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RESTORATION OF WETLANDS IN NORTHEASTERN HUNGARY

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ABSTRACT

Nowadays is evidently proved that the maintenance of state of protected or potential protected wetlands can only be provided through the restoration activities based on the results of well founded research.

There are many different types of wetlands, each of which provides a different range of benefits to human society.

The term wetlands groups together a wide range of inland, coastal and marine habitats which share a number of common features, but on the decision of the Ramsar Convention defining wetlands as: "Areas of marsh, fen, peatland or water, whether artificial, permanent or temporary, with water that is static or flowing, fresh, brackish or salt, including areas of marine water the depth of which at low tide does not exceed six meters."

Wetlands are an ecotone, the transitional zone between land and water, and they combine characteristics of both environments. The wetland habitat consist of permanent or seasonal shallow water dominated by large aquatic plants and broken into diverse microhabitats (Horne and Goldman, 1994).

Despite the importance of wetlands, vast areas have been degraded or lost as the results of human impacts. In order to reduce the rate of wetlands loss and enhance the contribution that these ecosystems can make to sustainable socio-economic development, a range of actions needs to be taken to improve restoration (Dugan, 1990). Only recently has recognition of their value as wildlife feeding and breeding are led to protection and restoration.

INTRODUCTION

In this century it is evidently proved, that the maintenance of the condition of protected or potentially protected wetlands can only be provided through management activities that are based on the results of well founded research.

There are many different types of wetlands, each of which provides a different range of benefits to human society (Mitsch and Gosselink 1993). Wetlands are an ecotone, the transitional zone between land and water, and they combine characteristics of both environments. The wetland habitat consists of permanent or seasonal shallow water dominated by large aquatic plants and broken into diverse microhabitats (Horne and Goldman, 1994).

Wetlands are threatened all over the world and those which are located in Central-Eastern Europe are of no exception. Wetlands well reflect the natural character and condition of the environment, therefore the priority of their restoration is well documented (Mitsch *et al.* 1994). This attitude is supported by several other factors since microorganisms, plant and animal communities have the highest biodiversity in wetlands, especially in the case of the temperate zone. Their heterogeneity and the role they play which are directly or indirectly advantageous for mankind can be easily damaged or even destroyed (Maltby 1994). In order to reduce the rate of wetlands loss and enhance the contribution that these ecosystems can make to sustainable socioeconomic development, a range of actions needs to be taken to improve their restoration (Dugan 1990). Only recently has the recognition of their value as wildlife feeding and breeding area led to their protection and restoration.

This paper presents the results of studies on hydrobiological conditions and different water supplies in the existing protected or potentially protected wetlands in the Northeastern part of Great Hungarian Plain.

MATERIALS AND METHODS

The 31 wetlands studied are located in North-eastern part of Hungary (Nyírség, Szabolcs, Hajdusag and Bihar areas) and the borderland (Bereg county) in the Ukraine. In the field temperature, pH, redox and conductivity were measured. In the laboratory the major anions and cations were analyzed to establish the status of water quality.

The oxygen contents were measured and oxygen saturation was estimated. To establish the trophic state of wetlands the concentrations of ortho-phosphate and total phosphorus were measured besides ammonium, nitrite, nitrate, Kjeldall nitrogen, total inorganic, -organic nitrogen forms, and total nitrogen (TN) was estimated.

The chemical oxygen demand (COD) and total organic carbon (TOC) were also measured to establish the saprobity of water quality.

Chlorophyll-α content of water samples were measured and the taxonomic composition of phyto- and zooplankton were studied. Floristic and cenological studies were carried out and we applied Simon's nature conservation ranks of the vascular flora analysis (Simon 1988).

On the basis of our results we summarized our suggestions for restoration from the point of view of the possible solution of water supply and the state of water quality. The preservation of nature values were given a high priority.

RESULTS AND DISCUSSION

Study of the water supply

With respect to the degree of solution of the problem of water supply (de Mars and Wassen 1993), the studied wetlands can be grouped and the results are presented in **Table 1**. We can state on the basis of this list, that the water supply at most of the protected wetlands have not been solved. The loss of water from precious wetlands, resulted in a degradation over and above the allochtonic organic pollution, that causes significant threat to these resources. This situation is characterized by the ancient Ér-bed at Pocsaj. Unfortunately the Nyírábrányi-bog and Kállósemjéni

Mohos can be placed into the nonsolved water supply group, although potential factors of the assuring of their water-demands are given, but both protected areas have almost totally dried up. With the disappearance of water, the spread of weeds is excessive, especially in the case of Mohos where an intervention for nature restoration is urgently need.

Table 1: The groups of wetlands studied with respect of the solved and nonsolved water supply in the norteastern part of Great Hungarian Plain.

solved	nonsolved	no problem
Bátorliget-bog	Nyirábrány-bog	Fényi-forest-bog
Fehérszik-marsh	Mohos-bog	Bihari-pasture
Haláp-reservoir	Hajdubagos	Hencida-marsh
Konyár sodic marsh	Pocsaj Ér-bed	Gáborján-marsh
Vajai reservoir	Bojt meadow	Kereki-marsh
Vámospércs-bog	Daru-bog	Bakonszeg reservoir
Beregi pond	Tiszadob oxbow	Dédai reservoir
Dédai pond	Borzsa oxbow	Nagyberegi channel
	Tisza dead-arm	Csizaji pond
	Szernye swamp	Szernye channel
	Csaronda	
	Mérce	
	Kráter pond	
	Vérke	

Biological water quality of studied wetlands

On the basis of the results of our chemical and biological water investigations we compiled the cation and anion types, trophic state and saprobity degrees of wetlands and their channels. Concerning the three indicators of the biological water quality it can be stated that the water of the channels is suitable for providing the appropriate level of supply. The degrees of the trophic state and saprobity are more favorable in the supplying channels, which may be attributed to the significant internal loading by nitrogen and phosphorus and organic matter.

During the floristic investigations 106 vascular plant species were identified which live in different types of wetlands. High plant species number and diverse community were characterized Bátorliget ancient-bog, Tiszadob oxbow system and Halápi-reservoir in Hungary, while natural or near-natural conditions were observed in case of Borzsa oxbow system, Mérce creek and Kráter-pond in Ukraine. Cenological studies were carried out in Bátorliget-, Nyírábrányi-bog and Mohos-bog at Kállósemjén and the findings were compared to the previous data (Lakatos, 1990). Heavy negative impact of water supply shortage could be established, mainly in case of Mohos-bog.

On the basis of the water quality and the plant species, wetland communities can be classified into four groups, namely, sodic (alkaline) marshes, bogs, transition-state wetlands and degraded wetlands (**Table 2**).

Table 2: Classification of wetlands on the basis of the water quality and the plant species communities in the northeastern part of Great Hungarian Plain

bogs	sodic marshes	transition-state wetlands	degraded wetlands
Bátorliget-bog	Fehérszik-marsh	Haláp-reservoir	Pocsaj Ér-bed
Fényi-forest-bog	Bihari-pasture	Hajdubagos	Mohos-bog
Nyirábrány-bog	Konyár sodic marsh	Bojt meadow	Tisza dead-arm
Daru-bog	Fehérszik-marsh	Borzsa oxbow	Szernye channel
Vajai reservoir	Hencida marsh	Kráter pond	Vérke
Tiszadob oxbow	Gáborján marsh	Beregi pond	
Szernye swamp	Nagyberegi canel	Dédai pond	
Mérce	Csaronda	Dédai reservoir	
		Csizaji pond	

The preservation, the conservation, the reconstruction, the rehabilitation, the management and the maintenance of biodiversity, where it is needed, are the main tasks of the nature restoration activities not only in our country but in many regions of the Earth. The experts in the nature protection and the ecologists can meet the expectations only if they act in cooperation.

The solution of water supply in Tiszadob oxbow system and the implementation of nature conservation treatment of valuable marsh-fern "floating-bog" are significant tasks. The case of

Mohos-bog at Kállósemjén may serve as a good example for illustrating the overall and harmonized research required to the proper way of the reconstruction. Firstly, it is necessary to search for well-water of the appropriate quality and quantity in the vicinity of the bog. Secondly, regular water chemical and ecological investigations should be performed in order to control the water quality of the supplying channel and canal for the sake of the suitable flooding. The third task is the hydrobiological research of the bog with a special attention given to the plant ecological and zooecological studies for revealing the effects of the changes after the nature reconstruction treatment. Finally, we have to analyze the efficiency of the reconstruction and the replantation, for the redesign of the reconstruction or treatment model in each case, as it is needed.

Wetlands in the Northeastern Great Hungarian Plain represent an internationally recognized as unique natural values. However, in addition to the general pollution problem they are in danger of drying up. As a consequence of the significant decreases of water quantity, all wetlands are in an extreme peril (Lakatos, 1995). Properly identifying them and especially saving the representatives of the internationally unique wetlands, should play a central role in the future nature restoration activity.

CONCLUSIONS

The wetlands belong to the most threatened waters and those are of no exception which are located in Central Eastern Europe. In order to reduce the rate of wetlands loss a range of action needs to be taken to improve restoration. Recently the recognition of their value as wildlife feeding and breeding area led to their protection and restoration.

The studied 31 wetlands are located in Northeastern part of Great Hungarian Plain. On the basis of our results restoration suggestions were summarized from the point of view of the possible solution of water supply and the state of water quality.

On the basis of the water quality and the plant species, communities wetlands can be classified into four groups, namely, sodic marshes, bogs, transition-state wetlands and degraded wetlands.

The preservation, the conservation and the reconstruction, the rehabilitation are the main tasks of the nature restoration activities in many regions of the world. Searching wetlands and saving them should play a central role in the future nature restoration activity.

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