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

RIVER EVELIX
SPECIAL AREA OF CONSERVATION (SAC)

CONSERVATION ADVICE PACKAGE

Image: Freshwater pearl mussel ©Sue Scott/NatureScot

Site Details

Site name: River Evelix SAC

Map: https://sitelink.nature.scot/site/8358

Location: Highlands and Islands

Site code: UK0030254

Area (ha): 23.6

Date designated: 17 March 2005

Qualifying features

Qualifying feature	SCM assessed condition on this site	SCM visit date	UK overall Conservation Status
Freshwater pearl mussel (*Margaritifera margaritifera*) [S1029]	Unfavourable Declining	July 2014	Unfavourable - bad

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

The SAC partially overlaps with

- Strath Carnaig and Strath Fleet Moors Special Protection Area (SPA) https://sitelink.nature.scot/site/9190
- Strath Carnaig and Strath Fleet Moors Site of Special Scientific Interest (SSSI) https://sitelink.nature.scot/site/9188

Key factors affecting the qualifying features

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. 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. In suitable conditions they can live for over 100 years. However freshwater mussel populations are vulnerable to changes to water quality (including pollution), hydrological alterations (including river engineering and abstractions), habitat degradation of river beds and banks, illegal pearl fishing and availability of host species.

The feature has been assessed through NatureScot's site condition monitoring programme as being in unfavourable declining condition at this SAC due to the low number and density of freshwater pearl mussels present, low levels of juvenile recruitment, water quality, water flow and disturbance of mussel beds through illegal pearl fishing and unauthorised engineering work. Since the most recent monitoring, the pearl mussel population has been further reduced by exceptionally low water levels.

Further information about freshwater pearl mussels can be found here.

Conservation Priorities

The River Evelix SAC partly overlaps with Strath Carnaig and Strath Fleet Moors SPA. Any management for the River Evelix SAC or assessment of plans or projects will also need to take account of the interests of Strath Carnaig and Strath Fleet Moors SPA where the sites overlap.

Conservation Objectives for freshwater pearl mussel (*Margaritifera margaritifera*)

1. To ensure that the qualifying feature of the River Evelix 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, b, c and 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 the River Evelix SAC is restored by meeting objectives 2a, 2b, 2c and 2d for the qualifying feature
The aim at this SAC is to restore freshwater pearl mussel to a favourable condition as a contribution to its wider conservation status. Therefore any impacts to 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 feature 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.

2a. Restore the population of the species as a viable component of the site

The conditions for the species' long-term existence at the River Evelix SAC should be restored. This includes encouraging and allowing the number and density of mussels to increase.

This 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, abstractions, and wildlife crime (illegal pearl mussel fishing). For a healthy mussel population the aim is to have at least 5 mussels per m^2 in appropriate habitat.
- Ensuring high quality habitat in river reaches that support freshwater pearl mussels (see conservation objective 2c).
- Allowing the species distribution within the site to be maintained or expanded (see conservation objective 2b).
- Maintaining the distribution and viability of the freshwater pearl mussel's host species, and their supporting habitat (see conservation objective 2d).

However, 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 their requirement for both, very high water quality and the associated natural, habitat conditions, with particular regard to nutrient and oxygen levels, flow rates and sediment load. These conditions generally need to be provided for all of the time.

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

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 the species throughout the site

Conditions within the site should allow for the distribution of freshwater pearl mussel to be expanded or at least restored to their previous known extent.

Distribution of mussels within the site can be affected by disturbance originating both within

and outwith the site. Factors such as abstraction, water pollution, illegal pearl fishing, river engineering and intensification of land use can risk 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. It is important that the distribution of mussels is maintained. Freshwater pearl mussels may be present in the main stem of the river, 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).

2c. Restore the habitats supporting the species 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.

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 will also lead to more sustainable river flow regimes. These land management practices will help to reduce the potential for damaging flood impacts and also create more sustainable steady flows during droughts.

Freshwater pearl mussel populations are particularly vulnerable to nutrient enrichment and increases of fine sediment, 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, 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 (BOD) should be <1 mg/L. BOD measures the oxygen consumed by bacteria from the decomposition of organic matter (such as sewage or run-off from eroding land) in water. Unpolluted water has a low BOD (i.e., well oxygenated water with a low level of organic matter). Freshwater pearl mussels need river water to have some organic particles, as this is what they feed on. However pearl mussels can be harmed by excessive levels of organic particles, and associated low levels of oxygen in water.
- Filamentous algae should have <5% coverage of the river bed during the summer months (indicating that the river does not have excess nutrients).
- Excess fine sediment should be avoided in the river as this can smother freshwater pearl mussels or interfere with filter feeding.

The quality of the riverbed habitat is particularly important for freshwater pearl mussels, and is best assessed by measuring the 'redox potential' (a measure of how much oxygen there is in the water).
- There should be no pronounced difference in the redox potential between open water and

interstitial (within sediment) water at 5cm depth (a typical depth for juvenile freshwater pearl mussels which are normally buried within the gravels).

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

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

Salmonid fish (native salmon and trout) 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 sites, however at this site, they are unknown. An abundance of > 0.1 native juvenile host salmonid per m^2 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. Factors that also affect the marine survival, and therefore viability, of Atlantic salmon and sea trout populations 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 and Atlantic salmon particularly in smaller streams. 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 Measures

Parts of the River Evelix SAC are within Strath Carnaig and Strath Fleet Moors SSSI and management changes described on the SSSI list of Operations Requiring Consent must have prior consent from SNH (NatureScot).

Current and recommended management for freshwater pearl mussel

Issue	Measure	Responsible party
Low number and density of mussels present, including low levels of juvenile recruitment	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
	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, Kyle of Sutherland Fisheries Board, river managers, NatureScot
Forest harvesting operations resulting in silt/nutrients entering the river – may affect freshwater pearl mussel	Planning and implementation of forest harvesting operations should better identify high risk areas. Management should include improved pollution control, blocking of drains and careful harvesting in riparian areas.	Scottish Forestry, Forestry & Land Scotland, Forestry owners and managers
	Promote adherence to the Forest and Water Guidelines, and published best practice, during forest restructuring and highlight the need to strictly control fine sediment and other diffuse pollution release into the river. Forestry planting and harvesting in the catchment needs to be planned so that heavy rainfall and droughts are buffered by the forest rather than exacerbating high/low extremes in flow as both very high and very low river levels can damage freshwater pearl mussels.	Scottish Forestry, Forestry & Land Scotland, Forestry owners and managers
Sediment load in river from un-forested land – may affect freshwater pearl mussel	Ensure minimal poaching, tracking, or trampling by red deer, livestock, visitors and vehicles to prevent an unnatural sediment load from being washed into the river.	Land managers, NatureScot, SGRPID (GEAC)
	Drain blocking in open peatland in the catchment to help to buffer high/low extremes in flow rate and reduce sediment run-off into the river.	Land managers
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	Highland Council

	and prevent pollutants from entering the river.	
Beneficial habitat management	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. Improvements have already been implemented by SEPA, removing a concrete in-river obstruction in the upper reaches.	SEPA
	Promotion of measures to increase resilience to climate change, particularly the creation of native riparian woodland and improved connection with floodplains. Measures to promote coordinated, catchment-scale activity are particularly important. Continued native tree planting in the upper reaches of the river would help improve the riparian habitat.	All
	Restore riparian and catchment peatlands to reduce fine sediment concentrations, improve floodplain connectivity and restore more natural hydrological regime to benefit freshwater pearl mussel.	All
Population size	Encourage the natural processes of river flow and morphology through a policy of non-intervention and thereby improve freshwater pearl mussel recruitment and survival. 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 to deeper pools if they would otherwise die due to their habitat drying out.	All
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.	All, NatureScot, Kyle of Sutherland Fisheries Board
Water flow	Abstraction by Scottish Water for a public water supply should not lower the water flow in the river in a way that would make conditions less suitable for freshwater pearl mussel.	SEPA, NatureScot, Scottish Water
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 for the Rivers Evelix and Oykel.	Fishery managers, Kyle of Sutherland Fisheries Board, Fisheries Trusts, NatureScot
	Voluntary catch and release policy	Fishery managers, Kyle of Sutherland Fisheries Board, Fisheries Trusts

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