



## **Hydrological and sedimentological regime of lower Vistula fluvial lakes (North Central Poland)**

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Regarding the outflow the Vistula River is the largest river in the Baltic catchment. In its lower course it has developed an anastomosing channel pattern modified strongly by intensive human hydrotechnical activity and by the regulation which have intensified about 200 years ago. Channel regulation apart from already existing lakes have left many new artificially created ones.

This activity have also altered the hydrological and sedimentary regime. It turned out that only the small portion of the lakes infilled rapidly but the majority have persisted to present day almost unchanged in spite of regulation. The reason of this resistance to silting is connected with specific interaction of sediment removing during high flood water episodes and strong groundwater circulation in former river arms transformed in present-day lakes.

As an example of a lake with an intensive groundwater exchange rate with the main Vistula channel and supposed Quaternary and Tertiary aquifers was selected the Old Vistula lake (Stara Wisła) near Grudziądz town. It has got an area of 50 ha, mean depth 1,73 m, maximum depth 8 m, length about 4 km and medium width about 100 m. In the years 2011-2015 in its surficial water were conducted measures with two weeks frequency which included: temperature, pH, Eh, suspended matter amount, total and carbonaceous mineralization. For comparison similar measurements were also conducted in other fluvial lakes and Vistula tributaries. Hydrological data were supplemented by geological investigations of floodplain sediments cover which has important impact on the rate of groundwater migration and circulation.

Investigations carried proved that there exists distinct gradient of carbonaceous mineralization from small values in the Vistula channel to high values at the valley edges. PH and Eh parameters in the Old Vistula lake were different than in all other surveyed sites what leads to conclusion that it is fed by deeper groundwaters than in the case of other fluvial lakes and Vistula tributaries, particularly in low water stand times. This is because it has not continuous flood sediments cover on its floor. The sediments accumulated during the low stands of water are removed from fluvial lakes while high stands by flood waters. Temporarily deposited sediment is also removed due to high groundwater “exchange” rate when the fluvial lake has a sufficient hydrological connectivity to the main Vistula channel.

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