



After-LIFE Communication Plan

project of Town of Gniezno No. LIFE07 ENV/PL/000605 entitled „Recultivation of Jelonek and Winiary lakes in Gniezno by inactivation of phosphorus in bottom sediments” co-financed in years of 2009 – 2010 by European Community within the Financial Instrument of LIFE +.

The document aims at presenting activities, actions and undertakings directed toward transferring to all the interested persons and subjects of assumptions and results of the project as well as at promotion of the financing source of Instrument LIFE +, the activities which will be implemented in the years of 2011 – 2012.

List of contents:

1. Description of the project
2. Strategy of promotional actions

DESCRIPTION OF THE PROJECT

Recultivation of Jelonek and Winiary lakes in Gniezno was conducted using the method of phosphorus inactivation in bottom sediments. Within the method the activities involved:

Action 1. Activities within the direct reception basin of the lakes.

- a). Monitoring and correction of the situation in reception basin of Jelonek and Winiary lakes.
- b). Regeneration of a retentive potential showed by the pond by Jelonek lake.
- c). Production of a band ditch.
- d). Elimination of the reed which overgrown surfaces of the lakes.
- e). Reconstruction of lake slopes by partial sodding and sowing of slopes.

Action 2. Inactivation of phosphorus in bottom sediments and elimination of water blooming caused in the pond and the lakes by Cyanophyceae algae.

- a). Inactivation of phosphorus in bottom sediments.
- b). Elimination of water blooming caused in the pond and the lakes by Cyanophyceae algae.

Action 3. Control and restructuring of fish stock.

Action 4. Stimulation of development and additional substitution of macrophytes in Jelonek and Winiary lakes.

Action 5. Promotion of the project.

Action 6. Management of the project.

Action 7. Monitoring.

The recultivation was:

- safe for natural environment and lake ecosystem,
- posed no risk for human health and life,
- posed no risk for function of the container.

Innovatory character of the method

The used in Gniezno, within the Life+ programme method of recultivating Jelonek and Winiary lakes, implemented by the PROTE company, is innovatory at the world scale. The method involves blocking (inactivation) of phosphorus directly in bottom sediments, using appropriate chemical substances (coagulants), which results in decreased amounts of phosphorus available in the water to, e.g. Cyanophyceae algae or phytoplankton algae, which could generate water blooming.

In the recultivation conducted by PROTE the important variables included site of coagulant dosing and induction of artificial resuspension of bottom sediments. Such activities allowed for a penetration of the dosed chemical substances into the outer layer of the sediments, the most active layer in the process of the inner feeding and, thus, participating in circulation of biogens, including phosphorus, between the sediments and water. Apart from trapping the phosphorus already present in the sediments, the procedure of administering chemical compounds directly to bottom sediments permits to improve their condition: the sediments may recover or increase their ability to store phosphorus and, in this way, reduce concentration of phosphorus in the water controlling its level in longer periods of time. The method affects the dynamics of phosphorus circulation in the container.

Inactivation of phosphorus directly in bottom sediments was possible due to construction by PROTE company of a bi-modular floating unit, unique at the world scale.

An assistance to the principal activities was provided by:

- introduction of macrophytes (in order to eliminate nutrients from the water),
- manipulation by fish stock (the introduced to the ecosystem pikes eliminate zooplanktonophagous fish),
- introduction to the inflowing water of partitions with iron filings (in order to trap phosphorus from surface inflows) and
- a system of ballots made of barley straw (in order to inhibit proliferation of Cyanophyceae algae).

Aims of the project

The project aims at dissemination of lake recultivation using inactivation of phosphorus in bottom sediments by application of coagulants directly to bottom sediments and activities supporting principal recultivation.

The performed activities aimed at:

- inhibition of progressive eutrophication of Jelonek and Winiary lakes in Gniezno and resulting from the eutrophication ecological risks related to the effect of environment on health and life quality of Gniezno inhabitants,
- improving water cleanness in the degraded lakes situated in parks, in the centre of town, visited by numerous tourists, visiting the first capital of Poland,
- improving quality of the biotope, revitalization of biocenoses in the lake environment, including restriction of toxic Cyanophyceae blooming, extension of biodiversity, qualitative and quantitative transformation of ichthyofauna,
- protection of inland resources of surface waters, in line with the EU Framework Directive related to Water Policy No. 2000/60/EC,
- improving water cleanness in Jelonek and Winiary lakes.

The project assumed that recultivation of Jelonek and Winiary lakes in Gniezno using phosphorus inactivation in bottom sediments would inhibit progressive eutrophication of the lakes, targeting at:

- reduction of phosphorus contents in the water from 0.5 mgP/l to around 0.2 – 0.1 mg P/l,
- decrease in phytoplankton production,
- increasing visibility of Secchi's circle/water transparency from 0.1m to around 0.6 – 1m,
- reduction in chlorophyll *a* content to around 15 mg/m³,
- increase in subaquatic plants and fishes, which would improve ecological equilibrium,
- re-establishment of submerged plants sets and plants with floating leaves,
- elimination of Cyanophyceae bloom,
- increase in landscape and recreation value of the lakes.

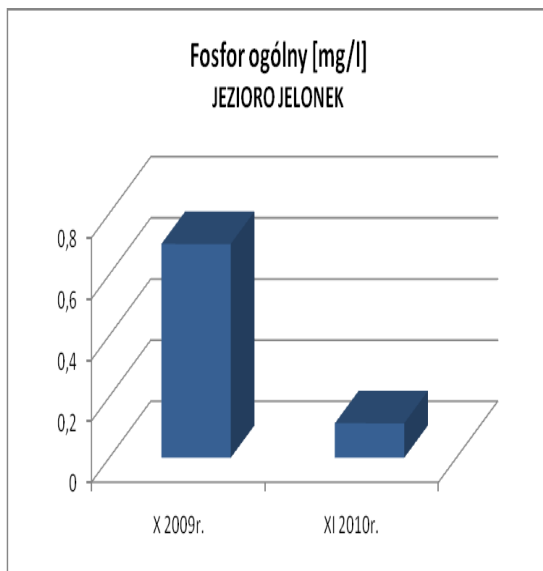
The conducted activities resulted in the following effects:

- **Reduction of phosphorus content in the water**

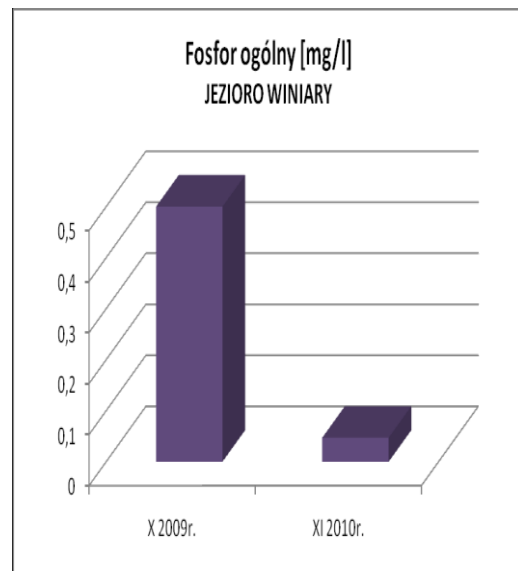
In July, 2009 total phosphorus content analyzed in water of Jelonek and Winiary lakes ranged between 1.7 and 1.5 mg/l. The reservoirs presented condition of a pronounced trophy (Vth class of water cleanness).

In 2010 phosphorus content in lakes of Jelonek and Winiary decreased, reaching values of the Ist class of water cleanness:

- in Winiary lake to the mean of 0.047 mg/l and
- in Jelonek lake to the mean of 0.113 mg/l.



Total phosphorus [mg/L]
JELONEK LAKE

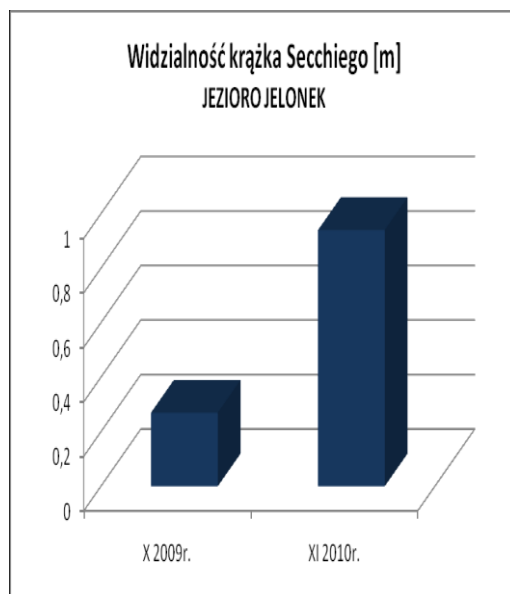


Total phosphorus [mg/L]
WINIARY LAKE

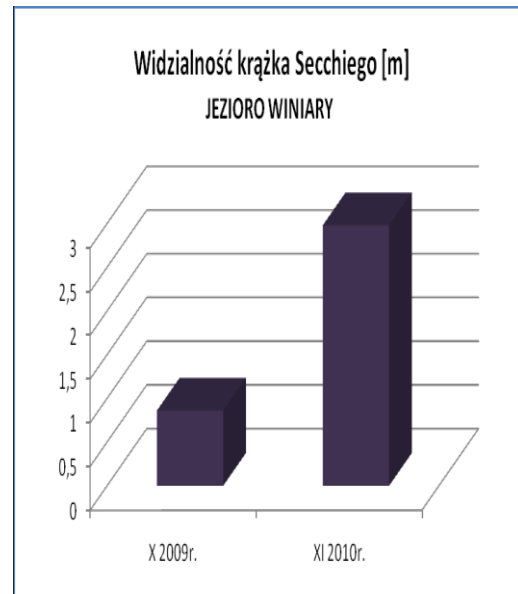
- **Decrease in phytoplankton production**
Phytoplankton production became reduced in Jelonek and Winiary lakes.
- **Increase in visibility of Secchi's circle/ recovery of water transparency - from 0.1m to around 0.6 – 1m**

In Summer, 2007 water transparency in Jelonek lake was low, within 10 cm, following completion of the project it averages at 0.94m.

In turn, in Winiary lake water transparency increased, on the average, from 0.86 m to 2.98 m.



Visibility of Secchi's circle
JELONEK LAKE

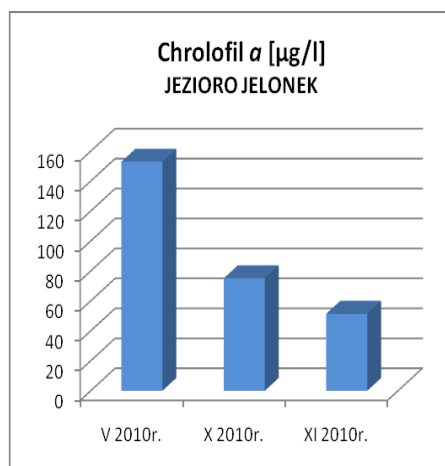


Visibility of Secchi's circle
WINIARY LAKE

- **Reduction in content of chlorophyll *a***

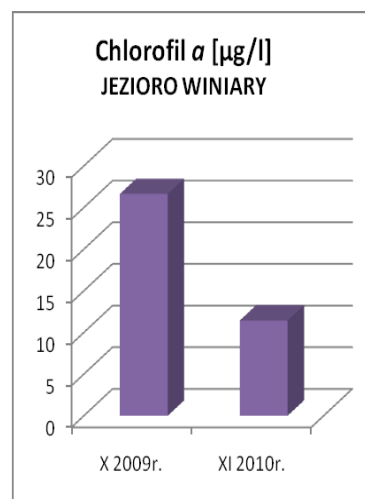
Inactivation of phosphorus in bottom sediments reduced chlorophyll *a* content in water of Winiary lake on the average from 26.63 µg/l to 11.43 µg/l, and in Jelonek lake on the average from the mean of 152.981 µg/l in 2010 to 51.46µg/l.

In Jelonek lake the content progressively decreased:



Chlorophyll *a* [µg/L]

JELONEK LAKE



Chlorophyll *a* [µg/L]

WINIARY LAKE

- **Increase in subaquatic plants and fishes, which improved ecological equilibrium and reconstructed sets of submerged plants and of plants with floating leaves**

In order to achieve a stable condition of the lakes, macrophytes were re-introduced. Bases with macrophytes form an efficient nutrient-removing elements from the water due to formation of barriers and islands. After water transparency was increased reconstruction was undertaken of aquatic flora enrooted in the sediments. The subaquatic plants were prepared in the form of seedlings with a load, enforcing their sedimentation on the bottom and striking roots.

In 2009-2010 the total number of 7050 of macrophyte seedlings were planted in both lakes and the pond, supplying the area of around 6.600m² of lake surface.

- **Elimination of Cyanophyceae bloom**

The lake of Jelonek manifested particularly favourable conditions for development of Cyanophyceae bloom. In Summer, 2009 a system of ballots made of barley straw was exposed in Jelonek and Winiary lakes. The ballots were placed at inflows to the pond and Jelonek lake and close to the bathing place in Winiary lake.

Oxygenous mineralization of the straw resulted in decomposition products which inhibited proliferation of Cyanophyceae algae, functioning as natural algistatic agents. The effects were evident after 3 weeks: no Cyanophyceae blooming could be noted.

In 2010, in the course of implementation of the project no algae blooming could be detected despite the high temperatures during the Summer.

- **Increase in the landscape and recreational value of the lakes**

Water in the lakes regained its transparency, aquatic plants add variability to the banks and the inhabitants gained favourite recreational sites around the lakes. Areas around the lakes are used by strolling inhabitants. Every day around the lakes numerous groups of people can be encountered who cultivate Nordic walking and jogging. The charming places around the lakes are used by school youth during classes of physical education. The lakes decorate the surrounding parks. In the Summer, hundreds of people rest at Winiary lake, taking advantage of the bathing. The view of Gniezno Cathedral church from banks of Jelonek lake represents an exceptional landscape and frequent goal of tourist excursions.

Implementation of the project permitted to obtain favourable results. Trophic condition of the lakes continues to improve. The innovative method of recultivation and the obtained results will provide material for a promotional action.

STRATEGY OF PROMOTIONAL ACTIVITIES

The activities linked to lake recultivation, conducted using the innovative method of phosphorus inactivation in bottom sediments within the Life+ programme provide topics of numerous conferences and meetings.

Project coordinators participated in, i.a., International Scientific-Technical Conference: Lake Protection and Recultivation in Toruń (June, 2010) and in International Ecological Trade Fair POL-EKO in Poznań (September, 2010), presenting the recultivation method applied within the Life+ programme.

Further meetings are planned with students and institutions responsible for preserving cleanness of lakes. Students, particularly students of Poznań universities take advantage of materials provided by Gniezno Municipal Office, related to recultivation activities, permitting them to analyze the results.

The town of Gniezno take part in ecological competitions, i.a., in IInd round of the competition for the Statuette of Clean Water (February, 2011) in the category of

research/implementation works linked to water protection and in the competition of Modernization of the Year, in the category of greens.

Coordinators of the project are contacted by numerous institutions interested in the applied in the first capital of Poland method of lake recultivation, which are burdened with similar problems in their environment. The method may be a reproducible process in various water containers, after preliminary studies of water and bottom sediments, aimed at establishing appropriate doses and type of coagulants.

The PROTE company participated in 2010 in a conference in Capetown, SIL2010, in which the method of lake recultivation by phosphorus inactivation in bottom sediment was presented at a poster session.

Aiming at:

- propagation and distribution of the project results and
- promotion of LIFE + instrument as a source of financing undertakings within the range of environmental protection

the following activities and actions are planned in 2011 – 2012:

- a. maintenance of the subwebsite of the project, within the www.gniezno.eu website** (presenting the data which allow other European towns to take advantage of experiences gained during implementation of the project),
- b. distribution of information booklets** - (in 2011 and 2012 the booklets will be mailed to selected units of territorial self-government within all 16 voivodships in Poland),
- c. international promotion of the project** – (it will be conducted using the network of Gniezno twin towns: in Germany (Speyer), in Holland (Veendam), in Russia (S. Posad), in Italy (Anagni), in Sweden (Falkenberg), in Hungary (Esztergom), in Lithuania (Radwiliškis), in Ukraine (Human) and it will involve distribution of booklets with summary of the project and presentation of project assumptions during common meetings and conferences),
- d. presentation of project assumptions and results** - (they will be transmitted during conferences, meetings and other events of the type arranged by Gniezno town),
- e. collaboration with the State Professional University in Gniezno undertaken in order to promote the project** (meetings with students and visits in the field),
- f. organization of excursions for students of universities interested in the project to the site of project implementation** - (the offer will include visits of the students, presentation of project assumptions and results),
- g. educational path around Gniezno lakes** - (the prepared booklet on lake flora will permit school youth to look for and to recognize water plants).

The PROTE company, which conducted principal recultivation activities, similarly to 2010 will be an exhibitor during International Ecological Trade Fairs POL-ECO in 2011 as well as a participant in the Conference devoted to shallow lakes, the 7th International Shallow Lake Conference, 24-28.04.2011 Wuxi, China. It has applied also for the „Now Poland” prize, the result will be known at the verge of April and May, 2011.

The activities undertaken within the Life+ project aimed at inhibiting the progressive eutrophication of Jelonek and Winiary lakes in Gniezno. A number of activities aimed at restoring good condition in the lakes will have to be followed by their permanent monitoring. A lake represents a sufficiently complex system that the activities conducted in two seasons and gaining positive results cannot be taken as a terminal action which will assure good results for numerous years. Preservation of the already obtained recultivation results will require permanent monitoring of the lakes and control of their drainage area. The lakes will need an appropriate care for them and the indispensable activities will include, i.a.:

- Seasonal elimination of reed from the region of inflow to Jelonek lake, which will take the biogens stored in the reed out of the lake,
- Control of the stock of fish species, conducting control catch of fish, which will allow for evaluation of fish species structure,
- In sites devoted to recreation controlled mowing of plants is admissible,
- Inhabitants should be informed that aquatic birds should not be fed,
- Anglers should be informed that excessive lure of fish is forbidden and excessive amounts of the lure are not permitted,
- Drainage area of the lakes should be controlled,
- Macrophytes should be kept under control and
- Water should be monitored.

Coordinators of the project pass their experience to any institution burdened with problems of lake eutrophication. Results of water testing and results of the project are analyzed and compared with parameters characterizing other water reservoirs. Through the organized seminars and conferences the data on the implemented project of lake recultivation using an innovative method within the Life+ programme is known on the limnology market.

Jadwiga Trzcńska

Piotr Wiśniewski

Projekt Miasta Gniezna nr LIFE07 ENV/PL/000605 pn. „Rekultywacja Jezior Jelonek i Winiary w Gnieźnie metodą inaktywacji fosforu w osadach dennych” jest współfinansowany przez Wspólnotę Europejską w ramach Instrumentu Finansowego LIFE +.

