



With Beaver translocation licence application(s) on the imminent horizon ([link to TFL proposal](#)) here is a summary of what we know in relation to Beaver- Atlantic salmon and trout interactions in Scotland which may help proprietors and land-owners in the catchment make informed responses to consultations.

Background

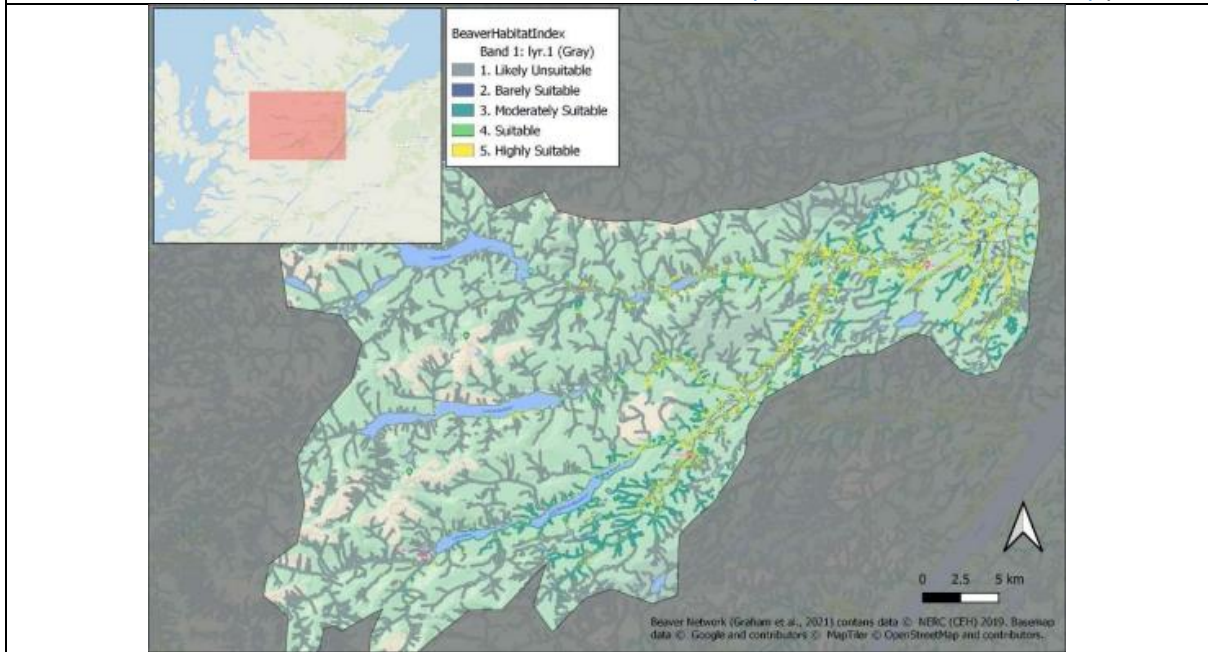
Beavers (*Castor Fiber*) and Atlantic salmon (*Salmon salar*- salmon) co-existed up until Beavers were hunted to extinction likely before the 16th century, Beavers and salmon continue to co-exist in other countries such as Norway and areas including Scandinavia where beavers are actively managed. Beavers are already known to occur in the catchment in a coastal burn and from Cannich downstream to the estuary (Naturescot 2021 survey). A couple of lodges occur along the edges of slack water. In Scotland, Beavers are well known to occur on the Tay, Forth and Earn catchments and are likely to occur in low numbers on other catchments. Hydro dams are proving significant barriers to movement. We are currently experiencing challenges associated with Biodiversity loss and Climate change, and a downward trend in returning adult salmon numbers likely due to reduced marine survival.

Habitat preferences

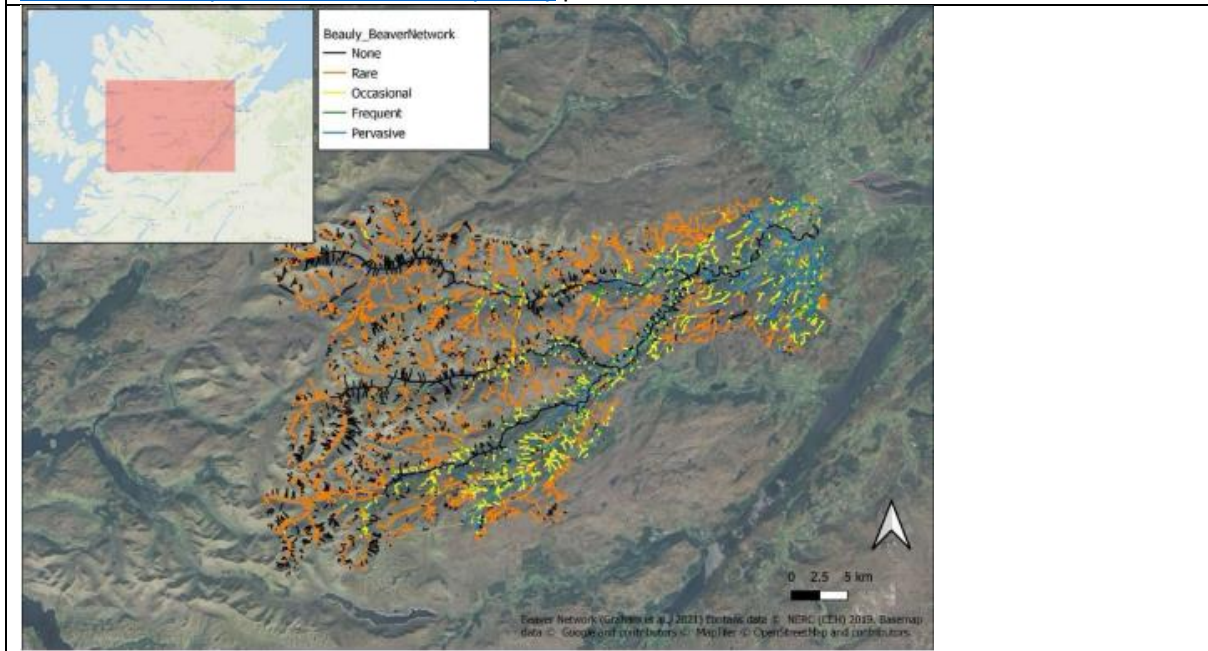
Beavers eat deciduous trees and various aquatic and emergent plants (when available in summer). Beavers require riparian broad leaf trees and a gradient of less than <2.5% to build dams and predominantly dam watercourses <6m wide. The gradient required to build dams overlaps with salmon and sea trout spawning. Beavers generally create wetland habitat and thin woodland. The size of burns they prefer may make them more likely to interact with trout/ sea trout spawning areas than salmon. Families defend territories that vary in size relative to the quality of habitat and other factors. Beaver colonies can exist without creating dams.

The [Glen Affric, River Glass and Beauly Catchment Feasibility study](#) (2022) highlights areas of beaver habitat and suitable gradient for damming in the Beauly catchment.

Beaver Habitat Index map of Beaully Catchment (based on vegetation distribution, and proximity to watercourse) taken from [Glen Affric, River Glass and Beaully Catchment Feasibility study](#) p12.



Beaver Dam Capacity map of Beaully Catchment (based on gradient) taken from [Glen Affric, River Glass and Beaully Catchment Feasibility study](#) p15.



Benefits to Salmon and Trout

The [Beaver Trust](#) has links to a range of information. Benefits include:

Increased abundance of aquatic invertebrates (fish food) in the form of chironomids, water beetles, dragonflies, and damselflies through wetland creation. These form a prey base for many species. This has been shown to benefit trout, could this also benefit salmon?

Creation of dams/ ponds that hold water back may lead to improvements to base flow during low precipitation periods (although this may be offset by smaller wetted widths downstream of dams at other times).

Better water quality, silt traps created may improve substrate quality below dams.

Beavers are likely to improve the hydro-morphology of streams that are embanked or straightened by re-connecting burns with their floodplains.

Creation of fish refuges and thermal refuges (large brown trout habitat).

Other benefits

Increased habitat diversity (and species diversity at landscape scale), through the creation of wetland and coppiced woodland (ground flora, invertebrates, amphibians, birds, mammals e.g. water vole).

Natural flood management.

Managing Conflict in Relation to Fish

Naturescot provide a [Beaver Mitigation Scheme/ advice service](#) and assess options for landowners on a case-by-case basis. Various mitigation can be applied such as removal of dams depending if dam is associated with a lodge (licence not necessary if <2 weeks old), metal tree guards, water gates, translocation, lethal control etc... These mitigation options are important to avoid the worst conflict beaver introduction may pose as beaver's natural predators are currently absent from the Beaulieu catchment.

On the Tay, out of 200 potential High concern management issues just 4% were associated with fishing/ recreation/ amenity (35% associated with agriculture, 40% associated with deciduous/and coniferous woodland [high value trees/ areas of limited regeneration]).

Riparian trees- The shade provided by riparian trees helps to keep water cool for salmonids. Trees also provide a valuable source of food for salmonids through providing a large surface area for invertebrates who can fall into the water. Knapdale showed 8.4% of trees were felled in 30m riparian zone over a period of 4.5 yrs. Beavers show preferences for specific tree species. For example they prefer aspen and willow to alder. The Beaulieu catchment has a predominance of alder which is not favoured by beavers.

Re-growth can depend on the presence of other herbivores (e.g. deer) nibbling re-growth so keeping deer numbers down can help re-generation. They fell most sizes of tree but tend to choose stems <10cm within 10m of a watercourse. Herbivory will vary with distance from the lodge. A predominance of younger trees and open grassy areas are created. Most vulnerable areas would be where tree cover is sparse already.

-**Loss of spawning and fry habitat** caused by damming/ creation of wetland/ siltation in burns.
Possible loss of gravel supply downstream of large dams.

-**Possible fish migration issues** (although from a current beaver site in the Beaully catchment on small burns, side channels have been created and dams shift about every few years), also Norway study did not show an impact on juvenile salmonid movement ([Malison and Halley 2020](#)). Damming of existing pinch points may be detrimental.

-Decreased dissolved oxygen and changes to thermal regime.

-Undermining and erosion of river banks by burrowing (Tay)- possible silting of salmonid spawning substrates.

Other Freshwater Species:

-Fresh water pearl mussels (FWPM) occur in the catchment on the mainstem. They rely on salmon and trout to host their larvae. If salmon or trout distribution changes FWPM distribution is also likely to change, but this may be unlikely in the Beaully as beaver damming only occurs on tributaries.

-Eel migration unaffected by dams, pool habitat created.

-River and sea lamprey passage affected by dams (brook lamprey ok overall as they often occur above barriers anyway).

-Increase in Minnow, Stickleback, Pike and cyprinid habitats. Increase in amphibian habitat.

Wider context

Scottish beavers are a European Protected Species (since 2019) and their management is guided by the [Beaver Management Strategy](#). Politically, the trans-location of beavers is popular and provides an alternative mitigation to the lethal control method. **Scotland's Beaver Strategy** is due to be published shortly. We provided comments through FMS (Fisheries Management Scotland) on the strategy. The draft document recommends that extensive public consultation and baseline surveys are done prior to local re-introduction, and recommends support for management organisations and landowners But what will this look like in practice?, Will there be support/ funding available to cover any extra work the board and others may have to carry out e.g. checking burns and removing beaver dams in sensitive areas?

-Beavers can bring economic and social benefit especially in the short term through initial boosts to eco-tourism.

-If national funding structures were tweaked it may ease potential conflict between land-owners and beaver presence.

What are the Beaully Fishery Board Doing?

-We will maintain good communication with TFL and try to minimise the impact that likely beaver releases may have on Atlantic salmon through supporting proprietors/ landowners where we can.

-We will respond to TFL's (and other possible future) consultation(s), and make these responses available to proprietors.

-This summer we are gathering electro-fishing baseline data with The Beaver Trust, UHI, and Trees for Life to try to understand better the interactions between beavers and fish. We hope to carry out invertebrate kick sampling, eDNA sampling and trout fry sampling (for future isotope analysis). In

future, genetics work may be done to see how salmon genetics change in response to beaver introductions.

-It is likely to take a few years for widespread ecosystem modification to occur (perhaps more than a decade), and we will work with proprietors to remove dams in lower-middle reaches of burns ahead of fish migration periods to reduce possible conflict with migratory salmonids. This work will be especially important at the top of the catchment, areas utilised by the diminishing spring fish component.

Main impressions of TFL proposal after site visit with Beaver Trust (16 Sep 2022)

The following insight is based on informal advice. Actual beaver behaviour may vary widely from that anticipated.

It is likely that beavers will mostly stay/ lodge on the mainstem and venture into tributaries for foraging only. Ground truthing has shown limited damming potential in most tributaries due to their rocky nature and the steep sidedness of the Beaully catchment. A predominance of Alder in the catchment is also advantageous in relation to maintaining riparian woodland in relation to fish.

Overall most salmon spawning happens on the mainstem and overall returning adult salmon numbers are unlikely to be affected although distribution of juvenile salmon may change if salmon are unable to access certain tributaries at certain times.

-Affric- no damming capacity and little marginal vegetation so beavers likely to spread out from here in search of better areas, although some are likely to stay due to presence of marginal vegetation and birch. Beanevean hydro-dam may slow their dispersal down.

-Glass and Beaully -preferable to beavers compared to Affric. Easily eroded bank is vulnerable to burrowing. Tributaries of the A.Deabhag where there is excellent spawning and juvenile salmonid habitat a possible conflict area- further assessment required.

Areas of sparse tree cover e.g. lower Glass and Beaully where there is just a single line of old trees (possibly poor regeneration potential) especially vulnerable, although the limited tree cover is not particularly attractive to beavers (and a lot of it is alder).

Belladrum and Bruaich burns: generally too rocky for burrowing and too wide for year-round dam structures so fish passage and spawning habitat unlikely to be affected. **Culburnie burn and its tributaries are small with shallow gradient with presence of ash, hazel and birch so are more likely to see damming and foraging activity.**

Teanassie burn/ between Aigas and Kilmorack dams: If beavers get there they are most likely to lodge in the banks of the mainstem and use Teanassie for foraging. Seasonal damming is possible.

Erchless burn: Wet willow woodland at the bottom of Erchless burn looks like good habitat for beavers but damming on the burn itself is unlikely. The few large trees in proximity to the burn also make foraging sub-optimal.

Eskadale burn: Seasonal damming is possible. As beavers are not using Eskadale burn already (despite being on the mainstem) perhaps trees are too sparse to be good foraging habitat.

Culligran burn (Farrar): Too spatey and wide for damming, predominance of alder makes this burn less desirable for foraging.

For context:

Approximate estimated potential loss of salmon spawning area if all-year round damming occurs: 0.5- 1% (minimum estimate includes the bottom of Culburnie burn, Kennel and Home burn, Allt Coilte, Glass burn).

Approximate estimated potential loss of Sea trout spawning area if all-year round damming occurs: 30-57% (minimum estimate includes Culburnie and Black burn, Kiltarlity ditch, Top and middle Allt an Loin, Allt Dearg).

Recommendations:

-Riparian restoration across the catchment (10m buffer zones) is recommended to reduce grazing and erosion pressure and make banks more resilient to beaver burrowing etc (especially on Glass, Beauly and upper catchment). Buffer zones can bring multiple benefits and grants are available.

- Tree guarding or tree painting (with sandy glue) recommended to protect old trees on the Glass and Beauly (just in case).

-Work with others to maximise the learning potential of the situation. E.g. Explore if sea trout and brown trout populations are affected by the presence of beavers in the Belladrum sub-catchment. Will there be a switch from a sea-trout dominant to brown trout dominant life history strategy due to altered habitat and abundance of invertebrates? Will there be any change to salmon genetics in relation to damming?

There is currently no evidence that the presence of beavers in the catchment will benefit Atlantic salmon or sea trout, but wider ecological gains are likely to be had and we will work with others to understand this interaction better. Wider ecological gains may benefit salmon in the long term but this has not been documented yet.

Please get in touch if you have any questions: ruth@beaulyfisheryboard, 07391553647.

Beaver knowings, Downie beat, Lower Beauly, May 2021



Sources of information:

The [Beaver-Salmonid Working Group](#) (BSWG) report (2015) and [Tayside Beaver Study Group: Final Report](#) (2015) fed into NatureScot's [Beaver in Scotland report](#) (2015). This was a comprehensive report, based on the Scottish Beaver Trial (Knapdale) and Tay- Section 3.4.7 'Fish' and 4.2 'Fisheries' are particularly relevant.

In 2017 the [Scottish Beaver Forum](#) was created (made up of various organisations and landowners to help guide NatureScot) and recently an update on Tay beavers was provided [NatureScot Research Report 1274- Survey of the Tayside Area Beaver Population 2020-2021](#)- this makes useful reading. Estimated territory numbers on the Tay have gone from 39 in 2012 (114 in 2017/18) to 251 in 2020/21.

[Rob Needham's](#) study- This study occurred in the Beaully catchment on two small trout burns close to each other. The results showed that **Brown trout in the beaver modified environment were bigger (length and weight) with greater parr numbers** when compared to the burn without beavers. This is consistent with the creation of pools (adult trout habitat) and greater abundance of aquatic invertebrates.

[Spey study](#)- This study analysed sediment cores from Loch Insh (Spey) for a specific nitrogen isotope (a proxy for marine derived nutrient i.e. returning salmon) and showed salmon abundance for the last 2000 years in the Spey to be mostly determined by North Atlantic sea surface temperature and exploitation rates. **The presence/ absence of beavers did not affect the historic abundance of salmon in the Spey.**

On the **Tay**- actual data pertaining to the impacts on salmon is lacking but the undermining of banks, bridges, flooding of farmland, and damming at pinch points (e.g. the top of waterfalls/ fish passes/ culverts etc) has been observed.