



018530 - SWITCH

Sustainable Water Management in the City of the Future

Integrated Project
Global Change and Ecosystems

Progress report D5.3-13a

Demonstration Site Vegetation Belt Lodz

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draft

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Dissemination Level		
PU	Public	
PP	Restricted to other programme participants (including the Commission Services)	X
RE	Restricted to a group specified by the consortium (including the Commission Services)	
CO	Confidential, only for members of the consortium (including the Commission Services)	

DEMONSTRATION & IMPLEMENTATION

Lodz, M: 13-24

The development of a protective vegetation belt around the Teresa reservoir (The Sokolowka river revitalization Project)

1. Introduction

The Teresa Reservoir was constructed within the first year of the SWITCH Project implementation (2006), in agreement with the Demonstration Project Tasks implementation schedule.

The activities in 2007 include the development of a protective vegetation belt around the new Teresa reservoir banks, in order to validate ecohydrological methods for improvement of the water quality in a cascade of stormwater retention ponds along the Sokolowka river course (Fig. 1.). The vegetation planting was additionally performed at the Zgierska reservoir, upstream the Teresa reservoir, for the purpose of comparative studies.

2. Intervention goals

The goal on this implementation was validation and demonstration of application of the ecohydrological approach for the improvement of water quality in stormwater retention ponds, in particular:

- Validation and demonstration of the efficiency of the shore-vegetation belts for nutrients (phosphorus, nitrogen) uptake;
- Validation and demonstration of the efficiency of the shore-vegetation belts for heavy metals removal;
- Quantification of the efficiency of the above processes' depending on the river's hydrology and ponds' hydraulics and selection of the best adapted species according to their capability of nutrients and heavy metals uptake and resistance to unstable hydrological conditions;
- Evaluation of the potential for use of aquatic plant communities as a tool for water quality improvement in specific conditions of the Sokolowka river and its ponds.

2. Study site

2.1. Sokolowka River

The Sokolowka river, crossing the northern part of the city is a typical urban stormwater receiver. Its natural flow gradually disappeared, being nowadays supplied mostly by about 50 storm water outlets. The main channel was regulated by concrete slabs, to straighten the course and deepen the bed for the purpose of runoff detention. Nevertheless, the middle section of the river valley located in the outskirts of the city, has maintained a semi natural character. Patches of meadows, wetlands and forests made this section appropriate as a pilot area for analyses of the best ecohydrological river rehabilitation options.

Reservoirs situated in the Sokolowka River receive nutrient-enriched stormwater, which increases their trophic state. According to the bottom-up concept, this stimulates phytoplankton growth and appearance of algae or cyanobacterial blooms, which may cause a limitation of ecosystem services (limit the biodiversity of the aquatic habitat, their recreational values) and if toxic, constitute potential hazard to users as possible carcinogens and tumour-promoters.

2.2. Teresa Reservoir

The Teresa reservoir was constructed within the framework of the SWITCH project. It is separated from the river bed with a 5 m wide dyke, located on the south side of the reservoir. An island of the area of 200 m² has been created on the west side of the reservoir as a wildfowl refuge. The sloping of island bank is varied. The south, east and west slopes of the reservoir banks equal 1:3 and the north slope of the reservoir – 1:4. The temporary water inflow supplies the reservoir with water directed from the water damming device located in the regulated river channel. Additional water supply comes from a rain water collector draining the “Lisciasta” housing estate. The reservoir escarpment has been reinforced with reinforcement matting “Teokrata T” and filled with gravel, which helps to establish the reservoir vegetation. The upper parts of the reservoir escarpment have been covered with a 5 cm deep layer of humus and planted with grass seeds.

The reservoir parameters are given in the table below:

Reservoir surface	0,77 ha
Water table surface	0,54 ha
Volume	3900 m ³
Reservoir length	185 m
Reservoir length (east side)	30 m
Reservoir length (west side)	55 m
Island surface	200 m ²

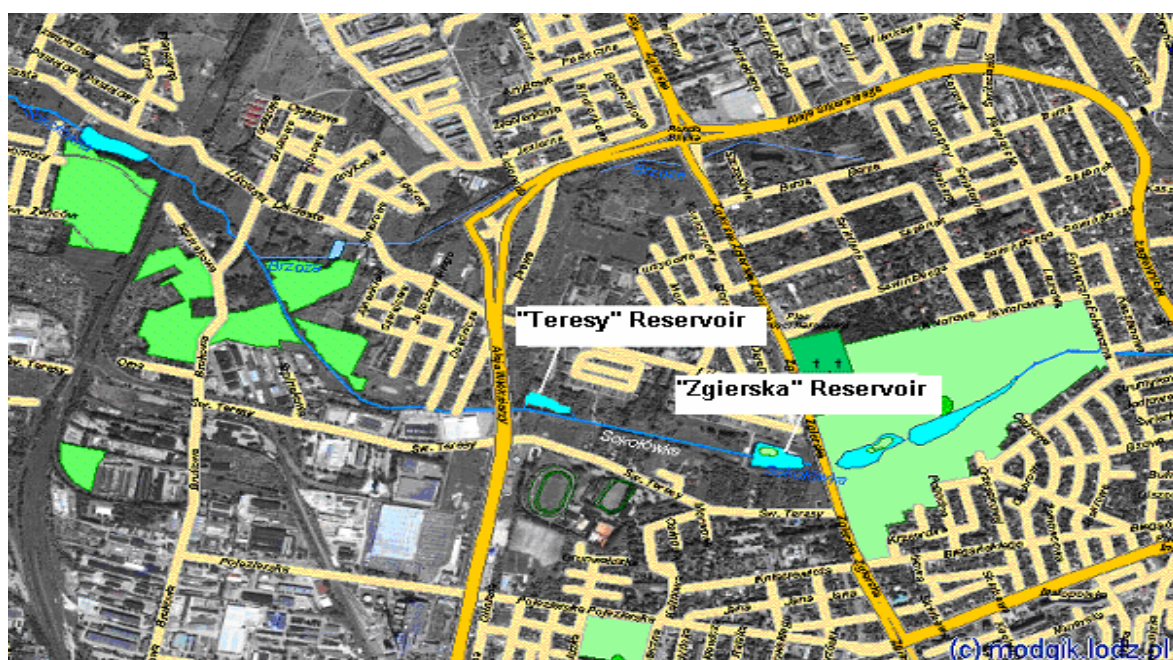


Figure 1. Location of the Teresa Reservoir - constructed in the first year of the SWITCH project implementation, and the Zgierska reservoir. The vegetation belt implementation was developed on both reservoirs.

3. Description of implementation

The vegetation was planted on the 6th of July 2007 (Teresa Reservoir) and 13th of July 2007 (Zgierska Reservoir).

It was planted in patches, along the shoreline of ponds, in the shallow water zone, along the water depth gradient, in order to record the effect of the water level on the plants growth and efficiency of pollutants removal. The plants species and sites for their planting were preliminarily selected based on their tolerance to insolation, shore morphology and water depth.

The dominating plant species was *Schoenoplectus lacustris* (L.) and *Iris pseudacorus* (L.) - 300 specimens each, *Sagittaria sagittifolia* (L.) - 240 specimens, *Acorus calamus* (L.) -150 specimens, and *Nuphar luteum* and *Nymphaea alba* – (48 specimens in total).

The plants were placed directly into the gravel bottom, which was especially designed for this purpose at the stage of the reservoir construction last year, using a special planting technology (Figure 2).

Figures 3 and 4 show the plants distribution.



Figure 2. Teresa reservoir bottom adapted for vegetation planting.

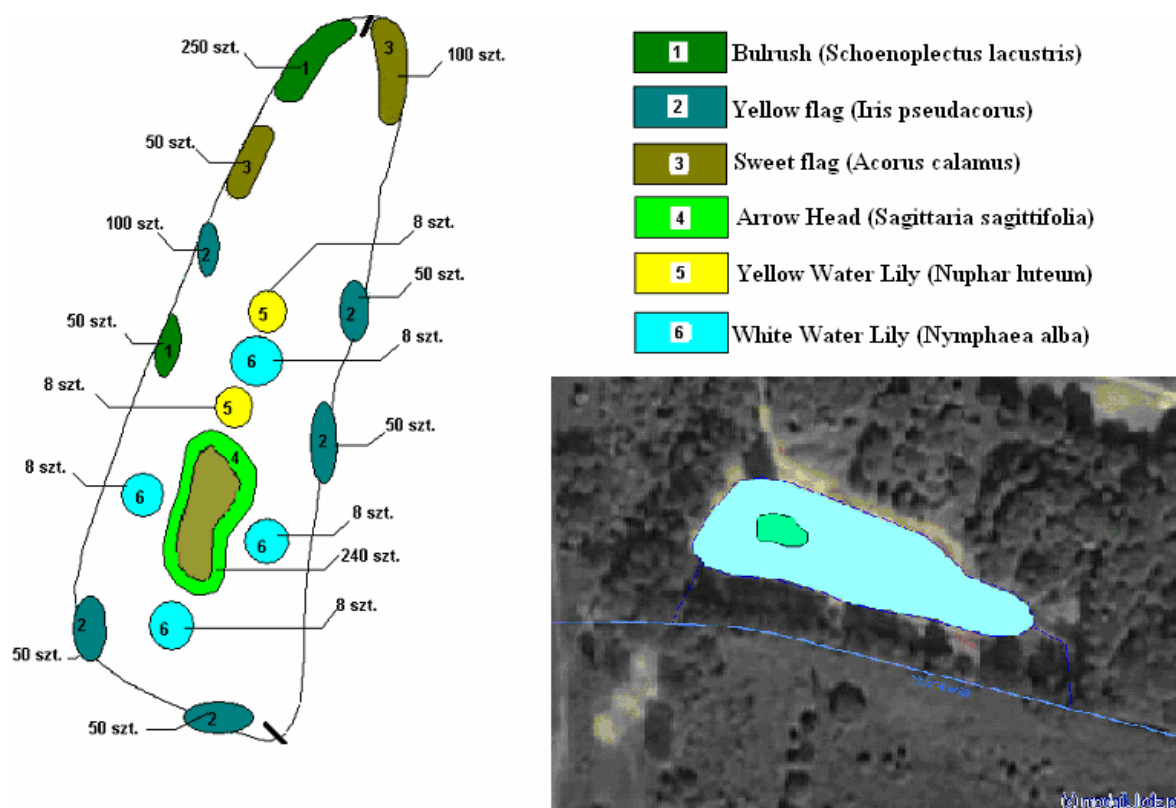


Figure 1 Distribution of vegetation in the Teresa reservoir.

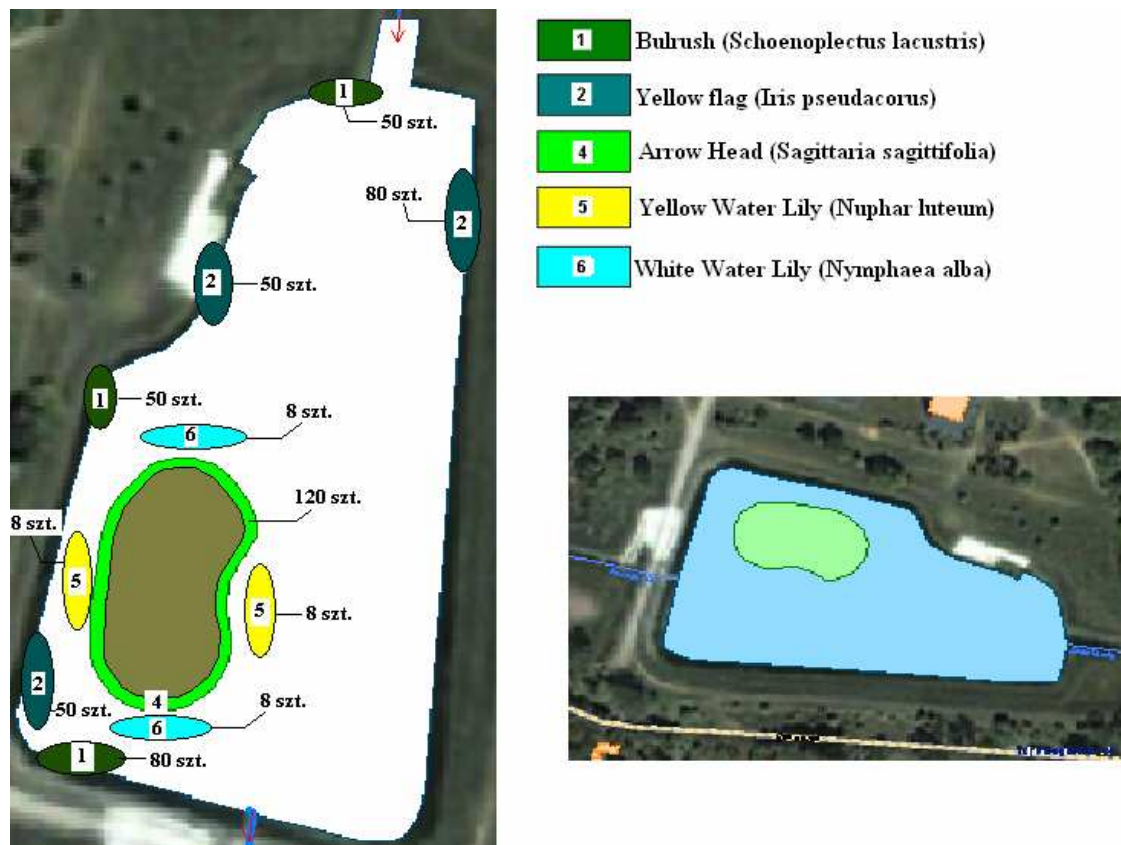


Figure 4 Distribution of vegetation on the Zgierska reservoir.

4. Monitoring

During the vegetation season, regular measurements included:

- Number of plants remaining after planting;
- Biomass production;
- Phosphorus content in plant tissue;
- Heavy metals content in plant tissues.

Additional measurements included:

- Analyses of the bottom sediments (45 samples in transects) for the nutrients and heavy metals content;
- Analyses of the bottom sediments (as above) for the phosphorus fractions, for the assessment of the internal load risk and phosphorus turnover;
- Hydrological measurements for the hydrological balance;
- Development of a two-dimensional water flow model, using CCHE2D 2.2;

5. Preliminary results

- According to the monitoring data only three of the selected plant species (*Bulrush*, *Sweet flag* and *Yellow flag*) have been able to withstand unstable hydrological conditions and high nutrients concentrations.
- Detailed results are under statistical analysis.
- Implementation in the 2008 will include further vegetation planting, with the plant species that proved to be the most efficient and tolerant, based on the results obtained within the last year.