

BOTTOM SEDIMENTS AS AN ARCHIVE OF ANTHROPOPRESSURE – CASE STUDY (KIELCE UPLAND, POLAND)

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Accumulation of bottom sediments is a process characteristic of all types of water reservoirs. The course of this phenomenon, and thus the composition of the bottom sediments, depends on many factors, including: the geological structure of the catchment area, the type of soil cover, the morphology of the basin and the size of the reservoir, hydrological and climatic conditions, and the degree of the catchment development [14]. Regardless of the type of source of origin, trace metals migrating to waters are deposited mainly in sediments, which, due to their ability to absorb and adsorb pollutants, are often referred to as geosorbents [1]. Bottom sediments accumulate contaminants that enter the reservoir over a long period of time. It can be argued that sediments are the ecological condition indicator of not only reservoirs, but also their catchment area. These deposits playing the role of a specific integral indicator of the level of anthropopressure. The analysis of the chemical composition of bottom sediments allows to determine the condition of the water ecosystem, as well as the degree of its degradation [1-4, 6-9, 11-13].

The aim of this study is to present a preliminary interpretation of the first results of the physical and chemical properties of bottom sediments from 3 selected water reservoirs located in the Kielce Upland.

Study area and methods

The investigations concerned three water reservoirs: Borków, Wilków and Rejów located in the Kielce Upland (Fig. 1, Fig. 2).

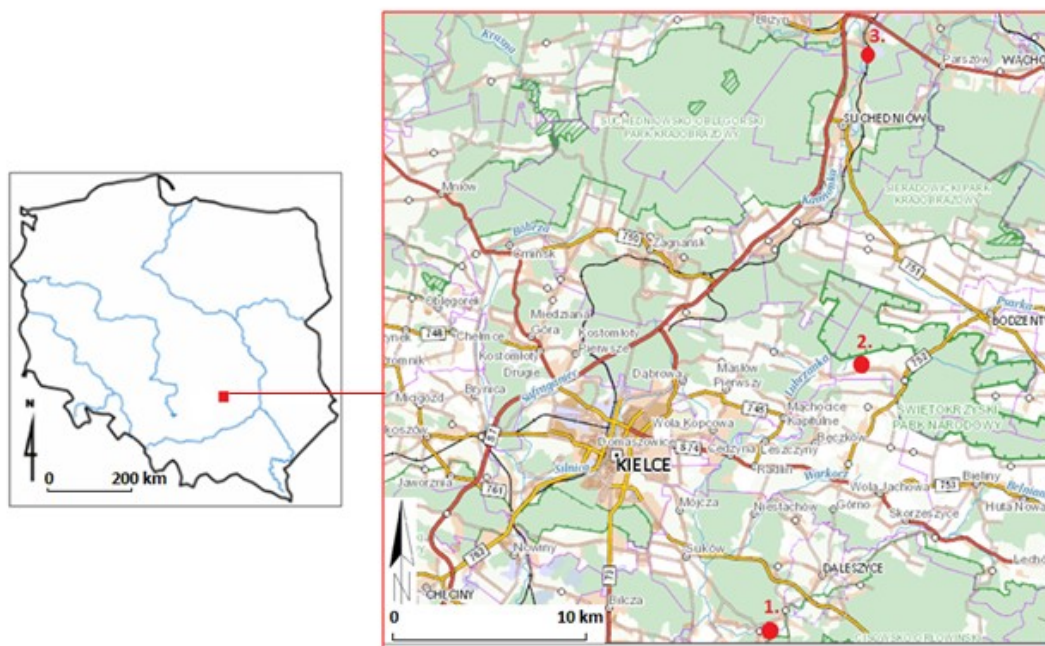


Fig. 1. Study site areas: 1 – Borków Reservoir, 2 – Wilków Reservoir, 3 – Rejów Reservoir.

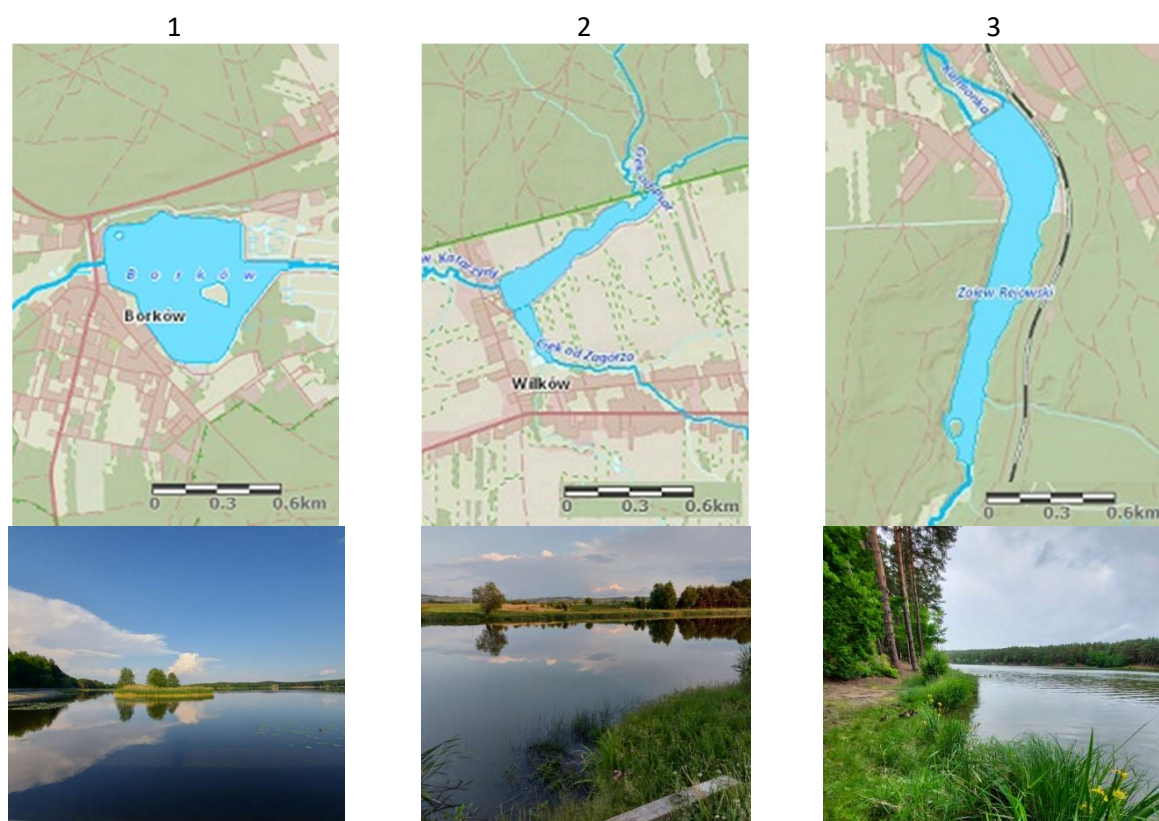


Fig. 2. Investigated water reservoirs 1 – Borków Reservoir, 2 – Wilków Reservoir, 3 – Rejów Reservoir [5, photos: I. Tomczyk-Wydrych, 2021].

The studied water reservoirs differ in age, size and the way of the catchment development. They are multi-purpose and their basic functions are: retention and tourist-recreational [3, 10, 11] (Table 1).

Table 1. Characteristic of the reservoirs and their catchments.

Reservoirs	Location	Construction year	Area [ha]	Catchment	Use	Type of reservoir / river	Forms of nature protection
Borków	50°46'22.7"N 20°45'21.8"E	1976	36	Czarna Nida od Stokowej do Pierzchnianki	forest area, built-up areas	flow tank, Belnianka	Cisowko-Orłowiński Protected Landscape Area
Wilków	50°55'11.3"N 20°50'58.0"E	2004	10.4	Lubrzanka do Zalewu Cedzyna	forest area agricultural	flow tank, Dopływ ze Św. Katarzyny	Świętokrzyski Protected Landscape Area, the buffer zone of the Świętokrzyski National Park, borders the Natura 2000 area (Łysogóry)
Rejów	51°04'56.1"N 20°51'17.5"E	rebuilt in 1939	30	Kamionka	forest area agricultural	flow tank, Kamionka	none

Samples of bottom sediments from the studied water bodies were collected in the summer of 2021 at designated test points from the 0-5 cm thick top layer using a tubular bucket. Five samples were taken at each test site and placed in sterile polyethylene containers. In laboratory conditions, the collected material was dried at room temperature, and then the concentration of trace metals was determined.

Bottom sediments are an excellent indicator of the influence of the catchment area on the geosystem of the reservoir, and also reflect its ecological condition. The selected water reservoirs differ from each other, among others age, area and the way of managing the catchment area. This suggests that the content of trace metals in bottom sediments will vary, which may be the result of anthropogenic pressure caused the impact of industry, agricultural activities, sanitary sewage discharge from sewage treatment plants and runoff from road infrastructure.

Therefore, this study focuses not only on the comparison of the chemical composition of bottom sediments, but also on determining the factors that may affect the content of trace metals in bottom sediments. The research results can be used to determine the current state of the environment and the nature, intensity and scale of the impact of natural and anthropogenic factors on the ecosystem. It is particularly important from the perspective of environmental monitoring, especially issues related to water protection and protection against pollution.

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