



Connecting people and rivers for sustainable free flowing rivers

The LIFE CONNECTS project takes actions to improve ecosystem functions and ecosystem services in seven rivers in southern Sweden benefiting humans, biodiversity and sustainable water use. We achieve this by improving connectivity through the removal of barriers, the creation of fish passages, and the restoration of degraded river habitats. Around 600 km of river in 7 catchment areas will be improved. The rivers support several species and their habitats. Target species are Atlantic salmon and two of the most threatened mussel species in Europe; freshwater pearl mussel and thick-shelled river mussel.

Description

Together with partner organisations, farmers, landowners, local communities and contractors' best practice are used to ensure the right river restoration measures at the right place. Around 600 km of river in 7 catchment areas will be improved. The project work closely with the European Centre of River Restoration (ECRR) and other organizations across Europe, to facilitate knowledge transfer and dissemination from the project.

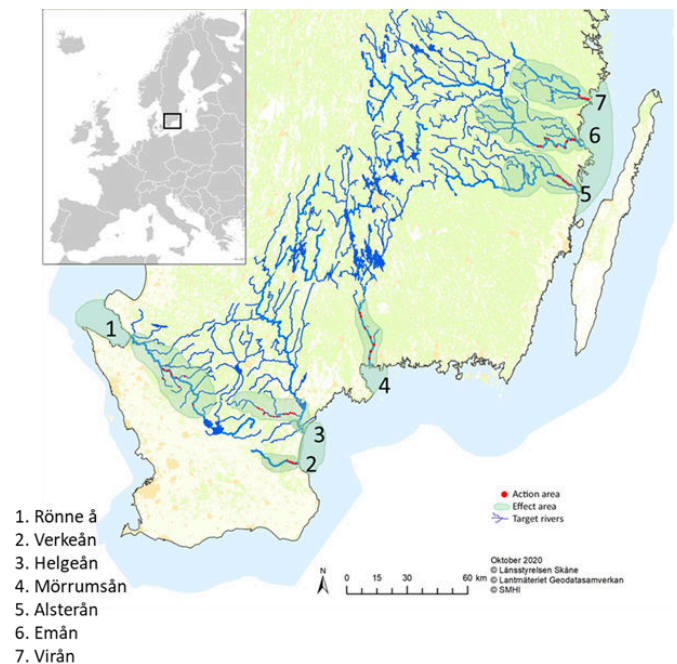


FIGURE 1 Map over the seven river catchments in LIFE CONNECTS.

The project is led by the County Board of Scania in partnership with the County Board of Kalmar, the Swedish Agency for Marine and water management, Klippan municipality, the Swedish angler association, Karlstad University and Uniper. The project was established in 2019 and is planned for completion in 2028.

Funding totalling €8.8 million for the LIFE CONNECTS Project has been funded by EU LIFE Nature programme (LIFE18/NAT/SE/000742), and all partners.

Background

Most rivers in Sweden and across Europe have been altered by humans for a long time by straightening, ditching and damming. As a result, we often find migration barriers that prevent species such as salmon (*Salmo salar*) and sea trout (*Salmo trutta*) from reaching their spawning and rearing areas in the upper parts of the river catchments.

Most rivers have moderate ecological status (classification according to the [Water Framework Directive](#)) as a result of human activities such as agriculture, hydropower and historical timber floating. The barriers have not only influenced the migrating fish populations. Mussel species such as freshwater pearl mussels that are dependent on host fish, such as salmon and trout, for its reproduction have declined drastically during the last decades due to the loss of host fish and suitable habitats.

Case study: Connectivity improvements

In Emån (no. 6 in the map) in the county of Kalmar, several barriers have been removed and river habitats restored. The ecosystem functions in the river have been improved by creating free migration possibilities as well as by adding stones, gravel and dead wood to create a more varied bottom structure. This will improve migration opportunities for fish and restore habitats for both fish and mussels. In turn, this contributes to better water quality and more natural free flowing rivers, one of the major goals of the [EU Biodiversity Strategy 2030](#). In Nötån, one of the larger tributaries to Emån, a barrier have been removed to re-activate a large braided river system.

Nötån River	High energy, gravel/cobble/boulder
Location	Kalmar county, Sweden
WFD mitigation measure	Removal of barrier, habitat restoration
Waterbody ID	SE634252-150052
Designation	Nature 2000 area
Project specific monitoring	Fish
Date of works	Autumn 2024/Spring 2025
Length	Open up 14.5 kilometres of river
Cost	Approx. €140 000

By removing the barrier, fig. 2, more than 2 hectares of braided river system was restored and more than 14.5 km of river once more open for fish migration.

This will increase the migration of fish and increase the populations of salmon and trout in the system. This in turn, will benefit the population of the threatened freshwater pearl mussel in the river, as they are dependent on salmon and trout to complete their life cycle. Habitat restoration was planned in parts of the opened braided river area, fig. 4. The aim was to restore the braided river to its former complexity and ecological functions. Since these braided rivers have unique ecosystems, they are important for the biodiversity of the river.



FIGURE 2 Section of the barrier that was removed and the braided river system downstream was activated again.
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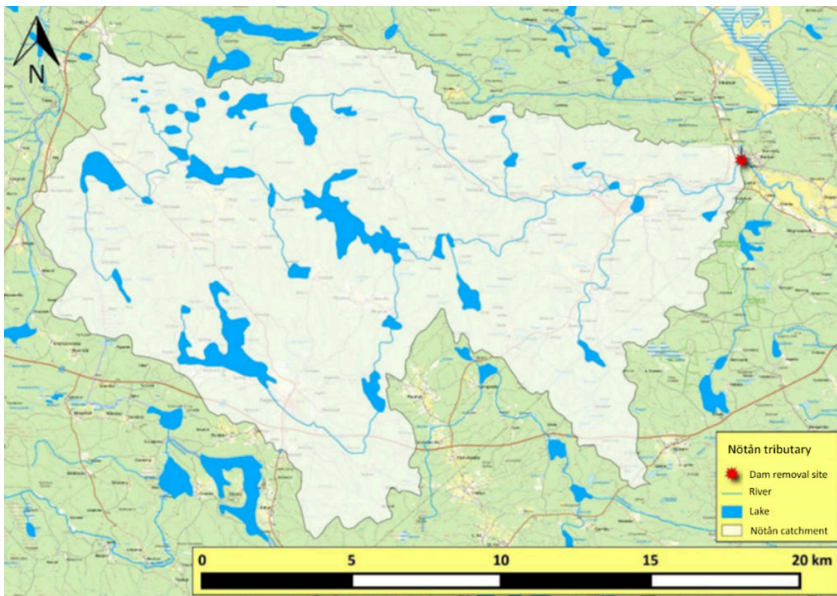


FIGURE 3 The upper parts of Nötån that has been opened for migrating fish after the barrier removal in Nötån. The red dot indicates the location of the barrier that was removed.

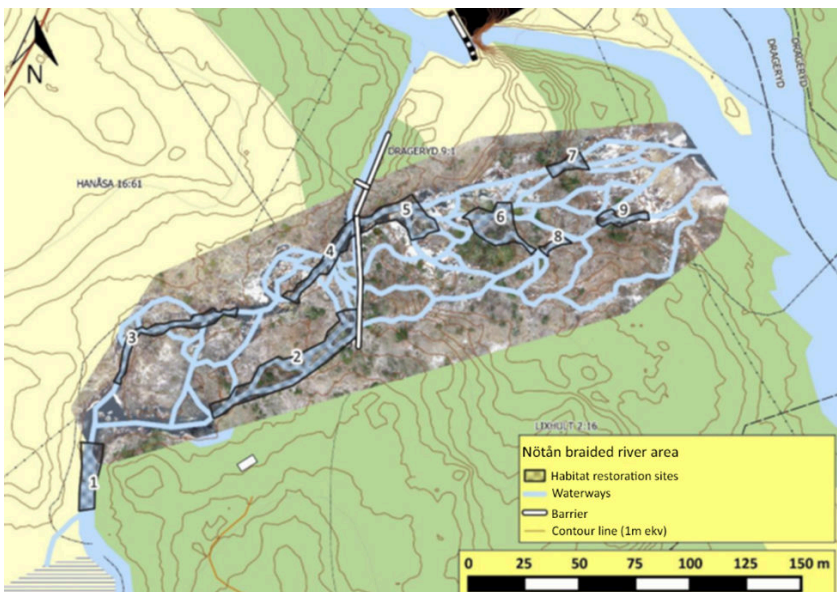


FIGURE 4 Map over the planned habitat restorations at 9 locations in the opened braided river system.

Improvements for freshwater pearl mussel



FIGURE 5 *The threatened freshwater pearl mussel can be up to 15 centimetres long and become over 250 years old. © Jakob Bergengren*

The freshwater pearl mussel (*Margaritifera margaritifera*) is present at Nötån, fig. 5. Historically it has been one of the largest populations in Kalmar County. However, over the past century, the mussel species have undergone a significant decline in both distribution and population size, primarily due to barriers, habitat degradation and other anthropogenic impacts. Today, the species is classified as Endangered in Sweden, with fragmented populations and reduced or absent reproduction. The freshwater pearl mussel is an important key-stone species in freshwater ecosystems, and provide important ecosystem services such as water purification, sediment mixing and stabilization, benefiting overall biodiversity.

In Nötån the removal of the barrier that opened 14.5 km of river is of great importance for the freshwater pearl mussel population in the river as well as for the whole Emån river system as a whole. Further, in the LIFE CONNECTS project re-introduction of mussels through infestations of host fish with mussel larvae has been conducted to enhance the reproduction in three of the project rivers.

Monitoring and lessons learnt

Electrofishing is a common scientific survey method and fishing technique used to monitor fish populations to determine abundance, population density and species composition before and after restoration measures. When performed correctly, electrofishing is not harmful to the fish.

The lessons learnt are as follows:

- Early dialog with stakeholders is essential for achieving sustainable restoration measures.
- Holistic approach – remove barrier and restore habitat to gain effects on ecosystem functions and for several species at the same time.
- Ensure you have competent and experienced contractors.

The project started in 2019 and with a budget of 8.8 million euro LIFE CONNECTS will open up around 600 kilometres of river and restore around 100 hectares of river habitat that will improve the conservation status for habitats and species. Hence, river restorations will bring back sustainable ecosystems that can provide ecosystem services for nature and people.



FIGURE 6 *Monitoring of pre- and post-restoration conditions has been conducted using electrofishing surveys, and drone footage. © Ebbe Berglund*

Life cycle of the freshwater pearl mussel (*Margaritifera margaritifera*)

The complex life cycle of freshwater pearl mussel. During the breeding season, females lay eggs and brood them inside specialized chambers in their gills. Males release sperm into the open water, which is then drawn into the females through their siphons. The sperm fertilizes the eggs. Inside the female mussel, fertilized eggs develop into microscopic larvae known as glochidia. The female release 1 to 4 million glochidia in July–August into the water where they must come into contact with the appropriate fish host, i.e. salmon or trout, as it swims by. Once in contact with the right host fish they must attach to the gills or the fins and encyst to complete development. Metamorphosis takes place within approximately 9 months during which the glochidia transform into microscopic juveniles and drop off. If by chance they settle into suitable habitat, the juveniles stay fully buried within the riverbed for at least 5 years. At the age of 12 they are mature and able to contribute to the reproduction of new mussels.

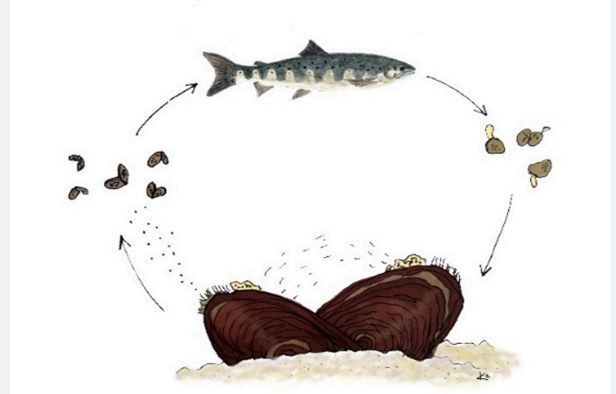


FIGURE 7 The freshwater pearl mussel is dependent on salmon and trout as host fish.
Illustration: Karin Olsson

Find out more about the project on www.lifeconnects.se and social media.

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