

DOI: 10.1515/jwld-2016-0036

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JOURNAL OF WATER AND LAND DEVELOPMENT  
2016, No. 31 (X–XII): 53–61  
PL ISSN 1429–7426

Available (PDF): <http://www.itp.edu.pl/wydawnictwo/journal>; <http://www.degruyter.com/view/j/jwld>

Received 30.08.2016  
Reviewed 19.10.2016  
Accepted 15.11.2016

A – study design  
B – data collection  
C – statistical analysis  
D – data interpretation  
E – manuscript preparation  
F – literature search

## Peatlands and their protection: select landscape parks of the Wielkopolska region

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**For citation:** Ilnicki P., Górecki K., Lewandowski P. 2016. Peatlands and their protection: select landscape parks of the Wielkopolska region. *Journal of Water and Land Development*. No. 31 p. 53–61. DOI: 10.1515/jwld-2016-0036.

### Abstract

In the context of five significantly different landscape parks in Wielkopolska (30,413 ha) 243 peatlands have been presented in terms of their characteristics, stratigraphy, change in means of utilisation and localisation. Thus trends in the change of peatland utilisation means in the period 1970–2016 were established and the resulting negative effects indicated. For this purpose the process of peatland protection established was analysed in the context of management plans carried out for both the protection of landscape parks and Natura 2000 sites within their territory. The above management plans, however, do not provide information as to localisation data, stratigraphy and to what purpose peatlands are used, which in all cover 2,690 ha – 4.2% of parks' area. Most often this means there are no formal applications for their protection. This could be said to be a byproduct of a lack of discussion as to the major threat to the environment presented by the increasing disappearance of peatlands – a result of the mineralisation and moorsh process of peat soils. To a large extent the former has resulted from a lack of scientific expertise in respect to soils, peats and land reclamation in research teams preparing landscape management plans.

**Key words:** *landscape park, management plan, Natura 2000 site, nature protection, peatland, utilisation, Wielkopolska region*

### INTRODUCTION

The creation of large environment protection areas in Poland in the main takes into consideration the special qualities of the landscape, rare collections of flora, as well as protected and endangered species of flora and fauna. Most often alas, the occurrence of peat and gytja deposits are not considered and moreover, those completing documentation for landscape park and Natura 2000 programmes often are not conversant with the localisation and structure of peatlands in these areas. Peatlands at present are only seen as

collections of flora. A peatland, it should be noted, is a geological deposit composed of peat and often, also gytja (limnic deposits), where at present (in various periods) collections of various flora and fauna are present. Consequently those in management of large areas under environmental protection (Landscape Park and National Park management, as well as Regional Boards of Environmental Protection) not knowing the localisation and structure of peatlands, do not undertake their protection. A similar view can be seen also in Directive 92/43/EEC on the conservation of natural habitats (Tab. 1). Natural habitats means

**Table 1.** Natural protected habitats on lowland peatlands observed in Poland in monitoring

Code	Habitat type	Plant community
6410	<i>Molinia</i> meadows on calcareous, peaty or clayed-silt laden soils	<i>Molinion caeruleae</i>
6510	lowland hay meadows	<i>Arrhenatherion elatioris</i> <i>Alopecurus pratensis</i>
7110	active raised bogs	<i>Sphagnetalia magellanici</i>
7120	degraded raised bogs still capable of natural regeneration	<i>Sphagnetalia magellanici</i> (degraded)
7140	transition mires and quaking bogs	<i>Scheuchzeria-Caricetea</i>
7150	depressions on peat substrates of the <i>Rhynchosporion</i>	<i>Rhynchosporion albae</i>
7210	calcareous fens with <i>Cladium mariscus</i> and species of the <i>Caricion davallianae</i>	<i>Cladium marisci</i> <i>Caricion davallianae</i>
7230	alkaline fens	<i>Caricion davallianae</i> and part of <i>Caricion</i>
91D0/91D1	woodland with birch	<i>Vaccinio uliginosi-Betuletum pubescentis</i>
91D0/91D2	woodland with <i>Pinus</i>	<i>Vaccinio uliginosi-Pinetum</i>
91E0	alluvial forest with <i>Alnus glutinosa</i> and <i>Fraxinus excelsior</i>	<i>Alnion incanae-Salicion albae</i>
91F0	riparian mixed forests with <i>Quercus robur</i> , <i>Ulmus laevis</i> and <i>Fraxinus excelsior</i>	

Source: Directive 92/43/EEC; MRÓZ (ed.) [2010; 2012].

terrestrial or aquatic areas distinguished by both abiotic and biotic features, not only by biotic features. The list of habitat types (Tab. 1) concentrates on rare bogs and transitional peatlands that occur in Poland (code: 7110, 7120, 7140, 7150, 91D0/91D2) or alkaline and calcareous fens (code: 7210, 7230). However, large collections of meadows (code 6410, 6510) and alluvial forests (code: 91E0) can be found much more often on peatlands. At the same time in Poland, as is the case in all European countries, invisible to the naked eye, a process of a gradual disappearance of peatlands is taking place [ILNICKI, SZAJDAK 2016]. The widespread lowering of ground water levels on peatlands, below the land surface, is accompanied by a process of surface subsidence, a result of the shrinking of dehydrated peat and loss of water uplift. Consequently there begins a process of peat-moorsh soils creation, associated with mineralisation and the physical and chemical processing of peat organic materials. The above results in a subsequent process of gradual change of peat soils into peat-moorsh, then into moorsh, mucky and at last into humic-mineral soils that contain only 3–10% of organic materials in the surface layer. In the final stage of the process of peatlands disappearing there arise mineral soils composed from materials underlying the peat. In Poland usually there are sandy soils, sometimes (for example in the upper valley of the Mosiński Canal in Wielkopolska) featuring soils composed by calcium deposits with highly unfavourable physical properties for agriculture. The present means of creating management plans for landscape park and that of Natura 2000 sites, as

well as conservation measures planning, because it does not take into account their occurrence, can not ensure the protection of peatlands.

The aim of this study is to present the localisation and characteristics of peatlands occurring in five landscape parks in central Wielkopolska, which overlap with the eight sites of Natura 2000 sites. The methodology used should constitute a research model in the creation or addition of documentation whose aim is the protection of landscape parks and Natura 2000 sites. Only in this way shall it be possible to afford the possibility to realise the objectives of Directive 92/43/EEC in respect to taking into consideration an abiotic environment and to ensure at least a partial protection of peatlands threatened with extinction. Agricultural soil maps that are available in Poland alas do not provide precise information on the localisation and creation of peatlands.

## STUDY AREAS

For the purposes of becoming familiar with plans for possible action that would allow for an end to the process of peatland loss in central Wielkopolska, five landscape parks with a total area of 66,280 ha (Tab. 2, Fig. 1) were analysed. Four of these in part overlap in their territory with several sites designated by Natura 2000. In the Promno, Puszcza Zielonka and Sierakowski landscape parks, the above Natura sites cover their most valuable nature sites, while the Rogaliński Landscape Park constitutes only a part of the considerably greater areas of the Rogaliński Habitat and the Rogaliński Warta Valley. The territorial overlap of areas covered by various forms of management

**Table 2.** Nature protection of selected landscape parks in the Wielkopolska region

Landscape park	Landscape park area ha	Indices of peatland occurrence %	Landscape park is a part of the Natura 2000 area (name)
Lednicki	7618	3.5	non
Promno <sup>1)</sup>	3364	5.1	PLH300030 Ostoja koło Promna <sup>4)</sup>
Puszcza Zielonka <sup>2)</sup>	12 202	6.6	PLH300058 Uroczyska Puszczy Zielonka
Rogaliński	12 683	1.3	PLH300017 Ostoja Rogalińska PLH300012 Rogalińska Dolina Warty <sup>4)</sup>
Sierakowski <sup>3)</sup>	30 413	4.2	PLH300029 Jezioro Mnich <sup>4)</sup> PLH300006 Jezioro Kubek <sup>4)</sup> PLH300032 Ostoja Sierakowsko-Międzychodzka <sup>4)</sup> PLB300015 Puszcza Notecka
Total	66 280	4.2	–

<sup>1)</sup> With nature reserves “Jezioro Dębiniac” and “Drażynek”.

<sup>2)</sup> With nature reserves “Jezioro Czarne” and “Jezioro Pławno”.

<sup>3)</sup> With nature reserves “Mszar nad jeziorem Mnich” and “Bukowy Ostrów”.

<sup>4)</sup> The management plan for the Natura 2000 site exists.

Source: own elaboration.

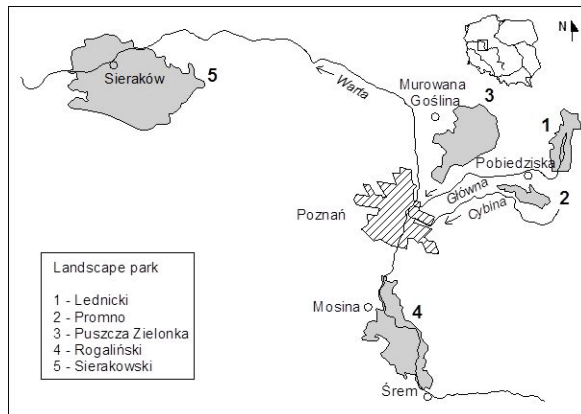


Fig. 1. Location of analysed landscape parks in the Wielkopolska region; source: own elaboration

plans and conservation measures plans. The Lednicki Landscape Park, created in 1988, stretches over an undulating moraine upland dissected by sub-glacial channels boasting several lakes and in the main utilized by agriculture – also embracing a historical monument, the isle of Ostrów Lednicki. The management plan for the above park was created in 2008, that of the small silvan Promno Landscape Park in 2009 (created in 1993) and the conservation measures plan for the Promno Natura site in 2014. The Puszcza Zielonka Landscape Park created in 1993 embraces a large forest complex with varied fragments of a post-glacial landscape. The management plan in this case was established in 2005, whereas for the Puszcza Zielonka Natura 2000 site PLH300058 such plan has yet to be created. The Rogaliński Landscape Park was created in 1997 and came to see a management plan in 2008. It covers a large fragment of an undammed Warta River valley above Poznań with many varied old river-beds, where extensive forest and agricultural production takes place. For the Natura 2000 site Rogalińska Warta valley that covers all of the landscape park, an management plan was created in 2011 and a conservation measures plan two years later. The Sierakowski Landscape Park is the biggest of this type in Wielkopolska. It was established in 1991, measuring 30,413 ha with a varied post-glacial landscape featuring moraine hills, numerous lakes, dunes, river valleys, headwaters and the southern part of the Puszcza Notecka woodlands. It is, alas, not embraced by any management plan. In 2016 a conservation measures plan was created for the Natura 2000 site Jezioro Kubek PLH300006. Conservation measures for state forest areas in the Natura 2000 sites PLH300032 and PLH3000029 was defined in the action plan of the Forestry Management Sieraków for the period 2016–2025. The analysed landscape parks show a large differentiation of landscapes and land use.

The location of landscape parks under investigation on a map of peatlands in the Poznań region [ILNICKI *et al.* 1996], covering a significant part of Wielkopolska and Lubusz regions, is shown in Figure 2. All the landscape parks under discussion are found



Fig. 2. Investigated landscape parks in the context of the peatlands map of the Poznań region; source: ILNICKI *et al.* [1996]

in the Central Poland Lowland, created in the most recent ice age, where peatlands account for 2.6% of the surface area. As far as the above parks are concerned, peatlands on average take up 4.2%, that is, almost as much (4.1%) on average in Poland itself [DEMBEK *et al.* 2000]. Their largest representation can be found in the Puszcza Zielonka Landscape Park (6.6%), and the smallest in the Rogaliński Landscape Park (1.3%).

## MATERIALS AND METHODS

So as to present objectively the means of peatland protection applied currently in landscape parks and Natura 2000 sites, five out of thirteen landscape parks situated in central Wielkopolska have been studied. Among these there can be found a large forest complex with the lowest outflow of surface waters (Puszcza Zielonka), a small woodland park (Promno) situated as a watershed, a mainly exploited for agriculture fragment of a flat moraine upland of the Poznański Lakeland (Lednicki), an extensively agricultural used section of the Warta River (undammed) valley above Poznań (Rogaliński) and a large fragment of the Międzychodzko-Sierakowski Lakeland characterised by a very large differentiation of sculpture of the earth's surface and the occurrence of a significant number of headwaters, lakes and forests, as well as a mosaic of various forms of land use as in the case of

the Sierakowski Landscape Park (LP). The present boundaries of every landscape park are defined on the basis of a map published in the year 2000 to a scale of 1:100,000 and 1:115,000 (Wielkopolska environmental protection map). In addition, topographical maps with a scale of 1:100,000, 1:50,000 and 1:25,000 were used, as well as those in official plans of Forestry Management (Sierakowski and Zielonka). Peatland maps were created to a scale of 1:25,000, which corresponds to that of maps used in the national documentation of peatlands in Poland conducted in the latter half of the 20th century. Every such park was documented in terms of its land area and legal status. Subsequently, existing documentation and decisions relating to landscape parks (and Natura 2000 sites within their borders), nature reserves, nature-landscape complexes and ecological sites. Next, management plans and conservation measures plans were analysed as were nature reserve documentation, according to official Natura 2000 Standard Data Form and two Forest Management plans. Finally, several dozen scholarly publications were consulted in respect to establishing a synthesis of research results in this literature.

The source material used as a basis of defining the characteristics of peatlands found in the respective landscape parks under study were 22 geological and geo-botanical monographs published by various authors in the period 1957–1973. At present they are kept at the National Archives, Poznań and it should be noted, based on the one methodology created by the Ministry of Agriculture in 1959 [ILNICKI 2002]. The names of peat species in the above mentioned were adapted to the requirements of subsequently created norms PN-85-G-02500 [TOLPA *et al.* 1967] and classification of gytja [ILNICKI 2002; TOBOLSKI 2000]. On account of the considerable lapse of time since the creation of this documentation it was both desirable and appropriate to conduct an inspection *in situ* of the chosen peatlands in the majority of landscape parks. This applied to both the present means of peatland utilisation and ad hoc inspection of peatland stratigraphy and assessment of existing threats arising from aquatic conditions, as well as the means of peatland utilisation. As a consequence of the fact that peatland disappearance to a large extent is directly linked to its forms of use, a comparative study was conducted on the respective means of peatland utilisation recorded in the literature (1957–1973) and more recent studies (1994, 2006). The present state of peatland utilisation was established on the basis of Google Earth satellite pictures from 2015–2016. In particular, the occurrence and localisation of habitats marked out in Habitat Directive 92/43/EEC was taken into account, limiting the field of study to those strictly related to peatlands. These were based on existing (2009 and 2013) Standard Data Forms in respect to Natura 2000 sites.

On the basis of these varied materials a taxonomy of peatland characteristics was undertaken for every landscape park, defining existing threats and an

assessment made of recommendations contained in management plans and conservation measures plans aiming to protect peatlands. A comprehensive outline of these studies was published in 2016 and 2017 in “Biuletyn Parków Krajobrazowych Wielkopolski” [ILNICKI *et al.* 2016a, b]. This data shall facilitate further studies by researchers investigating the protection of the above mentioned areas per se and moreover, the breadth of literature consulted in these publications should prove invaluable. This article therefore is of a synthetic nature, facilitating an assessment of the state of peatland protection in Wielkopolska landscape parks. Further, it should be noted that a peatland, according to Habitat Directive 92/43/EEC, is seen as an abiotic element in a habitat. This means that apart from fauna and flora collections (biotic elements) it is imperative that the management of parks takes into consideration the relevant layers of peat and gytja that are integral to these nature habitats.

## RESULTS AND DISCUSSION

### PEATLANDS

The landscape parks (LPs) under discussion cover 66,280 ha in all (Tab. 2, Fig. 1). Apart from the Sierakowski LP (30,413 ha), these are small parks (Lednicki and Promno) and medium ones (ca 12,000 ha). Peatlands in this landscape parks occur 4.2% of area, similar than in Poland. These parks, in terms of number and peatland variety represent common conditions in this Central Poland Lowland latitudinal belt (Fig. 2). The smallest proportion of peatlands in respect to LP surface area (1.3%) is claimed by the Rogaliński LP and the largest belongs to the woodland Puszcza Zielonka LP (6.6%). Moreover, the Natura 2000 site embraces the entire Rogaliński LP, as well as situated elsewhere the most environmentally valuable parts in the LPs of Promno, Puszcza Zielonka and Sierakowski. No Natura 2000 site alas, has been created in the Lednicki LP.

Among the 243 located and documented peatlands across all the LPs under analysis there is a decided domination of fens (235). A small number (8) of small transitional peatlands occur mainly in the Parks of Promno, Puszcza Zielonka and Sierakowski, whereas high peatlands (bogs) do not occur. In this context peatlands are defined by a commonly accepted methodology based on peat deposit stratigraphy and not as at present, on collections of flora that are present. On the basis of the existing composition of flora collections itself, part of the transitional peatlands have been described by botanists as bogs [CZUBIŃSKI, ŚWITALSKA 1937; GĄBKA 2000; MICHAŁOWSKA, RYMON-LIPIŃSKA 2008; PRZYBYŁAK 2008]. Apart from geological and geo-botanical documentation of peatlands in regard to their stratigraphy conducted in 1957–1973, subsequent partial stratigraphic analysis was conducted for only some objects [HOFFA 1991; KIASZEWICZ, STAŃKO 2011; KONIECZNA, KO-

WALEWSKI 2009; KOWALEWSKI, WIŚNIEWSKI 1994]. Several hitherto unresearched peatlands were identified in the Sierakowski LP, out of which of particular interest could be those situated on the southern edge of the Puszcza Notecka woodland and the Bukowy Ostrów nature reserve. Peatlands in all the Parks under discussion take up 2690.1 ha in total and in the majority (55.9%) under the peat layer there are layers of gytja. This testifies to the fact that they arose as a result of a silting process and overgrowth of lakes. In this context gytja is rarely encountered in the Rogalińskim LP, which covers mainly the Warta River valley (Tab. 3). In the five landscape parks under study small peatlands dominate, their average surface area measures only 11.1 ha. Almost half of all peat-

lands take up less than 5 ha, while only 18 exceed 30 ha (Tab. 4). Larger peatlands are found in the main in valleys occurring in the Parks of Puszcza Zielonka and Sierakowski. In all there are almost 50 mln m<sup>3</sup> in peat natural resources, and gytja around 30 mln m<sup>3</sup>. Almost half of these resources are found in the Sierakowski LP, while there are little in the Rogaliński LP. The drainage of the majority of peatlands has initiated soil processes leading to their extinction. The depth of the level of ground waters, means of peatland use and thickness of peat all decide the speed of this process. The average peat thickness in particular Parks oscillates between 1.18–2.09 m, the lowest being (1.18 m) in the Rogaliński LP.

**Table 3.** Peatlands characteristics in selected landscape parks

Landscape park	Peatlands number		Type of peatland number		Area of peatland with ha		Mean peatlands area ha	
	total	with peat and gytja	fens	transitional peatlands	peat	peat and gytja	peat	peat and gytja
Lednicki	31	25	31	0	268.5	170.2	8.66	6.81
Promno	21	12	21	0	170.5	104.2	8.12	8.68
Puszcza Zielonka	53	32	50	3	801.0	516.9	15.1	16.2
Rogaliński	27	4	26	1	167.2	47.3	6.2	11.7
Sierakowski	111	63	107	4	1 282.9	664.2	11.6	16.2
Total	243	136	235	8	2 690.1	1 502.8	11.1	11.1

Source: own elaboration.

**Table 4.** Dimension of peatlands and their geological reserves

Landscape park	Number of peatlands with an area of ha				Geological reserves thous. m <sup>3</sup>	
	≤5.0	5.1–9.9	10.0–29.9	≥30.0	peat	gytja
Lednicki	17	7	5	2	4 068	3 971
Promno	12	4	3	2	3 387	1 249
Puszcza Zielonka	28	12	9	4	13 763	11 593
Rogaliński	14	9	4	0	1 847	1 702
Sierakowski	54	17	30	10	25 239	13 869
Total	125	49	51	18	48 304	32 384

Source: own elaboration.

**Table 5.** Average depth of peat and gytja in analysed peatlands

Landscape park	Mean depth m		Number of peatlands with an average peat depth, m					
	peat	gytja	<0.5	0.5–0.99	1.0–1.99	2.0–2.99	3.0–4.99	≥5.0
Lednicki	1.51	2.33	2	7	11	7	4	0
Promno	2.09	1.64	–	3	7	8	3	0
Puszcza Zielonka	1.84	1.75	2	14	18	9	8	2
Rogaliński	1.18	2.58	1	11	14	0	0	1
Sierakowski	1.88	1.96	6	15	41	35	14	0
Total	1.80	2.15	11	50	91	59	29	3

Source: own elaboration.

An analysis of peat thickness has shown (Tab. 5) that most shallow, endangered peatlands threatened with disappearance (with a thickness less than 1 m) can be found in the Parks of Sierakowski (21) and Puszcza Zielonka (16). A detailed analysis (Tab. 6) records that this affects in total 391.5 ha, some 14.5% of peatland general surface area in the five landscape parks under analysis. The largest area of endangered peatlands threatened with extinction lies in the Rogaliński LP and Lednicki LP, covering 45.6% and 25.2% respectively of peatlands, the smallest (7%) in LP Promno. In the Sierakowski LP this phenomenon relates to as much as 140.9 ha, that is 11% of peatlands.

**Table 6.** Area of shallow peatlands in analysed landscape parks

Landscape park	Peatlands area (ha) with a peat depth (m)			Participation (%) in the total peatland area
	<0.5	0.5–0.99	<1.0	
Lednicki	8.3	59.4	67.7	25.2
Promno	0	11.9	11.9	7.0
Puszcza Zielonka	3.1	91.7	94.8	11.8
Rogaliński	1.0	75.2	76.2	45.6
Sierakowski	11.0	126.3	140.9	11.0
Total	27.0	364.5	391.5	14.6

Source: own elaboration.

## THREATS

The greatest threats to peatlands found in the landscape parks under discussion are at present changes to the means of their utilisation, which indi-

cate a depth of level of ground waters during the vegetative period. To a large extent these changes are conditioned by economic factors, which are in the main as follows:

- low economic (cost) effectiveness of the production of meadow hay, resulting from the purchase price, limitations of livestock (cattle and sheep), the concentration of cattle herds tied to the demands of dairies, as well as the domination of breeding alcoves of cattle based on a mixture of concentrated feeding stuff over that of the use of pastures and the production of green fodder;
- the change of permanent grassland to that of arable land, causing a visible acceleration of mineralisation in peat;
- change from permanent grassland to that of land taken up by undergrowth, shrubs and forest; as a result of an increase in evapotranspiration it causes a lowering of ground water levels and acceleration of peat mineralisation;
- change from permanent grassland to fish ponds causes a preservation of peat found under the water table, causing at the same time destruction of peatland during the construction of ponds and water channels;
- change from permanent grassland to that of rushes is usually connected to the occurrence of shallow ground water table that limit the mineralisation of peat.

On the basis of geological and geobotanical documentations in respect to the nature of peatland use in 1957–1973 and analysis of satellite pictures from 2015–2016, an assessment was made of the trend in peatland utilisation changes in respect to landscape parks (Tab. 7). Some 243 peatlands measuring 2690.1 ha in total were investigated. The research results subsequently permitted an assessment to be made for the parks individually and in total. The above show that a fall in grasslands has taken place in total for peat-

lands from 67 to 35%. Thus the surface area taken up by forests has increased visibly (18 to 32%) as well as fish ponds (1 to 8%), and arable land (0 to 6%). Importantly, the proportion of rushes has also increased (14 to 19%). An important factor in this context of change was the fragmentation of peatlands and administration of a large part of their area by respective Forestry Managements. For example, in the Sierakowski Landscape Park, based on numerous instances of subterranean water headwater seepage, fish ponds were constructed over a sizeable area that covered peatlands. Another cause in the above context was the neglect of ditch preservation, which contributed to meadows turning into marshland, excluding these from agricultural use and gradual population of reeds, trees and bushes. This is particularly visible in the Parks of Promno, Lednicki and Rogaliński. Moreover, planned afforestation can be observed in the Puszcza Zielonka and Sierakowski landscape parks. The beavers that have settled in Promno, Lednicki and Rogaliński LPs locally increased water levels and diminished the rate of peat mineralisation. Further, drier grasslands have changed to arable land, especially in the Lednicki, Rogaliński and Sierakowski landscape parks – in sum covering an area of around 160 ha.

The majority of the above mentioned changes in the means of peatland exploitation was responsible for accelerating the process of their extinction. This relates to mainly arable land and forests, and as a consequence, acceleration in peat mineralisation and peatland decline.

#### RECOMMENDATION FOR PEATLANDS PROTECTION IN MANAGEMENT PLANS

Management plans have been documented for four landscape parks though not for the Sierakowski LP. In respect to the Natura 2000 sites that are embraced by these parks management plans and conservation measures plans have been created only for the Nature 2000 areas PLH300030, PLH300012 and PLH300006 (Tab. 2). Although such plans for landscape parks cover their entire territory, Natura 2000 sites conservation measures plans focus on the protection of habitats listed in Directive 92/43/EEC. None of these plans contains maps of peatlands present in protected areas or their localisation, stratigraphy and means of utilisation. Existing plans contain foremost a record of flora and fauna – biotic objects in a habitat – omitting or providing to a very limited extent information on abiotic elements such as soil cover and peatlands threatened with disappearance. The ecosystem after all, is a part of nature constituting a functional whole in which takes place the exchange of matter between its living (plant communities) and inanimate (biotope) form – mineral soils or organic ones.

The range of protected habitats located in Natura 2000 sites was outlined in Table 8. The Standard Data Form analysis of these areas demonstrates that in the four landscape parks under study the protected habi-

**Table 7.** Change of peatland utilisation in landscape parks between the period 1957–1973 and the year 2015/2016

Landscape park	Period	Peatland utilization, %				
		grassland	rushes and shrubs	forest	water	arable land and other
Lednicki	1957–1965	71	16	13	–	–
	2015	35	39	18	3	5
Promno	1961–1964	51	26	23	–	–
	2015	13	64	20	3	–
Puszcza Zielonka	1958–1973	59	14	27	–	–
	2016	45	14	38	2	1
Rogaliński	1957–1973	44	43	9	4	–
	2015	34	34	17	8	7
Sierakowski	1959–1964	77	8	14	–	1
	2015	31	11	35	12	11
<b>Total</b>	<b>1957–1973</b>	<b>67</b>	<b>14</b>	<b>18</b>	<b>1</b>	<b>0</b>
	<b>2015–2016</b>	<b>35</b>	<b>19</b>	<b>32</b>	<b>8</b>	<b>6</b>

Source: own elaboration.

**Table 8.** Areas of natural protected habitats on wetlands in Natura 2000 sites and landscape parks (acc. Standard Data Forms and management plans)

Habitat code	Habitat type	Area (ha) in the landscape park				Area total ha
		Promno	Puszcza Zielonka	Rogaliński <sup>1)</sup>	Sierakowski	
6410	<i>Molinia</i> meadows	0.56	–	3.0	–	3.56
6510	lowland meadows <sup>2)</sup>	–	–	242.0 <sup>2)</sup>	54.59	296.59
7140	transition mires	0.69	12.38	–	1.96	15.03
7210	calcareous fens	1.41	12.38	–	0.14	13.93
7230	alkaline fens	–	–	–	2.16	2.16
91D0	woodland with birch and <i>Pinus</i>	–	3.20	–	–	3.20
91E0	alluvial forest ( <i>Alnus</i> , <i>Fraxinus</i> )	–	24.77	85.0	36.71	146.48
91F0	alluvial forest ( <i>Quercus</i> , <i>Ulmus</i> and <i>Fraxinus</i> )	–	–	–	53.14	53.14
Total, ha		2.66	52.73	330.0	148.7	534.09
%		0.5	9.8	61.8	27.9	100.0
% of the landscape park area		0.001	0.43	2.60	0.49	<b>0.80</b>

<sup>1)</sup> Habitat area in the total site “Rogalińskiej Doliny Warty” PLH300012.

<sup>2)</sup> Majority on mineral soil.

Source: Standard Data Forms.

tats in sum cover an area of 534.09 ha – only 0.8%. A decided majority of this territory (ca 300 ha) is taken up by meadows (habitats 6510 lowland meadows and 6410 *Molinia* meadows) and forests (ca 200 ha), that is habitats 91D0, 91E0 and 91F0 Woodland and Alluvial forests, which are mainly found in the Rogaliński and Sierakowski LPs. Some of these can be found on peatlands. Three habitats that can be found in peatlands (7140, 7210 and 7230) cover in all 31.12 ha and are mainly located in Puszcza Zielonka and around 2 ha in the Promno and Sierakowski LPs. The separation of alkaline peatlands (7210) in Puszcza Zielonka is controversial. The localisation of transitional peatlands (7140) in three landscape parks (Promno, Puszcza Zielonka and Sierakowski) was

based only on their flora and did not always correspond to peatland stratigraphy (Tab. 3).

The lack of peatland localisation in management plans signifies a lack of recommendations tied to their protection. An analysis of the respective recommendations contained in these documents (Tab. 9) clearly indicates the omission of information on the location of peatlands, not to mention their stratigraphy and present means of utilisation. Although usually the prohibition of exploiting peat is introduced, most often the lack of complex and concrete recommendations regarding the water economy both in the Warta River valley (Rogaliński LP), as well as those in small valleys that occur in all these Parks.

**Table 9.** Peatland protection in landscape park management plans

Landscape park or the overlying Natura 2000 site	Data on peatlands in landscape park management plans	Recommendation in the landscape park management plan prepared in the year (...) or in the Natura 2000 sites plan [...]
Lednicki	peatlands only mentioned but not located and described	new ecological sites with two peatlands in the Główna River valley (2008)
Promno	peatlands mentioned, not located and described, located only protected habitats (Tab. 6), no data on two peatland reserves	new ecological ground by Lake Kazanie, cutting of trees and shrubs on meadows and in rushes, dam up water in ditches on peatland, water table control by lakes (2009); protection of three habitats mentioned in Table 6 [2014]
Puszcza Zielonka	peatlands often mentioned, but not located and described	proposal of a new nature reserve with a lake and peatland, two new ecological sites with peatlands, damming up water in existing small valleys with peatland, peatland protection before overgrowing with trees and shrubs and through extensive meadow clearance (2005)
Rogaliński	peatlands only mentioned but not located and described	no recommendation for peatland protection (2008) protection of two habitats mentioned in Table 6, no recommendation for peatland protection [2011 and 2013]
Sierakowski	management plan does not exist; forest management plan does not locate and describe peatlands	forest management plan from [2015] is also the management plan for Natura 2000 sites; recommendations only for protected habitats (Tab. 6); protection of two peatland nature reserves

Source: own elaboration.

Further, Puszcza Zielonka management plan completely omit the significant lowering of water levels for many years in the lakes Kamińsko, Pławno and Czarne (Natura 2000 sites) and the peatlands surrounding them. In this catchment low in water this to a large extent is caused by the use of ground waters

for very large holiday estates equipped with water supply service and sewerage. Alas, in the documentation of management plans for landscape parks and Natura 2000 sites, experts in soils, water economy, and land reclamation do not take part. As a result the widespread process of peat mineralisation taking

place in Poland is not noticed, one causing the lowering peatland surface and numerous changes in the physical and chemical properties of peat [ILNICKI, SZAJDAK 2016].

## CONCLUSIONS

In the process of creating management plans and conservation measures plans for landscape parks and Natura 2000 sites, as a matter of rule the abiotic elements of the ecosystem are omitted, that is soils and existing peatlands. The lack of data on localisation, stratigraphy and means of utilisation of peatlands, as well as their fundamental threats is causing a progressive disappearance of peatlands in Poland. This in turn, in addition, leads often to a lack of relevant recommendations that would allow an end to such threats with the protection of peat meadows from overgrowth by bushes and trees, as well increasing the level of ground waters through the construction of catchments for existing watercourses. In order to change the present state of affairs in this context it is necessary that existing teams preparing environment protection plans (as well as augmenting ones already in use) engage soil, peat and melioration experts. Otherwise, the current change in peatland utilisation and related lowering of ground waters shall lead to a progressive disappearance of peatlands in the landscape parks under discussion.

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**Piotr ILNICKI, Krzysztof GÓRECKI, Piotr LEWANDOWSKI**

**Torfowiska i ich ochrona: Wybrane parki krajobrazowe Wielkopolski**

**STRESZCZENIE**

Na przykładzie pięciu różniących się istotnie parków krajobrazowych Wielkopolski (30 413 ha) przedstawiono charakterystykę, stratygrafię, zmianę sposobu użytkowania i lokalizację 243 torfowisk. Określono trend zmiany sposobu użytkowania torfowiska w latach 1970–2016 i wskazano wynikające z tego negatywne skutki. Analizowano sposoby ochrony torfowisk ustalone w ramach ostatnio sporządzonych planów ochrony parków krajobrazowych i wchodzących w ich skład obszarów Natura 2000. We wszystkich istniejących planach brak danych o lokalizacji, stratygrafii i sposobie użytkowania torfowisk, które zajmują łącznie 2690,1 ha, czyli 4,2% powierzchni parków. Skutkuje to najczęściej brakiem wniosków na temat ich ochrony. Nie wspomina się o głównym zagrożeniu, którym jest stale postępujące zanikanie torfowisk w wyniku mineralizacji i murszenia torfu. W znacznej mierze jest to wynikiem braku gleboznawców, torfoznawców i meliorantów w zespołach autorskich przygotowujących plany ochrony.

**Słowa kluczowe:** *obszar Natura 2000, park krajobrazowy, plany ochrony, torfowiska, Wielkopolska, zanikanie torfowisk*