Improve Aquatic LIFE

Länsstyrelsen Skåne

Co-funded by the European Union

Improving aquatic ecosystems from source to sea

The project started in 2024 and Improve Aquatic LIFE will implement over 300 restoration measures in 20 river catchment areas and 3 coastal areas in southern Sweden. This will benefit humans, biodiversity and sustainable water use. Further, the project will improve the conservation status for habitats (nature types according to EU Habitats directive) and species. Hence, restorations from source to sea will improve the resilience of water ecosystems that will provide ecosystem services for nature and people now and for future generations.

Description

The Improve Aquatic LIFE project takes actions to improve aquatic ecosystem functions and ecosystem services from source to sea in two water districts in southern Sweden, fig. 1. The project achieve this by improving connectivity through the removal of barriers, the creation of fish passages, and the restoration of degraded river, lake and coastal water habitats as well as improving hydrology and resilience by restoring wetland.

Together with partner organisations, farmers, landowners, local communities and contractors a holistic approach and best practice from source to sea are used to improve the status of our waters. The project work closely with the European Centre for River Restoration (ECRR) and other organisations across Europe, in order to facilitate knowledge transfer and dissemination from the project.

The project is led by the County Board of Skåne in partnership with the eight other county boards in Southern Sweden, two municipalities, the Swedish Agency for Marine and water management, the Swedish Environmental Protection Agency, three universities and the Swedish angler association. The project was established in 2024 and is planned for completion in 2031.

Funding totalling €34 million, the Improve Aquatic LIFE project has been funded by EU LIFE Nature programme (LIFE23/NAT/SE/101148230), and all partners.

Background and holistic approach

Most aquatic ecosystems in Sweden and across Europe have been significantly altered by human activities for a long time by river straightening, ditching and damming. As a result, many rivers often contain migration barriers that prevent species such as Atlantic salmon (*Salmo*

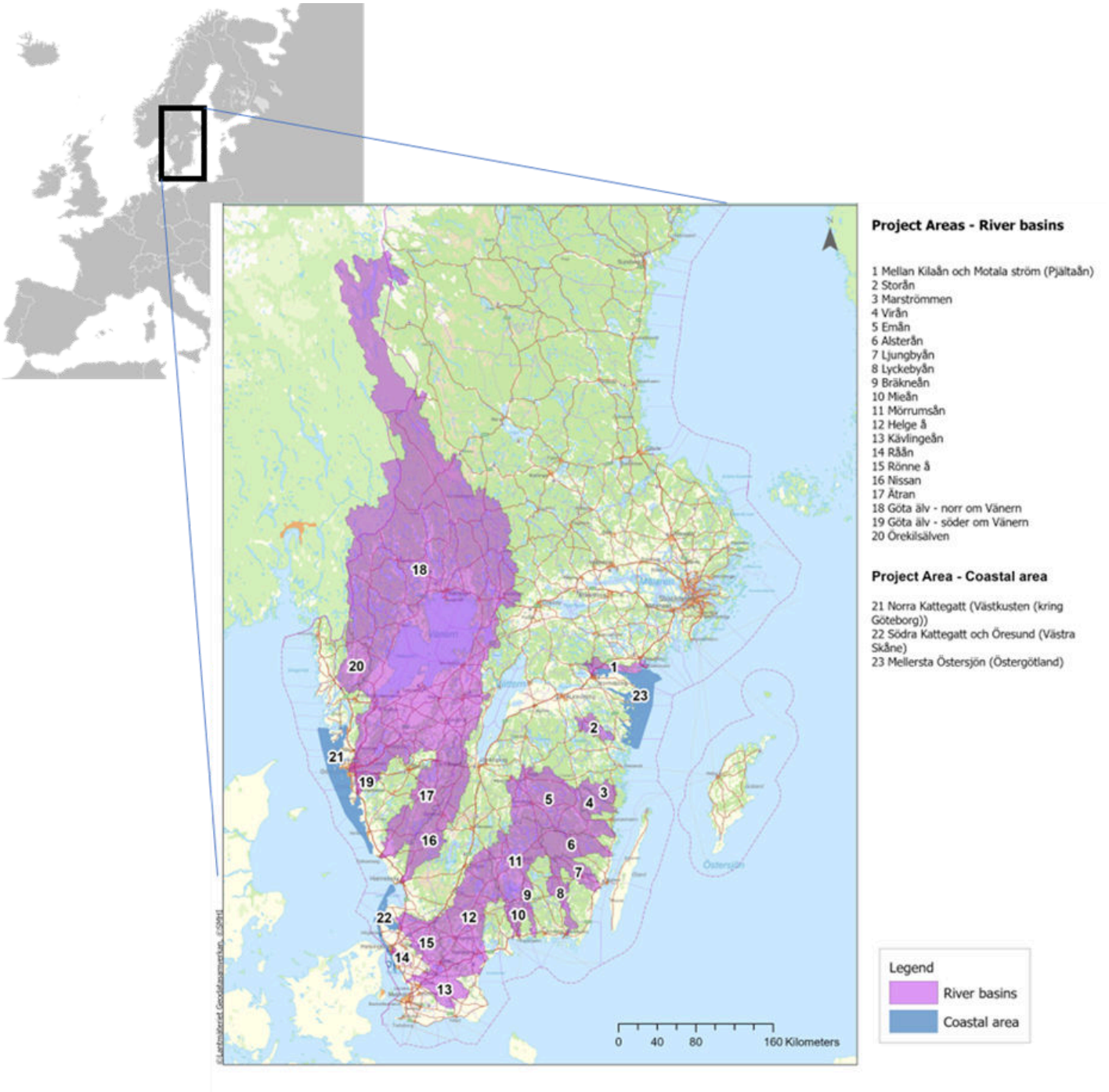

FIGURE 1 *Map over the Improve Aquatic LIFE project areas in Skagerrak and Kattegat Water District and South Baltic Sea Water District in southern Sweden.*

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 EU Water Framework Directive, WFD and Marine Strategy Framework Directive, MSFD) as a result of human activities such as agriculture, hydropower and historical timber floating. Also, many lake-, wetland- and coastal water ecosystems have been altered to benefit agriculture, forestry, shipping and industry. To improve the ecological status (according to EU WFD) or conservation status (according to the EU Habitats directive and Prioritised Action Framework, (PAF) for Natura 2000 in Sweden) as well as reaching the goals of the EU Biodiversity strategy for 2030, restoration measures are needed in many aquatic systems in southern Sweden.

The journey towards improved water ecosystems begins with a thorough investigation of the river catchments from their sources all the way to coastal waters. Understanding the current status and identifying the environmental impacts affecting the status are crucial information for determining what measures gives the highest impact and to prioritizing the restoration actions accordingly. In one catchment area, the most effective measure may be to improve longitudinal connectivity by removing migration barriers. In another, restoring the natural hydrological regime through wetland restoration may be of greater importance. By using a holistic approach looking at the whole catchment and all environmental problems present the most effective restoration measures can be applied. The holistic approach combines the different goals of EU directives and strategies, and the different types of restoration measures needed to improve ecological- and conservation status through improved connectivity, hydrology and habitats, fig. 2.

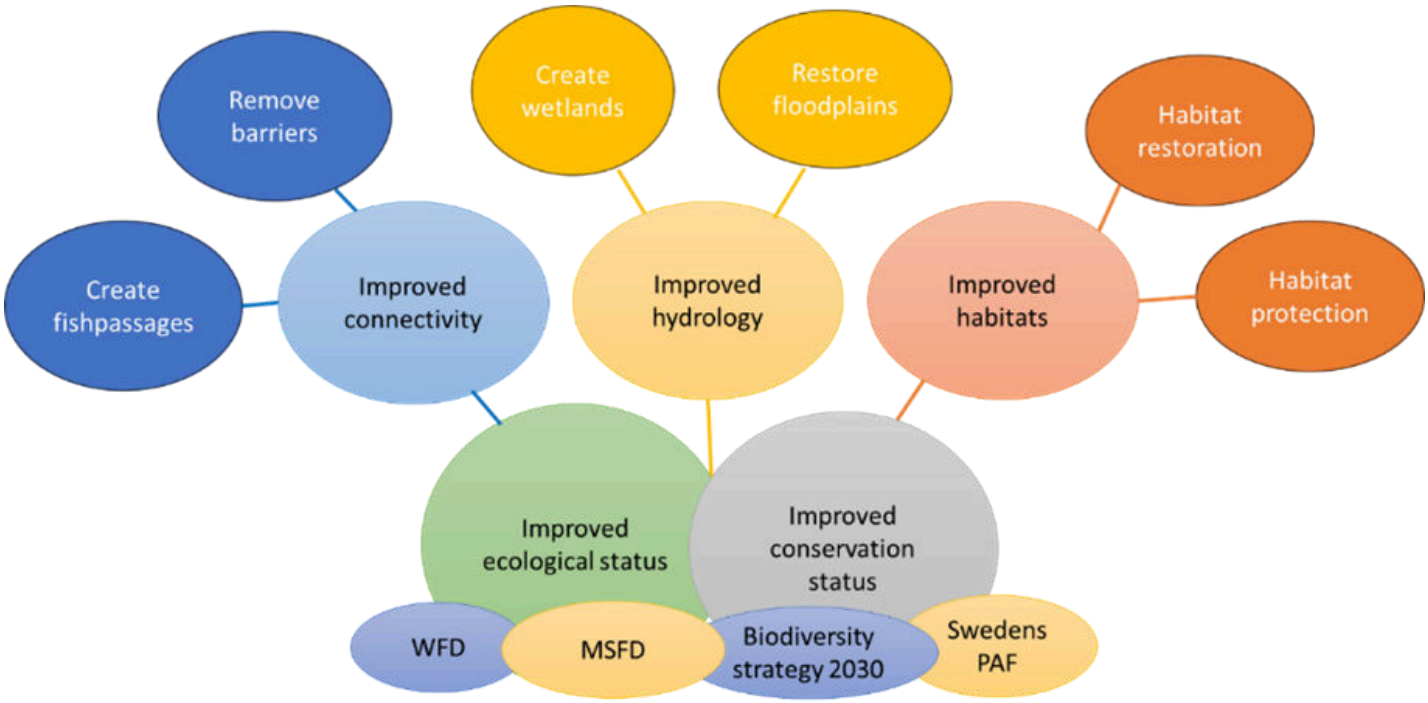

FIGURE 2 *By using a holistic approach several EU directives and strategies can be targeted within the project.*

Theme 1 – Connectivity

- Longitudinal connectivity
  - Barrier removal
- Lateral connectivity
  - Restore floodplains

Theme 2 – Morphology

- Rivers
  - Restore riffles and pools
  - Remeandering
- Coastal waters
  - Restore stone reefs

Theme 3 – Hydrology

- Wetland
  - Restore wetland
  - Re-wetting of mires and bogs
  - Plugging ditches in forest
- Lakes
  - Restore lowered lakes

Theme 4 – Species

- Mussels
  - Infestation of host fish
  - Restore habitats
- Eelgrass
  - Planting of eelgrass

FIGURE 3 *The four themes and restoration measures that Improve Aquatic LIFE project will work with.*

Themes, Habitat types and Species

To improve connectivity, hydrology and habitats in rivers, lakes, wetland and coastal areas it is important to focus on a couple of themes. Trying to grasp everything at once will make a project scattered, making it difficult to monitor the effects of restoration measures and to evaluate if the aim of the project is fulfilled. Improve Aquatic LIFE works in four different themes, fig. 3. The themes have been chosen according to habitat type and species targeted by the suggested restoration measures.

Atlantic salmon and sea lamprey (*Petromyzon marinus*) are the two targeted fish species in the project and most of the restoration measures that will be done in the project will directly or indirectly benefit these two species. Sea lamprey is a prehistoric fish that has existed for over 400 million years. Today, the survival of the species is strongly threatened and at risk of extinction in Sweden, fig. 4. A national action program works with concrete efforts to improve the situation for Sea lamprey. Increased knowledge and understanding of the species are an important part which the work in the project will contribute to.

FIGURE 4 *A sea lamprey preparing a spawning area by moving stones with their mouth. © Elisabeth Thysell*

Theme 1. Connectivity – longitudinal and lateral restorations

One of the most important restoration measures to improve the Atlantic salmon and sea lamprey populations is connectivity restoration by removing barriers and restoring floodplains to gain both longitudinal and lateral connectivity. Removing barriers, fig. 5, will allow migratory fish species such as salmon and lamprey to reach their spawning and nursery habitats that have been inaccessible for many centuries. However, many spawning and nursery habitats in rivers have been degraded or lost by human activities and needs to be restored at the same time as the barriers are removed to improve the reproduction success of these species.

FIGURE 5 *The first barrier in Råån river, just 3 kilometres from the sea, will be removed. © Ebbe Berglund*

One of the barriers in the Råån river, with no function today, will be removed within the project. By removing the barrier salmon and trout will be able to migrate from the sea to their spawning areas upstream.

Theme 2. Morphology – habitat restorations

To improve the morphology, habitat restoration will be done. Historically, stones were cleared from the rivers to accelerate drainage from agricultural and forestry areas. Today, one major habitat restoration measure is to bring back the stones to the river to recreate natural bed structures and flow conditions.

Along the coast of southern Sweden so called stone fishing, fig. 6, has occurred historically, where stones were removed from the seafloor to build piers and harbours. In these coastal areas it is a quite new restoration method to bring back the stones to the seafloor re-creating stone reefs and thereby restoring lost habitats and promote biodiversity in areas previously impacted by stone fishing.

FIGURE 6 *The most common tool for historical stone fishing was a grabbing tool. © Olle Nordell*

A special tool, see figure 6 was used from boats and often with a diver that placed the "jaws" around the boulder. This type of "stone fishing" was common in western Scania and in Denmark. In Improve Aquatic LIFE, coastal habitats where historical stone fishing is believed to have taken place, will be restored by recreating stone reefs.

Theme 3. Hydrology – restoring natural water regimes

The hydrology of many rivers has been altered over time due to human activities. To gain more agriculture land, wetlands has been drained and forests were ditched to get rid of the wet mires and bogs. Changes in land use and loss of wetland have affected surface runoff, groundwater storage and streamflow and thus altered the hydrology within the watershed areas. These alterations have led to increased floods and droughts in the southern parts of Sweden with impact on food production, infrastructure and society. By restoring wetland, mires and bogs as well as lakes, the project aims to re-establish natural hydrological processes to increase the resilience to climate-related impacts.

Theme 4. Species – specific restoration measures

For some species, such as mussels and plants, that do not migrate or move longer distances, habitat restoration alone is not enough. For these species, additional restoration measures are needed. Improve Aquatic LIFE will therefore strengthen the threatened mussel populations of freshwater pearl mussel (*Margaritifera margaritifera*) and thick-shelled river mussel (*Unio crassus*) by infestation of host fish with mussel larvae (i.e. glochidia) in nine of the project rivers.

In the coastal waters of southern Sweden, the important plant eelgrass has declined or gone extinct in many places. Eelgrass meadows are unique and among the most productive ecosystems in the world. They provide important habitats for many species and are vital nurseries for fish and provide habitats and food for a diversity of marine life. In the Improve Aquatic LIFE project, eelgrass will be planted by scuba divers, fig. 7, on at least 4 hectares.

FIGURE 7 *A scuba diver planting eelgrass at the seafloor. © Eduardo Infantes*

Best practice and engagement

Successful restoration of aquatic ecosystems requires the use of best practice and a close collaboration with academia to ensure that the latest knowledge about best practice for restoration of different types of aquatic ecosystems are incorporated in the project. Engaging stakeholders is also crucial to implement the right restoration measure at the right place to get the best effects possible.

Three of the universities in Sweden are partners in the project to ensure that best practices are used. They will keep the project up to date with the latest findings in research and by monitoring the effects of the implementations of restoration measures, fig. 8.

Electrofishing is also used to catch salmon and trout for marking to be able to track migration patterns by acoustic telemetry systems before and after restoration measures.

One important part of a LIFE project is to raise awareness and improve knowledge about aquatic ecosystems and why restoration is important. By engaging stakeholders in restoration activities and arrange information activit-

ies, such as walk and talks, school activities and give talks the partners of Improve Aquatic LIFE will contribute to a better understanding of the restorations done in the project and transfer knowledge and experiences to facilitate future restoration projects.

FIGURE 8 *One of the monitoring methods is boat electrofishing in deeper waters. © Karin Olsson*

Expected improvements and challenges

Free flowing rivers	300 km
Re-wetting	700 hectar
Introduction of mussels	500 000 juveniles
Planting eelgrass	4 hectar
Creating stonereefs	0.3 hectar
Restored wetlands	40 hectar
Restored lowered lakes	3 lakes
Removed barriers	96 barriers
River habitat restored	130 hectar

Through the restoration measures implemented in the project several kilometres of rivers and hectares of water habitat types will be improved. Further, several species will benefit from the restorations measures due to improved water quality, more natural hydrological regime and habitats.

Improve Aquatic LIFE has 17 partners and collaborates with several stakeholders when implementing the restoration measures. It requires a robust organisation and extensive communication for the project implementation to function well and everyone working towards a common goal. Other challenges for the project are:

- Permit and licences processes – often takes a lot of time and resources.
- Conflicting interests – for example the removal of a barrier at an old mill of cultural historical values to benefit fish migration and other nature values.
- Public and political opinion may change – so it gets harder to find funding for or implement the restoration measures.

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

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