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Beaver under spotlight in the Baltic Sea Region

The Eurasian beaver (*Castor fiber* L.) populations are considered to have reached densities causing substantial damage to forestry, e.g., in the south eastern Baltic Sea countries. The project *Water Management in Baltic Forests* WAMBAF of the Interreg Baltic Sea Region started in March 2016 and lasted for three years. WAMBAF committed to water management in Baltic forests and aimed to reduce nutrient and mercury export from forestry to streams, other water bodies towards the Baltic Sea. Three main topics like riparian forests, drainage system and beaver population / dam management that strongly related to mentioned issues. Protection of the Baltic Sea catchment is based on the protection of inland waters because the Sea gains the main inflow of nutrients and toxic compounds from inland waters.

The Eurasian beaver once widely distributed across region was affected by humans throughout the centuries. It is well-known that animals need spatially and temporally varying habitats containing sufficient and available food supply and shelter. Continuing human-induced landscape transformation results in habitat loss, increased isolation between landscape fragments and new disturbance types that challenge population. Thanks to legal protection and targeted conservation measures including hunting restrictions, reintroductions and translocations, natural recolonization, land/water protection and habitat restoration, the species has made a remarkable recovery. It is an evident example of positive comeback within its range. This species still has a protective status across many European countries. However, despite of its partial protection e.g., in Poland (Polish Minister of the Environment 2011), the rapid population growth and further spreading to new areas, their hunting is now allowed depending on the damage caused to landowners and forest owners/holders.

Many landowners and forest managers consider beavers to be a problematic species since they cause damage to forests and adjacent agricultural lands. Dam building, channel digging and tree felling result in the flooding of large areas. These beaver activities significantly alter the characteristics and appearance of water bodies and modifies species composition. In constructing their own home, the beaver significantly affects the welfare of other plants and animals. Further, damming and digging by beavers contributes to streams recovering to their natural meandering state. Beaver activity increases the biodiversity value of wetlands by increasing the diversity and richness of communities of plants, insects, fish, amphibians, birds, and mammals. In countries with low drinking water levels, beavers enhance retention of water and its self-purification. Moreover, it was recognized that beaver could be considered bioindicators of environmental pollution. Beaver ponds are used for assessing environmental status and biogeographic changes in the environment, and ponds could act as water cleaning plants. The chemical composition of water accumulated in a beaver reservoir changes, increasing the nitrogen content, and nitrogen, phosphorus and carbcompounds are accumulated in anaerobic sediments. Heavy metals are removed, and pollution of inflowing acids and bases is neutralized and stored in the bottom due to activities of microorganisms. In the beaver ponds, the hydrochemical conditions directly affect the accumulation of radionuclides, mainly in algae. Also, beavers create large volumes of deadwood and promote restoration in wetlands and riparian forests; moreover, coarse and fine woody debris is positive for deadwood-dependent species. As water is accumulated in beaver ponds, the level of groundwater of surrounding land locally rises, which changes chemical composition and moisture of soil and species composition of soil fauna.

Photo 1 and 2. Beaver damage to forestry is usually quite evident

Interreg Baltic Sea Region WAMBAF project has focused on three topics that have large impact of water quality as riparian forests, drainage, The Project suggested several useful management practices and methods according to experiences made at the country level that may be suited for beaver management and improving water quality in the Baltic area. It also emphasized usefulness of an adaptive management method. This is a decision process that promotes flexible decision-making. It includes a situation analysis, setting of objectives, developing a model, and selecting and implementing management actions. Stakeholders should be involved in setting objectives for beaver management. When the system had been monitored and the actions assessed, the model may be further developed. The novelty in the WAMBAF project is to clarify the beaver role in water quality, not only implementing and the nutrient load reduction targets of the HELCOM Baltic Sea Action Plan but also enabling to determine species management plans.

The Beaver handbook **"Beaver as a renewable resource – A beaver dam handbook for the Baltic Sea Region"** was published. It contains information collected during the Project and packaged for use of target groups and associated organisations, with general information on beaver populations and management needs, as well as country – specific legislation and policy concerning beaver management, damage control and hunting/trapping, and how to raise the value of beaver as a resource for landowners and hunters. The Book also includes knowledge on hunting and use of beaver for products (e.g., meat, fur, castoreum) and services (e.g., nature and hunting tourism). The handbook contributes to transnational learning on beaver management and use. It is a resource for national policy development in respective BSR countries; and provide incentives for sustainable management of beaver populations.

Photo 3. Old beaver dam in the forest

https://www.researchgate.net/publication/343180788_Beaver_as_a_renewable_resource_A_beaver_dam_handbook_for_the_Baltic_Sea_Region_Beaver_as_a_renewable_resource_A_beaver_dam_handbook_for_the_Baltic_Sea_Region

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For edited symposia, special issues

Iwata, M., Hirano, T. and Hasewaga, S. 1982. Radial variation in black alder. Genetics of Alders. Proc. 13th NEFTIC conf., 1981: 17–25.

For books

Eckerberg, K. 1987. Environmental protection in Swedish forestry: A study of the implementation process. University of Umeå, Umeå, 220 pp.

For multi-author books

Kandler, O. 1992. The German forest decline situation: a complex of diseases. In: P.D. Manion and D. Lanchance (Editors), Forest decline concepts. St. Paul, Minnesota, p. 181–190.

For unpublished reports, departmental notes, etc.

Arminas, A. 1995. Forest conditions in Lithuania. Lith. For. Res. Inst., Dep. Note SIN/261 (unpubl.). 9 pp.

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