

**MODELING OF THE INFLUENCE OF WEIRS AND LAND USE ON THE  
HYDROLOGICAL SYSTEM OF THE LOWER BIEBRZA VALLEY**

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The Biebrza National Park which is situated in northeast Poland is a unique wetland area where peat forming process is still active. For ages most of the territory, which were overgrown by sedges and mosses meadow, was used as meadow, lately mowing of this area have ceased. The hydraulic network of the valley was changed in the past also. Canals and drainage ditches were built. Alteration of land use and hydraulic network led to lowering of the groundwater table what stopped the peat forming process and mineralization of hydrogenic soils started. Moreover big area of sedge communities is overgrowing by bushes and forest vegetation. In order to stop the negative effect of human activities requires to implement proper management tools for this area. The required actions are connected with rise of groundwater level, maintain spring inundation and mowing of meadows. Based on research of BPN valley a hydrological model of the Lower Biebrza valley has been set up, using the physically-based groundwater and surface water model SIMGRO. The model gives insight in the regional groundwater flow. The application AlterrAqua enables the use of SIMGRO within the GIS environment of ArcView. It gives the possibility of using digital geographical information (soil, land use, watercourses maps, etc.), presenting and analyzing output data in a GIS environment.

The study focused on the influence of building weirs and the change in land use, on groundwater levels. For this case some scenarios were simulated. The first set of scenarios included building of weirs at different localizations, dimensions and capacity. Weirs were assumed in the drainage canals, ditches and in the Biebrza river. The second set of scenarios was based on changes in land use.

The study shows, that the construction of one or two weirs in the drainage canals raises the surface water levels and subsequently groundwater levels locally. This improves the soil moisture conditions, while the influence of a number of weirs is noticed in a larger area. If the discharge capacity of the Biebrza River is reduced (smaller cross-section of river), this results in higher water levels and raising of groundwater levels. The change in land use influences the groundwater levels as well, especially forested areas, cause a lowering of the groundwater levels.

To sum up, proper management of land use and water management are crucial to maintain suitable groundwater levels and favorable environmental conditions in the BPN.