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SESSION

River Restoration: A SHARED CHALLENGE



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Thermograph of the Upper-Vyisky reservoir water according to data of 2007-12. Red line - the maximum, black - medium, blue - the minimum value during the period observed.

INTRODUCTION

Over the last 40-50 years a large number of drinking water supply reservoirs was built in the Urals. One of them is the Upper-Vyisky Reservoir – a drinking water source for the Town of Kachkanar.

Balanced inflow of nutrients and regular inlet of cool mountain springs have led to special conditions of the reservoir having transitional functional type from oligo- to mesotrophic one. Strong "algae bloom" had never observed before took place at the reservoir in summer 2010 followed by deterioration of organoleptic water quality.

The objective of the project was development of the program to improve the environmental state of the reservoir and water quality, and stepwise implementation plan for these measures.

It was found that, the composition of fish fauna of the reservoir has undergone significant changes over past 20 years. Typical native river species like gudgeon, dace and burbot disappeared from the reservoir. Repeated introductions of new species - whitefish, carp and grass carp have not yielded positive results.

Comprehensive survey of the Upper-Vyisky reservoir found that the water body has a good ecological state with oligotrophic status, moderately low production of organic matter, and balanced composition of phytoplankton, invertebrates and ichthyocenosis. However, taking into consideration the inter-annual climate change and the global temperature trends, the balance can be fallen and demonstrate the environmental problems associated with high summer temperatures, year precipitation shortage and invasion of alien aquatic species, including microorganisms. In case of such "non-expected" situations appearance a number of measures were proposed to prevent adverse environmental effects on the Upper-Vyisky reservoir.





In conclusion it was agreed to cease new fish introduction experiments in the reservoir. In short terms the water quality of the Upper-Vyisky Reservoir will be determined by internal succession processes, including stabilization of species composition and structure of fish population.



METHODS

As far as the current state of the reservoir has been determined by prevailing flows of material and energy, it was necessary to estimate their intensity, weigh factor, the state of the reservoir with elimination or reduction of each of them, and choose the right set of measures that leads to the sound achievements.

SUBJECTS

Upper-Vyisky reservoir is located on the Viya River and the dam is mouth located from the km the 41 Of river. The reservoir constructed for drinking water supply of settlements in vicinity. Length of the Upper-Vyisky Reservoir - 1.69 km, a maximum width of 0.62 km. Surface area - 1.05 km². The volume of the reservoir for normal level - 4.59, useful - 4.0, and dead volume - 0.59 million m^3 . The maximum depth is 12.5 m, average depth - 4.37 m. Type of regulation of the flow is seasonal. The normal water level (NWL) is located at a height of 276.25 m BS (Baltic system).

CONCLUSIONS & RECOMENDATIONS

In the research the phosphorous limitation of the reservoir was revealed. From potable water point of view it is a positive consequence protecting the reservoir from annual algae bloom. To minimize risk of water deterioration a number of preventive measures was developed:

1) Pay much attention to hold the sanitary protection zones and respective recreational activities restrictions on the reservoir.

2) New "chilled" reservoir (with summer water of 12-14 ^oC) construction and operation in case of hot summer occurs.

3) Bivalve mussels introduction to develop abundant population of "natural capacitive filters".

4) Install and operate the ultrasonic generators at the point of water abstraction to destroy algae cells when the "algae bloom" happens.



PROCEDURE

All year-round water sampling and measurements of hydrological parameters were monthly carried out at the reservoir and its tributaries. The aquatic ecosystem survey included: investigation of the structure and composition of phytoplankton, macrophytes, macrozoobenthos, ichthyocenosis. In addition, the composition of bottom sediments was studied, and laboratory experiments demonstrated substances flows between sediments and water.