

PRACTICAL SOLUTIONS FOR ECOLOGICAL RECONSTRUCTION OF GERAI POND

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Abstract

Geraï Pond is one of the last natural wetlands along the Danube, being connected to natural flooding regime of the Danube and is situated at the confluence of the Danube River, between Gârcov and Islaz localities, in Olt County. Aquatic vegetation characteristic is a favorable habitat for two species of conservation concern that nest along the Danube: red duck and pygmy cormorant. During 1961-1970, Geraï Pond has changed radically due to impoundment and draining under the program of drainage and flood meadow regulate of the Danube. These works of land reclamation for decreasing surface lakes and wetlands and water stagnation period, had reduced the breeding areas of the two species mentioned above. Ecological reconstruction of Geraï Pond project was conducted by Technical University of Civil Engineering of Bucharest in collaboration with E.P.A. Olt and W.W.F.-Romania. The project was based on a hydrological study (which included a component related to flooding) for the area analyzed, study in which were highlighted the areas which have water access to and from the Pond, surfaces and volumes of water corresponding to different rates, the optimal level of water for restoration of the nesting area. Based on this study were identified the areas of artificial feed-water discharge to and from the Danube. This paper presents the possible solutions for ecological reconstruction of Geraï Pond, identified in the project.

Keywords: Geraï Pond, ecological reconstruction, flood, water discharge.

1 INTRODUCTION

Geraï Pond is located at the la confluence of River Olt and the Danube river, in Olt county, between the villages Gârcov (west) and Islaz (east) (figure 1). Geraï Pond represents one of the last natural wetlands area along the river Danube, connected to the natural flood flow of the river. Being a flooded area where water pool in most time of the year, it attracts many water birds that find there a place for nesting and feeding, for which locals say, admiring the scenery, "Ce rai – What a heaven" , which later became Geraï (photo 1).



Figure 1. The terrain location of Pond Gerai

The terrain topography is mostly flat, flood plain lookalike, but showing small bumps (type of sand dunes) that don't exceed a few meters, forming a characteristic micro relief, favoring water stagnation between the bumps, favor of a large and varied ecological complex. Flooded areas are covered with water during the floods and during low water levels, they become dry land, covered by alluvial soil and organic debris, representing the common grazing for the two villages. The existence of water for long period of time during a year, in comparison with the surrounding terrain makes it a good area for the growth of the sour dock, sea clubrush, bulrush, iris and arrowhead, etc... The presence of this hydrophilic species depends on the duration and intensity of spring floods, which they depend in an inversely proportion. This complex of aquatic species represents a favorable habitat for the species that nest along the Danube, like the red duck (*Aythya nyroca*) and pygmy cormorant (*Phalacrocorax pygmaeus*).

2. THE CURRENT SITUATION OF THE GERAI POND ECOSYSTEM

During the 70 Gerai Pond was the subject of embankment and drainage works carried out under the program for the regulation of the drainage and flooding waterside of the Danube. Thus such works were carried out for the magisterial draining channels, secondary drainage channels, works of art (bridges, culverts, roads etc.). For the surface water drainage that remained after the floods of the Danube river and its tributary Gircov rivulet with its tributary Ursa, works were carry out in a length of 1.2 km for water regulating and also, downstream of the confluence of rivulet Gircov with Ursa, an accumulation in area of 9 ha was build. These works of land improvement for decreasing lakes surface and wetlands and the water stagnation period has a direct effect on the birds species, which reduced their number and the size nesting areas in the Gerai Pond. Thus, has appeared the need to create and ensure the protection and conservation of bird species, by recreating the initial conditions favorable for nesting and food. This meant in fact the need to find and apply solutions to extend the period of water stagnation in Gerai Pond.

In principal, water flow in Gerai Pond is accomplished thru the drainage channels that are now in a high clogged state (photo 2)



Photo 1. Gerai Pond.



Photo 2. Gerai Pond – a drainage channel, partially clogged.

Besides the waters from the Danube, in periods of high waters, the area is fed by springs located at the terrace base, thus limiting the north region of the pond. In addition, in the north-west region was a creek, that originally (late 19th, early 20th century) download in the north-west area of the pond Gerai.

3. SOLUTIONS FOR THE ECOLOGICAL RECONSTRUCTION OF POND GERAI

The ecological reconstruction of Gerai Pond was based on a hydrological study (that included a component linked to flooding) related to the analyzed area, study made by TUCEB. In this study there were highlighted the water access area to and from the Pond, the water surfaces and volumes, for different elevations, the best water level of the Pond for assuring the ecological reconstruction of the nest areas.

In the hydrological study, a one-dimensional mathematical modeling was made, for the water flow for the Danube sector corresponding with Gerai Pond, the flows of the minor and major river bed, the medium velocity in the consecutive cross sections and the medium water levels corresponding to the sections.

The computations were made with the help of the HecRAS software program and the analysis was based on a digital terrain model (DTM).

During the field visits, the review of the digital terrain model and the conclusion of the hydrological study, was determined that the water flow in and out of the Pond is made through 2 channels:

- The drainage channel of the Gircov rivulet, on the north-west of the Pond (photo 3)
- The drainage channel, located in the central part of the Pond (photo 4)



Photo 3. Balta Gerai – drainage channels of rivulet Gircov.



Photo 4. Pond Gerai – drainage channel in the central area of the Pond.

In conclusion, in the same hydrological study, the flow through the drainage channels of the south-east and north-west region of the Pond was made, in natural state, for a multitude of debits that covers different levels of water in the Pond, in the conditions of ecological reconstruction. After the model, it was possible to do a qualitative and quantitative estimation concerning the controlled evacuation of the waters from the Pond, through the 2 channels. The delimitation of the ecological area was agreed upon with the environmental authorities and its presented in fig.2 In this area, a new hydrological model was built, needed for establishing the optimum water levels for the ecological reconstruction of the area.

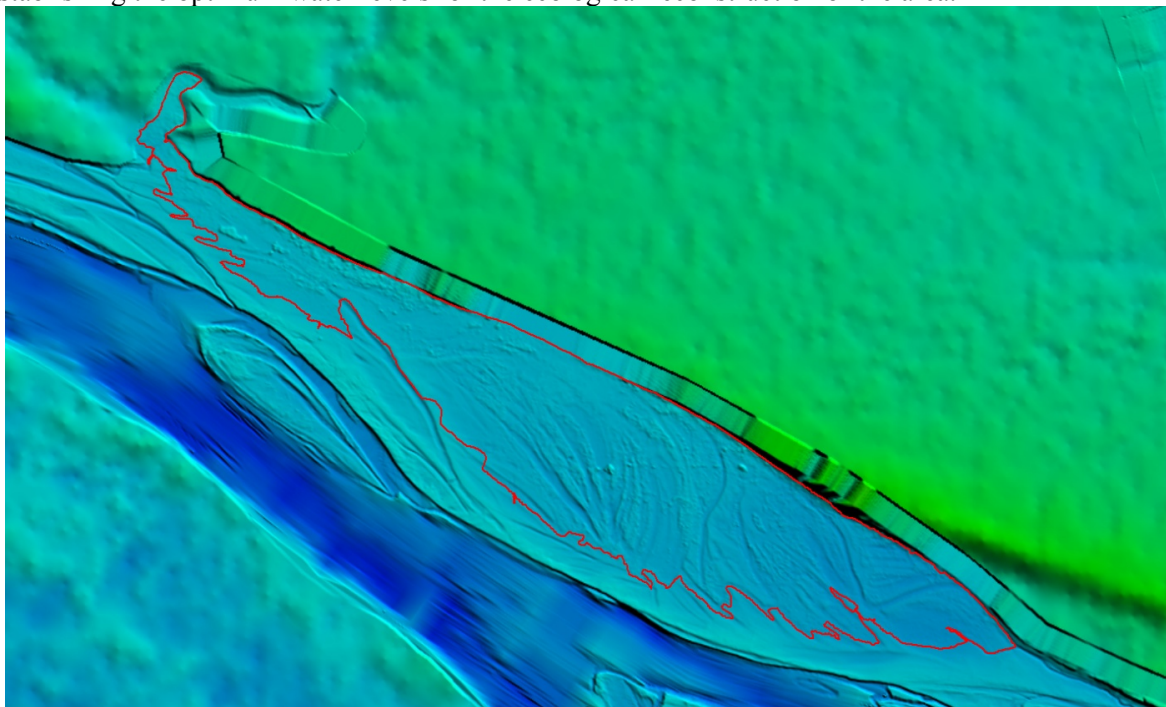


Figure 2. The digital terrain model for the area proposed for ecological reconstruction.

The propose solution for the ecological reconstruction of Pond Gerai consists in:

- The deviation of the channle that drains Garcov rivulet in the north-west region of the Pond Gerai, from the limit of the village Gârcov, by building a new channel that will unload the water in the

central region of the Gerai Pond and an obstruction dam of the existing channel (figure 2). This deviation channel will ensure the water surplus needed for the central area of the Pond.

- The obstruction of the channel in the central area of the Pond (figure 3), by using the resulted material from the building of the deviation channel in the north-west region.

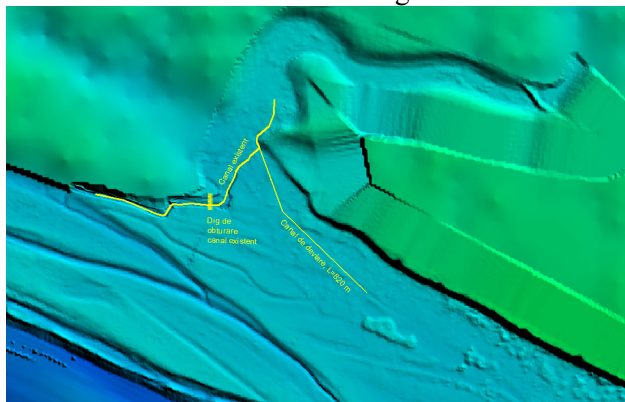


Figura 3. The digital terrain model with the proposed works-deviation channel of rivulet Garcov.

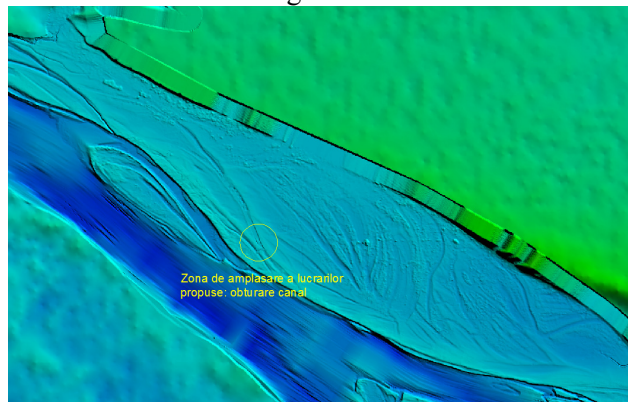


Figure 4. The digital terrain model with the proposed works – the obstruction of the drainage channel in the central area of the Pond.

From the point of view of the working area conditions and the execution technology adopted by the contractor, depending on the site facilities, the deviation works for the obstruction for both channels, will be carried out manually and/or mechanize, with small capacity equipment. The deviation channel will have a longitudinal slope bigger then the existing channel slope, thus creating a new direction flow. The longitudinal slope of the new channel will have a minimum 1‰. The section of the channel will be trapezoidal and the slope of the acclivity will be 1:1. The flow capacity of the channel will vary depending on the local condition. For example, for a medium depth of 1.1 meter, the channel will transport, at a depth of 1 meter, a flow of 2,3 c m/s, at a width of the bed channel of 2 meters.

The existing channel that drains the water from rivulet Gircov, will be obstructed by the building of the dam made from the local materials resulted from the deviation channel, with slopes of 1:3 upstream and downstream, with a width of 3 m at the canopy. For the protection against erosion of the slope, in the time of high water, an anti-erosion net made from polyethylene will be placed. After the works will be completed, the dam will be covered with grass upstream of the slope (toward Gerai Pond and the plantation of trees on the downstream slope (toward Danube). The obstruction channel in the central region of the Pond will begin after the deviation channel in the north-west and will be made by building the execution dam similar with the one propose for the obstruction channel in the north-west. It will be made from the resulting material of the earthworks needed for the construction of the deviation channel. In the following figures, are presented the longitudinal and cross sections, through an earth made dam propose for building.

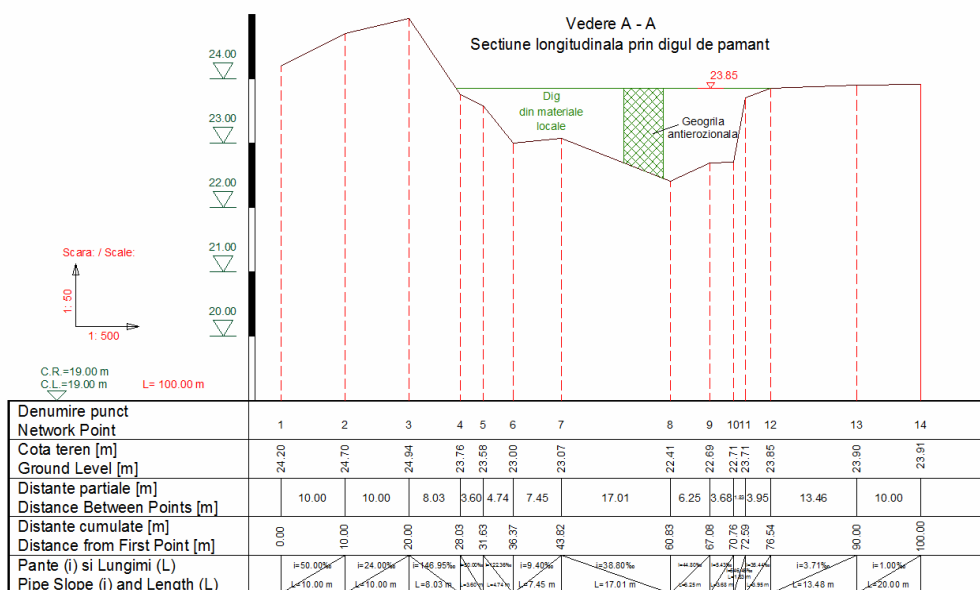


Figure 5. Longitudinal section through the closing dam for the drainage channel

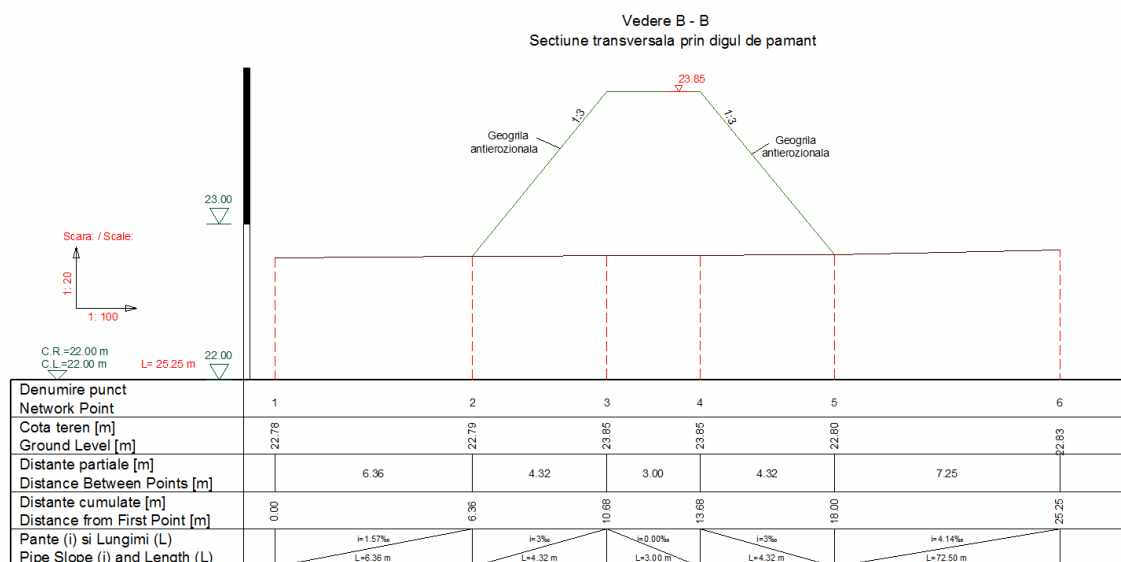


Figure 6. Cross section through the closing dam of the drainage channel

5. CONCLUSION

After completing the propose work, the next stage will be the monitoring of the effects made by the hydromechanics work-out. The monitoring will be made for a calendaristic year and will contain: the visual inspection of the water evacuation areas from starting point when the Pond is flooded and emptied, the measurements of the surface water level of the Pond, measurement of the debits and the levels of the new deviation channel. If the time for evacuating the water from Pond Gerai remains insufficient for making the proper condition for nesting, then the necessity for a new hidrotehnic construction for the control of the water debit and the levels will be made in the south-west of the Pond Gerai.

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