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Restoration in perspective – assessment of restoration possibilities in two urban recreational reservoirs in Lodz city.

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Introduction

Cities are peculiar ecosystems and their inhabitants are one of the most demanding species. Urban areas are designed so all of the basic needs are met. But recently the need for clean enviromnent and recreation is becoming more evident and thus is stressed but city dwellers and the government likewise.

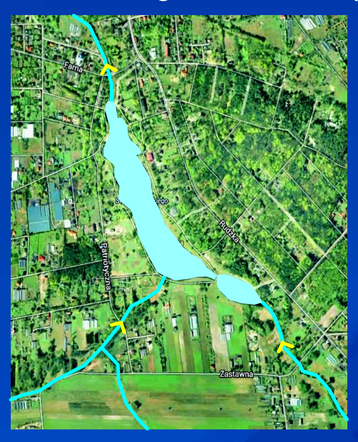
In the cities it is almost impossible to keep water in check. Passing from one extream to another, water washes pollutants from impervious surfaces and transports it to rivers, reservoirs and sewer combined system. Huge load of nutrients causes extensive algae development and consequently algae blooms.

Although there is not much we can do with pollution load we can minimize its effect on reservoirs by various means.

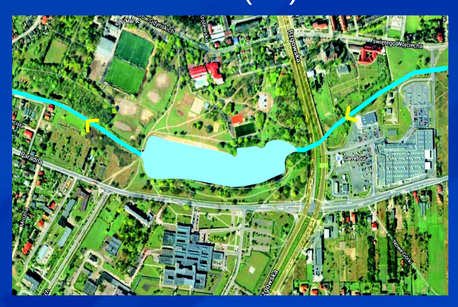
Location

Central Poland

Stefańskiego Reservoirs (SR)



Jana Reservoirs (JR)



Project

Ecohydrological rehabilitation is based on the concept of regulating hydrological and biological processes in the catchment to enhance the ability of self-purification of water.
Under the LIFE+ EH-REK project (08/ENV/PL/000517) three recreational reservoirs in “Arturówek” were rehabilitated by constructing reservoir for receiving and purifying stormwater and by constructing of biofiltration-sedimentation systems (BSS).
BSS minimized load of suspended matter, phosphorus and nitrogen compounds. Obtained reduction of those pollutants was **91.4%**, **71.4%** and **86.2%** respectively.

BSS application in “Arturówek”

In current study Stefańskiego Reservoirs and Jana Reservoirs are being monitored for further restoration. Results of the monitoring in 2012 and 2013 allowed to assess the possibilities of water quality improvement.

Results

Tab. 1 Basic characteristics of the monitored reservoirs and main land use types in their catchment.

Schindler’s factor is a measure of the impact of the surroundings on the reservoir - the higher the greater the effect. Reservoirs with the factor higher than 2 are considered to be susceptible to degradation resulting from the runoff from the catchment.

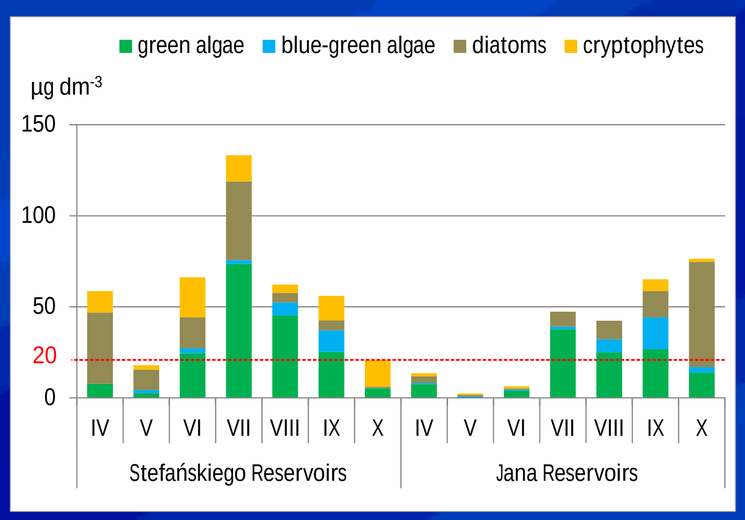
	area [m^2]	capacity [m^3]	average depth [m]	average retention time [day]	Schindler's factor
Stefańskiego Reservoirs	133500	232000	1.73	13.16	100
Jana Reservoirs	43000	44500	1.03	26.94	589
	watershed area [km^2]	Main land use [%]:			
		green areas	build-up areas	farmland	industrial areas
Stefańskiego Reservoirs	26.23	36.11	18.42	38.45	5.02
Jana Reservoirs	23.85	38.07	22.34	16.61	20.42

Fig. 1. Average daily nutrients load (single measurement for April! - snowmelt runoff).
JR are supplied by Olechówka river which average flow rate is: 0.11m^3s^{-1}). SR are supplied by two rivers: Ner (av. flow rate 0.26m^3s^{-1}) and Gadka (av. flow rate 0.024m^3s^{-1}). Although Gadka is a smaller tributary it carries much higher concentrations of nutrients:

[mg dm^{-3}]	nitrates	ammonium	phosphates
Olechówka	2.6	0.1	0.2
Ner	5.5	2.7	0.6
Gadka	48.8	1.2	1.3

Fig. 2. Average chlorophyll *a* concentration. Concentration higher than 20 µg dm^{-3} is considered as algae bloom (Nebaeus, 1984).

Although blue-green algae were not abundant (and not toxic) in the monitored period, studies from 2006 revealed significant microcystins concentration. Thus prevention of toxic blooms formation should be considered.



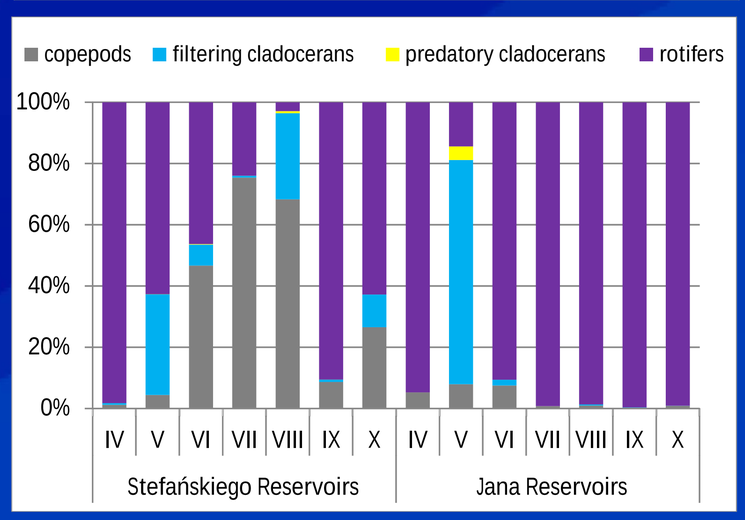


Fig. 3. Proportion of the most important zooplankton groups densities. Note that filtering cladocerans are mostly small *Bosmina* species with limited filtering capabilities.

Dominant fish in SR are: *Rutilus rutilus* (74%) and *Gymnocephalus cernua* (18%), in JR: *Carassius gibelio* (45%), *C. carassius* (32%) and *Gobio gobio* (15%). Ichthyofauna is nearly deprived of predatory fish.

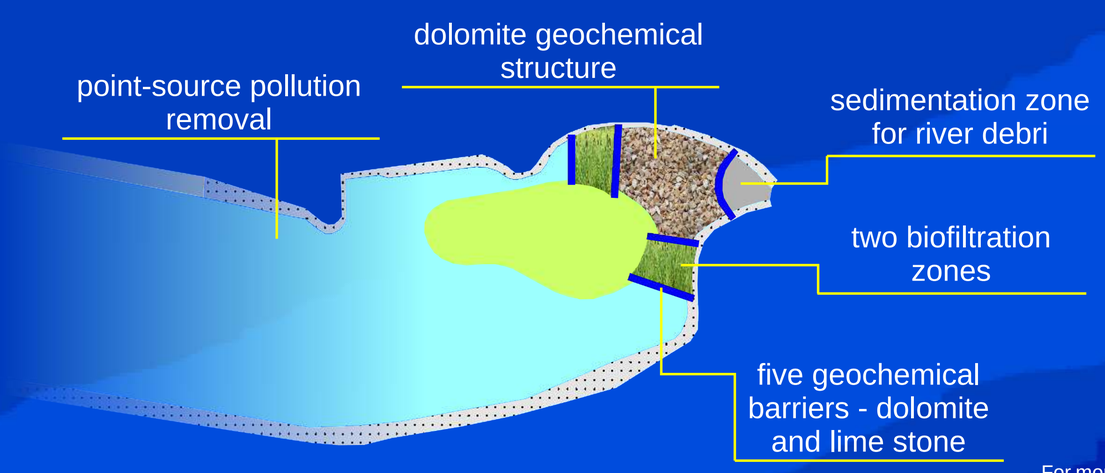
Conclusions & proposals

1 - Huge daily nutrient loads to both reservoirs is a cause of trophic interactions distortion. Formation of algae blooms is thus unavoidable, also due to insufficient top-down control.

2 - Location of the reservoirs within the city limits the possibilities to develop catchment-based water quality improving structures or systems. Therefore rehabilitation treatments should concentrate inside the reservoir’s margins.

3 - Restoration should firstly focus on reduction of available biogenic compounds. Nutrient control should be supported by proper design of the ecotone zones and enhancement of zooplankton communities by creation of shelters for zooplanktonic filtrators and fish stock biomanipulation.

A basic plan for Jana Reservoirs restoration has been compleated and it includes:



For more information please scan the code

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