

## Number of restored spawning sites (action C2) within project ReBorN in county of Västerbotten (LIFE15 NAT/SE/000892)



Picture 1. Helicopter, gravel to Lögdån 2020



Picture 2. Helicopter, gravel to Lögdån 2020



Picture 3. Constructed spawning area Lögdeälven 2018

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## Summary

One goal in the ReBorN project was to create 2300 spawning sites in total. In the county of Västerbotten we managed to create 11 800 spawning sites. The large number of spawning sites was mainly possible because areas in Lögdeälven below HC contains lots of suitable gravel and we were able to construct large spawning areas. These large areas surface in square meters were divided with 6 to get the number of spawning sites. Huge effort was made to construct spawning sites at more difficult areas in the upper region of Lögån and manually in many tributaries. 825 tons of external extra gravel was added with helicopter in Lögån 2020 and 2021.

The spawning sites were mainly made for the targeted fish species brown trout and salmon, but they are also most suitable for grayling, lamprey and a lot of benthic fauna.

These new constructed or reconstructed spawning sites will allow more fish to use good spawning areas and improve egg to fry survival.



*Picture 4. Manually constructed spawning site in tributary to Lögdeälven*

## Background

One of the objectives in the ReBorN project was to create 2300 spawning sites in total.

Lack of good spawning areas are common in timber flotation affected rivers. The former clearing of structures and big material from the riverbed and accumulation of water flow in narrow channels flushed the gravel downstream and away from the spawning sites.

Trout and salmon need good quality spawning sites to keep their eggs alive for six months. Constantly fresh flow of oxygen rich water is needed from start in October to hatching in May. A good gravel bed could also help both the eggs and small fry from predatory. A good habitat close downstream the spawning site for the juveniles to grow up in is also very important.

A spawning site (bed) is considered to be around 6 m<sup>2</sup> in size, based on constructed spawning sites in smaller brooks. In larger rivers huge spawning areas can be created and they can be as large as 2000 m<sup>2</sup>.

The spawning usually takes place late September and in the beginning or middle of October, which is the spawning time of salmon and brown trout in northern Sweden.

## Method

Restoring or creating spawning sites for salmon and trout is done with excavator and or manually with specially made tools. It is done by clearing a suitable area from stones and boulders to extract natural gravel (a mixture of small stones from 0,5cm-8cm in diameter) from the riverbed. The boulders and oversized stones are used to create a support on the downstream end of the spawning area. The extracted gravel area is then arranged with a slope leaning slightly against the current. The goal is to get waterflow down into the gravel bed. Extra gravel can be added from nearby areas or added externally. The water velocity over the spawning site can then be adjusted, all to get the best out of the precious spawning gravel. This is all done to get as good conditions as possible for the fish eggs to survive during winter.

A suitable area is for example:

- an area with lots of extractable spawning gravel
- an area that could distribute high waterflows to protect the spawning ground from erosion
- good areas for juveniles direct downstream the spawning site
- deep areas and or overhanging trees or banks for shelter for spawning fish
- an area upstream where new spawning gravel could be recruited and transported with waterflow to the spawning site

We have mainly used excavators to create spawning areas in the main river and big tributaries. Most of the time we have still manually adjusted them afterwards. In small tributaries we have only used manual force to create spawning sites. Extra gravel has been collected nearby and added manually with buckets.

During 2020 and 2021 we also did two large efforts by adding extra spawning gravel with helicopter to Lögån to already prepared spawning sites. In 2020 we added 450 tons and 2021 we added 375 tons.

Small single spawning ground is counted as one (smaller than 6m<sup>2</sup>). Bigger areas we call spawning areas and to transform them into countable “spawning sites” we divide these big areas, counted in square meters, with 6.

The spawning areas were mapped in a field GIS application or with a GPS and measurement noticed in a protocol. Later the areas were gathered in a GIS shape file and the geometry could then be calculated.

## Results

During the projects 6 years we have been able to restore 11 800 spawning grounds in Lögdeälvens catchment area

River / tributary	Method	Number of constructed spawning grounds
<b>Lögdeälven</b>	Excavator	11 177
Alskabäcken	Manuell/Excavator	63
Stor-Bjurvattsbäcken	Manuell	3
Blåbergssjöbäcken	Maskin	15
Karlsbäcken	Excavator	15
Kroknorsbäcken	Manuell	11
Kvarnbäcken	Manuell	6
Mettjärnbäcken	Manuell	4
Mjösjöån	Excavator	64
Mossavattsbäcken	Manuell	27
Ottjärnbäcken	Manuell	30
Rundbäcken	Manuell	35
Röjdtjärnbäcken	Manuell	59
Röttjärnbäcken	Manuell	34
Stockbäcken	Manuell	77
Storbäcken	Excavator	30
Storsjöbäcken	Excavator	19
Strömbäcken	Excavator	35
Studsarbäcken	Manuell	7
Sågbäcken	Manuell	89

## Discussion

One of the objectives in the ReBorN project was to create 2300 spawning sites (6 m<sup>2</sup>). By the end of field season 2021 and after 6 years of restoration 11 800 spawning sites have been created only in the county of Västerbotten in Lögdeälvens catchment area. Smaller areas or single sites are mainly created or restored manually in small brooks, tributaries, to Lögdeälven.

Some places in the main river Lögdeälven contained lots of right sized gravel and had other favorable conditions which made it possible to create spawning areas as big as 2000 m<sup>2</sup>. The spawning areas were usually located at the top of a rapid (river neck) where calm water pass over into a rapid.



*Picture 5. Newly constructed spawning area in Lögdeälven Högländ 2018. Immediately after construction a large 10-15 kg salmon could be seen at spawning area.*

The number of spawning sites and areas have increased over the years as the project has been running. This means that spawning fish in the river get more and larger areas for spawning each year and hopefully they don't have to compete amongst themselves in order to find good spawning beds.

The quality of spawning grounds is important but not easily understood. For example, one perfect spawning site one year could be useless next year due to low water flow. Therefore we have made spawning sites at different depths and with different water velocities to fit multiple spawning conditions.

In other projects we have seen that the support downstream the spawning site, the “neck”, is very important to create robust with large enough boulders. Otherwise the current in high waterflows will pick the stones and boulders away one by one and all the precious gravel will flush away. It is also important that the gravel has many different sizes of stones as the mixture will make the gravel bed more sustainable to high water velocities. It is a fine tune between the amount of a bit larger stones that will be kept at the site and the amount that will be sorted out and thrown downstream.

In some places we have started to clear away boulders just to find out that there isn't enough good gravel in the riverbed to create a spawning site. In these cases, we have added gravel from a nearby area or simply picked another spot that's better suited.

The sustainability of the spawning sites is important but not easy to control. At most sites where we added external spawning gravel with helicopter, we added a lot to ensure that the spawning areas would last for many years to come. For continuously gravel support to the spawning site we also filled an area direct upstream. We also adjusted the mixture of gravel to the estimated size of spawning fish.

Below the highest coastline (HC) Lögdeälven mostly had lot of accessible spawning gravel so it was easier to create larger areas for spawning.

Exposed areas with gravel are good for many other species than trout and salmon, like grayling, lampreys and lots of benthic fauna.

One goal with the restoration and construction of spawning sites is to recreate structures that naturally gathers gravel and creates natural spawning sites. To do that you need accessible gravel upstream, a big enough waterflow that will transport the gravel and structures that collect the transported gravel. This is not possible everywhere

In the end it is the fish who chooses witch spawning site they will use. By monitoring the spawning sites we learn more about how to improve the quality and methods to make better spawning grounds.

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