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Valuation of natural assets of some raised peat bogs against a background of Bieszczady Mts. landscape of the Lutowiska district

Waloryzacja przyrodnicza wybranych torfowisk wysokich na tle bieszczadzkiego krajobrazu gminy Lutowiska

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Abstract

The "Land of the Valleys" lying in the area of the Lutowiska district in the Western Bieszczady Mts. is undergoing unwelcome succession-related changes, such as for example the extinction of valuable plant species or even whole plant associations, and the disappearance of the mosaic pattern of biocoenoses. It is therefore necessary to conduct investigations aimed at assessing the natural values of this region.

The natural assets of the Lutowiska district, where the three raised peat bogs under study (Wołosate, Litmirz and Tarnawa) are situated, were assessed using the Oświt [1995] method for the natural valuation of wetlands and associated landscapes. The method involves awarding points to three groups of indicators: (i) the scope and forms of nature conservation; (ii) general natural values; and (iii) the richness of wetland biotopes, plant communities and flora [Oświt and Dembek 1995]. Altogether, the district scored 60.7 valuation points (with 9 points for relief richness included), which allows classifying it as an area with very high natural values (class VIII on a scale of I–X).

Streszczenie

Na terenie „Krainy dolin” w Bieszczadach Zachodnich zachodzą obecnie niekorzystne zmiany sukcesyjne polegające między innymi na wymieraniu cennych gatunków roślin, a niekiedy nawet całych zespołów roślinnych oraz zanik mozaikowego układu biocenotycznego. Z tego względu bardzo ważne jest prowadzenie badań mających na celu ocenę walorów przyrodniczych tak cennego obszaru jakim niewątpliwie jest obszar gminy Lutowiska.

Ocenę wartości przyrodniczych obszaru gminy Lutowiska na terenie, której zlokalizowane są 3 badane torfowiska (Wołosate, Litmirz i Tarnawa) przeprowadzono za pomocą metody waloryzacji przyrodniczej mokradel i związanych z nimi krajobrazów opracowaną przez Oświt [1995]. Metoda ta opiera się na punktowej ocenie [Oświt i Dembek, 1995]: zakresu i konserwatorskich form ochrony przyrody, wartości ogólnoprzyrodniczych oraz bogactwa mokradlowych biotopów, zbiorowisk roślinnych oraz występującej flory.

W sumie razem z punktami (9 punktów) jakie gmina otrzymała za bogactwo rzeźby otrzymujemy 60,7 punktów waloryzacyjnych. Wynik ten pozwala nam na zaklasyfikowanie jej do obszarów o bardzo dużych walorach przyrodniczych (VIII klasa w 10 stopniowej skali waloryzacyjnej).

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1. INTRODUCTION

The present-day human activity, especially agriculture, should take into account environmental considerations and observe the rules of sustainable development. To make a right decision whether to use the natural resources of a given region or conserve them, it is necessary to gather information on the specific natural values of the area, in particular of its landscape. Research in this field is of prime importance for areas with high biological diversity in the case of both natural ecosystems and those created or transformed by humans. Poland is obliged to comply with international agreements, among them the Convention on Biological Diversity (signed at the 1992 Conference on Environment and Development in Rio de Janeiro), which the country ratified in 1995 [Gliwicz 1996; Krzemiński 1996; Rykowski 1996; Ryszkowski 1996].

The Lutowiska district considered in the study includes the most attractive parts of the Bieszczady Mts. in terms of both natural assets and tourism potential. It has vast protected areas, such as the

Bieszczady National Park, the Landscape Park of the San River Valley and a zone of protected landscape as well as numerous natural reserves and nature monuments. It is also a part of the International Reserve of Biosphere "Eastern Carpathians".

The area of the district is host to various plant species, among them protected ones. Some more interesting plant communities occur on raised peat bogs. One can find many plants that are very rare in this part of the Carpathians, such as Andromeda marsh (*Andromeda polifolia*), cotton grass (*Eriophorum vaginatum*) and cranberry (*Oxycoccus palustris*), and species protected by law: marsh tea (*Ledum palustre*) and sundew (*Drosera rotundifolia*).

Regions generously endowed with natural resources, such as the Western Carpathians, deserve being thoroughly investigated to reveal their natural values. This will help define the needs and methods for the protection and rational use of natural resources, and to better protect areas with high biological diversity. The so-called

"Land of the Valleys" in the Bieszczady Mts. is an example of the region with biodiversity shaped by human activity. At present, the protection of this area is one of the most important tasks of the Bieszczady National Park [Michalik 1995].

The above-mentioned issues fell within the scope of the scientific interests of many authors, among them Michalik [2000] who devoted his work concerning the Bieszczady National Park to the protection of biological diversity in the cultural landscape of the "Land of the Valleys", particularly to the strategy of biodiversity protection in the Wołosate valley. Recently, a number of authors, e.g. Michalik [1995, 2000] and Zemanek [2000], were involved in inventory-making and describing the values of the vegetation cover of the Bieszczady National Park.

Many authors, such as Fijałkowski [1999], Nowicki et al. [1999], Urban and Błaszczuk [2004] and Przemyski [2004], focused on the valuation of peat bogs and water ecosystems in various parts of Poland.

Przemyski [2004] investigated the plant cover of the "Białe Ługi" peat-bog reserve in the Świętokrzyskie Voivodship. He found that its high value should mainly be attributed to the type of the biotope, the occurrence of rare phytocoenoses, well preserved in this region, and the presence of protected, threatened, dying or rare species of vascular plants. Many of the plants catalogued by this author are included in the IUCN Red List of Threatened Species. Fijałkowski [1999] carried out studies concerning the valuation and protection of peat-bog ecosystems in the Polesie National Park. He attempted to prove that various types of peat bogs differ considerably in natural value. To this end, he compiled a list of 50 rarest species of vascular plants, and assigned a stated value to each of them, using a 10-point scale (1 – lowest natural value, 10 – highest natural value). Species characteristic of lowland bogs received the highest scores in the area of the Polesie National Park. Lower scores were obtained by species of raised bogs, despite the fact that they belong to interesting and very rare plant communities in Poland [Fijałkowski 1999].

The present study attempts to determine the importance of three raised peat bogs (Wołosate, Litmirz and Tarnawa) in the Bieszczady Mts. in evaluating the natural assets of the Lutowiska district against a background of the natural landscape of this area.

2. MATERIALS AND METHODS

The natural values of the Lutowiska district area, where all the investigated peat bogs are located, were assessed using a method developed by Oświt and Dembek [1995] for valuating wetlands and associated landscapes. The method is based on awarding points to three groups of indicators [Oświt and Dembek 1995]:

1. Group A: scope and conservation forms of nature protection, including the occurrence of national parks, landscape parks, protected landscape areas, national reserves and nature monuments in the evaluated area;
2. Group B: general natural values, arising from the surface area of land occupied by forests, meadows, peat bogs and water reservoirs as well as landscape values;
3. Group C: richness of wetland biotopes, plant communities and flora.

The overall natural valuation of wetlands and associated landscapes is made by adding up all the points obtained in each of the three groups of indicators. Taking into account the fact that these figures depend largely on the size of the evaluated object, they should be divided by the surface area of the object (expressed in thousand hectares) [Oświt 2000]. The final results provide a basis for assigning the object to one of ten valuation classes (Table 1).

In addition, floristic investigations were carried out in the area of three raised bogs (Wołosate, Litmirz and Tarnawa) to perform an evaluation (by points) of plant communities and occurring species [Malec 2006].

3. RESULTS

All the investigated peat bogs are situated within the administrative boundaries of the Lutowiska district (eastern part of the Podkarpackie Voivodship). This rural district is one of the largest districts in Poland (476 km²) and has very low population density (about five persons per km²).

In evaluating the natural resources of the district, indicators of three groups (A, B and C) were considered.

Indicators of group A: valuation based on the conservation forms of nature protection

The results of the valuation of natural assets with regard to the forms of nature conservation are presented in Table 2.

The Lutowiska district scored 985.58 valuation points for Group A indicators (i.e. valuation number = 985.58).

Indicators of group B: valuation based on general natural values and landscape values

The results of the valuation of natural assets with regard to the area occupied by forests, meadows and peat bogs, and the density of the river network are shown in Table 3.

The Lutowiska district scored 417.03 valuation points for general natural values (i.e. valuation number = 417.03).

In addition, the landscape values of the district area were assessed taking into account the richness of relief features (on a scale of 1–10 points), yielding 9 points (to be added to the mean valuation index at a later stage of the valuation).

Indicators of group C: valuation based on plant species

Around 320 species of vascular plants and mosses having great significance for wetlands and hydrogenic habitats were found to occur in the Lutowiska district area, which translates into 1066 valuation points and the mean index of 3.3. This result puts the district to valuation class VI comprising areas with moderately high natural values. To better depict the natural values of raised peat bogs in the Western Carpathians, the mean valuation indexes for the peat bogs were calculated using phytosociological surveys. All the three peat bogs achieved similar results. The "Tarnawa" peat bog and the "Wołosate" peat bog (mean index 4.5 in both cases) showed outstanding natural values (class IX), while the "Litmirz" peat bog with a little lower index (4.1) exhibited very high natural values (class VII). The valuation indexes were also calculated and the natural values were determined for individual phytosociological surveys, which enabled a more comprehensive assessment of the natural values of the peat bogs with regard to the occurrence of vascular plant species and mosses characteristic of wetland habitats (Table 4). As shown in Table 4, the mean valuation indexes for individual phytosociological surveys varied between 3.3 and 5.9, and the most frequent valuation classes were VIII, IX and X.

The sum of all the valuation points awarded for the natural features of the Lutowiska district was 2468.61. Taking into account the surface area of the district (47 585 ha, i.e. 47.6 thousand ha), this translates into the mean valuation index of 51.86.

The final result, obtained by adding 9 points for relief richness, was 60.86. The latter index shows an overall assessment of the natural assets of the Lutowiska district, presenting it as an area of very high natural values (class VIII).

4. CONCLUSION

Based on the valuation of natural assets, the Lutowska district was found to constitute an area of very high natural values, falling into class VII (on a scale of I–X).

The results of the present study differ somewhat from those obtained by other authors, which may be attributed to the fact that the method used in the study has been designed for moist habitats, and the calculations were made based on the data from various works; only those concerning the vegetation of raised peat bogs came from the authors' research. The works of Faliński [1975], Denisiuk et al. [1990] and Michalik [1987] in discussing the natural values of the Bieszczady Wysokie Mts. and the former Krośnieńskie Voivodship place this region among the most valuable regions of Poland. It should be stressed that the above-mentioned authors considered not only the flora characteristic of wetlands and hydrogenic habitats, but also other types of vegetation

occurring in this area, among them particularly valuable species (endemic Eastern Carpathian species, rare Alpine and sub-Alpine species, and rare mountain species).

The valuation presented in the study has only a preliminary character, and it is necessary to carry out field investigations aimed at cataloguing the plant cover of wetlands in the Western Bieszczady Mts. Particular attention should be given to plant communities of the "Land of the Valleys" that are host to nearly all of the most valuable plant communities of raised bogs. Even a preliminary valuation of raised peat bogs, made on a basis of plant species occurring there ("Tarnawa" and "Wołosate" bogs – class IX, "Litmirz" bog – class VIII) showed that such areas deserve special care and protection. Currently, these areas are subject to unfavourable succession-related changes that adversely affect the natural resources of this region, causing the extinction of valuable associations and species of plants and the disappearance of the mosaic pattern of biocoenoses, as well as contributing to the uniformity of the landscape.

Table 1. Valuation classes used for overall valuation of natural resources of wetlands and associated landscapes (according to Oświt 2000)

Valuation class	Natural values	Range of mean valuation index
I	very low	<8.0
II	medium low	8.0–16.0
III	low	16.1–24.0
IV	moderate	24.1–32.0
V	medium moderate	32.1–40.0
VI	moderately high	40.1–48.0
VII	high	48.1–56.0
VIII	very high	56.1–64.0
IX	outstanding	64.1–72.0
X	unique, exceptional	>72.0

Table 2. Valuation based on conservation forms of nature protection (Malec 2006; www.lutowiska.pl)

Form of nature protection	Unit	Points	Lutowiska district	
			Area	Valuation number
1. National park (established)	50 ha	1	22 776.78	455.5
2. National park (projected)	60 ha	1	0	---
3. Landscape park (established)	70 ha	1	22 778.0 ha	325.4
4. Landscape park (projected)	80 ha	1	0	---
5. Protected landscape area (established)	90 ha	1	1844.1 ha	20.5
6. Protected landscape area (projected)	100 ha	1	0	---
7. Natural reserve (established)	a reserve 10 ha	10 1	4 711.79 ha	40 + 71.18 = 111.18
8. Natural reserve (projected)	a reserve	10	4	40
9. Nature monument (established)	a monument	1	33	33
			TOTAL	985.58

Table 3. Valuation based on general natural values (Malec 2006; www.lutowiska.pl)

General natural values	Unit	Points	Lutowiska district	
			Area	Valuation number
1. Forests	100 ha	1	39 952.92 ha	399.53
2. Meadows and peat bogs	150 ha	1	1579.19 ha	10.5
3. River network density	0.1 km/km ²	1	0.74 km/km ²	7
			TOTAL	417.03

Table 4. Valuation of three raised peat bogs based on occurring plant species [Malec 2006]

Peat bog	Phytosociological survey No.	Number of plant species	Number of valuation points	Mean valuation index	Valuation class	Natural values
"Tamawa"	1	12	42	3.5	VII	high
	2	12	50	4.2	VIII	very high
	3	9	46	5.1	X	unique, exceptional
	4	9	43	4.8	X	unique, exceptional
	5	11	60	5.5	X	unique, exceptional
	6	12	64	5.3	X	unique, exceptional
	7	10	49	4.9	X	unique, exceptional
	8	11	57	5.2	X	unique, exceptional
	9	10	51	5.1	X	unique, exceptional
	10	10	59	5.9	X	unique, exceptional
	11	13	58	4.5	IX	outstanding
"Wolosate"	1	7	25	3.6	VII	high
	2	8	30	3.8	VII	high
	3	9	36	4.0	VIII	very high
	4	9	44	4.9	X	unique, exceptional
	5	11	48	4.4	IX	outstanding
	6	12	52	4.3	IX	outstanding
	7	11	51	4.6	IX	outstanding
	8	10	48	4.8	X	unique, exceptional
	9	14	60	4.3	IX	outstanding
	10	12	56	4.7	X	unique, exceptional
	11	15	62	4.1	VIII	very high
	12	11	36	3.3	VI	moderately high
"Litmirz"	1	10	41	4.1	VIII	very high
	2	10	45	4.5	IX	outstanding
	3	10	42	4.2	VIII	very high
	4	14	51	3.6	VII	high
	5	14	51	3.6	VII	high
	6	13	54	4.2	VIII	very high
	7	14	55	3.9	VIII	very high
	8	10	41	4.1	VIII	very high
	9	11	45	4.1	VIII	very high
	10	9	41	4.6	IX	outstanding
	11	9	45	5.0	X	unique, exceptional
	12	10	44	4.4	IX	outstanding
	13	10	42	4.2	VIII	very high
	14	10	43	4.3	IX	outstanding
	15	11	51	4.6	IX	outstanding

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