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**Fish protection**

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# 1 Purpose

This document provides information and guidance on fish protection when carrying out water activities which are subject to authorisation by SEPA under the Environmental Authorisations (Scotland) Regulations 2018, (EASR).

# 2 Introduction

Carrying out regulated water activities can have a wide range of impacts on fish, including direct harm to fish or their eggs, damage to or loss of their habitats, to creation of obstacles to fish migration.

Activities are much less likely to have an impact on fish populations if work:

* Is carried out during the time period where fish are not spawning or migrating.
* Requires no machinery or equipment to be placed within the wetted part of the water environment.
* In-water working is limited to the shortest time necessary to carry out the activity.
* Is limited to dry areas only (e.g. sediment removal from exposed gravel bars).
* Is designed and conducted in a manner that does not harm fish or impede fish migration.

## 2.1 Timing of works

Some of the risks to fish populations can be at least partially avoided by scheduling the timing of any works to avoid the period from fish spawning through to emergence i.e. the period over which fish eggs and the developing, relatively immobile, young are present within the gravels of a watercourse or loch bed. Although exact timings can vary between locations and species present, in most cases this will be driven by salmon and brown/sea trout.

## 2.2 Harm to fish

Any activity including construction of a structure and any works involving plant and equipment including machinery entering the water can have the potential to harm fish including by trapping, stranding, injuring, and exposure to extreme water temperatures, as well as deterring spawning and crushing eggs.

As such, these works should be designed and constructed to mitigate these impacts wherever possible, and any residual impacts should be considered.

Mitigation could include, for example, the completion of a fish rescue prior to the commencement of in-river works, appropriate screening of intakes and outfalls to prevent fish from getting trapped or funnelled out of the watercourse, or the provision of adequate fish passage routes or facilities. Adequate screening and fish passage should be considered during both the construction period and in in the design of any permanent structure.

## 2.3 Fish Migration

For many fish species, the ability to move upstream and downstream unimpeded is critical to their lifecycles. Although this need is particularly well known for salmon, sea trout and eels, even species such as brown trout and lamprey must move around a watercourse to breed successfully. Activities in the water environment have the ability to impact on fish movements by, for example, preventing access to spawning habitat, preventing movement downstream to sea, or delaying fish at structures or works. These impacts could be limited to specific flow ranges or could occur at all times. Any delay to their movements can result in losses through predation, damage or disease, and significant curtailment of fish movements can result in the fragmentation of fish populations, putting them at a greater risk of long-term decline.

It is therefore critically important that any works have no or minimal impact on fish movements, and key to enabling this is adequate design of any temporary or permanent works.

### Design

* The design of any permanent and/or temporary structures must take into account the needs of fish to move upstream and downstream past or through a structure. For example river crossings, including culverts and bridge aprons, must be designed to take into account any site-specific factors including, but not limited to, the provision of a natural bed material and gradient through any structure, ensuring that fish movements through the structure are not restricted to a limited flow range, and that there are no steep or vertical steps incorporated in the design.
* Where a significant new or existing structure is being developed, such as an impoundment, it is likely that a formal fish pass(es) will be required to enable fish movements both upstream and downstream, taking into account the species of fish present and the flows in the watercourse. The design of these structures is complex and depends on the species present, flow availability and many site-specific criteria. It is likely that expert input will be required where a fish pass design is required.
* Further information, particularly in relation to the design of upstream fish passage facilities, can be found in the Institute of Fisheries Management’s [Fish Pass Manual](https://ifm.org.uk/ifm-training/ifm-fishery-guidance/). This document contains current best practice for fish passage design and should be adhered to in all cases.
* Where there are proposed alterations to the flow regime of a watercourse, consideration should be given to the impacts of these changes on the availability of fish habitat, including through long-term impacts on gravel movements. The ability of fish to move up and downstream should be fully considered, both at any structure associated with the works and any other locations in the affected reach(es). For example, any in-stream features in an impacted reach, including existing impoundments, culverts or waterfalls, should be identified and the ability of fish to pass over these assessed to ensure that the proposed flow regime does not prevent or limit the ability of fish to pass them.
* Where there are changes or alterations to the morphology of a watercourse or loch (e.g. bed material, channel shape and depth, or plan-form), works must also be conducted in a manner that does not impact fish habitat or movements. For example, in conducting sediment management works, care should be taken to avoid creating pits or hollows which could trap fish during low flow periods, or result in a near-vertical face in the channel which could result in fish being unable to move upstream and downstream. Similarly, if channel modification works result in an over-widening and shallowing of a watercourse, this may create a barrier to the movements of fish, particularly during times of low river flows.

Further information on good practice considerations, specifically related to design, can be found in individual water activities’ webpages. Where activities and structure design adhere to best practice, fish passage should not be an issue.

### Construction methods

* Temporary construction works and activities, such as a crossing, channel isolation or diversion, rock blasting, vibration or pile driving, directional drilling under a watercourse, or using artificial lighting at night can also affect both resident and migrating fish. Such impacts can occur even if the works are carried out out-with the wetted channel. Any such works or activities must be managed carefully to minimise any impact(s), including allowing the continued movement of fish through the site, the completion of a fish rescue (where fish are removed and relocated, typically by electrofishing) immediately prior to the commencement of works (and subsequent exclusion of fish from the working area), and the use of directional lighting. Note that repeat fish rescues may be required if works are inundated due to elevated flows and must be dewatered again.

# 3 What are SEPA’s duties in relation to protecting fish?

SEPA have a duty to protect the water environment from adverse impacts caused by activities we regulate. This includes protecting environmental standards and the status of the water environment.

Fish are a key indicator of the state of the environment and can be affected by activities in or near the water environment. Impact on fish will depend upon the activity location, type and scale, as well as the fish species present.

SEPA will assess proposed water activities (and associated construction works) to ensure there is no impact on fish. Conditions will be included in authorisations as required to ensure the protection of fish.

## Key considerations for fish and works in the water environment

To ensure that activities in the water environment do not impact on fish, you must first identify the likely species of fish present in the working area, and that are likely to pass through it. Once this is known, the likely impacts on these species can be considered and appropriate designs and working practises developed to prevent these impacts.

As described above, risks to fish include the prevention or delay of migration, damage or loss of habitat, and physical harm to fish or their eggs. With respect to the last of these risks, the potential for impacts on fish eggs and the youngest parts of their lifecycles, works should be timed to avoid these critical periods for which no adequate mitigation is available. To assist in identifying these periods, we have included supplementary information on fish spawning periods and other details relevant to preventing harm to them during any works ([Appendix 1](#_Appendix_1_Typical)). Note that brown trout are likely to be present in most waterbodies in Scotland, reflected in the standard in-water working window of 1 June to 30 September.

# 4 Registrations

## 4.1 Timing of works & passage of fish

To protect fish spawning and migration, certain water registration activities will have standard conditions specifying that the authorised activity and any associated construction works (which includes the installation and removal of temporary structures and crossings, full or partial channel isolation, over pumping, etc.),

* **Must not be undertaken in the wetted part of any watercourse or loch when fish are likely to be spawning in the watercourse or loch, nor during the period between such spawning and the subsequent emergence of juvenile fish.**
* **Must not prevent the passage of migratory fish.**

Consequently, activities should be limited to and planned for the period between 1 June to 30 September. Where lamprey are known to be present it may be necessary to limit works to between 1 July to 30 September.

### Work during the period between 1 June to 30 September

If you propose to carry out a registration level water activity and associated construction works during the period between 1 June to 30 September, you should be able to comply with the relevant standard conditions.Additional mitigation work to manage risks are unlikely to be required.

### Work during the period between 1 October to 31 May

If you propose to carry out a registration level water activity and associated construction works during the period between 1 October to 31 May, then you are unlikely to be able to comply with the standard conditions to protect the migration, spawning and youngest stages of fish.As such, further consideration is required.

It should be possible to comply with the standard conditions provided works **do not** include any of the following:

* Working in the wetted part of a watercourse or loch.
* Blasting, vibration or impact piling, or directional drilling.
* Machinery entering the watercourse, including for access.
* Installing or removing a temporary crossing.
* Full or partial (greater than 25 percent of wetted channel width) isolation of the channel and/or temporary diversion or over-pumping.
* Using artificial lighting at night.

If you propose to carry out works that **do** include any of these activities, you should carry out a risk assessment to establish the risks to fish spawning and migration. Specialist advice from a fish ecologist may be required to undertake this risk assessment. You may find it useful to contact your local District Salmon Fisheries Board or fisheries trust, the details of which can be obtained through [Fisheries Management Scotland](https://fms.scot/).

When assessing the risk to fish, the following factors should be considered:

* Suitability of the habitat within the watercourse or loch for spawning.
* The likelihood of fish movements (both upstream and downstream).
* The fish species present or likely to be present.
* The proposed timings and duration of the works.
* The working methods.

Potential impacts should be assessed from all proposed works including the activity itself and any associated construction works.

You should seek to carry out the works with no or minimal controlled risks to spawning, emergence or migration and therefore should seek to undertake mitigation to reduce risks where appropriate.

In identifying suitable mitigation, alternative approaches should be considered, taking into account factors including the site’s location in the catchment, the species present, whether partial or full channel isolation or temporary diversion is required, or whether over-pumping (and associated fish screening) is required.

For works in a loch, you shouldcheck for the presence of Arctic Charr and other rare fish species in that loch. In the first instance, the [National Biodiversity Network (NBN) Atlas Scotland](https://scotland.nbnatlas.org/) can be used to perform this check, but you may require additional expert advice to better understand the specific risks to each population of these fish.

**Result of assessment of risk**

**Low risk** means there is no spawning or fish migration in or near to the working area or the risks to spawning and/or migration can be easily mitigated.

**High risk** means spawning or fish migration is possible within or near the working area during the proposed working period. Mitigation is either very difficult or can only be achieved by working in bespoke specified time period or entirely outwith the spawning /migration periods.

If the risk assessment establishes there is a **low risk** to spawning and migration, it should be possible to comply with the standard conditions to protect fish spawning and fish migration. You may need to carry out specific mitigation to control the risk from the works.

If the risk assessment establishes there is a **high risk** to spawning and migration, it is unlikely you will be able to comply with the spawning and migration standard conditions. You should change the timing and/or methods by which the works will be carried out. If this is not possible, you will be unable to comply with registration standard condition and should not apply for a registration.

## 4.1 Harm to fish

In addition to the standard conditions limiting the timing of works and passage of fish as described above, certain registrations also contain a standard condition specifying that the authorised activity and any associated construction works (which includes the installation and removal of temporary structures and crossings, full or partial channel isolation, over pumping, etc.), **must not harm fish.**

As such all works must be designed and constructed in a manner to ensure that there is no harm to fish from the activity.

Where works are to take place within a wetted channel, and regardless of time of year, it is likely that any fish in the area will be physically harmed by any equipment and machinery used. As such, a fish rescue (where fish are removed and relocated), typically by electrofishing, should be carried out immediately prior to works commencing.

# 5 Permits

## 5.1 Timing of works & passage of fish

To protect fish spawning and migration, activities should ideally be limited to and planned for the period between 1 June to 30 September. Where lamprey are known to be present it may be necessary to limit works to 1 July to 30 September.

### Work during the period between 1 June to 30 September

If you propose to carry out a permit level water activity and associated construction works during the period between 1 June to 30 September and your works **do not** include any of the following:

* Work on the bed of a watercourse or loch;
* Work at the toe of a bank;
* Blasting, vibration or impact piling, or directional drilling;
* Using artificial lighting at night

there will be no condition in the permit limiting the timing of works. There will be standard conditions to prevent harm to fish and protect fish migration. Additional mitigation condition(s) may be included to control the risk from the works.

If any of the works listed above will be carried out, a condition will be included in the permit limiting the timing of the works in a watercourse or loch to being carried out only during the during the period between 1 June to 30 September. There will be standard conditions to prevent harm to fish and protect fish migration.

### Work during the period between 1 October to 31 May

If you propose to carry out a permit level water activity and associated construction works during the period between 1 October to 31 May and your works **do not** include any of the following:

* Working in the wetted part of a watercourse or loch;
* Machinery entering the watercourse (including for access);
* Installing or removing a temporary crossing;
* Full or partial (greater than 25 percent of wetted channel width) isolation of the channel and/or temporary diversion or over pumping;
* Blasting, directional drilling, vibration or impact piling;
* Artificial lighting at night

there will be no condition in the permit limiting the timing of works. There will be standard conditions to prevent harm to fish and protect fish migration. Additional mitigation condition(s) may be included to control the risk from the works.

If any of the works listed above will be carried out, a **Fish Ecology Report** ([see Appendix 2](#_Appendix_2_Fish)), including detailed descriptions of any relevant mitigation, must be submitted with the permit application.

When assessing the risk to fish, the following factors should be considered:

* The fish species present or likely to be present.
* Suitability of the habitat within the watercourse or loch for spawning.
* The likelihood of fish movements (both upstream and downstream).
* The proposed timings and duration of the works.
* The working methods.

If the channel is fully isolated, mitigation to allow fish migration/passage must be assessed. This should consider alternative approaches (e.g. partial isolation), and should consider, for example, location in the catchment, species present, diversion channel, and / or over pumping.

For works in a loch, you mustcheck for the presence of Arctic Charr or other rare fish species such as powan or vendace. In the first instance, the [National Biodiversity Network (NBN) Atlas Scotland](https://scotland.nbnatlas.org/) can be used to perform this check, but you may require additional expert advice to better understand the specific risks to each population of these fish.

**Result of assessment of risk**

**Low risk** means there is no spawning or fish migration in or near to the working area during the proposed working period, or risks to spawning and /or migration can be easily mitigated.

**High risk** means spawning or fish migration is possible within or near the working area during the proposed working period. Mitigation is either very difficult or can only be achieved by working in bespoke specified time period or entirely outwith the spawning and migration periods.

If the risk assessment establishes that there is a **low risk** to fish spawning and migration, there will be no condition in the permit limiting the timing of works. There will be conditions to prevent harm to fish and protect fish migration. Additional mitigation condition(s) may be included to control the risk from the works.

If the risk assessment establishes there is a **high risk** to fish spawning and migration, work in a watercourse or loch must only be undertaken during the period between 1 June to 30 September or during bespoke dates. There will be conditions to limit the timing of works, prevent harm to fish and protect fish migration. Additional mitigation condition(s) may also be included to control the risk from the works.

# Appendix 1 Typical fish spawning and egg development periods within Scottish rivers and lochs

To assist you in developing a plan for any works in the water environment, a brief summary of key factors to consider in relation to some of the most commonly encountered fish species is included below. These are also the species most likely to influence your work plan. This list is not intended to be exhaustive, either in terms of the species listed or the facts relating to each of them, but to help you determine where further information may be required to support your application, including the need for the appropriate timing of works, provision of fish passage, the need for a fish rescue(s) and / or other forms of mitigation to remove or minimise the risk to fish.

**Atlantic salmon**

Movements of adult salmon upstream to spawn can occur at any time of year, depending on the river concerned. Spawning can occur from October to January with egg development and emergence from gravels continuing through to April or May. Downstream smolt migration is typically from May to July. Atlantic salmon can spawn in all but the smallest of rivers and streams, where there is suitable substrate mix of gravel and cobbles with diameters of between 0.5 to 10 centimetres.

**Sea Trout**

Movements of sea trout upstream to spawn are typically from April to October, with spawning typically taking place from October to January. As with salmon, hatching and emergence from the stream bed continues through to April or May. Sea trout smolts migrate downstream to sea from April to July. Sea trout can spawn in streams and rivers of any size where suitable substrates, gravel and cobbles with diameters of between 0.3 to 10 centimetres, and flow conditions occur.

**Brown Trout**

Brown trout are the same species as sea trout, with the most obvious difference being that normally they do not move to and from the sea during their lives. As a consequence, they are often incorrectly thought of as non-migratory, but brown trout do move around a river or, to and from lochs, to spawn in the same way as salmon or sea trout. So consideration should be given to the requirements of brown trout in any planned works. Timings and spawning requirements of brown trout are as described for sea trout above, and note that brown trout can produce sea trout smolts.

**Arctic Charr**

The lifecycles of Arctic charr vary between and within lochs, such that in some locations spawning only takes place in streams feeding into or out of a loch, in some locations spawning only occurs in the loch (at one or more discrete depths), while in some locations spawning can occur in any of these areas. Like salmon, sea and brown trout, charr spawn from October to January with hatching and emerging continuing through to April or May. In all cases, spawning occurs in areas where clean gravels can be found.

**River Lamprey**

Spawning from April to May with egg development June to March. River lamprey will spawn in rivers of any size with a substrate of gravel with diameters of between 1 to 5 centimetres.

**Brook Lamprey**

Spawning from April to June with egg development July to March. Brook lamprey will spawn in rivers of any size with a substrate of sand or shallow gravel with diameters up to 0.5 centimetres.

**Sea Lamprey**

Spawning from May to June with egg development July to April. Sea lamprey will spawn in rivers of any size with a substrate of gravel with diameters up to 5 centimetres.

**European eel**

Glass eels and elvers upstream migration March to November. Silver eel downstream migrations June to October. Eels don’t spawn in freshwater.

**Vendace**

Spawning from November to December with egg development January to May. Vendace will spawn in loch shores with a substrate of gravel and pebbles.

**Powan**

Spawning from December to February with egg development March to May. Powan will spawn in loch shores with a substrate of gravel and pebbles.

**Grayling**

Grayling are a close relative of salmon and trout and they have similar lifecycles and breeding requirements to other salmonids, with spawning taking place in streams and rivers from April to May and hatching in and emergence in June. Grayling will spawn in medium to large rivers with a substrate of gravel and pebbles with diameters of between 0.2 to 10 centimetres.

# Appendix 2 Fish Ecology Report

This report must include, as a minimum, the following information:

### Location and fish ecology

* Site location map.
* Weather and flow conditions (including river width and depth) at the time of assessment.
* Photographs of the proposed location of activity clearly showing the bed of the river or loch (where covering larger area this should include a minimum of 3 locations).
* An assessment of overall habitat within the proposed working area, including:
	+ Details of substrate type/composition: e.g. sands, silts, clays, gravels, cobbles, boulders, bedrock.
	+ Details of any features (mesohabitat): e.g. glides, riffles, pools, rapids, chutes, slacks.
* If the working area/reach contains one or more habitat types an assessment should be made for each type.
* A list of fish species present and/or likely to be present.

### Mitigation Proposed

* A detailed description of any mitigation proposed.
* Note if the channel is to be fully or significantly isolated (greater than 25 percent of wetted channel width), an assessment of the impact on fish passage must also be provided. This should consider alternatives such as a partial or more limited isolation, or a diversion channel, and should take into consideration the location of he works within the catchment, the species present, and the length of time the channel isolation will be in place.

### Residual Risk to Fish

* An appraisal of any remaining “residual” risk of harm to fish and/or their migration as a result of the proposed works, and any taking into account any mitigation proposed by the applicant, must be provided.
* If a risk of harm to fish, including their spawning and emergence, or an impact on their ability to move through or past any works, is concluded, further details should be provided. This would include outlining whether or not any other suitable mitigation could have been included to minimise any residual risks, and if so outline why these have not been included as part of the proposed works.

### Additional Information

[Appendix 1](#_Appendix_1_Typical) provides a list of the main spawning and emergence periods by species that you may find helpful in completing a Fish Ecology Report. This list of species is not intended to be comprehensive, but rather to highlight those species most likely to dictate the timing of, or mitigation appropriate for, any works.

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