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NATURAL VALORIZATION OF DEGRADED SWAMP-ORIGINATING MEADOWS OF LOWER SILESIA (EXTENSION OF THE OŚWIT METHOD)

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Abstract. Swamp-originating meadows constituting indirect habitats between living peatlands and classical grasslands may be difficult to evaluate. An indiscriminate application of the Oświt (2000) method for their valorization does not fully reflect their value, because of flora which is different from flora found in living peatlands (in particular, the invasion of less hygrophilous flora). Based on the research carried out in the years 2005–2010 on eight swamp-originating meadow complexes, the scale was elaborated which enabled to more accurately valorize these habitat and floristically changed areas. The quantities of valorization values obtained by use of the author's method rely on the occurrence frequency of a given species (a number of posts in a given area), taking into consideration moisture requirements (the moisture indicator). In the author's method values were also given for species not taken into account by Oświt (2000). In addition, positive points were given for dying out species, and negative points for invasive species.

Key words: swamp-originating meadows, valorization, the Oświt method, the author's method

INTRODUCTION

Peatlands as ecosystems of complicated and fragile balance are very sensitive and respond violently to all kinds of changes. Major factors conditioning the transformation and disappearance of peatlands are inappropriate meliorations (grassland improvements) and an inadequate management and use of them (Ilnicki 2002, Tobolski 2003).

Relatively recently, attention was drawn to the changes in the species composition of plant communities of low peatlands as well as swamp-originating meadows which appeared after their drainage. The occurring transformations were analysed in the context of swamp-originating meadows degradation and its influence on the yield of grasslands (Prończuk 1956, Okruszko 1966), and on the natural environment (Noryśkiewicz 1978, Grynia 1980), as well as in respect of floristic and ecological issues (Jasnowski 1972, Pałczyński 1977, 1985). After the transformation of economic conditions in Poland, many swamp-originating meadows were put out of use or their use was dramatically limited, simultaneously ecognizing changes occurred in meadow communities (Ilnicki et al. 2004, Kozłowska 2005), while each area took its own direction of transformations which resulted in a diversity of the natural value.

The hitherto valorization methods of marshlands referred mainly to living and well-maintained peatlands (Oświt 2000), however they were not suitable for so greatly transformed sites as swamp-originating meadows.

This paper constitutes an extension and completion of the Oświt (2000) method used for the valorization of marshes, in order to adopt it for the conditions prevailing in degraded swamp-originating meadows.

MATERIALS AND METHODS

Swamp-originating meadows are defined as lowland meadows included in the group of swamp meadows, occurring in artificially drained and drying up podsol, as well as pool and still water marshy meadows. The soils of these meadows are muck (peat and mud-organic soils subject to the process of rotting), of variable moisture conditions, and the water table is always found beneath the depth of 50 cm.

FIELD EXAMINATIONS

The floristic and phytosociological research was carried out in the selected swamp-originating meadows in 2005–2010. The meadows selected for this research are situated in the lowland area of the Lower Silesia and are called as follows: Kotla, Głogówko, Parowa, Brnowiec, Przedmoście, Miękinia I and II as well as Milicz. They are meadow complexes of the area above 30 ha and documented farm use (Pałczyński 1970, 1976, Stepa 1976, Kalbarczyk 1982, Sobczak 1982, Badania… 1983 a, b, Kowalska 1990), which came into existence at the beginning of the 20th century as a result of melioration of lowland peatlands. Initially, they were used relatively intensively as meadows and pastures and they were characterised by adequate, from the viewpoint of a meadow expert, water relations. At present, they are not in use or are used extremely extensively, and the moisture conditions prevailing there are very changeable. However, they are valuable areas especially for the transformed agricultural landscape.

The plant species were denominated by use of the keys of Rothmaler (2002) and Rutkowski (2004). The names of vascular plant species were adopted after Mirek et al. (2002). The synthaxonomic affiliation was defined according to Matuszkiewicz (2006), Kucharski & Michalska-Hejduk (1994), Pott (1995) as well as Kucharski et al. (2001).

ANALYSIS OF NATURAL VALUES

The natural value of plant communities was evaluated by use of the method elaborated by Oświt (2000) and by the author's method. The Oświt method involved assigning a particular numerical value (from 1 to 10) to respective species occurring in phytocoenoses, and then calculating the mean value for each phytocoenosis (the phytosociological picture) by adding up the above values for all the obtained taxa and dividing the acquired sum by the total number of species in a community (the picture). The obtained results represented the valorization class to which the natural value of a community was assigned (Table 1).

The data analysis by use of the Oświt (2000) method has indicated that it may not be indiscriminately applied for describing the degraded swamp-originating meadows of southwestern Poland, as it is limited in such respects as follows:

- the Oświt (2000) method does not include many species of vascular plants which are found in the swamp-originating meadows of Lower Silesia, such as hygrophilous taxa;
- it presents a different geobotanical specificity of Lower Silesia (presence of subatlantic species, fewer taxa typical for areas of a higher degree of continentalism; lack of supraregional valorization character);
- it includes the overestimation of values for species more frequently occurring in southern and southwestern Poland, e.g. *Lathyrus pratensis*;
- the Oświt (2000) elaboration requires to be verified each time as there have appeared a new list of protected species (Rozporządzenie… 2004, 2012). In order to evaluate the natural value of rare species it is essential to become acquainted with the regional lists of endangered plants (in reference to the examined objects e.g. Kącki 2003);
- it includes relict species, which owing to their extremely scarce occurrence in Poland, do not constitute a measurable valorization indicator.

A critical analysis of the Oświt (2000) method resulted in the author's proposition of natural valorization of swamps, in particular of the swamp-originating meadows of southwestern Poland. The following

Table 1. Valorization classes for marshlands and hydrogenic habitats according to the Oświt method and the author's method (southwestern Poland) (according to: Oświt 2000)

Valorization classes	Description of natural values	Mean valorization indicator	
		Oświt method	author's method
I	very low natural values	< 1.4	< 2.00
II	averagely low natural values	1.5–1.8	2.00–3.19
III	low natural values	1.9–2.2	3.20–4.39
IV	moderate natural values	2.3–2.6	4.40–5.59
V	averagely moderate natural values	2.7–3.0	5.60–6.79
VI	moderately high natural values	3.1–3.4	6.80–7.99
VII	high natural values	3.5–3.8	8.00–9.19
VIII	very high natural values	3.9–4.2	9.20–10.39
IX	outstanding natural values	4.3–4.6	10.40–11.59
X	unique, exceptional natural values	> 4.6	≥ 11.60

valorization criteria (which, according to the author, are more objective and concise) were adopted:

- evaluation was carried out exclusively on the regional scale for the Silesian Lowland and Sasko-Łużycka Lowland;
- it was assumed that all the non-cultivated plant species found in the examined swamp-originating meadows are taxa occurring there spontaneously (sponateophytes), whose ecological amplitude allows them to occupy this type of hydrogenic habitats;
- consideration was given to the habitat preferences of respective species expressed by the soil moisture indicator (W), according to Zarzycki et al. (2002), which was converted into the 12-degree scale of the Ellenberg (1979) indicator for moisture (Feuchtezahl – F), and then transformed in such a way as to obtain the value of zero (WF) for dry habitat plants (W = 2 / F = 3), as well as to make the differences between respective categories equal to 1 (Table 2). The mean values were adopted in case of the species of a wider hydrologic spectrum. Furthermore, due to significant discrepancies between the values of the moisture indicators given by Zarzycki et al. (2002) and Ellenberg (1979) – for *Geranium palustre* the value of the W_F indicator was decreased by 1, and for *Hydrocotyle vulgaris* W_F was increased by 1. Despite the fact that *Spiraea tomentosa*, as a neophyte, was not included in either of the lists, it was taken into account by adopting the value of W_F = 4 acquired in the course of the author's field observations;
- the occurrence frequency of all the obtained taxa of vascular plants was estimated according to the amount of their posts in the area, taking into account the number of ATPOL squares occupied by them (Zając & Zając 2001), 264 squares were put to analysis. It was assumed that the valorization value (the number) of respective taxa was inversely proportional to the square root of the number of their posts according to "Distribution atlas of vascular plants in Poland" (Zając & Zając 2001) in the whole area, which is presented in Table 2. In case of *Spiraea tomentosa,* no data concerning the distribution of this species were found in "Distribution atlas…" in spite of its occurrence in Silesia as a spontaneophyte since the turning of the 19th and 20th centuries (Schube 1903), where it was observed in the Dolnośląskie and Niemodlińskie Bory (Forests) among others. Based on this information as well as present-day observations (Krukowski M. oral information; Tokarska-Guzik & Dajdok 2004), it was assumed that *Spiraea tomentosa* ocurs in at least 10 ATPOL squares;
- in addition, the valorization value was increased for endangered species under threat of fading out and extinction according to the category of their endangerment (Kącki 2003), adopting the following values: +4 for the EN category (Endangered) – *Scutellaria hastifolia,* +3 for the VU category (Vulnerable) – *Dianthus superbus, Senecio congestus,* +2 for the LC category (Least Concern) *Isolepis setacea, Juncus bulbosus*, and +1 for the NT category (Near Threatened) *Lathyrus palustris, Ranunculus lingua, Thalictrum flavum*;
- moreover, in case of strongly invasive non-native species (Tokarska-Guzik & Dajdok 2004, Weber & Gut 2004), the valorization value was decreased by –8 for: *Impatiens parviflora, Solidago gigantea, Spiraea tomentosa*, and by –4 for: *Acorus calamus, Conyza canadensis, Fallopia convolvulus, Helianthus tuberosus, Oxalis fontana*.

Lower plants and cultivated species were excluded from further analysis. The natural valorization value for each species is a sum of the above described components. For 27 species the numerical value was decreased, for 125 the value was increased, in 33 cases the value remained the same, for 50 species the value was added – the ones which were not included in the Oświt method (Podlaska 2009). The examples of valorization values calculated in such a way for vascular plants are presented in Table 2. As a result of taking into account a negative biocenotic impact of invasive species, the foregoing indicators may also obtain negative values (*Conyza canadensis, Fallopia convolvulus, Impatiens parviflora, Oxalis fontana, Solidago gigantea* and *Spiraea tomentosa*).

In order to compare the statistical reliability of both methods (the valorization values according to Oświt (2000) and to the author's own method), they were analyzed by use of the Wilcoxon Matched-Pairs nonparametric test due to the lack of normality of the distribution of both data collections. The H_0 zero hypothesis was as follows: *the valorization values in both methods do not differ statistically* (Podlaska 2009). In both sets, 186 species were put to analysis which gave the test result of $Z = 6.26063$, $p < 0.001$. The obtained result allowed to reject the above hypothesis and to adopt an alternative one which demonstrated that the author's method differs from the Oświt (2000) method in respect of its approach to the natural valorization of marshlands.

In order to set the scope of divisions between the author's valorization classes of respective phytosociological pictures, the foregoing taxa of vascular plants were compared (186 species) by use of the values of basic statistics. The difference between the mean values of the valorization value of both lists amounted to 0.72, and to 1.00 between their medians. It resulted in an extension of limit values of respective class divisions of phytosociological pictures by 0.9 in relation to the Oświt method. Furthermore, the author's method brought a solution to the lack of continuity, observed in the Oświt method, in respective valorization classes (systematically occurring

Table 2. Way of calculating the valorization values in the author's method

Species	Oświt valorization value (2000)	Number of posts (Zając & Zając 2001)	Valorization value – according to the number of posts	F (Ellenberg 1979)	W (Zarzycki et al. 2002)	W_F	Positive points for fading out species (Kącki 2003)	Negative points for invasive species (Tokarska-Guzik & Dajdok 2004, Weber & Gut 2004)	Valorization value according the author's method (Σ of columns d+g+h+i)
1	2	3	4	5	6	7	8	9	10
Achillea millefolium	2	263	1	4	2–3	–1			0
Achillea ptarmica	8	94	3	8~	4	2			5
Acorus calamus	4	191	2	10	5–6	5		–4	3
Aegopodium podagraria	2	260	1	6	3.5	1			2
Agrimonia eupatoria	2	230	2	4	2–3	–1			1
Agrostis capillaris	1	250	2	x	2–3	–1			1
Agrostis stolonifera	4	220	2	6~	4	2			4
Alisma plantago-aquatica	4	253	2	10	5–6	5			7
Alliaria petiolata	7	209	2	5	3.5	1			3
Alnus glutinosa	4	260	1	9=	5	4			5
Alopecurus geniculatus	3	167	2	9=	5	4			6
Alopecurus pratensis	2	258	1	6	4	2			3
Anthoxanthum odoratum	1	254	2	x	3	0			2
Apera spica-venti	.	204	2	6	3	0			2
Arrenatherum elatius	2	248	2	5	3	0			2
Avenula pubescens	2	147	2	x	3–4	1			3
Ballota nigra	.	237	2	5	3	0			2
Berula erecta	3	63	4	10~	6–5	6			10
Betula pendula	.	263	1	x	3	0			1
Betula pubescens	3	105	3	x	4–5	3			6
Bidens tripartita	.	209	2	8=	4–5	3			5
Briza media	1	214	2	x	3	0			2
Bromus hordeaceus	1	207	2	x	3	0			2
Bromus inermis	2	226	2	4~	2–3	–1			1
Bromus sterilis	.	168	2	4	2	–2			0
Calamagrostis canescens	4	78	3	9~	5	4			7
Caltha palustris	4	245	2	8=	5	4			6
Calystegia sepium	3	168	2	6	4	2			4
Campanula patula	2	246	2	5	3	0			2
Capsella bursa-pastoris	1	262	1	x	3	0			1
Cardamine amara	4	130	2	9=	5	4			6
Cardamine pratensis	3	230	2	7	4	2			4
Carduus crispus	.	159	2	5	4	2			4
Carex acutiformis	4	158	2	9~	5	4			6
Carex canescens	4	86	3	9	5	4			7
Carex echinata	4	118	3	.	5	4			7
Carex flava	8	75	3	8	5	4			7
Carex gracilis	4	108	3	9=	5	4			7
Carex hirta	1	241	2	6~	2–4	0			2
Carex nigra	4	199	2	8~	4–5	3			5
Carex ovalis	1	181	2	7~	3–4	1			3
Carex panicea	3	117	3	7~	4	2			5
Carex paniculata	4	81	3	9=	5	4			7
Carex pseudocyperus	7	81	3	10	5	4			7
Carex riparia	4	97	3	9=	5	4			7

1	2	3	4	5	6	7	8	9	10
Carex rostrata	4	114	3	10	5	4			7
Carex spicata	.	63	4	5	3–2	–0.5			3.5
Carex sylvatica	.	141	2	5	3–4	1			3
Carex vesicaria	4	82	3	9=	5	4			7
Carex vulpina	4	109	3	9~	5	4			7
Centaurea jacea	1	231	2	x	3	0			2
Centaurium erythraea	.	115	3	5	2–3	–1			2
Cerastium arvense	1	255	2	4	2	–2			0
Cerastium holosteoides	1	259	1	5	3–4	1			2
Chaerophyllum temulum	.	153	2	5	4	2			4
Chelidonium majus	.	260	1	5	3	0			1
Chrysanthemum leucanthemum	2	242	2	4	3	0			2
Circaea lutetiana	.	164	2	6	4	2			4
Cirsium arvense	1	262	1	x	2–3	–1			0
Cirsium oleraceum	3	220	2	7	4–5	3			5
Cirsium palustre	3	231	2	8~	4	2			4
Cirsium vulgare	1	260	1	5	3	0			1
Conyza canadensis	.	257	1	4	2–3	–1		–4	–4
Cornus sanguinea	.	207	2	x	2–4	0			2
Crataegus monogyna	.	170	2	4	3–4	1			3
Crepis biennis	1	133	2	5	3	0			2
Cuscuta europaea	.	54	4	7	4	2			6
Dactylis glomerata	2	263	1	5	3	0			1
Daucus carota	2	261	1	4	3	0			1
Deschampsia caespitosa	3	259	1	7~	4	2			3
Deschampsia flexuosa	1	225	2	x	3	0			2
Dianthus superbus	8	82	3	8~	4	2	3		8
Dryopteris filix-mas	2	240	2	5	3–4	1			3
Eleocharis palustris	4	141	2	10~	5	4			6
Elymus caninus	1	75	3	6	4	2			5
Elymus repens	1	248	2	5~	3	0			2
Epilobium hirsutum	3	184	2	8=	5	4			6
Epilobium palustre	4	143	2	9	5	4			6
Epilobium parviflorum	4	77	3	9=	4–5	3			6
Equisetum arvense	1	262	1	6~	3–4	1			2
Equisetum fluviatile	4	177	2	10	5	4			6
Equisetum palustre	3	185	2	7	4	2			4
Equisetum pratense	1	62	4	6	4	2			6
Eriophorum angustifolium	4	75	3	9=	5	4			7
Eupatorium cannabinum	2	192	2	7	4	2			4
Euphorbia cyparissias	1	249	2	3	2	–2			0
Fallopia convolvulus	.	251	2	x	3	0		–4	–2
Festuca gigantea	.	155	2	7	4	2			4
Festuca pratensis	2	216	2	6	3	0			2
Festuca rubra	2	219	2	x	2–4	0			2
Filipendula ulmaria	3	237	2	8	4–5	3			5
Fraxinus excelsior	2	250	2	x	4–3	1.5			3.5
Galeobdolon luteum	.	155	2	5	3	0			2
Galeopsis pubescens	.	192	2	4	3–4	1			3
Galeopsis tetrahit	1	180	2	5	3–4	1			3
Galium aparine	1	247	2	x	4–3	1.5			3.5
Galium mollugo	2	248	2	5	3	0			2
Galium palustre	4	223	2	9=	4–5	3			5
Galium uliginosum	3	127	3	8~	4	2			5
Geranium palustre	2	151	2	7~	5	3.5			5.5
Geranium pratense	2	188	2	5	3	0			2
Geranium robertianum	2	210	2	x	3	0			2

1	2	3	4	5	6	7	8	9	10
Geum rivale	3	176	2	8=	4	2			4
Geum urbanum	.	219	2	5	3–4	1			3
Glechoma hederacea	2	259	1	6	3–4	1			2
Glyceria fluitans	4	161	2	9=	6–5	6			8
Glyceria maxima	4	206	2	10~	6	6			8
Gnaphalium uliginosum	.	221	2	7	4	2			4
Helianthus tuberosus	.	53	4	6	3–4	1		–4	1
Holcus lanatus	2	236	2	6	4	2			4
Hottonia palustris	8	77	3	11	6	6			9
Humulus lupulus	2	247	2	8=	4–5	3			5
Hydrocotyle vulgaris	8	121	3	9~	4	3.5			6.5
Hypericum perforatum	1	262	1	4	2–3	–1			0
Hypericum tetrapterum	3	73	3	8=	4	2			5
Hypochoeris radicata	.	224	2	5	3	0			2
Impatiens noli-tangere	2	177	2	7	4	2			4
Impatiens parviflora	1	218	2	5	3	0		–8	–6
Inula britannica	2	174	2	7=	4	2			4
Iris pseudacorus	4	236	2	10	5	4			6
Isolepis setacea	.	45	4	8	5	4	2		10
Juncus articulatus	4	184	2	8~	4–5	3			5
Juncus bulbosus	.	55	4	10	4–6	4	2		10
Juncus conglomeratus	3	175	2	7~	4–5	3			5
Juncus effusus	3	253	2	7~	4–5	3			5
Juncus tenuis	.	156	2	6	4	2			4
Lamium maculatum	.	181	2	6	4	2			4
Lathyrus palustris	8	45	4	8=	4–5	3	1		8
Lathyrus pratensis	6	243	2	6	3–4	1			3
Lemna minor	4	234	2	11	6	6			8
Linaria vulgaris	1	254	2	3	2–3	–1			1
Lotus corniculatus	1	242	2	4	3–4	1			3
Lotus uliginosus	3	220	2	8~	4–5	3			5
Luzula multiflora	1	138	2	6~	3	0			2
Lychnis flos-cuculi	3	253	2	6~	4	2			4
Lycopus europaeus	4	232	2	9=	5	4			6
Lysimachia nummularia	3	243	2	6	4	2			4
Lysimachia thyrsiflora	8	59	4	9=	5	4			8
Lysimachia vulgaris	4	249	2	8~	4–5	3			5
Lythrum salicaria	3	236	2	8=	4–5	3			5
Matricaria maritima subsp. *inodora*	.	229	2	x	3	0			2
Medicago lupulina	1	232	2	4	2–3	–1			1
Melandrium album	4	256	2	4	3	0			2
Mentha aquatica	4	197	2	9=	5	4			6
Mentha longifolia	.	133	2	8~	4–5	3			5
Millium effusum	1	169	2	5	3–4	1			3
Molinia caerulea	3	149	2	7~	4–5	3			5
Myosotis palustris	3	232	2	8~	4–5	3			5
Myosotis sylvatica	.	64	4	6	3–4	1			5
Myosoton aquaticum	.	190	2	8=	4–5	3			5
Odontites serotina	1	166	2	5	3–4	1			3
Oxalis fontana	.	237	2	5	3	0		–4	–2
Papaver rhoeas	.	236	2	5	3	0			2
Peucedanum palustre	4	185	2	9=	5	4			6
Phalaris arundinacea	4	220	2	8=	5	4			6
Phleum pratense	2	233	2	5	2–3	–1			1
Phragmites australis	4	248	2	10~	5–6	5			7
Pimpinella major	3	123	3	6	3	0			3
Pimpinella saxifraga	2	251	2	3	2	–2			0

1	2	3	4	5	6	7	8	9	10
Plantago lanceolata	2	263	1	x	2–4	0			1
Plantago major	1	263	1	5	3–4	1			2
Plantago media	1	195	2	4	2–3	–1			1
Poa nemoralis	1	211	2	5	2–3	–1			1
Poa palustris	4	192	2	9=	4–5	3			5
Poa pratensis	2	255	2	5	3	0			2
Poa trivialis	1	161	2	7	4	2			4
Polygonum amphibium	4	249	2	11/8~	6	6			8
Polygonum bistorta	3	223	2	7~	4	2			4
Polygonum lapathifolium subsp. *lapathifolium*	.	206	2	7	3–4	1			3
Polygonum persicaria	.	226	2	3	3	0			2
Populus tremula	1	261	1	5	3	0			1
Potentilla anserina	3	252	2	6~	3–4	1			3
Potentilla argentea	1	246	2	2	2	–2			0
Potentilla erecta	1	213	2	x	3–4	1			3
Potentilla reptans	.	245	2	6	3–4	1			3
Prunella vulgaris	1	236	2	x	3–4	1			3
Ranunculus acris	3	262	1	x	3–4	1			2
Ranunculus auricomus	3	164	2	6	4	2			4
Ranunculus flammula	4	204	2	9~	4–5	3			5
Ranunculus lingua	4	53	4	10	6–5	5	1		10
Ranunculus repens	3	261	1	7~	4–3	1.5			2.5
Ranunculus sceleratus	3	167	2	9=	4–5	3			5
Ribes spicatum	.	108	3	8=	4	2			5
Rorippa palustris	.	237	2	9~	4	2			4
Rubus caesius	.	146	2	7=	2–4	0			2
Rubus idaeus	1	247	2	5	3–4	1			3
Rumex acetosa	2	260	1	x	3–4	1			2
Rumex crispus	1	247	2	6	3–4	1			3
Rumex hydrolapathum	4	147	2	10	5–6	5			7
Rumex obtusifolius	3	195	2	6	3–4	1			3
Salix cinerea	4	229	2	9~	4–5	3			5
Salix fragilis	1	248	2	8=	4	2			4
Sambucus nigra	2	262	1	5	3–4	1			2
Sanguisorba officinalis	1	204	2	7~	4	2			4
Scirpus sylvaticus	3	224	2	9	4–5	3			5
Scrophularia nodosa	1	239	2	6	3	0			2
Scrophularia umbrosa	1	91	3	10	4–5	3			6
Scutellaria hastifolia	.	48	4	8=	4	2	4		10
Senecio congestus	8	40	4	.	5	4	3		11
Senecio jacobaea	.	235	2	4~	2–3	–1			1
Solanum dulcamara	4	205	2	8~	5–4	3.5			5.5
Solidago gigantea	.	120	3	6	3–4	1		–8	–4
Sonchus asper	.	186	2	6	3	0			2
Sparganium erectum	4	143	2	10	6	6			8
Spiraea tomentosa	.	near 10	4	.	.	2		–8	–2
Spirodela polyrhiza	4	57	4	11	6	6			10
Stachys palustris	4	215	2	7~	4–5	3			5
Stellaria graminea	1	221	2	4	3	0			2
Stellaria palustris	4	73	3	8~	4–5	3			6
Succisa pratensis	3	140	2	7~	4	2			4
Symphytum officinale	4	223	2	8	4–5	3			5
Tanacetum vulgare	.	247	2	5	3–4	1			3
Taraxacum officinale	3	263	1	5	3	0			1
Thalictrum flavum	7	56	4	8~	4–5	3	1		8
Thelypteris palustris	4	98	3	8	4–5	3			6

1	2	3	4	5	6	7	8	9	10
Tragopogon dubius	.	29	5	4	2–3	–1			4
Tragopogon pratensis	1	117	3	4	3	0			3
Trifolium hybridum	3	170	2	6	4	2			4
Trifolium pratense	2	259	1	x	3	0			1
Trifolium repens	2	263	1	x	3–4	1			2
Typha angustifolia	4	119	3	10	6–5	5			8
Typha latifolia	4	218	2	10	6–5	5			7
Urtica dioica	2	263	1	6	3–4	1			2
Utricularia vulgaris	4	57	4	12	6	6			10
Veronica beccabunga	3	173	2	10	5–6	5			7
Veronica chamaedrys	2	262	1	4	3	0			1
Veronica officinalis	1	207	2	4	3	0			2
Veronica scutellata	4	99	3	9=	4–5	3			6
Viburnum opulus	5	216	2	x	3–4	1			3
Vicia cracca	2	210	2	5	3	0			2
Vicia hirsuta	.	224	2	x	3	0			2
Vicia sepium	.	161	2	5	3	0			2
Vicia tetrasperma	.	223	2	5~	3	0			2
Viola palustris	4	116	3	9	4–5	3			6
Viola tricolor	1	190	2	x	3	0			2

Notes for column 5 (F (Ellenberg 1979)): x – a wide amplitude (lack of indicatory character), ~ – the indicator of variable moisture conditions, = – the indicator of occurrence of periodic floodings.

"holes" e.g. between values from 1.8 to 1.9 and for classes II and III). The class boundaries which were set are presented in Table 1.

EXAMINED OBJECTS AT THE BACKGROUND OF PHYSICAL-GEOGRAPHICAL AND GEOBOTANICAL REGIONALIZATION

According to the physiographic division of Poland, eight objects were subject to the analysis (Fig. 1) which are situated in the scope of mesoregions: Pradolina Głogowska (318.32; Kotla, Głogówko), Bory Dolnośląskie (the Dolnośląskie Forest) (317.74; Parowa, Bronowiec), the boundary between Pradolina Wrocławska (318.52) and the Wrocław Plain (318.53; Przedmoście), the Wrocław Plain (318.53; Miękinia), Wysoczyzna Kaliska (318.12; Milicz). According to the geobotanical division of Poland, they are found in such districts as: Lubuskie (Kotla, Głogówko) and Baryckie (Milicz), the Śląsko-Łużycka Lowland with the Sub district of Bory Dolnośląskie (Parowa, Bronowiec) as well as the Śląska Lowland with the Sub district of the Chojnowsko-Legnicko--Wrocławska Plain (Przedmoście, Miękinia) (Szafer 1972, Kondracki 1994).

The objects which were earlier managed are mostly abandoned at present. In such areas, specific flora comes into existence representing various succession stages. There are also formed untypical stages of common flora communities (compare: Wołejko 2000).

RESULTS OF EXAMINATIONS AND DISCUSSION

FLORA AND VEGETATION OF THE EXAMINED OBJECTS

In the swamp-originating meadows of Lower Silesia, there were altogether recorded 235 species of vascular plants and 26 types of phytocoenoses (Podlaska 2009). In the examined meadows there were distinguished eight types of plant associations and one plant community in the rank of a plant association [after: Matuszkiewicz 2006]. They are communities included in the class of *Phragmitetea* R.Tx. et Prsg 1942: *Phragmitetum australis* (Gams 1927) Schmale 1939, *Cicuto-Caricetum pseudocyperi* Boer et Siss. in Boer 1942, *Caricetum acutiformis* Sauer 1937, *Caricetum rostratae* Rübel 1912, *Caricetum gracilis* (Graebn. et Hueck 1931) R.Tx. 1937, *Phalaridetum arundinaceae* (Koch 1926 n.n.) Libb. 1931, and reckoned among the class of *Molinio-Arrhenatheretea* R.Tx. 1937: *Scirpetum sylvatici* Ralski 1931, *Alopecuretum pratensis* (Regel 1925) Steffen 1931, as well as the community of *Deschampsia caespitosa = Deschampsietum caespitosae* (Horvatić 1930) (Podlaska 2009).

The remaining phytocoenoses are incomplete (impoverished) communities composed mainly of segetal, ruderal and invasive species. Even if they are composed of species typical for wetland systems or swamp-originating meadows, their species composition was greatly altered. There were distinguished: *Alnus glutinosa*, *Lysimachia vulgaris*, *Juncus conglomeratus*, *Carex nigra* and *Juncus conglomeratus*, *Carex nigra*, *Carex panicea*, *Holcus lanatus*, *Elymus caninus*, *Bromus*

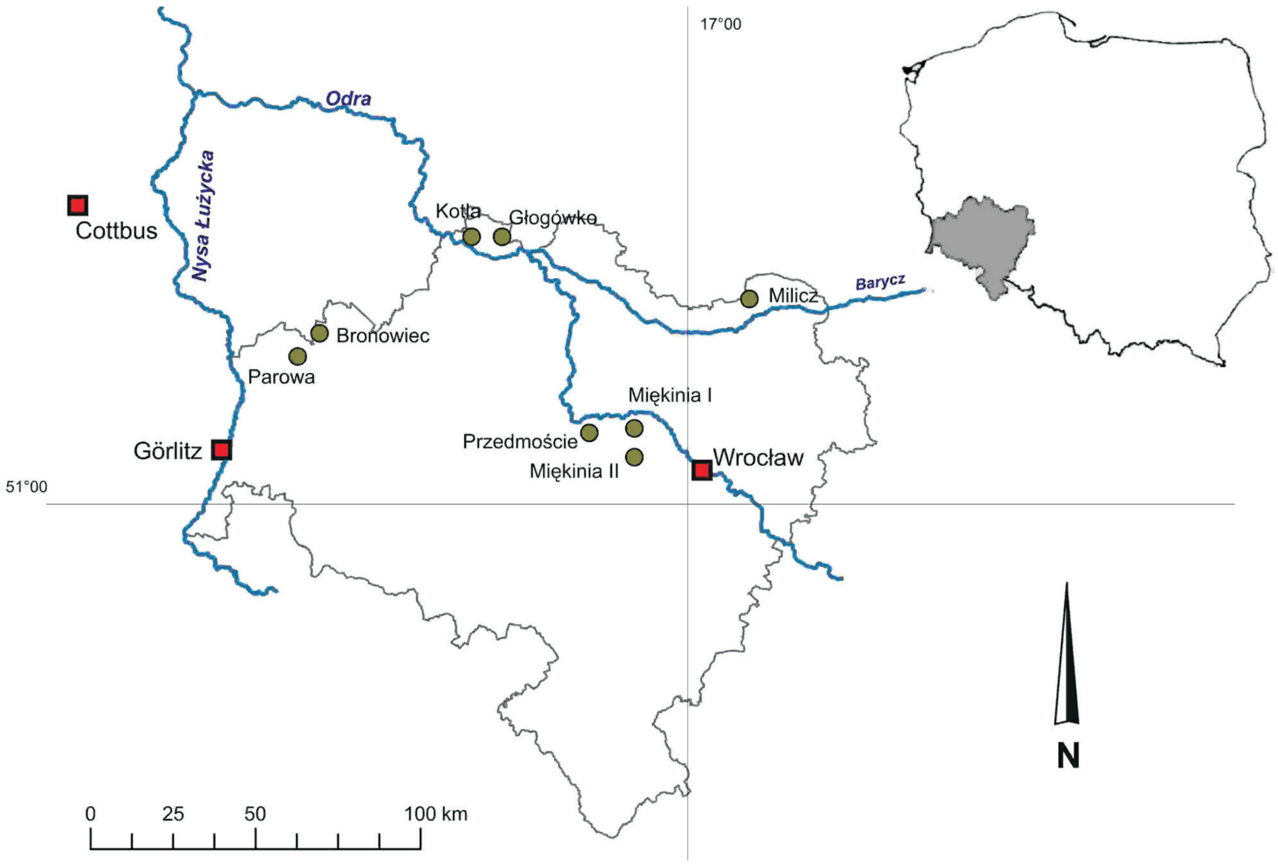

Fig. 1. Distribution of the examined objects

inermis, *Calamagrostis canescens*, *Urtica dioica*, *Galium aparine*, *Cirsium arvense*, *Solidago gigantea*, *Solidago gigantea* and *Impatiens parviflora*, *Spiraea tomentosa*.

NATURAL VALUES OF PHYTOCOENOSES

The evaluation was conducted for all the found phytocoenoses according to the Oświt (2000) method and to the author's method. The results of the entire evaluation were presented in Table 3. With the purpose of indicating differences in the evaluations conducted by use of both methods, two types of phytocoenoses were selected – the well-formed communities *Phragmitetum australis* and the community of invasive species *Spiraea tomentosa* (Tables 4 and 5).

Field observations of phytoceonoses *Phragmitetum australis* (Table 4) did not indicate a significant variation of reeds in respective objects, however nowhere their patches were preserved optimally (significant fragmentation, suboptimal habitat conditions, ecologically alien species or geographically penetrating into the patches etc). According to the Oświt (2000) method, cane reeds fall into classes from VI to VIII (values from moderately high to significantly high), whereas the highest values were acquired by reeds in the objects of Parowa and Miękinia I, the lowest by reeds in Bronowiec (in spite of their values comparable with the former).

According to the author's method, the phytocenoses *Phragmitetum australis* exhibited lower natural values in the range of classes from IV to VI (values from moderate to moderately high), which more clearly reflected their real value. The reeds of Parowa and Miękinia I acquired the highest values, the lowest values were obtained by the reeds of Głogówko.

The brushwood *Spiraea tomentosa* found in Parowa is composed of an invasive species, which classifies such objects as naturally invaluable. Even the Oświt (2000) elaboration did not include the valorization value for that kind of species. Among accompanying species there prevail taxa of higher valorization values, but their amount in the patches of spirea is marginal. According to the Oświt method, the presence of these species allows areas in which *Spiraea tomentosa* grows to be reckoned among class III (low values), which however does not reflect the real state of things. According to the author's method, these areas are reckoned among class II (moderately low values).

NATURAL VALUES OF RESPECTIVE EXAMINED OBJECTS

The variability of natural values of the whole examined objects was also put to analysis due to the large floristical variation of respective swamp-originating meadows (Table 3).

Table 3. Comparison of valorization classes for respective phytocoenoses and for the whole objects

Community		Kotla		Głogówko		Parowa		Bronowiec		Przedmoście		Miękinia I		Miękinia II		Milicz	
		according to Oświt (2000)	author's method	according to Oświt (2000)	author's method	according to Oświt (2000)	author's method	according to Oświt (2000)	author's method	according to Oświt (2000)	author's method	according to Oświt (2000)	author's method	according to Oświt (2000)	author's method	according to Oświt (2000)	author's method
Phragmitetum australis	class	–	–	VII	IV	VIII	VI	VI	V	VII	V	VIII	VI	–	–	–	–
	mid	–	–	3.68	5.37	4.00	7.00	3.25	6.57	3.62	5.70	4.00	7.00	–	–	–	–
	min	–	–	–	–	–	–	3.22	6.44	3.10	5.04	–	–	–	–	–	–
	max	–	–	–	–	–	–	3.28	6.71	3.86	6.14	–	–	–	–	–	–
Cicuto-Caricetum pseudo-cyperi	class	–	–	–	–	–	–	–	–	VIII	V	–	–	–	–	–	–
	mid	–	–	–	–	–	–	–	–	3.86	6.00	–	–	–	–	–	–
	min	–	–	–	–	–	–	–	–	3.73	5.64	–	–	–	–	–	–
	max	–	–	–	–	–	–	–	–	4.00	6.36	–	–	–	–	–	–
Caricetum acutiformis	class	–	–	IV	III	–	–	–	–	VI	IV	III	II	IV	III	–	–
	mid	–	–	2.30	3.25	–	–	–	–	3.38	4.74	1.87	2.00	2.51	3.54	–	–
	min	–	–	–	–	–	–	–	–	3.00	3.25	–	–	2.00	2.95	–	–
	max	–	–	–	–	–	–	–	–	4.00	6.00	–	–	3.23	4.73	–	–
Caricetum rostratae	class	–	–	–	–	–	–	–	–	VII	V	–	–	–	–	–	–
	mid	–	–	–	–	–	–	–	–	3.77	6.20	–	–	–	–	–	–
	min	–	–	–	–	–	–	–	–	3.60	5.80	–	–	–	–	–	–
	max	–	–	–	–	–	–	–	–	4.00	6.67	–	–	–	–	–	–
Caricetum gracilis	class	VI	IV	V	III	–	–	VI	IV	VII	V	–	–	IV	II	V	III
	mid	3.30	4.92	2.88	3.86	–	–	3.14	5.57	3.78	5.93	–	–	2.32	3.14	3.00	4.30
	min	2.64	3.82	2.33	3.33	–	–	–	–	3.28	5.15	–	–	–	–	–	–
	max	4.00	6.00	3.25	4.40	–	–	–	–	4.22	7.00	–	–	–	–	–	–
Phalaridetum arundinaceae	class	VI	III	V	III	II	II	VII	V	VI	IV	IV	III	–	–	–	–
	mid	3.40	3.40	3.02	4.33	1.82	2.26	3.56	6.00	3.24	4.77	2.42	3.54	–	–	–	–
	min	–	–	2.37	3.69	1.33	1.83	3.50	5.50	2.40	3.83	–	–	–	–	–	–
	max	–	–	3.50	4.75	2.12	3.83	3.62	6.50	4.50	6.17	–	–	–	–	–	–
Scirpetum sylvatici	class	–	–	–	–	–	–	–	–	V	IV	–	–	V	III	–	–
	mid	–	–	–	–	–	–	–	–	2.96	5.03	–	–	3.00	4.11	–	–
	min	–	–	–	–	–	–	–	–	2.87	4.50	–	–	3.00	4.04	–	–
	max	–	–	–	–	–	–	–	–	3.00	5.87	–	–	3.00	4.18	–	–
Community *Deschampsia caespitosa*	class	–	–	–	–	III	II	–	–	IV	II	–	–	–	–	VI	III
	mid	–	–	–	–	2.19	2.91	–	–	2.54	2.73	–	–	–	–	3.09	4.35
	min	–	–	–	–	1.80	2.88	–	–	–	–	–	–	–	–	2.89	4.11
	max	–	–	–	–	2.44	2.94	–	–	–	–	–	–	–	–	3.40	4.60

Alopecuretum pratensis	class	V	II	V	III	IV	II	–	–	III	II	II	I	III	II	V	III
	mid	2.87	2.87	2.98	3.56	2.28	3.00	–	–	2.11	2.83	1.69	1.64	2.13	2.66	2.66	3.52
	min	–	–	1.89	2.55	–	–	–	–	1.51	1.70	1.63	1.63	1.64	1.89	2.33	2.85
	max	–	–	3.64	4.32	–	–	–	–	2.69	4.19	1.75	1.65	2.54	3.18	3.00	4.25
Community *Alnus glutinosa*	class	III	III	–	–	–	–	–	–	–	–	–	–	–	–	–	–
	mid	2.04	3.50	–	–	–	–	–	–	–	–	–	–	–	–	–	–
	min	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
	max	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Community *Lysimachia vulgaris*	class	–	–	–	–	–	–	V	IV	–	–	–	–	–	–	–	–
	mid	–	–	–	–	–	–	3.00	5.10	–	–	–	–	–	–	–	–
	min	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
	max	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Community *Juncus conglomeratus*	class	–	–	–	–	–	–	VII	V	–	–	–	–	–	–	–	–
	mid	–	–	–	–	–	–	3.83	5.72	–	–	–	–	–	–	–	–
	min	–	–	–	–	–	–	3.54	5.45	–	–	–	–	–	–	–	–
	max	–	–	–	–	–	–	4.28	6.00	–	–	–	–	–	–	–	–
Community *Carex nigra* and *Juncus conglomeratus*	class	–	–	–	–	–	–	VI	IV	–	–	–	–	–	–	–	–
	mid	–	–	–	–	–	–	3.14	5.28	–	–	–	–	–	–	–	–
	min	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
	max	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Community *Carex nigra*	class	–	–	–	–	–	–	–	–	–	–	–	–	–	–	VI	III
	mid	–	–	–	–	–	–	–	–	–	–	–	–	–	–	3.14	4.21
	min	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
	max	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Community *Carex panicea*	class	–	–	–	–	–	–	–	–	–	–	–	–	–	–	VII	III
	mid	–	–	–	–	–	–	–	–	–	–	–	–	–	–	3.50	4.25
	min	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
	max	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Community *Holcus lanatus*	class	–	–	–	–	III	II	–	–	–	–	–	–	–	–	–	–
	mid	–	–	–	–	2.00	2.76	–	–	–	–	–	–	–	–	–	–
	min	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
	max	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Community *Elymus caninus*	class	–	–	IV	II	–	–	–	–	–	–	–	–	–	–	–	–
	mid	–	–	2.50	3.07	–	–	–	–	–	–	–	–	–	–	–	–
	min	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
	max	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Community *Bromus inermis*	class	–	–	–	–	–	–	–	–	–	–	I	I	–	–	–	–
	mid	–	–	–	–	–	–	–	–	–	–	1.41	–0.04	–	–	–	–
	min	–	–	–	–	–	–	–	–	–	–	1.33	–0.33	–	–	–	–
	max	–	–	–	–	–	–	–	–	–	–	1.50	0.25	–	–	–	–

Community *Calamagrostis canescens*	class	–	–	–	–	–	–	–	–	III	I	–	–	–	–	–	–
	mid	–	–	–	–	–	–	–	–	1.89	1.80	–	–	–	–	–	–
	min	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
	max	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Community *Urtica dioica*	class	–	–	V	III	–	–	–	–	–	–	–	–	–	–	–	–
	mid	–	–	2.91	4.14	–	–	–	–	–	–	–	–	–	–	–	–
	min	–	–	2.42	3.68	–	–	–	–	–	–	–	–	–	–	–	–
	max	–	–	3.40	4.60	–	–	–	–	–	–	–	–	–	–	–	–
Community *Galium aparine*	class	IV	III	–	–	–	–	–	–	–	–	–	–	–	–	–	–
	mid	2.27	3.43	–	–	–	–	–	–	–	–	–	–	–	–	–	–
	min	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
	max	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Community *Cirsium arvense*	class	I	II	–	–	–	–	–	–	–	–	–	–	–	–	–	–
	mid	1.43	3.14	–	–	–	–	–	–	–	–	–	–	–	–	–	–
	min	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
	max	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Community *Solidago gigantea*	class	–	–	–	–	–	–	–	–	–	–	III	II	II	I	–	–
	mid	–	–	–	–	–	–	–	–	–	–	2.19	2.48	1.56	1.29	–	–
	min	–	–	–	–	–	–	–	–	–	–	1.60	1.35	1.00	0.00	–	–
	max	–	–	–	–	–	–	–	–	–	–	2.70	3.72	2.12	2.59	–	–
Community *Solidago gigantea* and *Impatiens parviflora*	class	–	–	–	–	–	–	–	–	–	–	II	I	–	–	–	–
	mid	–	–	–	–	–	–	–	–	–	–	1.47	1.94	–	–	–	–
	min	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
	max	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Community *Spiraea tomentosa*	class	–	–	–	–	III	II	–	–	–	–	–	–	–	–	–	–
	mid	–	–	–	–	1.94	2.56	–	–	–	–	–	–	–	–	–	–
	min	–	–	–	–	1.50	1.50	–	–	–	–	–	–	–	–	–	–
	max	–	–	–	–	2.75	3.50	–	–	–	–	–	–	–	–	–	–
Remaining floristical systems	class	IV	II	V	III	IV	III	–	–	–	–	–	–	–	–	–	–
	mid	2.39	3.08	2.83	3.98	2.34	3.55	–	–	–	–	–	–	–	–	–	–
	min	1.39	2.30	2.42	3.21	2.25	3.42	–	–	–	–	–	–	–	–	–	–
	max	3.50	4.00	3.25	4.75	2.43	3.68	–	–	–	–	–	–	–	–	–	–
Mean valorization classes for the object	class	IV	III	V	III	IV	III	VI	V	VI	IV	III	II	IV	II	V/VI	III
	mid	2.53	3.48	2.89	3.94	2.37	3.43	3.32	5.71	3.11	4.57	2.15	2.65	2.30	2.95	3.08	4.13

Tabela 4. The evaluation of natural values for the association *Phragmitetum australis* in the examined objects

Species	LW_O	LW_W	Gł.	Par.	Bro.			Prz.					M I
			4	1	4	5	6	7	8	9	10	11	2
Acorus calamus	4	3	+	.	.	.	.	.	.	.	.	.	.
Agrostis stolonifera	4	4	+	.	.	.	.	.	.	.	.	.	.
Alisma plantago-aquatica	4	7	+	.	.	.	.	.	.	.	.	.	.
Alopecurus geniculatus	3	6	+	.	.	.	.	.	.	.	.	.	.
Bidens tripartita	–	5	.	.	+	+	.	.	.	.	.	.	.
Calystegia sepium	3	4	.	.	.	.	.	.	.	+	+	.	.
Carex acutiformis	4	6	.	.	.	.	.	.	+	+	+	+	.
Carex gracilis	4	7	+	.	+	.	.	+	+	+	.	.	.
Carex rostrata	4	7	+	.	.	.	.	.	.	.	.	.	.
Carex vesicaria	4	7	.	.	.	.	.	.	+	.	.	.	.
Epilobium palustre	4	6	.	.	.	+	.	.	.	.	.	.	.
Epilobium parviflorum	4	6	+	.	.	.	+	.	.	.	+	.	.
Equisetum palustre	3	4	.	.	.	.	+	.	.	.	.	.	.
Galium aparine	1	3.5	.	.	.	.	.	.	.	+	.	.	.
Galium palustre	4	5	+	.	.	.	.	.	.	.	+	+	.
Galium uliginosum	3	5	.	.	+	+	.	.	.	.	.	.	.
Glechoma hederacea	2	2	.	.	.	.	.	.	.	.	+	.	.
Hottonia palustris	8	9	+	.	.	.	.	.	.	.	.	.	.
Impatiens noli-tangere	2	4	.	.	.	.	.	+	.	.	.	.	.
Iris pseudacorus	4	6	+	.	.	.	.	.	.	+	.	+	.
Juncus conglomeratus	3	5	.	.	+	.	.	.	.	.	.	.	.
Juncus effusus	3	5	+	.	+	.	.	.	.	.	.	.	.
Lemna minor	4	8	.	.	+	+	+	.	.	.	.	.	.
Lycopus europaeus	4	6	.	.	+	+	+	.	.	.	.	.	.
Lysimachia vulgaris	4	5	.	.	.	.	.	.	.	+	+	+	.
Lythrum salicaria	3	5	.	.	.	.	+	.	+	+	.	+	.
Mentha aquatica	4	6	+	.	.	.	.	.	.	.	.	.	.
Phalaris arundinacea	4	6	.	.	.	.	.	.	+	.	.	.	.
Phragmites australis	4	7	+	+	+	+	+	+	+	+	+	+	+
Polygonum persicaria	–	2	+	.	.	.	.	.	.	.	.	.	.
Ranunculus repens	3	2.5	+	.	.	.	.	.	.	.	.	.	.
Rumex crispus	1	3	+	.	.	.	.	.	.	.	.	.	.
Scirpus sylvaticus	3	5	.	.	.	.	+	.	.	.	.	.	.
Scutellaria hastifolia	–	10	.	.	.	.	.	.	.	+	.	.	.
Solanum dulcamara	4	5.5	+	.	.	.	.	.	.	.	+	.	.
Symphytum officinale	4	5	+	.	.	.	.	+	+	+	+	+	.
Thalictrum flavum	7	8	.	.	.	.	.	.	.	.	+	.	.
Urtica dioica	2	2	.	.	.	.	.	.	.	.	+	.	.
Utricularia vulgaris	4	10	.	.	+	+	.	.	.	.	.	.	.
Veronica scutellata	4	6	+	.	.	.	.	.	.	.	.	.	.
Number of species in the picture			19	1	9	7	7	4	7	10	11	7	1
Σ of valorization points [A]			102	7	58	47	41	23	43	58.5	55.5	39	7
Mean valorization value			5.37	7.00	6.44	6.71	5.86	5.75	6.14	5.85	5.04	5.57	7.00
Mean valorization value for the association			5.37	7.00		6.57				5.70			7.00
Mean valorization class			IV	VI		V						V	VI
Σ of valorization points [O]			70	4	29	23	25	14	27	31	42	27	4
Mean valorization value			3.68	4.00	3.22	3.28	3.57	3.50	3.86	3.10	3.82	3.86	4.00
Mean valorization value or the association			3.68	4.00		3.25				3.62			4.00
Mean valorization class			VII	VIII		VI						VII	VIII

Notes: LW_O – valorization value according to Oświt (2000); LW_W – valorization value according to the author's method; Gł. – Głogówko, Par. – Parowa, Bro. – Bronowiec, Prz. – Przedmoście, M I – Miękinia I; [A] – the author's method, [O] – the Oświt method.

According to the Oświt (2000) classification the natural value of Kotla phytocoenoses is from moderate to moderately high (classes IV–VI prevail). Individually, there occur phytocoenoses of very low and low natural values (classes I and III). According to the author's method, there prevail phytocoenoses of averagely low and low values, and an individual phytocoenosis indicates moderate values (classes II–III

Table 5. Evaluation of natural values for the community *Spiraea tomentosa* in the object of Parowa

Species	LW_O	LW_W	Community *Spiraea tomentosa*			
			10	11	12	13
Betula pendula	–	1	.	+	.	.
Carex nigra	4	5	+	.	.	.
Deschampsia caespitosa	3	3	+	.	.	.
Deschampsia flexuosa	1	2	.	.	.	+
Holcus lanatus	2	4	+	.	.	.
Juncus conglomeratus	3	5	+	.	.	.
Juncus effusus	3	5	.	+	+	.
Lysimachia vulgaris	4	5	+	.	.	.
Molinia caerulea	3	5	.	+	.	.
Phalaris arundinacea	4	6	+	+	.	.
Phragmites australis	4	7	.	.	.	+
Poa pratensis	2	2	+	.	.	+
Spiraea tomentosa	–	–2	+	+	+	+
Number of species in the picture			8	5	2	4
Σ of valorization points [A]			28	15	3	9
Mean valorization value			3.5	3.00	1.50	2.25
Mean valorization value for the community			2.56			
Mean valorization class						II
Σ of valorization points [O]			22	10	3	6
Mean valorization value			2.75	2.00	1.50	1.50
Mean valorization value for the community			1.94			
Mean valorization class						III

Notes: LW_O – valorization value according to Oświt (2000); LW_W – valorization value according to the author's method; [A] – the author's method, [O] – the Oświt method.

and IV). According to the Oświt method, the mean valorization value for the whole object calculated on the basis of respective phytocoenoses falls into class IV (moderate values), but it falls into class III (low values) according to the author's method.

According to the Oświt (2000) method, in Głogówko there prevail communities of moderate and averagely moderate values (classes IV–V), an individual phytocoenosis indicates high values (class VII). According to the author's method, there predominate communities of low values (class III), individually there occur communities of averagely low and high values (classes I and VII). According to the Oświt method, the mean valorization value for the whole object falls into class V (averagely moderate values), and according to the author's method it falls into class III (low values).

The presence of the invasive species *Spiraea tomentosa* diminishes the value of communities which occur in habitats of disturbed water relations and advanced peat mineralization in Parowa. According to the Oświt (2000) classification, there predominate communities of averagely low to moderate values (classes II–IV), an individual phytocoenosis falls into class VIII (very high values). In the author's method there prevail phytocoenoses of averagely low and low values (classes II–III), an individual phytocoenosis falls into class VI (moderately high values). According to the Oświt method, the mean valorization value for the whole object falls into class IV (moderate values) but into class III (low values) according to the author's method.

According to the Oświt (2000) method, the communities in Bronowiec obtain from averagely moderate to high values (classes V–VII). According to the author's method the natural values of these phytoceonoses are lower – they fall into classes IV–V (moderate to averagely moderate values). According to the Oświt method, the mean valorization values for the whole object fall into class VI (moderately high values), but into class V (averagely moderate values) according to the author's method. From the natural point of view, at present there occurs a very beneficial process of secondary swamping. As a result of water stagnation, such areas are invaded by phytocoenoses of wetland flora including peat forming and protected species – e.g. *Utricularia vulgaris*. As the reconstruction of the swampy habitat has occurred relatively recently, some plant communities undergo early stages of secondary succession. The values are decreased by the presence of the invasive species *Spiraea tomentosa*.

The complex of swamp-originating meadows of Przedmoście is strongly diversified. According to the Oświt (2000) method, as a result of high variability of moisture conditions of various parts of the site, in secondarily swamping habitats there occur very valuable, including peat forming, communities (classes VI–VIII; moderately high to very high values) and less valuable communities typical for wet and fresh swamp-originating meadows (classes IV–V; moderate to averagely moderate values), as well as strongly degenerated forms of these meadows (class III, low values). According to the author's method, there predominate communities of moderate to averagely moderate values (classes IV–V), individually there occur communities of very low to averagely low values (classes I–II). According to the Oświt method, the mean valorization value for the whole object falls into class VI (moderately high values), but into class IV(moderate values) according to the author's method. The value of meadow complexes is increased by the presence of protected species and so is the value for the whole object owing to the presence of beavers which beneficially transform the habitat.

In the object of Miękinia I the natural value of communities is low, as swamp-originating meadows have to a large degree been destroyed. According to the Oświt (2000) method, there predominate classes I–IV (very low to moderate values) and an individual phytocoenosis falls into class VIII (very high values). According to the author's method, there prevail classes I–III (very low to low values), individually there occurs class VI (moderately high values). According to the Oświt method, the mean valorization value for the whole object falls into class III (low values), but into class II (averagely low values) according to the author's values. From the natural point of view, the presence of beavers has a beneficial influence on it.

The natural values of the Miękinia II object are averagely low to averagely moderate (classes II–V) according to the Oświt (2000) method. The author's method indicates their even lower values – they fall into classes I–III (very low to low values). According to the Oświt method, the mean valorization value for the whole object falls into class IV (moderate values), but into class II (averagely low values) according to the author's method. Such an outcome results from an advanced degradation of its habitats due to their significant dryness and a massive occurrence of the invasive species *Solidago gigantea* and *Impatiens parviflora*. In spite of significant degradation of the habitats, in the examined objects there still occur species of protected plants typical for peatland systems: *Centaurium erythraea*, *Dianthus superbus* and *Viburnum opulus*.

In the object of Milicz there predominate communities typical for swamp-originating meadows – *Deschampsia cespitosa* and degenerated foxtail meadows, the actual natural value of which is insignificant. According to the Oświt (2000) method, the occurring phytocoenoses are included into classes V–VII (averagely moderate to high values), but according to the author's method all the phytocoenoses fall into class III (low values). According to the Oświt method, the mean valorization value for the whole object is included in class V/VI (averagely moderate to moderately high values; discontinuity of the scale is evident in the Oświt method), but it falls into class III (low values according to the author's method.

The analysis of natural values of the Lower Silesia swamp-originating meadows indicates that the natural value of both respective objects and their phytocoenoses is fairly diversified. It is so due to a different degree of formation of respective plants patches, and due to various processes which occurred in these meadows in the past and which are occurring at present. Evaluation of the natural value of such meadows by use of the Oświt (2000) method produced an overestimated result. The values obtained in the valorization process by use of the author's method are closer to the actual state (recorded in the field) of respective phytocoenoses.

The marshy meadow valleys, in which low peatlands are situated, are included in the areas formed by variable fluvial processes, mainly periodic surface floodings. Such conditions gave rise to a wide variety of biotopes characterized by very high natural values (Oświt 1996). The natural values of peatland objects, situated within the area of such valleys, are generally significant (Urban & Grzywna 2003) provided these are living peatlands. All the examined objects of Lower Silesia once underwent melioration and currently they represent a better or worse post-melioration state. As a result of these activities and due to the disappearance of peatland flora there developed substitute communities of grasslands. The natural value of such objects is variously evaluated – e.g. Załuski & Kamińska (1999) and Sztyber (2004) state that grassland complexes in objects of that type do not generally indicate high natural values although, as many of them play a non-productive role, they hold a significant sway over hydrological, microclimatic, hydro sanitary and biocenotic conditions. In place of peat forming phytocoenoses there develop substitute meadow communities. The other authors (Olaczek et al. 1990, Kochanowska 1997, Bacieczko 1999, Grzelak et al. 2002/2003, Grzelak & Bocian 2006) indicate that meadow communities, in various stages of secondary succession, are characterised by undeniable natural values. Abandoned grasslands, in spite of the lack of economic productivity, fulfill important ecological functions because they frequently serve as a shelter and refuge for various plants and animals (mainly entomo- and avifauna), they maintain bioversity of agricultural landscape, they constitute a diaspora bank for natural flora and they play a significant role in the life of a human being.

After the post-melioration development of marshy ecosystems there frequently come into existence communities of low natural values – phytocoenoses of moderate values survive solely in wet habitats as these create good conditions for maintaining marshy species. Habitats of a various degree of moisture conditions and intensity of use are characterised by different natural values. Dry habitats used intensively and extensively indicate very low natural values. Variably wet habitats used intensively are characterised by low natural values and those used extensively by averagely low values. Wet habitats used both intensively and extensively indicate moderate natural values (Kryszak et al. 2006).

In most cases the natural value of phytocoenoses of the examined swamp-originating meadows varies substantially from the value given for optimally formed phytocoenoses of low peatlands (Oświt 2000). The examined objects, despite their far reaching transformations, are still featured by a significant natural value. At present, new and extremely varied systems are formed – from swampy to extremely dry. Areas which spontaneously undergo secondarily swamping are exceedingly valuable from the natural point of view, as they are invaded by species and plant communities similar to natural ones. The calculated values of valorization classes are often largely overestimated (in relation to the species composition of phytocoenoses), which in case of most phytocoenoses (in particular those including dominant invasive species) results from an increase in the class value caused by a marginal occurrence of species of a high valorization value. Hence, on evaluating the natural value of a given community it is necessary to take into account the floristical and phytosociological analysis, as only such a juxtaposition produces a more accurate image of an examined object.

CONCLUSIONS

1. The valorization of the Lower Silesia swamp-originating meadows was carried out by use of the Oświt method and the author's method. Either of these methods offered a different approach towards the natural valorization of the marshy land, in particular swamp-originating meadows.
2. On the basis of the author's method the valorization values were calculated for all the species of vascular flora which spontaneously occur in the examined meadows. In relation to the Oświt method, the valorization values for 27 species were decreased, for 125 they were increased and for 33 they remained unchanged. The valorization values were also determined for 50 species which were not included in the Oświt elaboration.
3. The comparison of the natural values evaluation carried out by use of the Oświt method and the author's method indicates that the author's method classified the phytocoenoses of swamp-originating meadows and their whole complexes more adequately in respect of the degree of their degradation. According to the author's method, the phytocoenoses in the researched areas obtained lower values than in the case of the Oświt method.

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