

WETLAND MANAGEMENT AND RESTORATION PROJECTS IN THE LOWER PRUT BASIN RELATED TO EFFECTS OF ANTHROPOGENIC ACTIVITIES

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Abstract

In this material, we propose the following three potential demonstration sites for wetland management and restoration projects in the Lower Prut basin: Prut flood plain, downstream of Sovarca swamp, up to the mouth point in the Danube; Brates Lake located NE from Galaţi city, connected with the Prut.river by the valley of Ghimia brook; Horincea hydrographical basin. The most important aspects are the technical (technical works for effective exploitation of water resources and the role improvement works combined with fish farming biotechnology) and organizational ones (decision-makers involved and the specific tasks). Arrangements for water management of the Prut basin were taken into account: coverage requirement of water for population centers, industrial and other use, combating the destructive effects of water, hydropower potential of the main rivers in the basin, protect the quality of river water sources and ensure health and environmental requirements of the population. Differences of terminology can be eliminated simply, by using IUCN system of classification whose main aim is to manage the protected area. In the system there are 6 categories of protected areas, which also involve a varying degree of human intervention – from nonexistent (category I-a and I-b) to a higher degree (category V). All categories are the same importance and relevance for biodiversity conservation.

Keywords: Lower Prut Basin, Wetland Management, Horincea, Anthropogenic Effects.

1. GENERAL FRAME AND MEASUREMENTS FOR BIODIVERSITY PROTECTION

The Lower Meadow of Inferior Prut River Natural Park includes all the flood meadow of Prut river on the administrative territory of Galaţi county. The Lower Meadow of Inferior Prut River Natural Park has the endorsement of CMN 19/Cj/18.02.2003. The planning maps of UP V Prut Meadow were drawn up by SILVAPROIECT, in 1995. The area of the Natural Park fits the type of habitat formed of: Natural eutrophic lakes with a *Magnopotamion* or *Hydrocharition*-type vegetation (Natura 2000 code of habitats: 3150) and lakes or dirty grey to blue – green water ponds, more or less turbid, especially rich in basic substances (pH usually higher than 7), many freely floating *Hydrocharition* communities being present at the surface or, in case of the deep systems and open water surfaces, the *Hydrocharition* communities are associated to the submersed vegetation formed of large cormophytes. For all the types of existing habitats housing a large variety of fauna (especially avifauna), sedentary as well as migrating or passing fauna, the Maţa – Rădeanu humid area, with a surface of 386 ha, is similar to the special preservation areas from the Danube Delta. Other areas on Prut river may be considered similar the this one (Pochina lake, the area where dams are being built, between Vlădeşti and Giurgiuleşti customs point, Prut Isle, Brateş lake) (Gâstescu, P., 1971).

Romania is part of the the Natura 2000 European Network (SPAs – Special Protection Areas and SCIs - Sites of Community Importance) aiming to protect wildlife and its habitats, whose surface is not definitively established. Also, the national authority responsible for the protected areas in Romania is hardly starting the process (January, 2010) of handing out the Natura 2000 sites to different legal entities (NGOs, economic agencies, research institutes, local authorities etc.) in order to manage them (Vartolomei, 2010).

GIS techniques and GPS means were used for the inventory and Land Register records of these types of surfaces and also for the integration in digital formats of the protected area limits at a European level (Vartolomei, 2003).

2. INVENTORY OF WETLANDS AND FLOODPLAIN HABITATS

In 1998 "Romanian Waters" National Company the main manager of the water resources from Romania has started the preparation at the request of the Ministry of Water Forest and Environment Protection the inventory of the wetland and floodplains at national level including the potential for restoration according with the particular case from Romania where the process of land restitution to the previous owners is in the second step of application. In order to determine the wetland conservation potential in the Danube River Basin, an evaluation study of wetlands and floodplains areas was done by an

international consortium under the UNDP/GEF Assistance. Also, at the national level an inventory of the wetlands and floodplains was done including all existing natural wetlands or wetlands for which the initial situation was changed. In both reports the Prut catchment area was presented with a large number of existing wetlands and also with a large restoration potential. Out of about 200 wetlands recorded for whole Prut basin (many of them are less than 1 sqkm surface) a number of 19 wetlands were selected and discussed in the inception phase. These are included in the table 1. Some of these wetlands are still under the natural conditions (10) and the rest were modified to be used by agriculture (Vartolomei, 2002).

Table 1. The wetlands within the Prut catchment area

No.	County	Location	River	Surface (sqkm)	Wetlands conditon/usage
1	Iasi	Dranceneni	Drinceni-river	2.70	agriculture
2	Iasi	Albita-Falciu	Poganesti river	24.3	agriculture
3	Vaslui	Albita-Falciu	Stanilesti river	36.8	agriculture
4	Vaslui	Albita-Falciu	Banului lake	56.55	agriculture
5	Vaslui	Albita-Falciu	Berezeni river	40.20	agriculture
6	Vaslui	Albita-Falciu	Falciu river	28.70	agriculture
7	Vaslui	Bata- Rinzești	Ranzești river	3.00	agriculture
8	Vaslui	Urlati	Elan river	0.75	natural
9	Vaslui	Gusitei	Elan river	2.30	natural
10	Vaslui	Poste Elan	Elan river	0.75	natural
11	Vaslui	Paicani	Elan river	1.25	natural
12	Vaslui	Giurcani	Elan river	0.30	natural
13	Vaslui	Murgani	Elan river	0.50	natural
14	Galati	Galati - Vadoni	Prut river	75	natural
15	Galati	Rogojani	Horincea river	1.50	natural
16	Galati	Vlădești	Prut river	269	agriculture
17	Galati	Bratesul de Sus	Prut river	58.01	agriculture
18	Galati	Bratesul de Jos	Prut river	97.47	agriculture
19	Galati	Badaleni	Prut and Danube	17.86	agriculture
20	Galati	Ostrovul Prut	Prut and Danube	56.6	natural
21	Galati	Lower Prut floodplain	Prut	5,480.41	natural
22	Galati	Vlăscuța swamp	Prut	41.8	natural

It has to be mentioned that several wetlands which in present are in natural stage are included or will be included in the List of Protected Areas under the legislation preservation. In this regard the planning of wetlands and floodplains rehabilitation is underdevelopment and will depend by the finalization of the land restitution action. Among the protected areas within Galati county, according to the criteria of habitat identification, three of them (Ostrovul Prut, Lower Prut river meadow and Vlăscuța swamp) have been indicated to include some wetlands as well (Figure 1) (Vartolomei & colab, 2011).

3. PROPOSAL FOR WETLAND MANAGEMENT AND SOLUTIONS

We propose the following potential demonstration sites for wetland management and restoration projects in the Lower Prut basin: Prut flood plain, downstream of Sovarca swamp, up to the mouth point in the Danube; Brates Lake located NE from Galați city, connected with the Prut.river by the valley of Ghimia brook; Horincea hydrographical basin (Figure 2).

Based on the analysis of the premises and conclusions that have emerged there can be extracted a series of proposals to solve the problem. The most important aspects are the technical (technical works for effective exploitation of water resources and the role improvement works combined with fish farming biotechnology) and organizational ones (decision-makers involved and the specific tasks) (Vartolomei & colab., 2011).

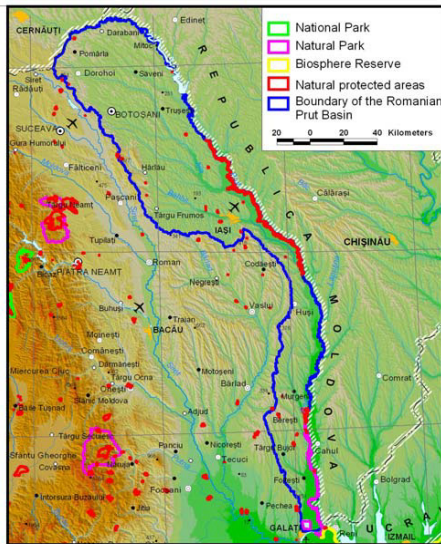


Figure 1. Natural Protected Areas in the Romanian Prut Basin*

*Source: Bălțeanu D., Dumitrașcu Monica, Ciupitu D., Maxim I., *România, Ariile naturale protejate*, 2009

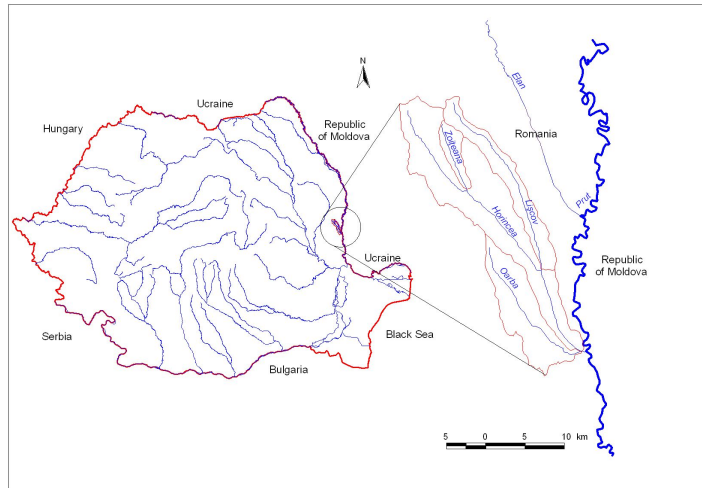


Figure 2. Location of Horincea sub-basin

3.1. Technical aspects

Rivers crossing the plain area as is the case of Prut river are not adequate for the partitioning of the river bed of their basins, because of the hydrologic regime with large flow variations. They may however be used as power sources for the system units created as a result of improvement works on the former marshes or for natural marshes as well as for economic, touristic and social utilities (Fig. 3 and Fig. 4). Water use in these two cases requires the installation of pumping stations in the Giurgiulești Oancea-area location, water and wastewater treatment. Their location will be dictated by the population exodus from town to village and the development of small rural industries. To complete the sub-basin planning, they should be viewed as indivisible natural units (Vartolomei, 2008).



Figure 3. Natural potential for touristic activities in Lower Meadow of the Inferior Prut River Natural Park

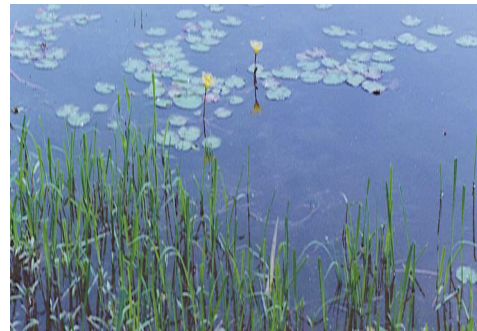


Figure 4. Biodiversity aspect in Pochina lake area

Developing works on these basins should start from the watershed line and include all works required for combating and preserving soil erosion and the total elimination of the harmful effects of the flood water. The accumulation of water thus created can store the flood waves and can also have a complex use: agro-fishery, water supply for livestock farms, for recreation (Surd Vasile & colab., 2011). Regardless of the type of use, they must perform the following functions: to not allow the water flooding downstream, to ensure a guaranteed minimum flow during periods of low fluid potential and to ensure efficient use of water resources. Possible locations of accumulation for Horincea sub-basin can be completed in a subsequent step, with accumulations in its lower sector thereby ensuring effective control of the flow of the whole basin. The investment costs will be higher because of the fact that in this area Horincea stream has a riverbed requiring a dam of approximately 6 km. Another future possibility would be that of transferring water from Prut although it would involve higher costs. This option would be justified in case the population in this area will grow up and small industry would develop (Pop Iuliana & colab., 2011).

The entire range of hydrotechnical works in the sub-basin Horincea of Oancea, Bisericii and Stoenești valleys aimed at regulating the water stream in order to avoid negative effects of flooding must

nevertheless respect the principles of ecological planning in order to avoid failures occurring after the completion of this type of works respectively: the disappearance of flooded area which increases the speed of the water drainage because of the fact that the river beds, after the improvement works are performed, they become channels, thus the riparians can only use the water for a short time; increasing speed also leads to a gradual deepening of the river causing a general lowering of groundwater in the area leading to depletion of water from wells and land dryness. When considering the environmental planning, one should start from the principle that the streams in the Prut basin represent simultaneously ways of circulation, tanks and complex ecological zones which are in strict interaction with the surrounding areas. Based on the data presented so far, respectively the abiotic and biotic components of the climatic, hydrologic regime, soil structure, vegetation, the intensity of erosion processes, profiles, the first steps that are recommended are: cutting the steep banks, which immediately reduces erosion, creating low gradient banks, stabilization of river's bottom current by adding of rocks and boulders and planting both grass and shrub vegetation on the banks in order to stabilize the soil. The restructuring of fisheries facilities open the prospect of achieving some strategic objective of the sector, namely: the application intensive fish farming of the valuable species in demand on the internal and external markets, the application of biotechnology in acclimatised spaces, mechanization and automation of piscicultural technologies (Surd Vasile & colab, 2011).

Regarding the natural marshes that can still be found in the Prut meadow the best solution would be that they preserve their current form and they should become natural reservations. Preserving these areas will lead to the conservation of the biological balance and biodiversity of the area. Moreover, under the present circumstances, opens the perspective towards a new approach: the Prut meadow would enter the international circuit of protection and development.

3.2. Organisational issues

The central authorities that have specific responsibilities in environmental protection are the Ministry of Agriculture and Rural Development, Ministry of Environment and Forests and the two national companies - Romanian Waters National Company and National Company Romsilva). *Ministry of Environment and Forests* has major responsibility for environmental protection in Romania, its main tasks being related to water management of river basin planning for the reclaim of new water sources, coordinates the preparation of plans and frameworks for developing the hydrographical basins, approves the water-related works, establishes forecast and information activities in the field of water management and hydrology, etc. (Pop Iuliana & colab, 2011). *Ministry of Agriculture and Rural Development* has specific responsibilities the field of protection of soil, terrestrial and aquatic ecosystems. Also, it elaborates and sets up priority programs for improvement of works and financing, preventing and combating animal diseases, plant protection and phytosanitary quarantine, quality control of seeds and seedlings. This ministry approves land improvement, conservation and environmental protection programs and it elaborates regulations regarding agricultural systems, technologies of plant cultivation and animal husbandry, forest regeneration, harvesting, collection and transport, and soil quality standards in order to maintain and improve it, to remove the negative consequences on aquatic and terrestrial ecosystems to ensure conservation of specific functions, biodiversity and natural habitats, and communicates with the central environmental authorities. *Ministry of Agriculture and Rural Development* keeps track of land rendered unfit for agricultural production and provides upon the request of their owners specialized technical assistance for land improvement works. *Romanian Waters National Company* manages water resources (surface and groundwater) and prepares and monitors the implementation of programs for meeting the water demands of the population and economy, exploitation of new water sources, rational use and protection against depletion and pollution, complex planning of water in accordance with current and future requirements. It is also the Romanian Waters National Company that correlates the water works with land reclamation works. *National Forest Company Romsilva* is required to perform all the works of ecological restoration, regeneration, plantation and maintenance.

3.3. Law aspects

In Legislation of many states definition „Natural Environment” was transformed through last decade into „Naturally-Anthropogenic” one. This change reflects attempts to find more precise equilibrium between the present-economical development and future generation's survival (Vartolomei & Mădălina-Teodora Andrei, 2008). River basins became the main „indicators” to attain such equilibrium. And their problems are focal for further Sustainable Development (and for success of concrete modern approaches, such as Spatial Planning, Environmental Management, Technology Foresight, Pollution Prevention, Cleaner Production,

Eco-efficiency, Life Cycle Assessment etc. (Surd Vasile & colab. 2011). For Water Management Systems on the cross-border flows this reality brings up a huge knot of multilevel problems. Their step-by-step resolution will be possible when, instead to struggle with consequences, authorities of all levels will do away with causes. And further absence if causal-investigatory connections between the economical and environmental aspects in this area as well as in activity of authorities will aggravate the situation. Therefore the „survival” of existent and new enterprises under the new conditions as well as their attraction for necessary investments and international support, will directly depend of systems accounting, appraisal, risks assessment and Audit implementation. Today in Lower Prut basin there are some examples of the enterprises reporting completely harmonised with the EU regulations. But parallel to the Environmental Inspectors the separately collected data is referred to other control bodies (Sanitary Service, Workmen’s Protection, Emergency Planning, Statistics Office, Municipal Structures, Water Management etc.). But at the source of information is absent the interior self-organisation accordingly to the „process approach”, foreseen by International Standards of Quality ISO 9000:2000 and Environmental Management ISO 14000. Other experience such as Ukrainian-Austrian-Romanian former project already demonstrate, that such approach is profitable for the enterprises, regional executive authorities and local self-Governments, whereas it concentrates limited resources for the key (weak) points and sectors. And simultaneously it generates a good opportunity for joint revealing and agreement of win-win solutions. On the other hand the same principles becomes now a basis for safe development of business and investments in the Eastern Europe, today and in the future as well.

4. EFFECTS OF ANTHROPOGENIC ACTIVITIES ON WETLANDS AND FLOODPLAINS

The human pressure has been led to the changes of structure and functionality of the wetlands floodplains and of the Prut river, characterized through the apparition of a strongly anthropized environment (Surd Vasile & colab, 2011). The key issues of anthropogenic activities which have had effects on wetlands and floodplains of the river Prut are represented in table 2 bellow:

Table 2. The key issues of anthropogenic activities which have had effects on wetlands and floodplains

Key issues	Impact
Hydrotechnical works and reservoirs 8 non-permanent or semi-permanent reservoirs which keep 40 million m ² 329 km of embankments along of 480 km banks on the Prut river and some tributaries to protect of near 100.000 ha of agricultural land, 25 localities and 120 industrial units.	Reduction of wetlands and floodplains. Reduction of efficiency of nutrients sink. Reduction of the water running area of the river which increases the flow velocity and affects the flood forest and embankments. Reduction of water quality self-dynamics. Reduction of suspended solids transport efficiency. Increasing of erosion un downstream areas. Decreasing of groundwater recharge capacity. Water shortages. Disappearance of diverse habitats which offered life conditions for a high vegetal and animal. Birds biodiversity. Decrease of economical (fisheries, wood, reeds, hunting) and touristic potential. Disappearance of micro – climate effects.
Agriculture and rural land use	Increase of nutrients concentration in river water. Increase of toxic substance loads. Salinisation. Stepisation. Disappearance of swamps, meadows, reed beds.
Fisheries	Disappearance of spawning conditions. Reduction of fish quantity. Reduction of economically high quality species.

Regarding the industrial and diffuse pollution which have an impact on Prut ecology and water quality, this being closely linked with the ecology of the floodplain forested corridor and the existing wetlands, the situation is much severe in the upper part of the basin, based on a large concentration of industry, agriculture and human settlements in comparison with the lower Prut where the impact is much smaller.

5. CONCLUSIONS AND RECOMMENDATIONS ABOUT BIODIVERSITY PROTECTION AND WATER RESOURCES MANAGEMENT IN LOWER PRUT BASIN

In present we recommend that surveys are carried out to evaluate the current state of biological and landscape diversity of the lakes, especially those with ornithological importance and so that a long-term integrated monitoring system is devised for the lakes and wetlands in the Lower Danube Region. Also, it is recommend that scientific evidence is compiled for assigning nature conservation status to Lakes Kagul, Kartal, and Kugurlui and prepare proposals for designating Lake Kagul as a wetland of international significance, so that the point and non-point sources of pollution in the lake basins are identified and assessed. At least we recommend that dynamic modeling is used as an aid for lake management taking full account of any inherent limitations in such models. The spirit of Environment protection Law and Water Law seen as interior documents for each enterprise aimed to order their own knowledge about the flows of waste (losses, sewage, discharges and package materials). The general outside task of this study becomes the universal primary source of information for further accounts to Environmental and Water Management Structures, Emergency Planning, Labour Safety, Sanitary and Municipal Services, Statistics Office etc.

In general, the implementation of this study is the first step, which brings together the interests of the enterprises, Local, Regional and National authorities for the Natural Resource Conservation, safe Water Management and Waste Minimisation and Competitiveness of Productions and Services as core elements of Sustainable Spatial Development in Lower Prut basin.

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