

NATURAL AND ENVIRONMENTAL VALUES AND DANGERS  
OF ECOLOGICAL AREAS „ŚCINAWSKIE SWAMPS”

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**Abstract:** A prospective brown coal mine „Legnica” is to be responsible for forming a depression funnel which can cover „Ścinawskie Swamps” where 26 herbaceous plant species forming 7 communities were recognized, among others: *Phragmitetum australis*, *Caricetum gracilis* and *Acoretum calami*. Investigated wetland characterizes changeable level of water which brings about the presence of as many as 30.77% species connected with *Molinio-Arrhenatheretea* class. The half of taxa belongs to synantropic species, while 50% are non – synantropic ones. The area of „Ścinawskie Swamps” can be assessed as featuring moderately high nature values and, therefore worth further protection as ecological areas.

## INTRODUCTION

Living nature does surprisingly often take a position of a loser when confronted with human activity and image of management. Very often one can hear about the influence of pollution on the plants [4, 5, 16]. But there is something more dangerous – the negative influence of human being on the whole ecosystems – specially on wetlands. It is enough to mention endangered peatland in the river Rospuda valley, classified to protection programme Natura 2000 or threads to the Lake Gopło in Landscape Reserve named Nadgoplanski Centenary Park which includes seven ornithological reserves [2, 6]. In the region of Lower Silesia potential dangers to various elements of living nature is a prospective brown coal mine „Legnica”. The change of water relations, resulting from the need of drying the mine area can be a danger to marshland spreading close to the planned investment. Yet it is worth mentioning that the term ‘swamps’ does not refer only to peatland, but also to trembling bogs, morass, as well as, in a broader sense, to water reservoirs [6]. Swamps and bogs play an important role in maintaining biodiversity. Peatlands can become specific retention reservoirs since peat, due to its structure, is able to store considerable amounts of water. Peat is also capable of accumulation of chemical elements, e.g. carbon and nitrogen, contributing in this way to greenhouse effect reduction [10]. The existing waterlogged areas should be subjected to a special protection as, currently, many of them, due to so far lasting human activity, undergo degradation [11, 12, 13]. One of protected areas endangered by brown coal mine „Legnica” is ecological areas „Ścinawskie Swamps”.

### ***Localization of the research area***

„Ścinawskie Swamps”, the area of which ranges 20.87 ha, are located in the east north of Ścinawa (Lower Silesian voivodship). From the south – east part they are adjacent to wet meadows and from the northern part – cultivated fields. Swamps abut upon the River Zimnica, which discharges to the River Odra and a water-course Młynówka, which is a tributary of the River Zimnica. The presence of the mentioned water – courses provides for frequent flooding of the area, especially in the spring, therefore „Ścinawskie Swamps” gained the status of ecological grassland according to Regulation by provincial governor of Legnica, dated 31st of May 1996 regarding the subject matter of recognition of ecological arable land and the normative act was Regulation of Lower Silesian Voivode dated 22nd of August 2002 [<http://oi.uwoj.wroc.pl/Journals of Law2002/DzU185.htm>].

### ***Predicted dangers resulting from the neighborhood of „Legnica” mine***

An open-cut mining requires drainage of the area [17]. The level of ground waters will be lowered through pumping out water from an open pit. In result there will occur a depression funnel ranging up to 5 km from exploitation boundaries bringing about decreased pressure of underground waters on approximate area of 120 km<sup>2</sup>. This phenomena will definitely affect water ecosystems, numerous water, swamp and wet habitats will be damaged, which, in turn, will result in poor biodiversity of „Legnica” mine adjacent areas [6]. Therefore „Ścinawskie Swamps”, because of their location in the vicinity of the future mine, can be endangered by hydrological alterations which is strictly connected with the changes both in swamp function and vegetation.

### ***Objective and methods of investigation***

The aim of the work was floristic and phyto-sociological characteristics of „Ścinawskie Swamps”, determination of peat deposit thickness and the degree of natural features of plant habitats on the examined area, as well as nature valorization of marshland.

Field investigation was conducted in 2008. There was prepared floristic index and there were taken 25 phyto-sociological photos according to the method by Braun-Blanquet. Phyto-sociological photos were tabled to serve as phyto-sociological tables. There were also estimated such parameters as degree of constancy and degree of ground cover D [14]. The names of plant species were introduced according to Mirek *et al.* [8] in order to determine phyto-sociological classes and the elaboration by Matuszkiewicz [7] was followed to demarcate plant communities. Peat deposit thickness was determined on the basis of sampling that was performed 16 times (with the use of a sampling stick) in the central part of the object. The degree of decomposition was measured according to the microscope method, while burning to ashes-using a muffle oven, at the temperature of 560°C. Nature values were determined according to the method by Oświt [9]. To assess synanthropic groups there were used works by the following authors [18, 19, 20].

## RESULTS AND DISCUSSION

### ***Physical properties of the organic soil***

The sampling proved that hydrogenic soil thickness did not exceed the range from 6 to 21 cm. The only exception was a measurement point where the mentioned thickness amounted to 97 cm, but peat occurring there was highly contaminated by sand, dust and clay.

That point was the nearest to the Młynówka water course which, when flooding, drifted alluvial deposits. Such a low thickness of an organic layer does not entitle „Ścinawskie Swamps” to be classified as peatland since peatland should feature at least 30 cm – layer of peat [3, 15]. Thus, the most appropriate term seems to be “wetlands”.

The content of burnt to ashes parts in an organic soil was markedly high and it ranged from 53 to 68%. Those values confirm continuous drifting of alluvial deposits by the Młynówka water course. Fluctuations of water level in plant growing period are strictly connected with water level in the Młynówka and cause significant alterations in the degree of organic soil hydration, which translates into peat decomposition degree. The values of decomposition degree are from 29 up to 75%, which points to medium – decomposed peat as humopeat [1].

### **Floristic analysis**

On the area of “Ścinawskie Swamps” there were recognized 26 vascular plant species creating 7 plant associations:

- Class: *Phragmitetea* R.Tx. et Prsg 1942  
 Alliance: *Phragmition* Koch 1926  
 Association: *Acoretum calami* Kobendza 1948  
*Glycerietum maximae*Hueck 1931  
*Typhetum latifoliae* Soó 1927  
*Phragmitetum australis* (Gams 1927) Schmale 1939  
*Scirpetum lacustris* (Allrge 1922) Chouard 1924
- Alliance: *Magnocaricion* Koch 1926  
 Association: *Caricetum gracilis* (Graebn. Et hueck 1931) R. Tx. 1937
- Alliance: *Sparganio-Glycerion fluitantis* Br.-Bl. et Siss  
 Association: *Sparganio-Glycerietum fluitantis* Br.-Bl. 1925 n.n.

Phytocenosis mentioned above constitute a mosaic of covers. The largest area of „Ścinawskie Swamps” is occupied by *Caricetum gracili* association. Its floristic composition is very poor – in particular photo were recorded from 1 to 10 species (Tab. 1., record 14–23).

The species accompanying sharp sedge can be fund in trace amounts and their constancy equals I. *Carex acuta* also appears in other phytocenosis and, therefore, its degree of ground cover D is the highest, amounting 3640.8. Localization of sedge – covered ground with *Carex acuta* species remains in agreement with characteristics by Matuszkiewicz [7] where the author stated that the mentioned phytocenosis occupies the areas in bottom land near rivers, as well as near smaller water courses. Equally poor, in terms of floristic composition, are reed rushes *Phragmitetum australis* (Tab.1., record 9–11). Their covers can be found mainly on the borders of Młynówka water course. An interesting association is *Acoretum calamis* (Tab.1., record 1–4). *Acorus calamus* also occurs in small quantities in other biocenosis no wonder its degree of ground cover D ranges 1410.4 belonging to one of higher – value degrees featuring the area in question. According to Matuszkiewicz [7] this phytocenosis appears on the bedding poor in peat





Tab. 2. List of vascular flora and their characteristic; undermined syntaxonomic unit  
 AP – Apophytes, ARCH – Archeophytes, KEN – Kenophytes, NS – Unsynantrophic species

Species	Class	Groups of synantrophic plants	Evaluation number	Mean evaluation number	Class evaluation
<i>Acorus calamus</i> L.	Phragm.	kenofit	4		
<i>Betula pendula</i> Roth	Epilob.	apofit	1		
<i>Carex acuta</i> L.	Phragm.	nie synantropijny	4		
<i>Carex rostrata</i> Stokes	Phragm.	nie synantropijny	4		
<i>Chenopodium bonus-henricus</i> L.	Artem.	archoefit	lack		
<i>Cirsium palustre</i> (L.) Scop.	Mol.-Arrh.	nie synantropijny	3		
<i>Equisetum arvense</i> L.	Agrop.	apofit	1		
<i>Glyceria fluitans</i> (L.) R.Br.	Phragm.	nie synantropijny	4		
<i>Glyceria maxima</i> (Hartman) Holub.	Phragm.	nie synantropijny	4		
<i>Iris pseudacorus</i> L.	Phragm.	nie synantropijny	4		
<i>Lychnis flos-cuculi</i> L.	Mol.-Arrh.	apofit	3	3.19	VI
<i>Lycopus europaeus</i> L.	Alnetea	apofit	4		
<i>Lysimachia vulgaris</i> L.	Mol.-Arrh.	nie synantropijny	4		
<i>Myosotis palustris</i> (L.) L. em Rchb.	Mol.-Arrh.	nie synantropijny	3		
<i>Phragmites australis</i> (Cav.) Trin. ex Steud.	Phragm.	apofit	4		
<i>Polygonum amphibium</i> L.	-	apofit	4		
<i>Polygonum persicaria</i> L.	-	apofit	lack		
<i>Ranunculus repens</i> L.	Mol.-arrh.	apofit	3		
<i>Rorippa amphibia</i> (L.) Besser	Phragm.	nie synantropijny	4		
<i>Rorippa palustris</i> (L.) Besser	Bident.	nie synantropijny	lack		
<i>Scirpus lacustris</i> (L.) Palla	Phragm.	nie synantropijny	4		
<i>Stachys palustris</i> L.	Mol.-Arrh.	apofit	4		
<i>Symphytum officinale</i> L.	Mol.-Arrh.	apofit	4		
<i>Thalictrum flavum</i> L.	Mol.-Arrh.	nie synantropijny	7		
<i>Typha latifolia</i> L.	Phragm.	nie synantropijny	4		
<i>Urtica dioica</i> L.	Artem.	apofit	2		

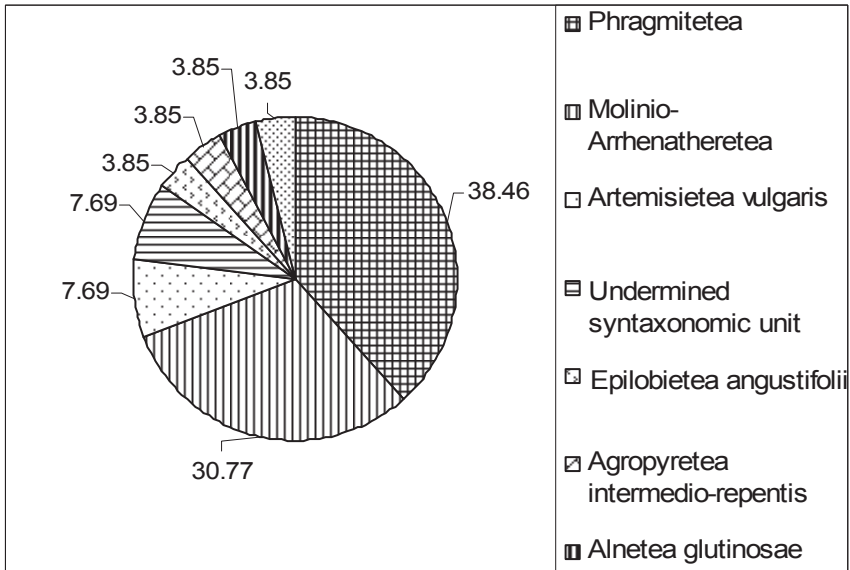


Fig. 1. Participation [%] of plant classes of „Ścinawskie Swamps”

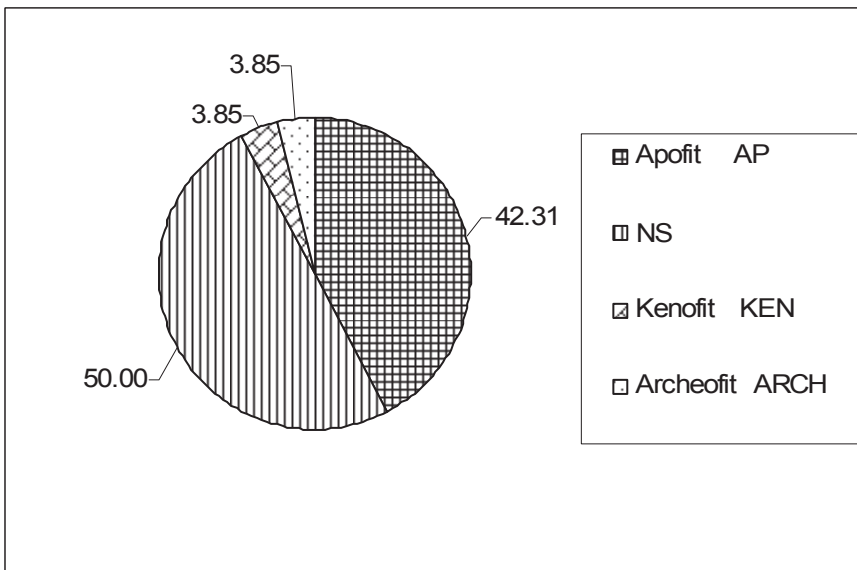


Fig. 2. Participation [%] of synantropic plant groups in “Ścinawskie Swaps”  
 AP – Apophytes, ARCH – Archeophytes, KEN – Kenophytes, NS – Unsynantrophic species

number for „Ścinawskie Swamps” amounts 3, 19. This value does not exceed the range 3.1–3.4 determined for VI evaluation class which involves the areas of moderately high nature values.

The mentioned values were additionally estimated according to another way proposed by Oświt [9] (Tab. 3). In that case there were analyzed not particular plant species but the whole communities. Points 2, 4, 6, 8 and 10 are assigned to particular biocenosis. Mean coefficients for the whole examined area allow to classify it to an appropriate valorization class. In „Ścinawskie Swamps” the only community to gain evaluation number 8 was *Sparganio-Glycerietum fluitantis* which means that this community was classified as the one to be worth regional protection. The remaining biocenosis were regarded as rare is swamp habitats and potentially endangered (evaluation number 6). The outcome of the whole procedure enabled classification of „Ścinawskie Swamps” to IX class, representing outstanding nature values.

Both methods proposed by Oświt [9] assess „Ścinawskie Swamps” in considerably different ways. Characteristics based on the values of species (Tab. 2) determines the examined swamp as the area of moderately high nature values, while when the whole communities (Tab. 3) are taken into account, nature values of „Ścinawskie Swamps” are said to be unique.

Tab. 3. Natural value of „Ścinawskie Swamps” according to Oświt’s method

Plant association	Evaluation number	Total evaluation number	Mean evaluation number	Class evaluation
<i>Acoretum calamis</i>	6			IX High natural value
<i>Glycerietum maximae</i>	6			
<i>Typhetum latifoliae</i>	6			
<i>Phragmitetum australis</i>	6	44	6.29	
<i>Scirpetum lacustris</i>	6			
<i>Caricetum gracilis</i>	6			
<i>Sparganio-Glycerietum fluitantis</i>	8			

Yet it seems not justified to classify this area as possessing unique nature values since nearly 31% of species are connected with *Molinio-Arrhenatheretea* class. Therefore, it more sensible to assess this area a featuring moderately high nature values, which is a sufficient condition to protect it as ecological areas. Regardless diverse assessment, these swamps are a valuable area, with plant species typical for wetland.

## CONCLUSIONS

1. „Ścinawskie Swamps” are ecological areas which can possibly be found within the boundaries of predicted depression funnel of a planned brown coal mine „Legnica”.
2. Because of not significant hydrogenic soil thickness this object cannot be called peatland. The best term to refer to it is wetland.
3. In the area of the mentioned wetland were recognized 26 plant species forming 7 plant communities, including especially interesting calamus rush *Acoretum calami*



- but *Caricetum gracilis* and *Phragmitetum australis* are dominating associations there.
4. Among recognized plant species 38% are representatives of *Phragmitetea* class, while nearly 31% belong to *Molinio-Arrhenatheretea* class.
  5. Non – synantropic species provide for 50%. There occurs one kenophytes and one archeophytes.
  6. The assessment of nature values followed the method by Oświt and classified „Ścinawskie Swamps” as the area of moderately high nature values which is sufficient to protect it and regard as ecological areas.
  7. Possible drying of marshland ecosystem could result from functioning of depression funnel of a planned brown coal mine „Legnica” and would definitely make swamp vegetation in the region of Ścinawa poorer as far as plant species typical for wetland are taken into account.

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#### WALORY PRZYRODNICZE I ZAGROŻENIA UŻYTKU EKOLOGICZNEGO „BAGNA ŚCINAWSKIE”

Planowana kopalnia węgla brunatnego „Legnica” ma być odpowiedzialna za powstanie leja depresyjnego, w obrębie którego mogą znaleźć się „Bagna Ścinawskie”. Rozpoznano na nich 26 gatunków roślin zielnych tworzących 7 zespołów m. in.: *Phragmitetum australis*, *Caricetum gracilis*, *Acoretum calami*. Omawiane mokradło charakteryzuje się zmiennym poziomem wody, co powoduje występowanie aż 30,77% gatunków związanych z klasą *Molinio-Arrhenatheretea*. Spośród taksonów występujących na badanym obszarze połowę stanowią gatunki synantropijne, pozostałe to gatunki nie synantropijne. Obszar „Bagien Ścinawskich” można uznać jako obszar o umiarkowanie dużych walorach przyrodniczych, czyli w pełni zasługujący na dalszą ochronę jako użytek ekologiczny.