

### **Effective restoration of aquatic ecosystems**

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In the late 1990s, after a massive fermentation, restoration of Børselva was started in Ballangen municipality in Nordland, northern Norway. Credit: NIVA

Despite having increased human wellbeing in the past, intense modifications by multiple and interacting pressures have degraded ecosystems and the sustainability of their goods and services. For ecosystem restoration to deliver on multiple environmental and societal



targets, the process of restoration must be redesigned to create a unified and scale-dependent approach that integrates natural and social sciences as well as the broader restoration community.

Use, development and exploitation of water resources might seem incompatible with preservation of aquatic ecosystem biodiversity. However, researchers from The Norwegian Institute for Water Research (NIVA) and colleagues have developed a new framework for effective ecosystem restoration, which integrates these goals. This new framework may be essential for achieving the UN targets of restoring at least 15 % of all degraded ecosystems within 2020.

Restoration of aquatic <u>ecosystems</u> can improve both the delivery of <u>ecosystem services</u> and the ecological functioning. In two peer reviewed articles published in 2016, in cooperation with international colleagues, NIVA researchers present how this can be done.

#### Lack of results from current restoration practices

"Special attention has been paid to the restoration of rivers over the last decades, providing many experiences we can learn from," says Therese Fosholt Moe, researcher at NIVA.

"Overall, the results from most <u>restoration projects</u> have not been as successful as we hoped for. Many restorations are not followed up with monitoring programs, and in most cases, we simply don't know if the projects are successful.

There are several reasons for this: poor planning, vaguely defined aims, lack of sufficient financial support, and primarily small and fragmented projects. Additionally, attention has been paid to restoring the appearance of nature, not ensuring that the ecosystem processes are intact."



# The Operational Restoration Unit (OR): Restoration of the future

"Whether future projects will be successful or not depends on our approach to the restoration task. It is we, as humans, who see the need for and carry out these projects, though our incentives can be many and different," says Fosholt Moe.

"The measures we take must be regarded as part of a whole, in which all relevant social conditions are accounted for."

Fosholt Moe stresses that this approach must be used at all organizational levels - from agricultural politics, via the EU Water Framework Directive, down to local decisions in the municipalities and the needs of the landowners. This should reveal the possibilities and limitations of a restoration project. In this manner, the goals will be more realistic, increasing the probabilities of a successful project.

In other words, restoration planning is a crucial step in the process. Planning must be both holistic and restricted in time and space. This is where the NIVA researchers and colleagues suggest the new concept: The Operational Restoration Unit (OR).

The geographical boundaries of an OR will be defined based on catchments and landscape features, but other factors which might influence, or potentially conceal, the catchment effects are also accounted for when drawing the boundaries. Such factors are assessed at all relevant levels; from climate change to local point sources, integrating the time effect. All these aspects should be included when an OR is defined, because this influences both which measures should be taken, how to define the success criteria, and also the calculations of costbenefit for the project.



The concept of, and the background for, OR is published in WIREs Water and Advances in Ecological Research, respectively.

### A holistic approach

What differentiates an OR from earlier restoration practices is that an OR integrates all of the important and successful restoration elements in a holistic way, where the result is more than the sum of the individual elements, Fosholt Moe explains. "OR includes all the essential drivers for either success or fiasco; such as including all relevant parties, being interdisciplinary, scalable and flexible such that it can be used in any restoration. The core of its success lies in the consideration of both nature and human interests. This is essential for a successful restoration, but has in earlier projects often been ignored."

While the full implementation of the OR concept has not yet been tested, one of the most successful restorations in Europe, the Skjernå-catchment in Denmark, suggests good results, as it includes many of the elements of an OR.

#### Let nature do the job

When choosing restoration measures, the focus has to be on strengthening natural processes, allowing nature to do the work. For this, we need to assess the ecosystem's ability to return to its original state. This is not currently a common practice, making the outcome of many restoration projects unforeseeable. OR, on the other hand, looks at a system's resilience (the ability to recover from a disruption), indicating how the system will respond to the restoration.

"The interplay of such restoration with natural processes is a costeffective and sustainable solution, reducing the need for long-term



maintenance," Fosholt Moe points out.

# Interdisciplinary cooperation gives interdisciplinary benefits

For the implementation of an OR, an interdisciplinary approach is needed.

"To make this operative, we suggest that all relevant parties put in effort to increase the knowledge exchange. It is also important that future projects are followed up," says Nikolai Friberg, research director at NIVA.

"By applying the OR concept as described in the articles, planning and accomplishment of the projects will be more holistic. This, in turn, gives customized measures, lower costs, a reduced need for maintenance, more successful restorations, learning, knowledge based optimizing of the ecosystem services, and a better aquatic environment for future generations."

#### **Unique possibilities in Norway**

"In Norway, we've had very few restoration projects in aquatic environments, compared to other countries, for instance in Scandinavia. But there is a need for restoration projects also in Norway," Friberg says. "This situation gives us a unique possibility to implement OR in future projects, thereby avoiding the mistakes that have been done in the past."

A Strategic Institute Initative was in 2016 started up by The Norwegian Institute for Water Research, in which the effects of the restoration measures in <u>aquatic ecosystems</u> will be analyzed. This initiative runs over several years, and the methods presented above will be tested.



**More information:** Nikolai Friberg et al. Effective restoration of aquatic ecosystems: scaling the barriers, *Wiley Interdisciplinary Reviews: Water* (2017). DOI: 10.1002/wat2.1190

#### Provided by Norwegian Institute for Water Research (NIVA)

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