

FUNCTIONING AND PROTECTION OF WETLANDS IN THE YOUNG GLACIAL AREAS OF NORTH-EASTERN POLAND

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S u m m a r y: Results of the research carried out in the north-eastern region of Poland (10.2% of the total area of Poland), are presented in the paper. Three types of lands (plains of ice-dammed lake origin, moraine uplands, sandy outwash plains) occur in this region. The wetlands require individual methods of protection and use with consideration to their specific hydrological and biotopic features, natural values and condition. The main aim is to preserve the wetlands in the state maintaining their important role in the landscape. Endeavours should be directed towards protection of wetlands with the best vegetation cover including most of raised bogs, transitional and headwater peatlands, gytja bogs with repeated bogginess, meadows with rich flora and swampy sections of river valleys. There is a need to restore these wetlands to their natural state. Some parts of the previously dewatered objects can be used for agricultural purposes.

K e y w o r d s: landscape types, peatbogs, wetland inventory, wetland utilisation

INTRODUCTION

In north-eastern Poland, a considerably large wetland area, i.e., biotopes of high hydration level with specific vegetation storing organic matter is found [2,3]. The origin of wetlands is connected with all kinds of hydrogenic soil-forming biotopes but peatlands are the most important of them [8]. The natural role of wetlands is more and more appreciated. It includes water storage, regulation of water economy and organic matter storage. Wetlands belong to the most endangered biotopes as they easily undergo unfavourable changes.

In Poland, about 43460 km², i.e., nearly 14% of the total area, is wetlands. In the years 1991-1994, a survey and evaluation of wetlands was carried out in the framework of a co-operation project between Poland and Holland [3,12]. The present paper is related to wetlands of the Olsztyn region (Fig. 1). They constitutes

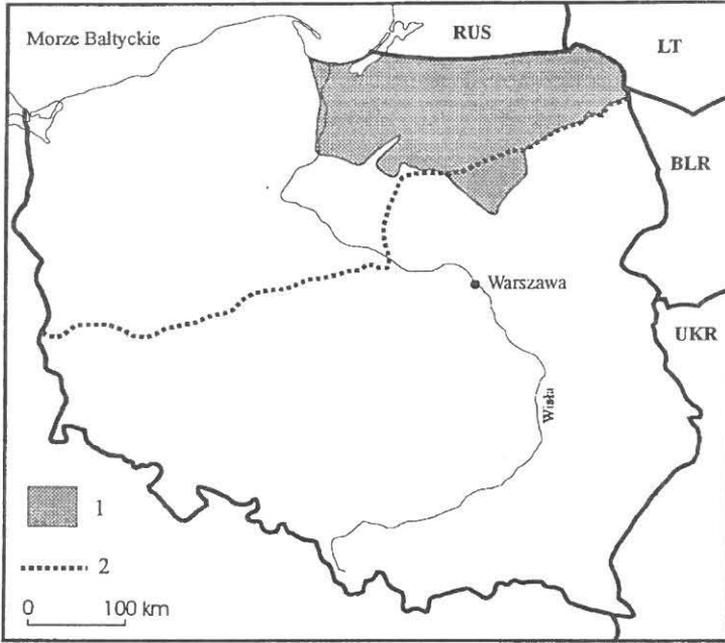


Fig. 1. Location of the investigated region. 1 – the area studied, 2 – extent of the Vistulian glaciation

10.2% of the total area of Poland. It is a valuable natural young glacial area where wetlands are important components of the landscape. They are more specific than the rest of the country. Their features significantly affect functioning and protection possibilities of wetlands.

MATERIALS AND METHODS

The survey and evaluation of wetlands was based on geological reports referring to peatlands and various cartographic documents. The data collected were verified in the field. Both wetlands in their natural state with a different degree of transformation and wetlands which are used for agricultural purposes were studied. A map of wetlands to scale 1:100 000 is a result of the research. The synthesis covers biotopic characteristics of the region, description of wetlands (including vegetation cover), nature evaluation and a catalogue of objects where protection is required. In conclusion, protection methods of wetlands and their usage were presented. A computer database on wetlands was created. The results presented below are related to 3 macroregions: the Staropruska Lowland, the Masurian Lakeland and the Lithuanian Lakeland [5].

RESULTS AND DISCUSSION

Specific features of wetlands in various types of landscape

In the three macroregions (the Staropruska Lowland, the Masurian Lakeland and the Lithuanian Lakeland) wetlands constitute 2118.2 km², i.e., 10.9% of the total area (Table 1). Peatlands cover 1388.5 km², that is 7.2% of the area. A peat-cover of the region is higher than an average peatcover of Poland (3.9%). The share of transitional peatlands is 1.5 times higher and of raised peatlands is 2 times higher in the region of Olsztyn than in the whole country (Table 1). Wetlands in the north-eastern Poland are highly differentiated as a result of specific biotopic conditions, particularly the geological structure, relief features and ways of water supply [9,11]. In the region of Olsztyn, three types of lands where wetlands show certain specific features and require specific principles of protection and utilisation were distinguished (Fig. 2).

Table 1. Wetlands in the Olsztyn region (the Staropruska Lowland, the Masurian Lakeland, the Lithuanian Lakeland) and in Poland

Wetland type	Area (km ²)		Percentage in relation to the area of			
	Olsztyn region	Poland	peatland area		total area	
			Olsztyn region	Poland	Olsztyn region	Poland
Peatland	1388.5	12110	100.0	100.0	7.2	3.9
- low	1231.2	11327	88.7	93.9	-	-
- transitional	68.3	403	4.9	3.3	-	-
- raised	89.0	380	6.4	3.2	-	-
Non-peat wetlands	729.7	31350	-	-	3.7	10.0
Total wetland area	2118.2	43460	-	-	10.9	13.9
Total area	19398.0	312685	-	-	100.0	100.0

Ground moraine and stagnant plains of ice-dammed lake origin with a small number of wetlands predominate in the Staropruska Lowland and northern parts of the Masurian Lakeland and the Lithuanian Lakeland. It was a consequence of flat land without vast concave landforms or wide river valleys. Objects with partial bogginess and soils where the top-layer gleying processes took place, are found in the areas with compact clays and loams. Peatlands were formed in the areas of permanent paludification, most frequently in the ice-melting depressions. Climatic conditions had a positive impact on the formation of considerably large areas of raised and transitional peatlands. Apart from the raised peatlands and post-lake

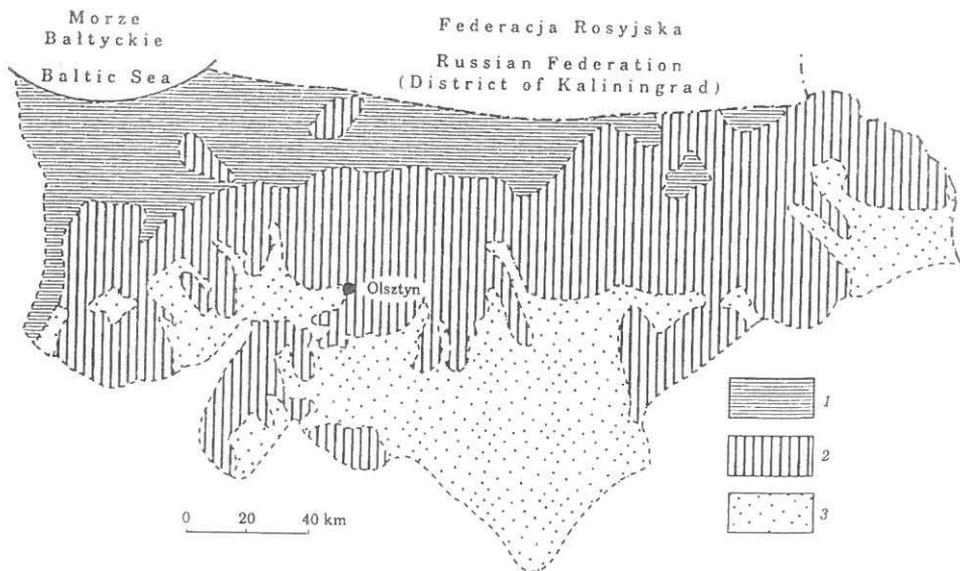


Fig. 2. Landscape types in the Olsztyn region. 1 – plains of ice-dammed lake origin, 2 – moraine uplands, 3 – sandy outwash plains

peatlands, peatlands formed as a result of direct paludification of mineral soils were found. Most ombrogenic wetlands occurred in the Staropruska Lowland. In the area studied, wetlands called silt-covered grounds were formed in the river valleys and ice-melting depressions [8]. They were fluviogenic biotopes where silt was deposited by surface waters [1]. Not many wetlands were found in their natural state. Most low peatlands were transformed into green lands. The region is a typical agricultural area with fertile soils. It is agriculturally feasible to use wetlands as grasslands. However, the most valuable of them should be protected as nature reserves, ecological lands and nature-landscape complexes.

Specific features and exceptional natural value was found in the central moraine part of the region (within Masurian Lakeland and Lithuanian Lakeland). The region had a differentiated relief with a great number of small wetland objects, mainly peatlands. Wetlands of the moraine zone were formed in the complex hydrological conditions related to the litogenic variability of glacial deposits and a diversified system of geological beds. Peatlands without outflow irregularly located in midmorainic depressions, were typical of the zone. They were generally small but peat in the whole profile showed a high of thickness. They were supplied by underground waters from the adjacent areas in the form of headwater outflow.

This way of supplying biotopes with water is called a soligenic type of hydrological supply [1]. Low peatlands are also found in the immediate vicinity of lakes. Formation of ombrogenic wetlands from some small peatlands was caused by poor precipitation waters. There were more such objects in the mesoregion of the Olsztyn Lakeland and in some parts of the Lithuanian Lakeland.

There were significantly fewer typical fluviogenic valley peatlands because of a small number of river valleys. Rivers flew along gaps through numerous land depressions. A typical example is a post-lake basin of the Łyna river [10]. The area and the number of non-peat wetlands in the region are significantly smaller than in other parts of the country due to the lack of well-developed valley landforms.

Wetlands of the moraine zone play an important role in the environment. They take part in the regulation of water economy, deposition of organic matter and circulation of biogenes. They create barriers limiting eutrophication of surface and ground waters. Specific flora and fauna of the wetlands increase biodiversity of the environment. Complex protection and pro-ecological use of wetlands in the moraine zone is a priority. A conducive factor is the soligenic type of water supply which provides permanent moistening.

Wetlands cover a large area in the outwash region of the southern parts of the Masurian Lakeland and the Lithuanian Lakeland macroregions. Plain outwash covers are mostly found in the mesoregions of the Augustów Plain and the Masurian Plain. Flat lands dominate there and moraine islands with a diversified relief are found only locally. Outwash deposits show great homogeneity of granulometric composition and belong to a group of loose and weakly loamy sands. Wetlands were formed in biotopes with a topogenic type of hydrological supply and in the river valleys [1]. In these biotopes a vast groundwater reservoir is a source of water supplying hydrogenic biotopes. It is created by water infiltrating easily through permeable sand beds. In the lower areas, there are peat deposits with alder-wood peat. Drainage of topogenic biotopes causes a steady ground water fall in a large area. Fast shallow-wing and transformation of organic soils into mineral-organic soils and then into mineral soils is observed. As a result, dewatered areas do not undergo repeated bogginess. However, vast fluviogenic wetlands are formed in the river valleys. They are represented by peatlands of stagnant riverside carrs, mud-covered grounds of flooding riverside carrs and silt-covered grounds where alluvial, mainly light soils, were formed. Additionally, small ombrogenic peatlands are found in the outwash areas. They occur, among others, around some lakes of the Masurian Plain and in the area of the Augustów Primeval Forest.

A significant share of large peatlands is a characteristic feature of the outwash zone. In comparison with other zones, biotopic conditions cause overdrying, intensive mineralization of organic matter and fast peat soil wastage. It is necessary to slow these processes down. In order to provide better soil moistening to limit mineralization in the areas with topogenic supply, it is necessary to change hydrological conditions in a significantly large area.

Conditions and requirements of wetland protection

The current conditions of wetland protection will be presented for the Warmia and Mazury Voivodeship which occupy most of the region. Despite unfavourable transformations, wetlands of the region are of high natural value. Part of the wetlands is protected using of various methods. Creation of a network of areas protected in the Warmia and Mazury Voivodeship is nearly completed [13]. However, it is not regarded as final but should be modified and supplemented continuously. In the case of wetlands, changes in the network of the protected areas should be particularly significant [6].

At present (as of the end of 2001) in the Warmia and Mazury Voivodeship, there are 8 landscape parks with a total area of 145 425.4 ha (two of them are partly situated in adjacent voivodeships), (Table 2). A considerably large area of wetlands is protected in these parks. Foundation of 3 more landscape parks, i.e., Galwica-Sawica, Górna Łyna (the Upper Łyna Valley) and the Puszcza Borecka (the Borecka Primeval Forest) is planned. Nature reserves play an important role in wetland protection (at present there are 97 of them in a total area of 28 043.5 ha). They include 15 peatland reserves which mainly protect peat-forming plant associations and peat deposits. They are only small as they cover a total area of 555.1 ha. A considerably large area of wetlands is protected in other types of reserves, mainly floral, landscape and faunal. Some of them cover large areas. There are 3 reserves (out of 8 in Poland) under protection of the Ramsar Convention on the protection of internationally recognised wetlands particularly waterfowl habitats. They include the reserves of Łuknajno, the Karaś Lake and the Oświn Lake.

Areas of protected landscape, which include sites of specific landscape with various types of ecosystems, cover a large area. Land management should provide a relative ecological balance. These areas are included in the plans of spatial management. Apart from the nature protection methods listed above, ecological lands, geological reference sites and nature-landscape complexes created in Poland since 1991. They are approved by local authorities and are included in a

Table 2. Nature protection in the Warmia and Mazury Province (Voivodeship). Situation at the end of 2001

Categories of the protected areas	Number	Total area (ha)	Percent of Voivodeship's area
National park	0	0.0	0.00
Nature reserve	97	28043.5	1.16*
- including peatland reserves	15	555.1	-
- including wetland reserves	23	5746.6	-
Wetlands protected under Ramsar Convention	3	3325.0	-
Landscape park	6+2**	145425.4	6.01
Area of protected landscape	28	113118.2	46.90
Ecological land	265	3930.0	-
Nature-landscape complexes	8	13118.2	-
Geological reference site	1	2.0	-
Protected areas in total	405	1297280.8	53.60

*Within the borders of landscape parks and areas of protected landscape there are some nature reserves, ecological lands, and nature-landscape complexes; **Two landscape parks are partly located in the adjacent voivodeship

lower class of nature protection than nature reserves. Ecological lands include the remains of natural ecosystems occurring in arable lands. They are generally small peatlands, ponds, water-heads and other wetlands. Up to the present, 265 ecological lands of the total area of 3930 ha have been created in the Warmia and Mazury Voivodeship. There are 6 nature-landscape complexes where interesting wetlands are also protected.

The projects by ECONET Poland and CORINE biotopes networks, which are the basis for the creation of the Pan-European network of protected areas called Nature 2000, include numerous wetlands of high natural value [4,14]. Both programmes are a good base for the extension of wetland protection. Most of the valuable wetlands are found in different classes of the ecological network. However, further extension of protected wetlands network is required particularly in the north-eastern Poland rich in this kind of biotopes. The number and the area of peatland reserves, ecological lands and geological reference sites should be increased. In order to select wetlands for different forms of protection, the following principles should be considered:

- all raised and transitional peatlands with well-preserved vegetation should be protected.
- wetlands with rare plant communities should be protected. It is particularly important in the case of boreal plant associations which occur mainly in the north-eastern Poland [7].

- wetlands with biotopes of rare and endangered plant species (listed in the Red Data Book) should be protected.
- well-developed headwater peatlands should be protected. They are relatively rare and at the same time typical of the region. Moreover, it is difficult to use them for agricultural purposes.
- peatlands where scientific research has already been carried out should be protected (palinology, phytosociology).
- wetlands which are important animal habitats (water and mud birds, swamp turtle etc.), irrespective of the vegetation cover condition should be protected.
- protection of wetlands should be adapted to the three specified landscape zones.

CONCLUSIONS

1. In comparison with the rest of the country, wetlands of the young glacial areas in the north-eastern Poland show clear specific features and high internal differentiation. Taking into consideration different biotopic conditions and types of wetlands, three types of land in the region were distinguished: plains of ice-dammed lake origin, moraine uplands, sandy outwash plains. Wetland specific activities should be adapted to these types of lands.

2. In the region of Olsztyn the strategic aim is to preserve wetlands in the state maintains their important role in the landscape. It includes water storage, organic matter accumulation and formation of habitats for specific plants and animals. In order to achieve this aim, it is required to protect more wetland sites using various methods of efficient and active protection.

3. The main activity should be directed towards the protection of wetlands with the best vegetation, most raised and transitional peatlands, headwater peatlands, gyttja bogs with repeated bogginess, meadows with rich flora and swampy parts of river valleys. A restoration programme of the wetlands to their natural condition is also required. Part of dewatered objects can be used for agricultural purposes.

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FUNKCJONOWANIE I OCHRONA MOKRADEŁ OBSZARÓW MŁODOGLACJALNYCH POLSKI PÓŁNOCNO-WSCHODNIEJ

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S t r e s z c z e n i e. W artykule przedstawiono wyniki prac wykonywanych w regionie północno-wschodniej Polski obejmującym 10,2% powierzchni kraju. W omawianym regionie występują trzy typy obszarów (równiny zastoiskowe, wysoczyzny morenowe, równiny sandrowe), w których mokradła ze względu na specyfikę hydrologiczno-siedliskową, walory przyrodnicze i stan zachowania wymagają odrębnych zasad ochrony i użytkowania. Głównym zadaniem jest zachowanie mokradeł w stanie umożliwiającym pełnienie ważnych funkcji w krajobrazie. Kierunki działań powinny polegać na ochronie mokradeł o najlepiej zachowanej roślinności, w tym większości torfowisk wysokich i przejściowych, torfowisk źródłkowych, wtórnie zabagnionych gytiowisk, bogatych florystycznie łąk oraz mokradłowych odcinków dolin rzecznych. Potrzebny jest również program przywracania mokradłom ich naturalnego stanu. Część już odwodnionych obiektów może być wykorzystywana rolniczo.

S ł o w a k l u c z o w e: typy krajobrazu, torfowiska, inwentaryzacja, użytkowanie mokradeł