

**The aim of the project** is to assess the effect of the zoogenic factor modifying the environmental, retention and hydromorphological conditions of small lowland watercourses based on the activity of the Eurasian beaver (*Castor fiber* L.). The scope of research will cover both forest sites and those located in agricultural areas. The location of beaver dams and ponds as a determinant factor diversifying environmental, retention and hydromorphological functions.

Within the planned research the following **research hypotheses** are adopted:

- Retention of water resources due to water damming in beaver ponds results from channel detention and groundwater storage (predominantly the latter);
- Changes in hydraulic and hydrological conditions as a result of beaver damming and the presence of dead wood in the stream channel are manifested primarily at low and medium water stages, and are negligible at high water stages;
- Remote sensing of the tree stand condition and the ecological status of waters may be used to assess the environmental impact of beavers.

During the three-year implementation of the project the research assumes locating sites with beaver dams or beaver dam systems. Within a radius of 75 km from Poznań, 5 sites will be selected in forest complexes and mid-field areas. After selecting the appropriate sites, an inventory of structures will be carried out to determine the exact parameters of beaver dams, such as width, height and length. The height of damming will also be measured. It is also planned to carry out detailed geodetic measurements on sections of 1 km each upstream and downstream of the dam. This will allow an estimate of the flume retention. Re-measurement of channel geometry after 2 years will provide information on changes that have occurred in the channel due to beaver dams. Hydrological measurements and continuous monitoring of water levels will allow to determine the variability of flows. The study of bottom sediments stored in the created beaver pond will provide valuable data on sedimentation processes. On the other hand, measurements of water quality parameters will allow evaluation of water quality and self-purification processes occurring in the ponds. Implementation of a network of piezometric wells in a repetitive scheme and systematic monitoring will provide a lot of information on changes in groundwater levels and their flow. The use of data from field trips, aerial and satellite photographs, information on land use and numerical terrain models will allow to determine the influence of beavers on the condition of stands and species variability.

To date the storage capacity of beaver ponds in studies on the subject has been estimated solely based on the channel detention. Also hydrological analyses have lacked quantitative references to changes in flow conditions resulting e.g. from increased values of resistance coefficients due to dam construction or tree trunks fallen into the river channel. When investigating the structure, composition and morphology of sediments in beaver ponds the impact of beaver activity was not investigated in detail, treating beaver ponds as water bodies, in which only natural hydromorphological processes take place. Analyses of the impact of beaver activity frequently failed to include changes in the river section geometry resulting from silting of the beaver ponds. When analyzing the effect of beaver dams the investigations did not consider changes in the ecological status of watercourses or changes and the condition of single trees and forest ecosystems located within the impoundment impact zone. In view of the current state of knowledge, including the analyzed case studies, we observe a lack of a comprehensive analysis comprising both environmental, hydrological and hydromorphological conditions. On this basis a generally unique research problem has been formulated, which the authors will attempt to solve indicating novel research prospects.

The proposed project will provide insight into an important research problem in environmental engineering, providing scientific foundations for an objective assessment of environmentally friendly river maintenance methods including beaver activity and replacing standard engineering measures. Presented problems concerning the impact of beaver activity are in line with the modern approach to environmental management problems comprising natural solutions or semi-natural solutions.

The authors expect that the implementation of the project will provide a range of information to estimate the actual water retention capacity of the dam. Both the water stored in the trough of the beaver pond and that stored in the ground will be considered. Ground retention is expected to have a greater potential than channel retention, but research is needed to determine this unequivocally. Another effect of the implemented project will be the determination of changes in hydraulic and hydrological conditions caused by beaver activity including damming up water by means of dams. The research will provide information on the size and composition of accumulated pollutants and processes taking place in the riverbed.