

NATURAL AND ECONOMIC VALUE OF THE MID-FOREST MEADOWS IN THE BUKÓWKA RIVER VALLEY

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Abstract. Mid-forest meadows have a high natural value, due to preserving unique meadow and ecotone biotopes, similar to the natural state. Due to their dissimilarity, they also had a considerable effect on the functioning of forest ecosystems they border. The aim of the study conducted in 2006-2010 in the Bukówka river valley was to assess the natural values of mid-forest meadows with the Oświt method [2000] based on 140 phytosociological records, to estimate the economic value by evaluating dry matter yield and to calculate the fodder value of sward. Richness and floristic diversity of mid-forest meadows was observed, resulting mainly from the mosaic character of habitats and intensity of use. The studied communities from the classes *Phragmitetea*, *Potametea*, *Lemnetea*, as well as *Molinio-Arrhenatheretea* generally presented a poor quality, due to a very late time of cutting and excessive moisture of most habitats.

Key words: fodder value, *Lemnetea*, *Phragmitetea*, plant communities, *Potametea*, valuation of natural resources

INTRODUCTION

Mid-forest meadows are a specific kind of permanent grasslands. Situated within sometimes large forest complexes, they belong to areas of a high natural value [Trzaskoś *et al.* 2002, Czyż *et al.* 2006]. They often have a character of almost single-species concentrations and are the closest to the natural environment. Their size is highly varied, from small patches to the areas of ten to twenty hectares. They are often a biotope of the highest value for the flora, as well as the habitat for precious animal species. They vanish in spite of functioning of the European regulations which are supposed to serve as their protection. Therefore, due to their high natural value, preservation of unique meadow and ecotone biotopes, close to the natural state in respect of flora fauna, habitats, utilization

[Smith *et al.* 1996], landscape [Mosek 1995, Trąba 1999, Trąba *et al.* 2003] and tourism [Sawicki 2006], they should be protected. The factors that have a considerable effect on the natural value of mid-forest meadows, their richness and floristic diversity, are first of all habitat conditions, which among other things result from the mosaic nature of habitats [Grzelak 2004, Grzelak and Bocian 2006, Nawrocki 2006]. To a lesser extent they are dependent on the intensity of use and the occurrence of rare species with a high value of the evaluation number [Oświt 2000]. According to Ratyńska and Szwed [1999], river valleys in mid-forest areas have high natural value. Through their dissimilarity, they also have a substantial effect on functioning of forest ecosystems with they are adjacent to. Because of a close neighbourhood of watercourses and diversified vegetation cover the whole area makes an attractive place for feeding and living of many wild animals and rarely found species of singing birds.

The fodder value of biomass from mid-forest meadows, which are characterized by a vast diversity of communities and rich genetic resources, is barely known. However, they usually present a poor quality, due to a very late cutting time. However, it is a valuable raw material for production of pellets and briquette, which can be applied as a power resource. The few works concerning the natural value of individual species of sedges or sedge meadows, or those with a proportion of sedges, include studies by Denisiuk [1968], Seidler [1964], Grzelak *et al.* [2005] as well as Janyszek *et al.* [2005].

The aim of this study was to estimate and analyse the natural value of highly valued mid-forest meadows in the Bukówka river valley and to determine their economic value.

MATERIAL AND METHODS

The scientific analysis was performed of the results of geobotanical analyses from the years 2006-2010, conducted in the valley of the Bukówka river, flowing along the edge of the Noteć Forest, at the localities Mniszek and Wizany, within the section between roads from Wieleń to Przesieki and from Wieleń towards Lubcz Mały, in the area of the Greater Poland Voivodeship, Czarnków-Trzcianka district (52°54' N; 16°06' E). A total of about 140 phytosociological records were analysed with the Braun-Blanquet method [1954]. The studied meadow communities were subjected to natural evaluation, where the natural value assessment was performed with the Oświt method [2000]: the mean evaluation number, natural value and the evaluation class.

Moreover, the current dry matter yield was evaluated for individual communities and the fodder value score index of sward was calculated, according to Filipek [1973].

RESULTS AND DISCUSSION

Natural value

The studied communities in evaluated areas were differentiated in respect of natural value (Table 1). The average evaluation number ranged from 6.7 in the community *Equisetum fluviatile* with *Nuphar lutea* to 2.1 in the community with *Agropyron repens*. Among them were single-species communities, with a hardly diversified structure, with hydrophilous vegetation composed of aquatic and rush species, but also multispecies communities. The flora of those communities is often naturally formed from the classes *Phragmitetea*, *Potametea*, *Lemnetea*, *Alnetea glutinosae*, as well as from the class

Molinio-Arrhenatheretea [Grzelak *et al.* 2007]. Due to the natural character of habitats, the majority of those communities are distinguished by richness of flora and fauna, although some patches are characterized by species poverty and facial diversification in the form of almost single-species concentrations of only some species. The exception is a multispecies community of swamp horsetail *Equisetum fluviatile* with *Nuphar*, which was noticed by Żukowski and Jackowiak [1995]. This is the only community situated in the studied meadows with an outstanding natural value. It is characterized by the enormous floristic richness, making a nymphoide zone, with high aesthetic experiences. Communities with high, dominating common reed (*Phragmites australis*) and common bulrush (*Typha latifolia*), had a very high natural value (Nvn), with evaluation category VIII C. They formed dense stands, with simplified species composition, weakening the vitality of other species. High natural values are also observed in communities of sedge rushes *Caricetum gracilis* and *Caricetum acutiformis* with a distinct predominance of *Carex gracilis* and *Carex acutiformis* as well as with *Calamagrostis canescens*. Communities with the predominance of *Phalaris arundinacea*, *Calamagrostis canescens* and *Caricetum hirta*, form rather monotonous aggregations of one species [Grzelak 2004]. That is why they have a moderate natural value. These are communities with hydrophilous vegetation, mainly with rush species.

Table 1. Natural value of natural plant communities

Community	Natural value number (NVN)		
	mean evaluation number	natural qualities	evaluation category
<i>Equisetum fluviatile</i> with <i>Nuphar lutea</i>	6.7	exceptional	IX (D)
<i>Typhetum latifoliae</i>	5.9	very high	VIII C
<i>Phragmitetum australis</i>	5.8	very high	VIII C
<i>Caricetum gracilis</i>	5.0	high	VIIC
<i>Caricetum acutiformis</i>	5.2	high	VIIC
<i>Caricetum hirta</i>	4.9	moderately high	VI B
<i>Calamagrostietum canescens</i>	4.6	moderately high	VI C
<i>Phalaridetum arundinaceae</i>	4.6	moderately high	VI C
zb. <i>Urtica dioica</i> z <i>Phalaris arundinacea</i>	3.7	moderate	IV B
zb. z <i>Festuca rubra</i>	3.6	moderate	IV B
<i>Arrhenatheretum elatioris</i>	3.4	low	III A
<i>Alopecuretum pratensis</i>	2.3	low	I A
zb. z <i>Agropyron repens</i>	2.1	low	I A

A multispecies community composed of grasses, herbs and weeds, has a moderate value, as well as those of sedges, Cuperaceae and Fabaceae *Urtica dioica* with *Phalaris arundinacea* and with *Arrhenatherum elatius*, and communities with *Festuca rubra*. Those communities are often found in the studied meadows and they occupy substantial areas. The least natural value and the lowest evaluation category has the community *Alopecuretum pratensis* with *Agropyron repens*, characterized by the predominance of couch grass (*Agropyron repens*) and nitrophilous creeping cinquefoil (*Potentilla reptans*), ground ivy (*Glechoma hederacea*), and of grasses, Kentucky bluegrass (*Poa pratensis*). Such a low category and evaluation number, according to Szoszkiewicz and Szoszkiewicz [1998], results from the fact that the natural value of phytocenoses is determined by the presence of valuable rare plants, endangered and dying, and not the

value of the biodiversity index. Grzelak and Bocian [2006], in turn, observed that along with decreasing anthropopressure, meadow communities are characterized by higher natural value.

Economic value

The studied communities show not only considerable natural value but also a differentiated economic value. Due to the excessive moisture of most habitats in the studied area, the majority of communities of a high natural value have a poor economic value or are wastelands. In the studied communities, five were strongly moist, two swampy and three aquatic, two moderately moist and one dry (Table 2).

Table 2. Wetland habitat and fodder value number of natural plant communities

Community	Wetland habitat	Fodder value number (FVN)*		
		yield, DM·ha ⁻¹	FVN	value of sward
<i>Arrhenatheretum elatioris</i>	moderately moist	4.4- 7.5	7.4	good
<i>Phalaridetum arundinaceae</i>	strongly moist	7.0-11.0	6.8	good
<i>Alopecuretum pratensis</i>	strongly moist	5.6-7.8	6.1	good
<i>Phragmitetum australis</i>	aquatic	8.4-14.0	–	poor
zb. <i>Urtica dioica</i> z <i>Phalarisarundinacea</i>	strongly moist	6.6-9.8	3.2	poor
<i>Caricetum acutiformis</i>	swampy	5.4-8.8	1.7	poor
<i>Caricetum gracilis</i>	swampy	5.2-8.5	2.5	poor
zb. z <i>Agropyronrepens</i>	moist	2.4-4.2	2.9	poor
zb. z <i>Festuca rubra</i>	dry	4.8- 5.6	5.3	mediocre
<i>Caricetum hirta</i>	strongly moist	4.2-6.8	1.8	mediocre
<i>Calamagrostitetum canescens</i>	strongly moist	3.8-6.8	1.6	mediocre
<i>Equisetum fluviatile</i> z <i>Nupharlutea</i>	aquatic	–	–	wasteland
<i>Typhetum latifoliae</i>	aquatic	–	–	wasteland

* FVN – fodder value score index of sward according to Filipek

Communities formed in the optimal habitat conditions and with sustainable utilization may both indicate high natural value and present a considerable fodder value. They include the high yielding community with the predominance of *Phalaris arundinacea* and *Alopecurus pratensis*, giving yields on a level of 7.0-11.0 and 5.6-7.8 (Mg·ha⁻¹) respectively. The sward of some communities, in spite of a low yield, can be the source of collecting herbal plants, as well as a nectar flow for bees [Mosek 1995, Sawicki 2006], and having a specific microclimate and a natural landscape value, they create prospects for recreation and tourism [Trąba 1999, Trzaskoś *et al.* 2002].

CONCLUSIONS

1. The factors that have the effect on changes in the natural and economic value of communities from different phytosociological units in mid-forest ecosystems are mainly the mosaic nature of habitats and the intensity of use.

2. The multispecies community of swamp horsetail *Equisetum fluviatile* with *Nupharlutea*, with evaluation category IX (D), has an outstanding natural value in the studied area. It is characterized by vast floristic richness, and the least natural value, and the association *Alopecuretum pratensis* and the community with *Agropyron repens* has the lowest evaluation category.

3. Because of the excessive moisture of most habitats and the late time of cutting the majority of communities with a high natural value have poor economic and fodder value and some of them are wastelands.

REFERENCES

- Braun-Blanquet J., 1954. Pflanzensociologie. Springer Verl. Wien.
- Czyż H., Rogalski M., Kitzczak T., 2006. Skład florystyczny i walory przyrodnicze łąk śródleśnych. Człowiek – środowisko przyrodnicze Pomorza Zachodniego [Floristic composition and natural value of mid-forest meadows. Man-natural environment of West Pomerania]. T. I, Wyd. PRINT GROUP Daniel Krzanowski, 159-164 [in Polish].
- Denisiuk M., 1968. Wartość gospodarcza ważniejszych gatunków turzyc w Polsce [Economic value of major species of sedges in Poland]. PTPN, Wydz. Nauk Roln. i Leśn. Pr. Kom. NaukRol. i Kom. Nauk Leś. 24 [in Polish].
- Filipek M., 1973. Projekt kwalifikacji siedlisk łąkowych i pastwiskowych na podstawie liczb wartości użytkowej [Project for evaluation of meadow and pasture habitats based on fodder value score inde]. Post. Nauk Rol. 4, 59-68 [in Polish].
- Grzelak M., 2004. Zróżnicowanie fitosocjologiczne szuwaru mozgowego *Phalaridetum arundinaceae* (Koch 1926 n.n.) Libb. 1931 na tle warunków siedliskowych w wybranych dolinach rzecznych Wielkopolski [Phytosociological diversification of against the habitat background in some river valleys of Great Poland]. Roczn. AR Poznań, Rozpr. Nauk. 354 [in Polish].
- Grzelak M., Bocian T., 2006. Zróżnicowanie geobotaniczne zbiorowisk seminaturalnych doliny Noteci Bystrzej oraz ich rola w krajobrazie [Geobotanical diversification of saminatural communities of the Bystra Noteć valley and their role in landscape]. Ann. Univ. Mariae Curie-Skłodowska, Sect. E, Agricultura LXI, 257-266[in Polish].
- Grzelak M., Janyszek M., Janyszek S., Kaczmarek Z., 2007. Kształtowanie się zbiorowisk w ekosystemach śródleśnych siedlisk podmokłych [Communities in mid-forest ecosystems of swamp habitats]. Fragm. Agron. 3, 151-157[in Polish].
- Grzelak M., Janyszek M., Szychalski W., 2005. Evaluation of the fodder value of the over ground parts of sedges from the section Muehlenbergianae (L.H. Bailey) Kük. Roczn. AR Poznań, Botanika 9, 89-95.
- Janyszek M., Grzelak M., Janyszek S., 2005. Nutritive value of the over groundparts of sedges from the section Vulpinae (Carey) christ. at different plant developmental stages. Roczn. AR Poznań, Botanika 9, 103-109.
- Mosek B., 1995. Walory krajobrazowe użytków zielonych w dolinach rzecznych Lubelszczyzny [Landscape value of grasslands in river valleys of the Lublin region]. Ann. Univ. Mariae Curie-Skłodowska, Sect. E, Agricultura 50, Suppl. 52, 277-280[in Polish].
- Nawrocki P., 2006. Walory przyrodnicze dolin rzecznych [Natural value of river valleys] [In:] Woda w krajobrazie rolniczym [Water in agricultural landscape], W. Mioduszewski (ed.), Woda – Środowisko – Obszary Wiejskie, Rozpr. nauk., Monografie18, 80-88[in Polish].
- Oświt J., 2000. Metoda przyrodniczej waloryzacji mokradeł i wyniki jej zastosowania w wybranych obiektach [Method for natural evaluation of swamps and the results of its application in some facilities]. IMUZ Falenty, 3-32[in Polish].
- Ratyńska H., Szwed W., 1999. Charakterystyka i znaczenie biocenotyczne użytków zielonych w dolinie Warty w parkach krajobrazowych środkowej Polski [Characteristics and biocenotic importance of grasslands in the Warta river valley in landscape parks of Central Poland]. Mat. Konf. Nauk. Tech. Znaczenie użytków zielonych i zadrzewień w ochronie środowiska rolniczego, Kraków – Jaworki, 287-299[in Polish].
- Sawicki B., 2006. Rola paszowa, krajobrazowa oraz turystyczna trwałych użytków zielonych w Kozłowieckim Parku Krajobrazowym [The fodder, landscape and touristic role of permanent grasslands in the Kozłowiecki Landscape Park] Ann. Univ. Mariae Curie-Skłodowska, Sect. E, Agricultura61, 361-367[in Polish].

- Seidler S., 1964. Wartość pokarmowa siana doliny Wisły na odcinku od Krakowa do Warszawy [Fodder value of hay of the Vistula river valley in the section from Kraków to Warsaw]. Roczn. Nauk Rol. 76 F(1), 41-53[in Polish].
- Smith R.S., Pullan S., Shiel R.S., 1996. Seed shed in the making of hay from mesotrophic grassland in a field in Northern England: effects of hay cut date, grazing and fertilizer in a split-plot experiment. J. Appl. Ecol. 33, 833-841.
- Szoszkiewicz K., Szoszkiewicz J., 1998. Ocena różnorodności gatunkowej pratacenoz na przykładzie wybranych zbiorowisk [Evaluation of pratensis species diversity on the example of some communities]. Pozn. Tow. Przyj. Nauk., Wydz. Nauk Rol. i Leś. 85, 47-51 [in Polish].
- Trąba Cz., 1999. Florystyczne i krajobrazowe walory łąk w dolinach rzecznych Kotliny Zamojskiej [Floristic and landscape value of meadows in the river valleys of the Zamojska Basin]. Fol. Univ. Agric. Stetin., Agricultura 75, 321-324[in Polish].
- Trąba Cz., Wolański P., Trojan H., 2003. Znaczenie ekosystemów trawiastych w środowisku przyrodniczym [Importance of grass ecosystems in agricultural environment]. Zesz. Nauk. Pd.-Wschod. Oddz. PTIE i PTG 3, 89-96[in Polish].
- Trzaskoś M., Czyż H., Kitzczak T., 2002. Skład florystyczny i walory przyrodnicze łąk śródleśnych na tle warunków wodnych [Floristic composition and natural value of mid-forest meadows against the background of water conditions]. Roczn. AR Pozn., Melior. Inż. Środ. 23, 477-484[in Polish].
- Żukowski W., Jackowiak B., 1995. Ginące i zagrożone rośliny Pomorza Zachodniego i Wielkopolski [Dying and endangered plants of West Pomerania and Great Poland]. Wyd. Nauk. Bogucki [in Polish].

WALORY PRZYRODNICZE I WARTOŚĆ GOSPODARCZA ŁĄK ŚRÓDLEŚNYCH W DOLINIE RZEKI BUKÓWKA

Streszczenie. Łąki śródleśne ze względu na zachowanie unikalnych biotopów łąkowych i ekotonowych, zbliżonych do stanu naturalnego, mają cenne walory przyrodnicze. Poprzez swoją odmienną wydatnie wpływają też na funkcjonowanie ekosystemów leśnych, z którymi sąsiadują. Celem badań wykonanych w latach 2006-2010 w dolinie rzeki Bukówka była ocena walorów przyrodniczych łąk śródleśnych metodą Oświta [2000] na podstawie 140 zdjęć fitosocjologicznych, określenie wartości gospodarczej przez oszacowanie plonu suchej masy oraz wyliczenie wartości użytkowej runi. Stwierdzono bogactwo i różnorodność florystyczną łąk śródleśnych, wynikającą głównie z mozaikowości siedlisk i intensywności użytkowania. Wyróżnione zbiorowiska z klasy *Phragmitetea*, *Potametea*, *Lemnetea*, a także *Molinio-Arrhenatheretea* na ogół przedstawiały mierną jakość, ze względu na bardzo późny termin koszenia i nadmierne uwilgotnienie większości siedlisk.

Słowa kluczowe: *Lemnetea*, *Phragmitetea*, *Potametea*, waloryzacja przyrodnicza, wartość użytkowa, zbiorowiska roślinne

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