrates to settle and grow to adulthood.

This feature has been assessed through NatureScot's site condition monitoring programme as being in unfavourable declining condition at this SAC due to the small number of freshwater pearl mussels present as a result of the legacy of past (now illegal) pearl fishing. Pearl mussel fishing has also occurred on this site since it became illegal. Wildlife crime is the most significant ongoing threat to this small, remote and vulnerable population.

Other factors that could affect freshwater mussel populations are changes to water quality (including pollution) and barriers that prevent fish from using their natural range within river systems. The low nutrient supply in rivers at the start of the food chain leads to low food availability for freshwater pearl mussels (and their host fish) and reduces the ability of populations of all aquatic species to increase. The productivity of the river systems could be enhanced by greater tree cover in the upper reaches adding nutrients and habitat diversity to watercourses from fallen leaves and branches. In recent years, freshwater pearl mussels have also been affected by exceptionally low water levels.

Further information about freshwater pearl mussels can be found [here](#).

Otter

Otters at this site require continued access to unpolluted fresh and coastal waters. There should be a plentiful food supply and habitats for providing shelter for both resting and breeding. Otters are wide ranging and normally occur at low densities. At this site, otters associated with the SAC are likely to feed and to have holts or resting places near the site boundary as well as within the site itself. Recreational disturbance can have an effect on otter but they have large ranges and can largely avoid people unless disturbed close to places used for breeding.

Otters are also sensitive to exposure to residues from oil spills, bio-accumulating toxins, notably persistent organochlorine compounds, PCBs and heavy metals. They can be sensitive to physical disturbance due to changes in hydrology and/or barriers between supporting habitats. Otters are sensitive to changes in the fish populations that they feed on which could be caused by excessive nutrient enrichment, gross pollution or excessive siltation. Road deaths and accidental entanglement in fish and crustacean traps are also a potential cause of mortality.

Otters are not prolific breeders and have a relatively short life expectancy of around 4 years in the wild. Females are capable of producing cubs at yearly intervals, but the litter size is only two or perhaps three, so each female's total reproductive capacity is relatively limited and this has implications for maintaining the population as the loss of a breeding female with dependent young means the loss of juvenile recruitment within her home range for at least a year.

Further information about otters can be found [here](#).

Conservation Priorities

The western acidic oak woodland is the primary reason for selection of this site as an SAC. Any management for the SAC or assessment of plans or projects will need to take account of all SAC features, however appropriate management of oak woodland should therefore have priority if any conflict between management of different SAC features were to arise. In practice, there is unlikely to be any conflict between management of oak woodland, otters and freshwater pearl mussels within this site.

Conservation Objectives for Western acidic oak woodland (also known as old sessile oak woods with *Ilex* and *Blechnum* in the British Isles)

1. To ensure that the qualifying features of Ardvar and Loch a' Mhuilinn Woodlands SAC are in favourable condition and make an appropriate contribution to achieving favourable conservation status
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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
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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, b and 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 Ardvar and Loch a’ Mhuilinn Woodlands SAC is restored by meeting objectives 2a, 2b and 2c

The aim at this SAC is to restore the qualifying feature to a favourable condition as a contribution to its wider conservation status. Therefore any impacts on 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 qualifying feature 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 western acidic oak woodland within the site

The extent of the western acidic oak woodland feature, taken from the Standard Data Form, has been estimated at approximately 250 ha, although there is some uncertainty about extent within the Ardvar Woodlands component. This should be maintained or allowed to increase through natural regeneration; 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 levels of grazing that are too high to allow seedlings to develop into mature trees and minimising the risk of fire.

2b. Restore the structure, function and supporting processes of the western acidic oak woodland

Woodlands are extremely complex ecosystems, and in order to maintain and enhance the structure, function and processes supporting the habitat the key elements that should be in place include:

- Canopy cover should be restored to over 50% where trees are more scattered than this.

- The presence of an understory should be restored with species such as new shoots from hazel trees, honeysuckle scrambling along the ground, holly and bramble.
- There should be low levels of herbivore impacts throughout the site to facilitate regeneration and growth of trees, shrubs, herbs, bryophytes and lichens, reduce levels of ground disturbance and assist with structural woodland variation.
- Invasive non-native species should not be introduced to the site.
- There should be mixed age classes of trees, varied canopy cover, deadwood/fallen trees, understorey, ground flora & epiphytic plants.
- Large, long lived trees with the characteristics of existing species, especially oak. Relevant characteristics include bark chemistry and structure, shade, leaf litter, fruiting, senescence and deadwood development.
- Levels of humidity should remain high enough to support characteristic bryophyte and lichen assemblages.
- Pathogens should be prevented from arrival, establishment and spread.
- Invasive native species such as bracken should be controlled if their spread starts to restrict growth of the woodland species listed in 2c.

2c. Maintain the distribution and viability of typical species of the western acidic oak woodland

The key tree species found on this site are oak (*Quercus robur*, *Q. petraea* and an intermediate form between these two species) and birch (*Betula pendula* and/or *B. pubescens*). There is significant variation between individual stands of the habitat in domination by either oak or birch, with oak-dominated areas found only in the Loch a' Mhuilinn part of the site. Holly *Ilex aquifolium*, hazel *Corylus avellana*, wych elm *Ulmus glabra*, aspen *Populus tremula*, rowan *Sorbus aucuparia* and bird cherry *Prunus padus* trees should also be important components of the habitat.

The ground flora includes plants such as blaeberry *Vaccinium myrtillus*, wood sorrel *Oxalis acetosella*, creeping soft grass *Holcus mollis*, wavy hair grass *Deschampsia flexuosa* and dog violet *Viola riviniana*.

Wilson's filmy-fern *Hymenophyllum wilsonii* is found in humid parts of the site, particularly in Gleann Leireag. The Lobarion lichen community is found extensively at Loch a' Mhuilinn and in Gleann Leireag as well as more sporadically in the rest of the site.

Red deer *Cervus elaphus* and roe deer *Capreolus capreolus* use the woodland for shelter, grazing and browsing, especially in winter. Whilst some grazing and browsing is necessary to maintain the structure of the woodland, presence of large numbers of deer prevents tree regeneration.

Several burns and lochans lie within the site and these, together with the rocky shore and woodland, provide habitat for otters *Lutra lutra*. The site also contains the breeding areas of several species of dragonfly and damselfly.

Overarching conservation objectives for all species features

1. To ensure that the qualifying features of Ardvar and Loch a' Mhuilinn Woodlands 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, b and c and, for freshwater pearl mussel, part d). 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 Ardvar and Loch a' Mhuilinn Woodlands SAC is restored by meeting objectives 2a, 2b and 2c for each qualifying feature (and 2d for freshwater pearl mussel)

The aim at this SAC is to maintain, and where appropriate restore, the qualifying features to a favourable condition as a contribution to their wider conservation status. Therefore any impacts on the objectives shown in 2a, 2b, 2c or 2d 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, 2c and 2d. 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, 2c or 2d 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 freshwater pearl mussel

2a. Restore the population of freshwater pearl mussel as a viable component of the site

The main requirements for restoring the freshwater pearl mussel population within this SAC are that:

- the population should be allowed to recover from past (now illegal) pearl mussel fishing.
- there should be no further illegal pearl mussel fishing.

Other than this, the conservation objective is considered to be met if the conditions for the species' long-term existence are in place. These conditions include:

- avoiding effects that could lead to an inability of the population to successfully reproduce and recruit sufficient juveniles into the population (e.g. >20% of the population should be juvenile (<65mm long). Very young juveniles (<30mm long) should also be present).
- avoiding effects that could lead to a permanent reduction in the density and number of freshwater pearl mussels in the population, or that prevent a recovery in density and numbers, through mortality, injury or impacts caused by disturbance. These effects could be caused by development, water pollution, river engineering, land-use change and abstractions. For a healthy mussel population the aim is to have at least an average of 5 mussels per m² in areas of suitable natural habitat.
- ensuring high quality habitat in river reaches that support freshwater pearl mussels (see conservation objective 2c)
- restoring the distribution of freshwater pearl mussels within the site to sections of river from which they have been lost (see conservation objective 2b)
- restoring the distribution and viability of the freshwater pearl mussel's host species, and their supporting habitat (see conservation objective 2d).

Freshwater pearl mussels are in unfavourable condition at this site. The focus of this objective will therefore be to stop the decline in population and subsequently promote its increase. Recovery of freshwater pearl mussel populations is notoriously difficult. This is partly due to their unusually long lifecycle and also due to their requirement for very high water quality and other habitat requirements, with the species requiring near natural conditions for important factors such as fine sediment and nutrients. These conditions generally need to be provided all the time.

The early stages of the pearl mussels' lifecycle is also complex and delicate, as it relies on the presence of healthy, abundant, juvenile, native salmonid populations. It is therefore also important that the local salmonid populations are robust and able to access all relevant areas of the SAC and the wider catchment.

The low nutrient supply in the rivers on this site at the start of the food chain leads to low food availability for freshwater pearl mussels (and their host fish) and currently reduces the ability of populations of all aquatic species to increase. The low productivity of the river systems and barriers that restrict access by host fish to lochs are likely to be slowing the recovery of the pearl mussel population. Productivity of the entire aquatic ecosystem should be enhanced by encouraging greater tree cover in the upper reaches of rivers where there are currently few or no trees adjacent to the river. This would add modest levels of nutrients and increase habitat diversity to rivers from fallen leaves and branches, enhancing host fish populations and the food supply for pearl mussels. An increase in riparian woodland would also provide shade thereby helping to maintain a lower water temperature in the summer months which would benefit host fish. The ability of host fish to survive low water levels and/or high water temperatures would also be enhanced by removing any barriers that prevent fish movement (including those outwith the SAC

boundary). This would enhance the host fish population (and therefore benefit freshwater pearl mussels) allow fish to move between rivers and the lochs when low water levels or high water temperatures make the river habitat less suitable for salmonids.

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.

2b. Restore the distribution of freshwater pearl mussel throughout the site

Distribution of mussels within the site can be affected by disturbance originating both within and outwith the site. Factors such as water abstraction, water pollution, illegal pearl fishing, river engineering and intensification of land use can risk directly affecting freshwater pearl mussels.

The species can be directly affected, or the species' habitat quality reduced such that recruitment is unsuccessful, leading to a contraction in the species' distribution in the site. It is important that distribution is maintained within the site. Freshwater pearl mussels may be present in the main river within a site, as well as in tributaries (and tributaries may contain populations that are not currently known).

Plans and projects that cause disturbance, displacement and barrier effects to the host species can also affect mussel distribution (see conservation objective 2d).

Conditions within the site should allow for the distribution of the species to be expanded or at least restored to their previous known extent where pearl mussels have been lost. Pearl mussels should re-colonise this area naturally, if sufficient larvae are produced elsewhere and there are sufficient host fish. For 'sufficient' larvae and host fish to be found, populations of pearl mussel and host fish should be restored - as described in 2a – by increasing river productivity and enhancing the habitat for pearl mussels and fish.

2c. Restore the habitats supporting freshwater pearl mussel within the site and availability of food

The distribution and extent of the species' habitat within the site, together with the structure, function and supporting processes of the habitat should be restored.

The rivers within this SAC currently have low productivity due to the low nutrient input at the base of the food chain and correspondingly low food supply for freshwater pearl mussels and their host fish species. This low level of productivity is slowing the potential for freshwater pearl mussel recovery on this site. Aquatic ecosystem productivity should be enhanced by encouraging greater tree cover in the upper reaches of the rivers. This would add a modest supply of nutrients and habitat diversity to watercourses from fallen leaves and branches, enhancing the food supply for pearl mussels as well as the shade from trees helping to regulate fluctuations in summer water temperatures.

Freshwater pearl mussels are typically found in rivers with 'soft' high water quality conditions, combined with abundant gravel river beds. They feed by filtering fine organic particles from the water. In order to maintain the supporting freshwater pearl mussels' habitat it is important that the species' high quality habitat requirements are met.

High water quality and natural flow conditions should be in place to provide the necessary conditions for freshwater pearl mussel. The restoration of peatlands (e.g., drain-blocking) and creation of native riparian woodlands – both within the site and in the wider catchment - will also lead to more sustainable river flow regimes. This would also help to reduce the potential for damaging floods and create more sustainable steady flows during droughts.

Freshwater pearl mussel populations are particularly vulnerable to excessive or unnatural levels of nutrient enrichment and fine sediment increases, both of which can affect the juvenile mussels that predominantly live buried in river gravels. River engineering can also directly damage populations, as well as interrupt the supply of sediment that maintains habitat. Changes in land use have the potential to increase nutrient and fine sediment concentrations in the river. However land use changes, such as the establishment of native riparian woodlands mentioned above, have the potential to improve habitat by providing shade that can mitigate damaging peaks in summer temperature, stabilise river banks and reduce erosion.

Specific targets for some water quality parameters include:

- Nutrient concentrations should be near-natural. Soluble reactive phosphorus is particularly important (the annual mean should be <0.005mg/l).
- Mean Biochemical Oxygen Demand should be <1 mg/l.
- Filamentous algae should have <5% coverage of the river bed during the summer months.
- Excess fine sediment is a considerable danger to freshwater pearl mussels and there should be no pronounced difference in the redox potential between open water and interstitial water at 5cm depth.

2d. Restore the distribution and viability of freshwater pearl mussel host species and their supporting habitats

Sufficient salmonid fish hosts should be present within the site to support juvenile mussel recruitment.

The rivers within this site currently have low productivity, with low nutrient input at the base of the food chain and correspondingly low food supply for host salmonids. This low level of productivity is slowing the potential for pearl mussel recovery on this site because the low food supply for salmonids limits their populations. Aquatic ecosystem productivity should be enhanced by encouraging greater tree cover and removing any barriers that prevent fish from moving between rivers and lochs, as described in 2a.

Salmonid fish are an integral part of the freshwater pearl mussels' lifecycle and should be available in sufficient numbers to ensure continued recruitment of juvenile mussels to the population. It is important that juvenile host salmonids, including any range of genetic types, are present in all areas of the catchment to which they, and adult fish, have natural access and where freshwater pearl mussels have historically been present.

The host species can vary in different rivers. An abundance of more than 0.1 native juvenile host salmonid per m² in appropriate habitat should ensure sufficient host species are available. More generally, the density of host juvenile salmonids should not differ significantly from those expected for the river type/reach under conditions of high physical and chemical quality.

Freshwater pearl mussel population viability is dependent upon host salmonid population viability, so any threats to host species stocks should be avoided. Factors that can affect the viability of host species include those that affect freshwater pearl mussel, but potential barriers to fish migration, inappropriate fish stocking and biosecurity are also further increased risk factors. Although brown trout are the primary salmonid host in this SAC, impacts upon the marine health and survival, and in turn the viability, of Atlantic salmon and sea trout populations within the SAC, should also be considered.

Host species should be able to continue to use and access all areas of importance within the site. Plans and projects that cause disturbance, displacement and barrier effects to

host species can affect their distribution and in turn the distribution of freshwater pearl mussels.

To ensure a viable population of host species is present supporting salmonid habitat should be maintained throughout the site. Atlantic salmon and trout, both require the presence of clean gravels for spawning. For Atlantic salmon and large trout, these typically occur at the tail-end of pools, although spawning may take place if suitable gravels and flows are present. On emergence, usually between March and early May, the young fry disperse and set up territories which they defend aggressively. Atlantic salmon fry prefer fast flows (>30 cm/s) in addition to a rough bed of pebble, cobble and gravel; favouring these areas which provide a surface turbulence (riffle habitat). Trout fry prefer areas of relatively low water velocity near the streambed. Cover from stones, plants and debris is essential for maintaining high fry densities.

Atlantic salmon that have survived their first winter (parr) prefer deeper water than fry (typically 15-40 cm) and a coarser substrate of pebbles, cobbles and boulders. Trout parr generally favour currents of relatively low speed, where cover is available. Juvenile trout are often to be found under bankside cover, within undercuts, among tree roots or in marginal vegetation. Cover remains important for adult trout particularly in smaller streams like the ones on this site. The shade from bushes next to the river or overhanging trees is likely to help to prevent fish from becoming stressed due to high water temperature combined with low water levels.

Conservation Objectives for otter

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

The conditions for the long-term existence of otter at Ardvar and Loch a' Mhuilinn Woodlands SAC should be maintained.

An estimate of the number of otters 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.
- 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).

Otters are wide-ranging and highly mobile. The population at Ardvar and Loch a' Mhuilinn Woodlands is reliant on suitable habitat in the surrounding wider terrestrial and marine environments. It is unlikely to be viable (capable of functioning) 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 otter will partly feed in coastal waters that lie outwith the boundary of the site along the coast of Eddrachilles Bay and into Loch a' Chàirn Bhàin, Loch Glencoul and Loch Glendhu. 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 40 km and females living in the same habitat can have a linear home range of 20 km. Ranges are thought to have some

degree of overlap and males have been known to range as far as 80 km, bearing in mind that localised plans or projects more than 5 km from the site boundary would be unlikely to have a significant effect on otter from the SAC.

Otters are 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 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.

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

The distribution and extent of otter habitat should be maintained within the site, 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. Otters forage on fish and crabs close to the rocky shore in the sea adjacent to this SAC and on fish and amphibians in the lochs and streams within the site. Streams or lochs within the site that support a healthy fish population should be maintained throughout the site to enable foraging for key prey species such as salmonids, crabs and eels. Access to ponds, ditches, reed beds and wetlands where amphibians may breed is also important. Ample sources of freshwater are essential to enable animals that feed in the sea to remove salt from their fur. They also need areas with abundant crevices within tree roots, boulders, crevices and/or peat to provide secure holt sites. Dense patches of gorse can also be valuable for providing lie-ups and couches.

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 set out under the Water Framework Directive (2000/60/EC) should be met. Several streams run through the site, however these are below the size threshold for SEPA's freshwater classification system and so separate water quality monitoring is needed.

Conservation Measures

Ardvar and Loch a' Mhuilinn Woodlands SAC is notified as two separate Sites 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 western acidic oak woods

Issue	Measure	Responsible party
Herbivore impacts	Ensure that herbivore impacts are maintained at low levels based on the FCS (Scottish Forestry)/SNH (NatureScot) Herbivore Impact Assessment. Future deer control effort and culls should be informed by monitoring of woodland structure to ensure there is sufficient diversity of tree regeneration whilst also allowing enough light through the canopy to maintain lichens and maintain an understorey of characteristic woodland plants.	Land managers, Deer Management Group & NatureScot
Trampling (human, stock & wild mammal) and other mammalian plant damage	Keep trampling impacts to a low level (e.g., those from deer, livestock and people).	Land manager, Deer Management Group, NatureScot
Invasion by non-native species	Invasive non-native species such as Rhododendron should not be introduced to the site or planted nearby where they might spread into the site.	Land managers and neighbours
Hydrology	Ensure natural hydrological processes are maintained where they support significant populations of typical wooded ravine bryophytes and lichens.	Land managers SEPA NatureScot
Future threats	A coordinated resilience planning process should be developed to respond to anticipated future threats to the habitat. Management actions arising from the resilience planning process, and site-level plans, should be implemented to anticipate future threats to the habitat on the site. This resilience work may also include further research to understand the vulnerabilities of the habitat.	NatureScot Land managers

Current and recommended management for

- freshwater pearl mussels
- otter

Issue	Measure	Responsible party
Ongoing species protection	Freshwater pearl mussels are fully protected under Schedule 5 of the Wildlife and Countryside Act 1981 as amended. Offences include intentionally or recklessly killing, injuring or taking from the wild a freshwater pearl mussel.	All
	Otter are a European Protected Species and therefore the species protection provisions of the Habitats Regulations apply.	All
Low number and density of mussels present	Continue to monitor for signs of illegal freshwater pearl mussel fishing, report any findings to the Police and implement agreed actions to deter criminal activity.	Public, Police, Fisheries Trusts, NatureScot
	Management planning to evaluate and manage potential pressures arising from marine finfish aquaculture in Scotland.	Marine Scotland/ NatureScot
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 river.	Highland Council
	Any future development including housing sites in the catchment should have zero discharge into burns.	Housing developers, Homeowners, The Highland Council, NatureScot
Beneficial habitat management	Removal of any barriers that prevent host fish moving between rivers and to lochs	Land managers, fisheries managers, SEPA
	Evaluation of diffuse pollution and morphological pressures through the river basin planning process and the implementation of restoration measures to maintain or improve habitat for freshwater pearl mussel.	SEPA
	Promotion of measures to increase resilience to climate change, particularly the creation of native riparian woodland with an emphasis on enhancing the cover of oak and other tree species already found on the site. Measures to promote	All

	<p>coordinated, catchment-scale activity are particularly important.</p> <p>Native tree planting that is compatible with the oak woodland habitat in appropriate locations would help improve the riparian habitat for freshwater pearl mussel.</p>	
	<p>Restore riparian and catchment peatlands to reduce fine sediment concentrations, improve floodplain connectivity and restore more natural hydrological regime to benefit freshwater pearl mussel.</p>	All
	<p>Applications for funding for the creation of native riparian woodlands would be of benefit to the freshwater pearl mussel population.</p>	All
Population size fresh water pearl mussel and salmonids	<p>Encourage the natural processes of river flow and morphology through a policy of non-intervention and thereby improve freshwater pearl mussel and salmonid recruitment and survival.</p> <p>The only case where intervention is definitely beneficial is that when the river level is particularly low, it may be appropriate to move pearl mussels (under licence) to deeper pools if they would otherwise die due to their habitat drying out.</p>	All
Invasive species	<p>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.</p>	All
Water flow fresh water pearl mussel and salmonids	<p>Manage abstraction and water transfers to ensure that access to essential habitats by salmonids is maintained and water flow is not lowered/raised in a way that would reduce the populations of freshwater pearl mussel.</p>	SEPA, NatureScot, Scottish Water
Coastal development proposals	<p>Any coastal development proposals within or adjacent to the site should include measures to protect otter such as avoiding displacement of otter from breeding or foraging areas, disturbance/displacement from resting places, disturbance of foraging otter or potential entrapment of otter (e.g. in temporarily uncovered cavities).</p>	Land owners, land managers, developers, The Highland Council

Maintain population of salmonid host species	Legislation is in place to manage and protect Atlantic salmon in freshwater and at sea. This includes a statutory close season and catch & release period.	All
	Develop an Atlantic salmon conservation plan	District Salmon Fisheries Boards, Fishery managers, Fisheries Trusts NatureScot
	Voluntary catch and release policy for all salmonids.	District Salmon Fisheries Boards, Fisheries managers, Fisheries Trusts

All habitats and species

Research and monitoring	To identify emerging impacts on the habitat and their causes, in order to understand the long term issues, and to inform future management of the habitat across Scotland. Research bodies should have a local contact they can call upon if undertaking field data collection remotely.	NatureScot, University researchers
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