

ReBorN Restoration of Boreal Nordic Rivers

A LIFE project which restored watercourses heavily affected from the timber floating era.

*Co-financed by the European
Commission's LIFE instrument*



LAYMANS REPORT
LIFE15 NAT/SE/000892

ReBorN - "Restoration of Boreal Nordic rivers"



COORDINATING BENEFICIARY
County Administrative Board of Västerbotten

COUNTRY - REGION
Sweden - Norrbotten and Västerbotten counties

PROJECT PERIOD
7 july 2016 - 31 march 2022

TOTAL BUDGET
13 052 87 EUR

EU FINANCING
7 829 810 EUR (60%)

WEBSITE
<https://www.rebornlife.org>



Scan the QR code with your
smartphone to get to the website

BENEFICIARIES AND CO-FINANCERS

LIFE programme of the European Union, County Administrative Board of
Västerbotten, County Administrative Board of Norrbotten, Swedish Agency for
Marine and Water Management, Swedish Forest Agency,
Nordmalings municipality, Gällivare municipality



**Länsstyrelsen
Västerbotten**



**Länsstyrelsen
Norrbotten**

**Havs
och Vatten
myndigheten**



**Nordmalings
kommun**



GÄLLIVARE

ADDITIONAL CO-FINANCERS

Arvidsjaurs municipality, Bodens municipality, Jokkmokks municipality, Piteå
municipality, Älvsby municipality, Luleå municipality, SCA Forest AB, Sveaskog AB

Photos in the report

Where	What	Photographer
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Methods and achieved goals

With the help of excavators, rocks and boulders have been returned to the water. Large wooden debris have been laid down as they provide food to insects, protection to small fish fries and create a varied environment in the water.

Special hand tools have been used to move rocks, boulders and gravel but also to create spawning grounds for fish species.

Project objectives and background

ReBorN LIFE aimed to restore watercourses heavily affected by timber floating measures in Norrbottens- and Västerbotten counties. The cleared watercourses served as a transportation route for timber logs during the timber floating era.

Several animal and plant species suffered in the cleared environments. Today, many of the species are endangered. The restoration of watercourses gives nature the conditions to recover.

**243
km**

Restored watercourses
Aim: 202 km

109

Hectares restored water
habitat

14679

Created spawning grounds
Aim: 2300



Improve habitat for target species
Atlantic salmon, freshwater pearl
mussel and otter

4

Demonstration sites
established. Aim: 4

i

Dissemination of the project. 121
meetings with 9640 participants



The importance of restoring watercourses

During mid 19th century, the large-scale timber floating operation began. The waterway was the best option to transport timber from the forests to the coastal industries.

To facilitate the route for timber, the watercourses was cleared of blocks and boulders and even straightened. The altered watercourse was more narrow, straight and had a high water velocity. As a result, habitats for animal species such as fish, freshwater pearl mussel and other insects disappeared.

Some of the remains from the timber floating era have a high cultural-historical value and need to be preserved. The project has taken this into account by saving valuable environments.



Example of remains from the timber floating era.



Stone pier

Riverbank stabilization structure

Cleared reach

Here, one side of river
Långträskälven has been
cleared of rocks and boulders
to facilitate the timber floating
operations...

Untouched reach

...while the opposite side was
left in its pristine condition.

Completely untouched
watercourses are rare in
northern Sweden as most
watercourses have been used
for timber floating.



Forestry impact

Not only have the timber floating operations left a negative impact on the watercourses, the forestry have also contributed. Even today, forestry can lead to negative environmental impact if not sufficient measures are taken. Without these measures, habitats for fishes and other species which lives in- and close to the water is at risk.

The *quality* of water can also be affected. Stream crossings without some kind of bridge, and rutting close to streams may cause erosion and transport of sediments, nutrients and heavy metals from the soil to the water.

121

MEETINGS

9640

PERSONS
REACHED

ReBorN and the forest

Numerous information meetings have been arranged within the project. Swedish Forest Agency has informed how good environmental consideration to water environments can be accounted during forestry actions. Landowners, forest companies, NGOs and various associations have participated during the meetings.



The project has developed four demonstration sites with information signs about consideration to aquatic environments and restoration of watercourses. The information is based on the forest sector's common targets for good environmental consideration.

The demonstration sites have windbreaks and fireplaces in a scenic environment and provides nice areas for excursions and recreational activities. However, if you can't visit them physically, you can do so digitally.



Would you like to visit a demonstration site? Scan the QR-code for directions or to make a digital visit.



Restored watercourses

The benefits for species and habitats

The measures taken in projects such as ReBorN are important pieces in the work of restoring habitats for endangered species. All areas restored within ReBorN are so-called *Natura 2000 areas*. The target species within the project are otter, freshwater pearl mussel and atlantic salmon. Other animal and plant species that lives in and around the watercourses also benefit from the restoration.

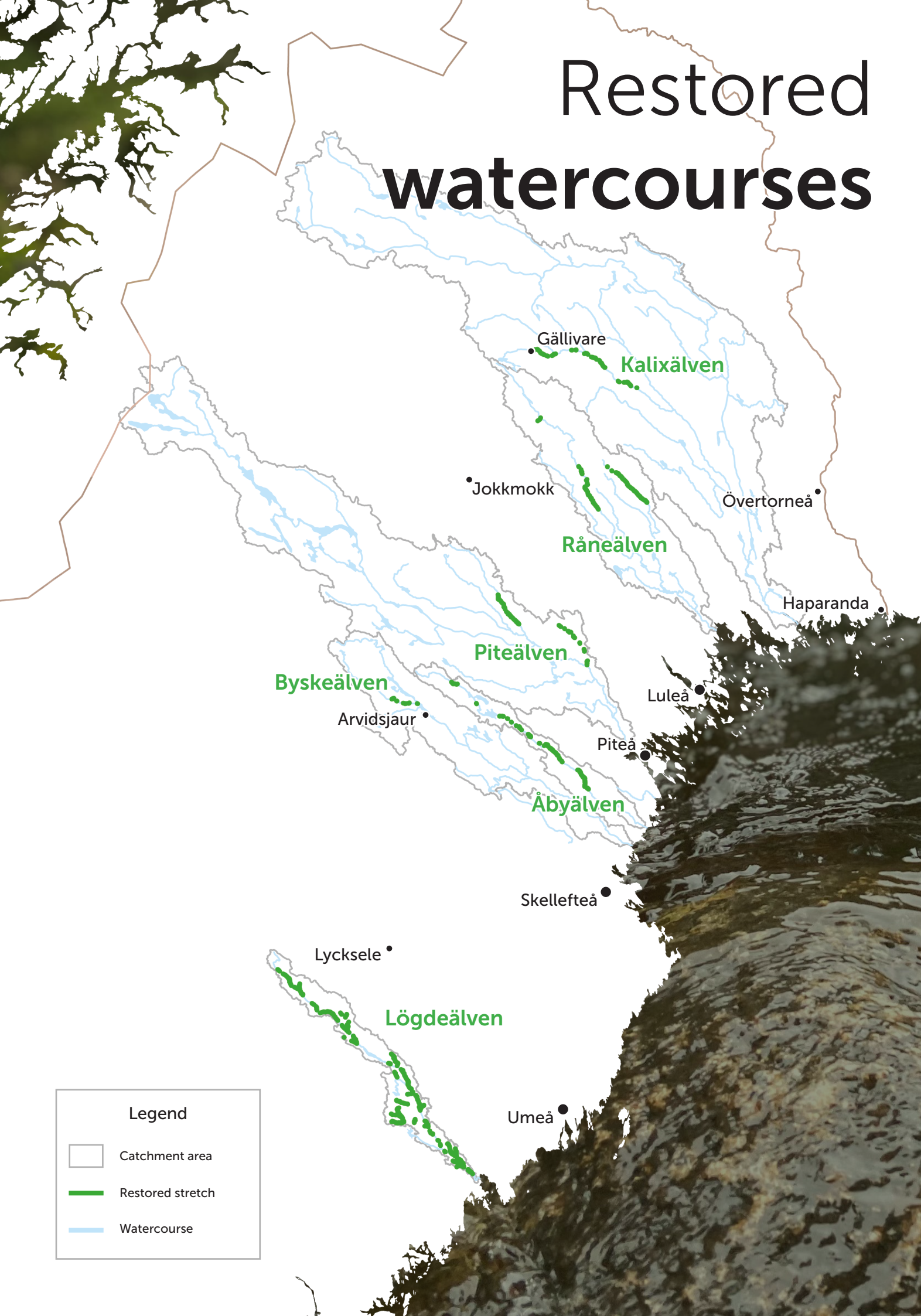
The work within ReBorN is also a major step towards achieving national environmental goals and contribute to the watercourses achieving *good ecological status* based on the EU Water Framework Directive.

Natura 2000

Natura 2000 is a network of protected areas within the entire EU, containing rare natural habitat types and core breeding and resting sites for rare and threatened species. The aim of the network is to ensure the long-term survival of valuable and threatened species and habitats.

EU Water Framework Directive

Is developed by EU to create a common management of the member states waters, where same rules and assessments apply to all member states. The purpose is to take care of our waters for the future.



Target species: **Otter (*Lutra lutra*)**

The otter is a lissom animal, adapted for a life in water. The otter leaves marks along its home areas by placing droppings on top of well-chosen rocks.

Ditching of lakes and wetlands, incorrect size and position of road culverts and the expansion of hydropower plants have changed and even destroyed the otters habitats. Therefore, it is particularly important to preserve and restore water environments which can constitute as good habitat for otter to strengthen its future.

Otter facts

- can grow up to 90 - 140 cm long
- weighs between 7 - 12 kilos
- dark brown fur with lighter neck
- have webbed toes
- eats up to 1,5 kilos of fish a day

58 %

**INCREASE OF SITES
WITH OTTER ALONG THE
PROJECTS WATERCOURSES**



Target species: Atlantic salmon (*Salmo salar*)

The Atlantic salmon is a species living in both freshwater and the sea. Salmon fry hatch in the river where they spend their first years before it is time to migrate out to the sea. After a couple of years eating and increasing in size at sea, the salmon migrates all the way back to the same watercourse it was born in, to spawn. Salmons are dependent on watercourses without migration obstacles as the migration is a vital part of its behaviour.

With national monitoring programs of Atlantic salmon and data from fish counters, the project has been able to document how the salmon reproduced and migrated within the project rivers.

Climate, diseases, management in both sea and rivers together with the salmon's long generation cycle are factors making it difficult to draw conclusions about the project's impact on salmon stocks. The national monitoring program will continue to monitor salmon populations and its development. Read more in chapter *After LIFE* on p. 34.



Salmon life cycle

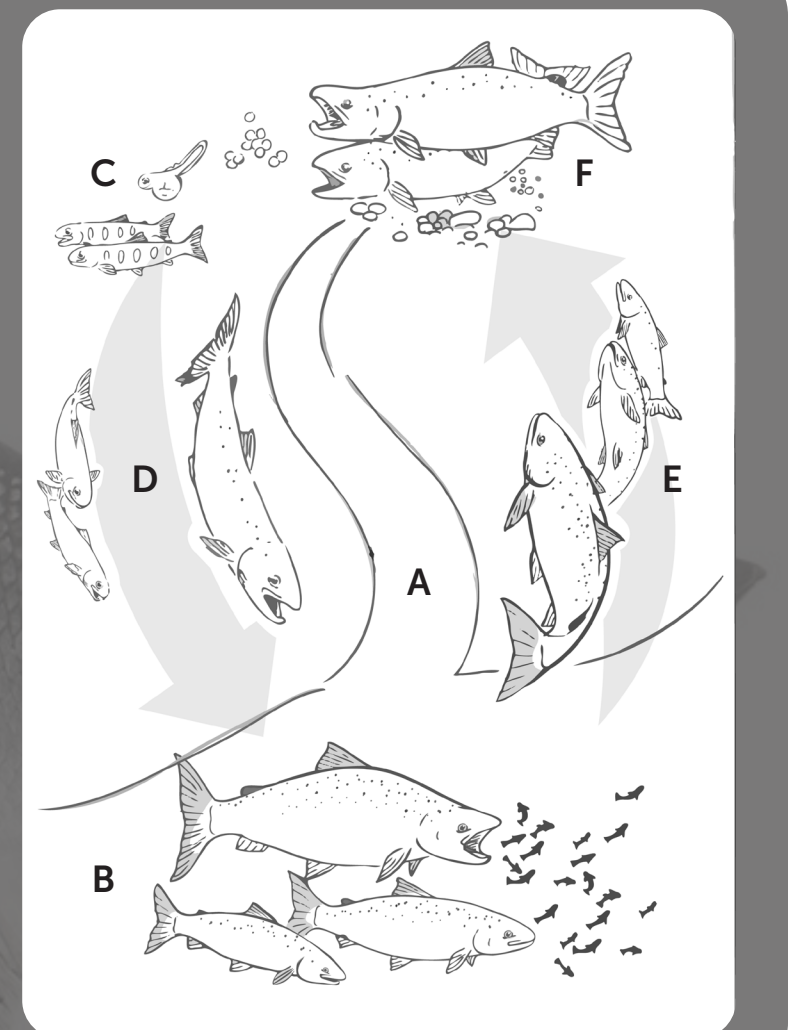
- A** Watercourse
- B** Sea
- C** Hatched fry and parr
- D** Downstream migration of smolt and kelt to the sea
- E** Upstream migration of adult salmon
- F** Spawning (reproduction)

Fry - newly hatched salmon

Parr - young salmon living in the watercourse

Smolt - salmon migrating to the sea

Kelt - adult salmon migrating to the sea after spawning





Target species:

Freshwater pearl mussel (*Margaritifera margaritifera*)

The freshwater pearl mussel is one of the most long-lived species in the Swedish fauna. The oldest documented mussel was about 280 years old. The freshwater pearl mussel is endangered (EN) according to the IUCN red list. Without measures to preserve it, its future is uncertain. The mussel is dependent on the presence of Atlantic salmon and/or brown trout in the same watercourse for its reproduction. The mussel larvae, called *glochidia larvae*, lives as a parasite on the fish's gills during its larvae stage.

ReBorN have investigated the infection-rate of mussel larvae on the gills of salmon and trout. Surveys of this kind are done by electrofishing young salmon and trout and counting the number of larvae on their gills. After examination, the fishes are released back into the water. It has not been possible to see any change of the mussel distribution during the project duration. However, valuable information have been collected for future studies.

#1

**FIRST NOTED ATTACHMENT
OF GLOCHIDIA ON SALMON
IN SWEDEN**

ON AN
AVERAGE

17

ACTIVE
EXCAVATORS
EACH YEAR

The excavator bucket has a grid with a grip function allowing:

- Rocks and boulders to be lifted with precision
- Trees to be put down in the watercourse
- Gravel can be layered through the grid
- Vegetation to be lifted more gently
- A decreased turbidity of the water during work

Method: Mechanical restoration

The work with the excavator is led by a foreman with biological knowledge. Together with the operator they decide the shape and formation of the watercourse during its restoration.

243
km

RESTORED
WATERCOURSES

The clearings made during the timber floating were done with all from hand power, horse power, winches, bulldozers to dynamite. Due to the extensive efforts clearing the watercourses - similar efforts is needed to restore them.

A photograph of two men in waders working in a stream. They are using long-handled tools to move rocks and create spawning grounds. The man on the left is wearing a green jacket and the man on the right is wearing a dark jacket. Both have patches on their sleeves. The water is shallow and rocky.

14 679

CONSTRUCTED SPAWNING GROUNDS

Method: Manual restoration

Parallely with the excavator work, rocks and smaller boulders can be relocated with special hand tools. The tools can also be used to loosen the packed river bottom and create spawning grounds for the fish. This approach is called the Hartijoki method. Manual restoration is also particularly suitable in small watercourses where large machines do more harm than good.

Salmon and trout need gravel beds in the streams to be able to reproduce. In the watercourses of northern Sweden, there is often a great shortage of spawning grounds as the gravel has been flushed away to varying degrees. In some sections, new gravel needs to be redirected to the area if it is not possible to find it in the surroundings.



48%

**OF THE PROJECT'S FOLLOW-
UP SPAWNING GROUNDS HAVE
BEEN USED BY SPAWNING FISH**

Spawning salmon

The female salmon selects a suitable spawning area and awaits the male's courtship. When she is content with the male swimming by her side, the female digs a pit by whipping her tail fin in the gravel. The male gives of his milt simultaneously as the female lays her eggs in the pit. The fertilized roe grains lie protected in the gravel all winter until they hatch during spring.

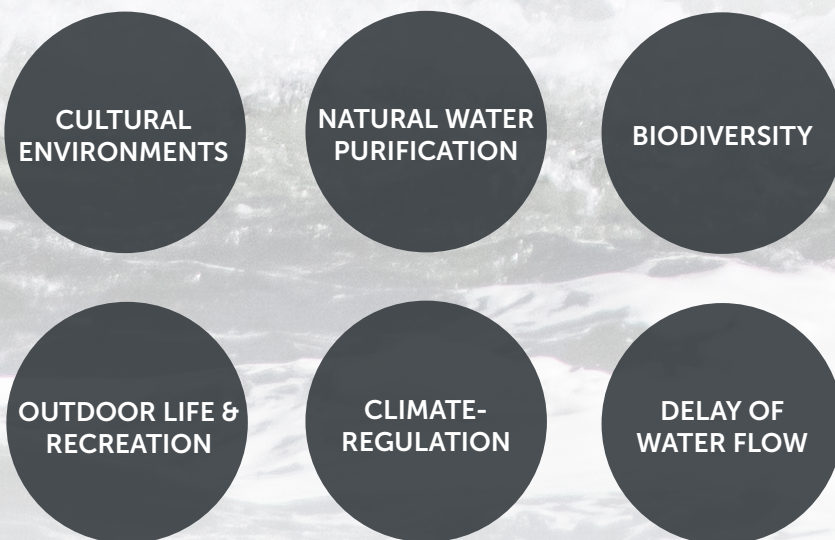
Monitoring of spawning grounds

During restoration, 14 679 spawning grounds were created. The function of the spawning grounds has been followed up by documenting spawning fish from land and with the help of water binoculars, it is possible to see if the gravel has been excavated by a fish.

Assessment of benefit and effect

ReBorN has not only contributed to great commitment, knowledge building and pride among participants, other stakeholders and the public. The restoration of natural watercourses also contributes to a thriving landscape with a rich wildlife, pulsating water and recreation in outdoor environments. For the community, the areas along the rivers can be a magnet for tourism and contribute to a positive rural development.

In the final phase of the project, an evaluation with the aim of assessing and valuing *ecosystem services* was linked to the project's measures. After restoration, watercourses can offer a range of necessary ecosystem services such as:



"Ecosystem services are all products and services that nature's ecosystems give to us humans and that contribute to our welfare and quality of life. "

Source: The Swedish Environmental Protection Agency

A valuable ecosystem service that is found in restored watercourses is that high water flows are subdued and the water velocity decreases. When watercourses flow more slowly through the landscape, the effects of extreme drought are moderated as more water can be filtered down to the groundwater. With a slower pace, natural water purification becomes more efficient. And as a result - we get more pure water.

Monitoring of Rewetted areas

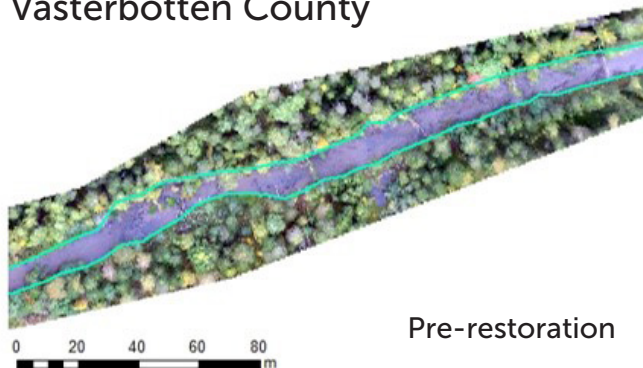
In many sites, the watercourses have been narrowed to facilitate the timber's passage during timber floating. By relocating rocks and boulders to the watercourse during the restoration, its width increases to a more natural level. This also increases the extent of the water surface. Cut off tributaries are reopened and the connection with the riparian zones is restored. The riparian zones holds important ecosystems which are homes to many different species.

With the help of drones, before and after images of the watercourses have been collected and to analyze changes in the wetted areas.

109
hectares

**INCREASE OF
AQUATIC HABITATS**

Mjösjöån
Västerbotten County



Pre-restoration



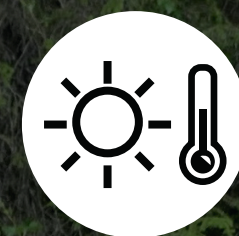
After restoration



Monitoring of geomorphology and hydraulics

Umeå University conducted a study which examined restoration impact on channel form, complexity and flow velocity variation.

Data have been collected at a total of eight locations in Lögde river mainstem and tributaries in the county of Västerbotten.



IMPORTANT FUNCTIONS IN A CHANGING CLIMATE

The natural processes of restored rivers have important functions in a changing climate. For example, the riparian zones can retain water in the landscape more effectively during dry periods and absorb more during high flows.

The results clearly show that the river stretches got wider after the restoration, had a more meandering course and have become more heterogeneous, i.e. more varied.

The restoration has created conditions for the watercourses to regain their natural processes which got lost during the floating era.

After LIFE

The work of restoring watercourses will continue in other projects after ReBorN's completion. This type of nature conservation measures have been identified as high priority at regional, national and international levels.

The restoration of watercourses is a measure required to be able to achieve several of Sweden's environmental goals, The Global Goals within the 2030 Agenda and achieve good ecological status in accordance with the EU Water Framework Directive.

The County Administrative Boards regular environmental monitoring of freshwater investigates water chemistry, eutrophication, acidification, environmental pollution and the presence of metals. Fish, benthic fauna, aquatic plants and macrophytes are also sampled.

Salmon and sea trout are monitored in several of the watercourses in which they are reproducing. This is done by electrofishing of younger individuals and assessing population changes.

The County Administrative Boards are also responsible for monitoring and implementing measures to protect endangered species. More than 150 species and habitats have an action program, including the freshwater pearl mussel and otter, which have been target species in the ReBorN project.

Sweden's environmental goals



Flourishing Lakes and Streams



A Rich Diversity of Plant and Animal Life

The Global Goals, 2030 Agenda





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