Rivers of LIFE

ecostreams

ecosystem based restoration and management of boreal rivers

River restoration using excavators

Restoring rivers previously used for timber transportation

Life

NATURA 2000

Why restore the rivers?

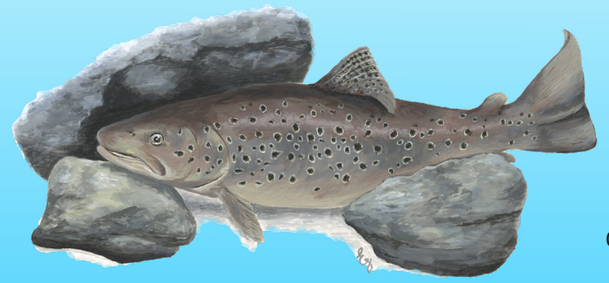
In Northern Sweden nearly all rivers were used to transport timber, from the largest rivers to the smallest streams. Timber was floated down long stretches from far inland all the way to the coast where Swedens largest sawmills were located.

The clearing and straightening of rivers to facilitate timber floating has resulted in a loss of natural variation; for example, through increased water velocities and a change in river bottom topology. The clearing of rivers created a more homogenous environment for aquatic plants, insects and fish. The biodiversity of our rivers and streams has decreased and the condidtions for life have deteriorated in our waters.

Clearing stones and boulders from a river with the help of a bulldozer to allow easier floating of timber.

Today river restoration is a common nature conservation measure. The goal of restoration is to recreate those habitats in and around the river that existed before the timber floating era. This is achieved by placing the cleared stones, gravel, trees and large boulders back into the river environments.

This type of conservation measure often provides quick and positive effects to those species which have their life cycles connected to river habitats. Nonetheless, it can take a long time before population sizes increase significantly.



Öring (*Salmo trutta*)

River restoration recreates a variety of formerly lost habitats that could be compared to furnishing an empty house. Many animals and plants require different habitats and in a heterogenous river there is space for a larger variety of species. Many species contribute not only to an increased biodiversity but also provide more food for example trout, grayling, otter and not least the sporting angler.

Fresher water

Water quality can also be improved following restoration measures through a general decrease in water velocity. If water remains longer in the river due to an increased heterogenous bottom topology then small aquatic organisms and plants have more time to break down and assimilate particles and nutrients. The number of animals and plants increases when more habitat becomes available through restoration which results in an even more effective water purifying process. Nutrients are converted and maintained in the river food web instead of being transported to lakes or the ocean.

Freshwater pearl mussel (*Margaritifera margaritifera*)

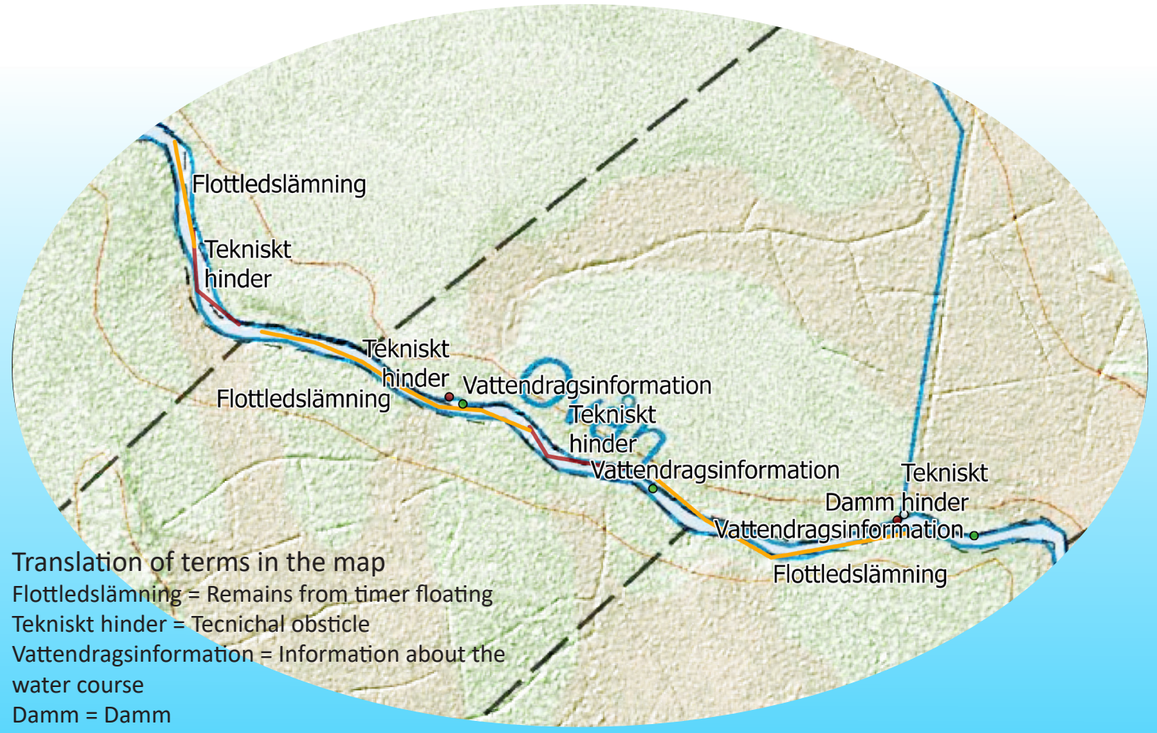
The freshwater pearl mussel is an effective filter that contributes to the purifying of our waters. The freshwater pearl mussel requires sand, gravel and smaller stones to allow it to dig down into the bottom substrate of the river. Such small material is often absent in rivers used for timber transport as it gets carried away due to the unnaturally high water velocites produced through the clearing of the river channels.

River restoration in practice

Restoring a river usually involves working with an excavator to help move large boulders and stones. In smaller streams the work can be carried out manually with the help of tools and winches.

Before restoration commences

Before restoring a river trained field workers walk long stretches of the river and survey and map the different walls and structures that were built to ease the floating of timber. These surveys show how large the impact of floating has been on each river and the planning for each restoration measure can begin. If an excavator is to be used then access paths to and from the river must be planned as well as where refueling of the machine can occur during the course of the work. It is important that the access roads to the river do not negatively impact on the natural surrondings by, for example, leaving deep machine tracks in the ground.



Translation of terms in the map
Flottledslämning = Remains from timer floating
Tekniskt hinder = Tecnichal obsticle
Vattendragsinformation = Information about the water course
Damm = Damm

The map shows an example of the information that gets collected during field surveys before restoration can begin. Points and lines are drawn to show the location and size of different restraining walls built for timber transport on the river. Mapped objects are linked to their respective photographs taken during the field visit to help in the planning of different restoration works.

River restoration with an excavator

The restoration approach to return removed blocks and stones to a river is very specific to each stretch of river and differs from case to case. The amount of trees that can be used as large woody debris in the river and the amount of gravel and stone that has been removed along each stretch of river can vary enormiously. Therefore each restoration measure begins with a unqiue set of challenges and local conditions. Typically the work will involve widening the river, raising its bed and recreating meanders and curves that have been previously canalised during timber transport. By building up the river bed there becomes a greater connection between the river channel and its surronding environment, recreating a more natural buffer area between the aquatic and terresterial environments. The excavator dismantles the canalising walls on the river's edge and returns the stone material to the channel. An ecological clerk of works is onsite at all times to lead the excavator driver and see that the work is completed with the desired improvements to the natural environment.

An ecological clerk of works is actively engaged during the whole process and instructs the excavator driver how the stones and boulders are to be placed in the river to give the best natural results, Agnelån Jämtland county.

The excavator operater and the clerk of works, work together, starting at the top of the river stretch and working downstream. The illustration shows a restored stretch upstream the excavator and an unrestored timber floating stretch downstream from the machine. Along the unrestored stretch of river only coniferous trees grow, some years after restoration there will be bushes, shrubs and decidious trees along the buffer zone of the river.

Restoration always starts at the top of a stretch and then work progresses further and further downstream. The excavator normally conducts the work from within the river channel itself. This is necessary to complete the work in such a way that the river and its floodplains can be as natural as possible. If the excavator only worked from one side of the river bank instead of being in the water the risk of leaving deep machine tracks in the ground increases. Machine tracks near a waterbody increase the risk for sediment to leak out into the river. Having the excavator in the water also makes it easier to reach material from both sides of the river.

The ecological clerk of works constantly checks that the newly restored river upstream from the excavator has recieved the desired result, with different water velocities, water depths and a heterogenous river bed. The work, quite simply, creates a variety of habitats that were once present in the river before timber floating. Recreating the habitats supports a wider range of species which had once called the river home.

The environmental impact of restoration

While the excavator is actively working the turbidity of the river increases. However, this is a relatively short-lived impact with the finer material settling in the downstream slower deeper stretches of the river and in the connecting lakes. Turbidity caused during restoration can have a temporary negative effect on both animals and plants. However, the impact is much less than the existing degradation of the river ecosystem with the destruction and removal of many habitats that species rely on to survive. To protect fish populations no restoration work is carried out during the spawning periods and during the hatching periods of the fish eggs in those rivers where spawning is expected.

After restoration when the cleared stone material is reintroduced into the river channel the newly opened riparian buffer zones will look quite different. An important part of restoration is that the river is allowed a more natural connection to its riparian zones. With time, bushes and decidious trees will recolonise these zones along the river's edge and will provide protection, shadow and food to the river's bottom dwelling animals and insects.

Kolarsjöbäcken Gävleborg county, directly after restoration the riparian zones can be muddy and look like a construction site. However, the decidious trees, bushes and shrubs will soon colonise and contribute with food and protection to the river's small organisms.

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Länsstyrelsen Västernorrland

Länsstyrelsen Gävleborg

Länsstyrelsen Västerbotten

Produced with the financial support from the European union´s LIFE programme.

Project number: LIFE18 NAT/SE/000268 and LIFE19 NAT/SE/000333
The project Rivers of LIFE is responsible for the content of this product, and it may not necessarily represent the views of the EuropeanCommission. This product is produced with economical supportfrom the European Union financial instrument Life.

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Layout & text: Elin Götzmann, Pierre Samuelsson and Anna Rost.
Cover photo: Restoration with an excavator at Lögdeälven, Gustav Fält.
Illustrations: Elin Götzmann
Photos: Bulldozer, Västerbottens museum.
Freshwater pearl mussels Pierre Samuelsson.
Clerk of works and excavator, Elin Götzmann and
Kolarsjöbäcken after restoration, County administrative board Gävleborg.