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THE CONSERVATION REQUIREMENTS OF RARE AND THREATENED VASCULAR PLANTS OF NATURA 2000 HABITATS OF THE DOLINA PŁONI I JEZIORO MIEDWIE (PŁONIA VALLEY AND MIEDWIE LAKE) SPECIAL AREA OF CONSERVATION

POTRZEBY OCHRONY RZADKICH I ZAGROŻONYCH ROŚLIN NACZYNIOWYCH SIEDLISK PRZYRODNICZYCH NA OBSZARZE NATURA 2000 DOLINA PŁONI I JEZIORO MIEDWIE

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Streszczenie. Obszar Dolina Płoni i Jezioro Miedwie PLH 320006 jest jednym z najcenniejszych obiektów sieci Natura 2000 na Pomorzu Zachodnim. Został on ustanowiony w celu ochrony 17 typów siedlisk przyrodniczych, dwóch gatunków roślin i czterech gatunków zwierząt wymienionych w załączniku I i II dyrektywy siedliskowej. Celem niniejszej pracy było zaprezentowanie wartościowych taksonów flory naczyniowej tego obszaru. Z 745 gatunków odnotowanych na badanym terenie stwierdzono 93 taksony o wysokiej wartości przyrodniczej. Wśród nich występują zarówno gatunki objęte ochroną prawną, jak również taksony rzadkie i zagrożone w Polsce. Większość z nich należy do gatunków o ważnej roli diagnostycznej w identyfikacji siedlisk przyrodniczych występujących na tym terenie. Najliczniejsze z nich są gatunki wskaźnikowe siedlisk z grupy łąk, muraw i ziołorośli. Do największych zagrożeń szaty roślinnej badanego terenu należy: eutrofizacja siedlisk, zmiana stosunków wodnych, sukcesja oraz upraszczanie struktury wiekowej i gatunkowej drzewostanów. W celu zachowania bioróżnorodności niniejszego obiektu należy otoczyć go szczególną ochroną.

Key words: endangered plant species, Natura 2000, Natura 2000 habitats.

Słowa kluczowe: Natura 2000, siedliska przyrodnicze, zagrożone gatunki roślin.

INTRODUCTION

The European Natura 2000 network, which Poland joined in 2004, has been established in order to preserve specific, valuable types of habitats and species endangered across Europe. Protected areas within this network are being managed according to three basic rules. First of them is an appropriate assessment requirement for any project, to determine its implications for the Natura 2000 site. Therefore, any activity, that may have significant negative impact on the site, is forbidden, apart from few exceptions. Another rule is the site administrator's obligation to prevent any worsening of the conservation status of species and

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habitats protected within the site. The last principle of the Natura 2000 management is proactive conservation which should ensure retaining the favourable conservation status of species and habitats (Dyrektywa Rady... 1992, Ustawa... 2004).

The Dolina Płoni i Jezioro Miedwie (Płonia Valley and Miedwie Lake) Special Area of Conservation is one of the most important Natura 2000 sites in West Pomerania. 17 habitats, 2 plant species and 4 animal species are subjects of conservation within the site.

The essential conservation objective of this area is to keep the favourable conservation status of habitats and populations of protected species. From the overall perspective, it serves to preserve biological diversity within the Continental biogeographical region, as well as the entire Europe's natural heritage. Also, achieving the site's conservation objective indirectly contributes to the preservation of local biodiversity, including the survival of populations of species which are rare or threatened in Poland, or in West Pomerania.

Dolina Płoni i Jezioro Miedwie (Płonia Valley and Miedwie Lake) have been an object of ecological research for many years (e.g. Jasnowski 1962, Jasnowska 1973, Wołejko 1982, Bacieczko 1995, 1996, 1999, Borówka 2007). The purpose of the study is to determine the risk of extinction and to present conservation requirements of vascular plants which are indicators of Natura 2000 habitats.

STUDY AREA

The Dolina Płoni i Jezioro Miedwie (Płonia Valley and Miedwie Lake) Special Area of Conservation is situated in three mesoregions. The majority of the area is located in Pyrzyce Plain. The northern part of the site is placed in Goleniów Plain, whereas the southern one – in Myślibórz Lakeland (Kondracki 2001).

According to the geobotanical zoning of Poland, the discussed area is located in Pyrzyce Landscape Subregion of Myślibórz Landscape Region in Szczecin Region which belongs to Pomeranian Division of Middle European Province (Matuszkiewicz 1993).

The Dolina Płoni i Jezioro Miedwie (Płonia Valley and Miedwie Lake) Special Area of Conservation covers 20 755,9 ha and includes the Płonia river valley, situated to the south-east of Szczecin (Fig. 1), from its springs near Barlinek, to the Kołbacz village (Natura 2000 Standardowy... 2003). There are also valleys of two tributaries of Płonia – located within its borders (Strzelica and Krzekna rivers), as well as the Miedwie lake, and various smaller lakes: Płoń, Będgoszcz, Zaborsko, Żelewo, and Żelewko.

There are two units within the discussed area, which are different in their origin, geomorphologic structure, and habitats structure. First of them is the "Headwaters of the Płonia valley", which has a gorge character – it consists of deep vale which crosses a terminal moraine's strip, several gullies, and erosion hollows. The other one is so-called "Proto-Miedwie Basin" which involves part of Płonia and Krzekna valleys situated within the Pleistocene ice-marginal lake and ground moraine. Slight height differences and fertile soils are characteristic for this area (Natura 2000 Standardowy... 2003, Borówka 2007).



Fig. 1. Localization of the Dolina Płoni i Jezioro Miedwie (Płonia Valley and Miedwie Lake) Special Area of Conservation in West Pomeranian Voivodeship

Rys. 1. Lokalizacja obszaru Natura 2000 Dolina Płoni i Jezioro Miedwie w województwie zachodniopomorskim

Among the biotopes, there are calcareous fens located along several lakes. They are covered with bed vegetation, e.g. saw-sedge beds. Valley bottom consists of extensive soligenous mire, along with numerous wet calcareous grasslands. Area of histosols, after having been partially drained, used to be utilized for meadows and pastures. Therefore, it is abundant in more or less wet meadows, some of which are retreating upon tall herb fringe, and shrub communities as the result of the lack of maintenance. Upper edges of the valley, as well as gorges' sides are covered with xerothermic grasslands, and xero-thermophile oak forests, whereas dry, sandy hills are rich in mixed forests, and mesic meadows. Other forest communities include alluvial woods (nearby the Płoń lake), riparian mixed elm forests (by the Miedwie lake), and oak-hornbeam forests (on the edges of the Płonia valley). Within the borders of the site, there are wide, intensely used by avifauna, wildlife corridors.

Subjects of conservation of the Dolina Płoni i Jezioro Miedwie (Płonia Valley and Miedwie Lake) Special Area of Conservation are presented in Table 1.

Table 1. Subjects of conservation of the Dolina Płoni i Jezioro Miedwie (Płonia Valley and Miedwie Lake) Special Area of Conservation (PLH 320006) – habitats and species listed in Annex I and Annex II of the Habitats Directive (source: Natura 2000 Standardowy... 2003)

Tabela 1. Przedmioty ochrony w obszarze Natura 2000 Dolina Płoni i Jezioro Miedwie PLH 320006 (Natura 2000 – Standardowy... 2003)

Code Kod	Name of the subject of conservation Nazwa przedmiotu ochrony
<i>Habitats</i> <i>Siedliska przyrodnicze</i>	
3140	Hard oligo-mesotrophic waters with benthic vegetation of <i>Chara</i> spp. Twardowodneoligo- i mezotroficzne zbiorniki z podwodnymi łąkami ramienic <i>Chara</i> spp.
3150	Natural eutrophic lakes with <i>Magnopotamion</i> or <i>Hydrocharition</i> – type vegetation Starorzeczca i naturalne eutroficzne zbiorniki wodne ze zbiorowiskami z <i>Nympheion</i> , <i>Potamion</i>
6120*	Xeric sand calcareous grasslands Cieplolubne, śródlądowe murawy napiaskowe (<i>Koelerion glaucae</i>)
6210	Semi-natural dry grasslands and scrubland facies on calcareous substrates (<i>Festuco-Brometalia</i>) (* important orchid sites) Murawy kserotermiczne (<i>Festuco-Brometea</i> i cieplolubne murawy z <i>Asplenion septentrionalis</i> <i>Festucion pallentis</i>) – priorytetowe są tylko murawy z istotnymi stanowiskami storczyków
6410	<i>Molinia</i> meadows on calcareous, peaty or clayey-siltladen soils (<i>Molinion caeruleae</i>) Zmiennowilgotne łąki trzęślicowe (<i>Molinion</i>)
6430	Hydrophilous tall herb fringe communities of plains and of the montane to alpine levels Ziolorośla górskie (<i>Adenostylion alliariae</i>) i ziolorośla nadrzeczne (<i>Convolvuletalia sepium</i>)
6510	Lowland hay meadows (<i>Alopecurus pratensis</i> , <i>Sanguisorba officinalis</i>) Niżowe i górskie świeże łąki użytkowane ekstensywnie (<i>Arrhenatherion elatioris</i>)
7210*	Calcareous fens with <i>Cladium mariscus</i> and species of the <i>Caricion davallianae</i> Torfowiska nakredowe (<i>Cladietum marisci</i> , <i>Caricetum buxbaumii</i> , <i>Schoenetum nigricantis</i>)
7220*	Petrifying springs with tufa formation (<i>Cratoneurion</i>) Źródlika wapienne ze zbiorowiskami <i>Cratoneurion commutati</i>
7230	Alkaline fens Górskie i nizinne torfowiska zasadowe o charakterze młak, turzycowisk i mechowisk
9110	<i>Luzulo-Fagetum</i> beech forests Kwaśne buczyny (<i>Luzulo-Fagetum</i>)
9130	<i>Asperulo-Fagetum</i> beech forests Żyzne buczyny (<i>Dentario glandulosae-Fagenion</i> , <i>Galio odorati-Fagenion</i>)
9160	Sub-Atlantic and medio-European oak or oakhornbeam forests of the <i>Carpinion betuli</i> Grąd subatlantycki (<i>Stellario-Carpinetum</i>)
9170	<i>Galio-Carpinetum</i> oak-hornbeam forests Grąd środkowoeuropejski i subkontynentalny (<i>Galio-Carpinetum</i> , <i>Tilio-Carpinetum</i>)
9190	Old acidophilous oak woods with <i>Quercus robur</i> on sandy plains Kwaśne dąbrowy (<i>Quercion robori-petraeae</i>)
91E0*	Alluvial forests with <i>Alnus glutinosa</i> and <i>Fraxinus excelsior</i> (<i>Alno-Padion</i> , <i>Alnion incanae</i> , <i>Salicion albae</i>) Łęgi wierzbowe, topolowe, olszowe i jesionowe (<i>Salicetum albo-fragilis</i> , <i>Populetum albae</i> , <i>Alnenion glutinosoincanae</i>) i olsy źródliskowe
91F0	Riparian mixed forests of <i>Quercus robur</i> , <i>Ulmus laevis</i> and <i>Ulmus minor</i> , <i>Fraxinus excelsior</i> or <i>Fraxinus angustifolia</i> , along the great rivers (<i>Ulmion minoris</i>) Łęgowe lasy dębowo- wiazowo-jesionowe (<i>Ficario-Ulmetum</i>)
<i>Plant species</i> <i>Gatunki roślin</i>	
1614	<i>Apium repens</i>
1903	<i>Liparis loeselii</i>
<i>Animal species</i> <i>Gatunki zwierząt</i>	
1188	<i>Bombina bombina</i>
1130	<i>Aspius aspius</i>
1149	<i>Cobitis taenia</i>
1088	<i>Cerambyx cerdo</i>

Explanation: * – a priority habitat.

Objaśnienie: * – siedlisko priorytetowe.

MATERIAL AND METHODS

The comprehensive study of the vegetation of the Płonia valley has been conducted for 25 years. There were 745 vascular plant taxa recorded in the flora (Bacieczko and Wołejko 1997, Bacieczko 1995, 1997, 1999, 2000, 2004, Bacieczko et al. 2000, 2006, Bacieczko and Klera 2006). For the purpose of this study however, the most important plant species were selected, from all vascular plants reported from the area. The species were selected according to the following criteria:

- status of international species protection – based on the annexes of the Habitat Directive (Dyrektywa Rady... 1992);
- status of national legal species protection – based on the Regulation of the Minister of the Environment dated 9 October 2014 on plant species protection (Rozporządzenie Ministra Środowiska... 2014);
- status of national legal species protection before the 9 October 2014 – based on the Regulation of the Minister of the Environment dated 20 January 2012 on wild plant species under protection (Rozporządzenie Ministra Środowiska... 2012);
- national threat category according to Zarzycki and Mirek (2006);
- regional threat category according to Żukowski and Jackowiak (1995).

List of the selected taxa is organized alphabetically. Each species entry in the checklist is annotated with additional information on the criteria mentioned above, as well as on the habitat code when the species is an indicator of a Natura 2000 habitat – is a characteristic species of plant communities associated with the habitat or commonly occurs in this type of vegetation. That last information was obtained from the studies of Herbich (2004a, b, c) and Mróz (2010, 2012a, b). Species names follow Mirek et al. (2002). Habitats codes and names are based on the Interpretation Manual of European Union Habitats (2013).

The report on the conservation status of the discussed site's habitats is based on the information from the Standard Data Form (Natura 2000 Standardowy... 2003), with the consideration of the evaluation grades used in the Manual on how to submit data to the Natura 2000 Standard Data Forms (Instrukcja... 2012). The evaluation grades of habitats future prospects include: excellent (A) when habitat has its structure in excellent condition or in good condition with simultaneous excellent condition of its functions, good (B) for habitats of any combination other than those described under A or C, and average or reduced (C) when both habitat's structure and functions are in unfavourable condition. The grades of overall assessment are based on evaluations of various habitat's factors, and include: excellent (A), good (B), and significant (C).

The report on the threats and conservation objectives of the site's habitats follows its current Conservation Management Plan (Zarządzenie... 2014).

RESULTS AND DISCUSSION

Rare vascular plants of the Dolina Płoni i Jezioro Miedwie (Płonia Valley and Miedwie Lake) Special Area of Conservation (PLH 320006)

On the basis of the chosen criteria, there were 93 species selected, which are considered particularly relevant (Table 2).

Table 2. Register of the valuable vascular plant species recorded in the Dolina Płoni i Jezioro Miedwie (Płonia Valley and Miedwie Lake) Special Area of Conservation (PLH 320006)

Tabela 2. Wykaz cennych gatunków roślin naczyniowych występujących na obszarze Natura 2000 Dolina Płoni i Jezioro Miedwie (PLH 320006)

1	2	3	4	5	6	7
Species botanical name Nazwa gatunkowa	Status of species legal protection Status ochrony prawnej gatunku	Former status of species legal protection Dawny status ochrony prawnej gatunku	Threat category Kategoria zagrożenia		Status of Natura 2000 protection Status ochrony międzynarodowej w ramach sieci Natura 2000	Natura 2000 habitat Siedlisko przyrodnicze
			in Poland w Polsce	in West Pomerania na Pomorzu Zachodnim		
<i>Acer campestre</i> L.				R		9170, 91F0
<i>Actaea spicata</i> L.				V		9130
<i>Alisma lanceolatum</i> With.			V			
<i>Allium ursinum</i> L.	!	!	[V]	R		9130
<i>Allium scorodoprasum</i> L.			V			6120
<i>Angelica archangelica</i> L. ssp. <i>litoralis</i> (Fr.) Thell.	!	!!				6430
<i>Anthericum liliago</i> L.	!!*	!!*	V	V		6210
<i>Apium repens</i> (Jacq.) Lag.	!!*	!!*	E	E	II DS	
<i>Arum maculatum</i> L.	!!	!!	E			
<i>Asarum europaeum</i> L.		!		V		
<i>Batrachium aquatile</i> (L.) Dumort.		!!				
<i>Batrachium fluitans</i> (Lam.) Wimm.	!	!!				
<i>Campanula latifolia</i> L.	!	!!	V	V		9170
<i>Campanula sibirica</i> L.	!!*	!!*		V		6210
<i>Carex buxbaumii</i> Wahlb.	!!		E			7210, 7230
<i>Carex disticha</i> Hudson				V		7210
<i>Carex lepidocarpa</i> Lausch.				V		7230
<i>Centaurium erythraea</i> Rafm.	!	!!				
<i>Centaurium pulchellum</i> (Sw.) Druce	!	!!				
<i>Centaurium littorale</i> (Turner) Gilmour	!!	!!	V	V		
<i>Ceratophyllum submersum</i> L.				V		3150
<i>Chaerophyllum hirsutum</i> L.				R		91E0
<i>Cladium mariscus</i> (L.) Pohl	!!	!!		R		7210
<i>Conium maculatum</i> L.				R		
<i>Convallaria majalis</i> L.		!				
<i>Corydalis intermedia</i> (L.) Mérat				R		9160
<i>Corydalis solida</i> (L.) Clairv.				R		9160
<i>Cucubalus baccifer</i> L.				V		6430
<i>Dactylorhiza majalis</i> (Rchb.) P.F. Hunt & Summerh.	!	!!*				7230

Cont. Table 2 – cd. tab. 2

1	2	3	4	5	6	7
<i>Dactylorhiza incarnata</i> (L.) Soó	!	!!*				7230
<i>Dianthus superbus</i> L.	!!*	!!*	V	E		6410
<i>Dryopteris cristata</i> (L.) A. Gray			V	V		
<i>Epipactis helleborine</i> (L.) Crantz	!	!!				9130
<i>Epipactis palustris</i> (L.) Crantz	!!	!!	V	V		7230
<i>Frangula alnus</i> Mill.		!				9190, 91E0
<i>Galanthus nivalis</i> L.	!	!!		I	V DS	
<i>Galium odoratum</i> (L.) Scop.		!				9130
<i>Hedera helix</i> L.		!				9130
<i>Helichrysum arenarium</i> Moench	!	!				6120
<i>Hepatica nobilis</i> Schreb.		!!				9130, 9160
<i>Hieracium echinoides</i> Lumn.			V	V		6120
<i>Hippuris vulgaris</i> L.			V			3150
<i>Hypericum humifusum</i> L.				R		
<i>Inula salicina</i> L.				V		6410
<i>Juncus subnodulosus</i> Schrank	!		V	V		7230
<i>Kickxia elatine</i> (L.) Dumort.			E	R		
<i>Lathyrus palustris</i> L.	!		V	V		
<i>Lilium martagon</i> L.	!!	!!		V		
<i>Linum austriacum</i> L.	!!	!!	V			6210
<i>Liparis loeselii</i> (L.) Rich.	!!*	!!*	E	E	II DS	7210
<i>Listera ovata</i> (L.) R.Br.	!	!!				
<i>Lithospermum officinale</i> L.				V		
<i>Menyanthes trifoliata</i> L.	!	!				7210, 7230
<i>Najas marina</i> L.				V		3150
<i>Neottia nidus-avis</i> (L.) Rich.	!	!!		V		
<i>Nuphar lutea</i> (L.) Sibth. & Sm.		!				3150
<i>Nymphaea alba</i> L.	!	!				3150
<i>Ononis repens</i> L.	!	!		V		
<i>Ononis spinosa</i> L.	!	!				
<i>Ononis arvensis</i> L.		!				
<i>Ophioglossum vulgatum</i> L.	!!*	!!*	V	V		6410
<i>Orchis militaris</i> L.	!!*	!!*	V			
<i>Orchis palustris</i> Jacq.	!!*	!!*	E			7210, 7230
<i>Orobanche caryophyllacea</i> Sm.	!	!!		E		
<i>Orobanche pallidiflora</i> Wimm. & Grab.	!	!!	R	E		
<i>Oxytropis pilosa</i> (L.) DC.	!!*	!!*		V		6210
<i>Peucedanum cervaria</i> (L.) Lapeyr.				V		
<i>Polypodium vulgare</i> L.		!!				
<i>Populus nigra</i> L.				V		91E0
<i>Primula veris</i> L.		!				
<i>Prunella grandiflora</i> (L.) Scholler				V		6210
<i>Pulsatilla pratensis</i> (L.) Mill.	!!*	!!*	V	V		
<i>Ribes nigrum</i> L.		!				91E0
<i>Samolus valenrandi</i> L.			E	V		

Cont. Table 2 – cd. tab. 2

1	2	3	4	5	6	7
<i>Scabiosa canescens</i> Waldst. & Kit.				V		
<i>Scabiosa columbaria</i> L. s. s.				V		6210
<i>Schoenus nigricans</i> L.	!!	!!	V	E		7210
<i>Scilla bifolia</i> L.	!	!!				
<i>Scorzonera purpurea</i> L.	!!*	!!*	V	E		6210
<i>Stachys recta</i> L.				V		6210
<i>Taxus baccata</i> L.	!	!!		R		
<i>Tetragonolobus maritimus</i> (L.) Roht	!		V	V		6210, 6410
<i>Teucrium scordium</i> L.			V	V		
<i>Triglochin maritimum</i> L.	!		[E]	V		
<i>Trisetum flavescens</i> (L.) P. Beauv.				V		6510
<i>Trollius europaeus</i> L. S. Str.	!!*	!!*		V		
<i>Utricularia vulgaris</i> L.		!!				3150
<i>Veronica montana</i> L.				V		91E0
<i>Viburnum opulus</i> L.		!				
<i>Vicia sylvatica</i> L.				R		
<i>Vinca minor</i> L.		!				
<i>Viola mirabilis</i> L.				R		
<i>Zannichellia palustris</i> L.			V	V		3150

Explanations – objaśnienia:

Column 1 – Kolumna 1 – Species botanical name – Nazwa botaniczna gatunku.

Column 2 – Kolumna 2 – Status of legal protection – Status ochrony prawnej: !! – species under strict legal protection in Poland – gatunki objęte ścisłą ochroną gatunkową w Polsce, ! – species under partial legal protection in Poland – gatunki objęte częściową ochroną gatunkową w Polsce, * – species that require active conservation – gatunki wymagające ochrony czynnej.

Column 3 – Kolumna 3 – Former status of legal protection (before 9 October 2014) – Dawny status ochrony prawnej (przed 9 października 2014): !! – species under strict legal protection in Poland – gatunki objęte ścisłą ochroną gatunkową w Polsce, ! – species under partial legal protection in Poland – gatunki objęte częściową ochroną gatunkową w Polsce, * – species that require active conservation – gatunki wymagające ochrony czynnej.

Column 4 – Kolumna 4 – Species threat category in Poland – Kategoria zagrożenia gatunku w Polsce: E – species of extremely high risk of extinction (critically endangered) – gatunki wymierające (krytycznie zagrożone), [E] – species of extremely high risk of extinction (critically endangered) in isolated sites, beyond their main area of occurrence – gatunki wymierające (krytycznie zagrożone) – gatunki silnie zagrożone wymarciem na izolowanych stanowiskach poza głównym obszarem swojego występowania; V – vulnerable species (species of high risk of endangerment) – gatunki narażone (zagrożone wyginieciem), [V] – vulnerable species (species of high risk of endangerment), endangered beyond their main area of occurrence – gatunki narażone – zagrożone na izolowanych stanowiskach poza głównym obszarem swojego występowania, R – rare species (potentially threatened) – gatunki rzadkie (potencjalnie zagrożone).

Column 5 – Kolumna 5 – Species threat category in West Pomerania – Kategoria zagrożenia gatunku na Pomorzu Zachodnim: E – species of extremely high risk of extinction locally – gatunki wymierające lokalnie, V – locally vulnerable species – gatunki lokalnie narażone na wymarcie, R – locally rare species – gatunki lokalnie rzadkie i przez to zagrożone; I – species of not yet evaluated risk – gatunki o nieokreślonym zagrożeniu.

Column 6 – Kolumna 6 – Status of international species protection – Status ochrony międzynarodowej gatunku: II DS – species listed in the Annex II of the Habitats Directive, species of Community interest, whose conservation requires the designation of special areas of conservation – gatunek wymieniony w załączniku II dyrektywy siedliskowej, ważny dla Wspólnoty, którego ochrona wymaga wyznaczenia specjalnych obszarów ochrony, V DS – species listed in the Annex V of the Habitats Directive, species of Community interest, whose taking in the Wild and exploitation may be subject to management measures – gatunek wymieniony w załączniku V dyrektywy siedliskowej, ważny dla Wspólnoty, którego pozyskiwanie ze stanu dzikiego i eksploatacja może podlegać działaniom w zakresie zarządzania.

Column 7 – Kolumna 7 – Natural habitat, for which each taxon is a characteristic species: see Table 1 – siedlisko przyrodnicze, dla którego dany takson stanowi gatunek wskaźnikowy: objaśnienia jak w tabeli 1.

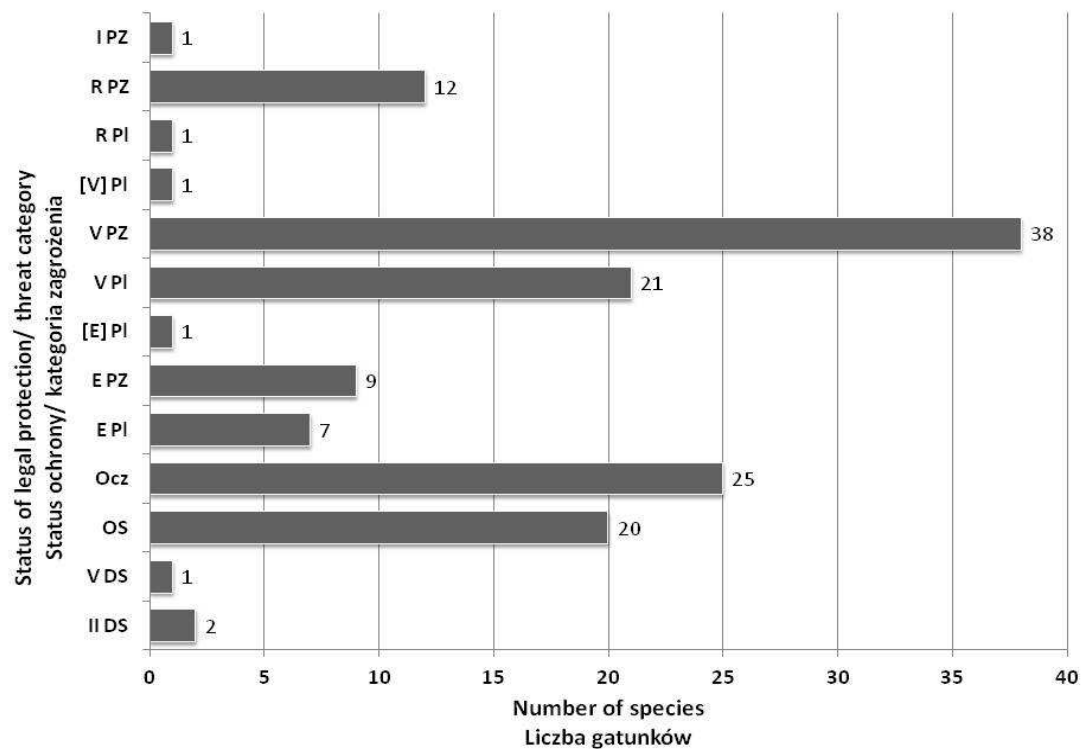


Fig. 2. Participation of legally protected, threatened, and rare species in the flora of the Dolina Płoni i Jezioro Miedwie (Płonia Valley and Miedwie Lake) Special Area of Conservation (PLH 320006): II DS – species listed in the Annex II of the Habitats Directive, species of Community interest, whose conservation requires the designation of special areas of conservation; V DS – species listed in the Annex V of the Habitats Directive, species of Community interest, whose taking in the Wild and exploitation may be subject to management measures; OS – species under strict legal protection in Poland; Ocz – species under partial legal protection in Poland; E PI – species of extremely high risk of extinction (critically endangered) in Poland; E PZ – species of extremely high risk of extinction (critically endangered) in West Pomerania; [E] PI – species of extremely high risk of extinction (critically endangered) in Poland in isolated sites, beyond their main area of occurrence; V PI – vulnerable species – species of high risk of endangerment in Poland; V PZ – vulnerable species – species of high risk of endangerment in West Pomerania; [V] PI – vulnerable species (species of high risk of endangerment), endangered in isolated sites, beyond their main area of occurrence; R PI – species rare in Poland (potentially threatened); R PZ – species rare in West Pomerania (potentially threatened); I PZ – species of not yet evaluated threat in West Pomerania

Rys. 2. Liczba gatunków objętych ochroną, zagrożonych i rzadkich we florze obszaru Natura 2000 Dolina Płoni i Jezioro Miedwie (PLH 320006): II DS – gatunek wymieniony w załączniku II dyrektywy siedliskowej, ważny dla Wspólnoty, którego ochrona wymaga wyznaczenia specjalnych obszarów ochrony; V DS – gatunek wymieniony w załączniku V dyrektywy siedliskowej, ważny dla Wspólnoty, którego pozyskiwanie ze stanu dzikiego i eksploatacja może podlegać działaniom w zakresie zarządzania; OS – gatunki objęte ścisłą ochroną gatunkową w Polsce; Ocz – gatunki objęte częściową ochroną gatunkową w Polsce; E PI – gatunki wymierające (krytycznie zagrożone) w Polsce; E PZ – gatunki wymierające (krytycznie zagrożone) na Pomorzu Zachodnim; [E] PI – gatunki wymierające (krytycznie zagrożone) – gatunki silnie zagrożone wymarciem na izolowanych stanowiskach poza głównym obszarem swojego występowania; V PI – gatunki narażone (zagrożone wyginięciem) w Polsce; V PZ – gatunki narażone (zagrożone wyginięciem) na Pomorzu Zachodnim; [V] PI – gatunki narażone w Polsce – zagrożone na izolowanych stanowiskach poza głównym obszarem swojego występowania; R PL – gatunki rzadkie w Polsce (potencjalnie zagrożone); R PZ – gatunki rzadkie na Pomorzu Zachodnim (potencjalnie zagrożone); I PZ – gatunki o nieokreślonym zagrożeniu na Pomorzu Zachodnim

Species under legal protection

Among the species recorded in the research area, there were found 3 taxa of European Union interest: *Apium repens* and *Liparis loeselii* – listed in the Annex II of the Habitat Directive, and *Galanthus nivalis* – listed in the Annex V of the Habitat Directive (Fig. 2). Species under strict legal protection in Poland are represented numerously – there were 20 of them recorded, 12 of which requires active conservation (e.g.: *Anthericum liliago*, *Ophioglossum vulgatum*, *Orchis militaris*, and *Trollius europaeus*). Moreover, 25 of the selected taxa is partially protected by law, e.g.: *Allium ursinum*, *Dactylorhiza incarnata*, *Menyanthes trifoliata*, *Nymphaea alba*, and *Ononis spinosa*.

Also species which were legally protected in 2012–2014 (Rozporządzenie Ministra Środowiska... 2012) are considered valuable in this study. Alongside with the issue of new, currently being in force, register of protected plant species (Rozporządzenie Ministra Środowiska... 2014), many of the formerly strictly protected taxa have obtained the status of partial protection, and few of them have been excluded from any protection (Table 2).

Species rare and threatened in Poland and West Pomerania

Numerous species recorded in the research area are classified into different national and local threat categories. Participation of the mentioned categories is presented in Fig. 1.

7 of the discussed taxa is considered critically endangered in Poland, e.g.: *Arum maculatum*, *Carex buxbaumii*, or *Orchis palustris*. Additionally, one species (*Triglochin maritimum*) of extremely high risk of extinction when occurring in isolated sites in Poland was found. There were also recorded 9 taxa that are critically endangered in West Pomerania, e.g.: *Dianthus superbus*, *Orobanche caryophyllacea*, or *Schoenus nigricans*.

Within the research area, there were also recorded 21 species that are considered vulnerable in Poland, e.g.: *Allium scorodoprasum*, *Centaurium littorale*, *Epipactis palustris*, *Juncus subnodulosus*, and *Hieracium echioides*, as well as 1 species vulnerable when occurring in isolated sites (*Allium ursinum*). Furthermore, 38 of the discussed taxa is considered vulnerable in West Pomerania, e.g.: *Carex disticha*, *Dryopteris cristata*, *Inula salicina*, *Najas marina*, or *Zannichellia palustris*.

There was only 1 species recorded, which is rare to Poland – *Orobanche pallidiflora*, whereas 12 taxa is rare to West Pomerania, e.g.: *Chaerophyllum hirsutum*, *Cladium mariscus*, *Hypericum humifusum*, *Kickxia elatine*, or *Viola mirabilis*. Moreover, 1 species (*Galanthus nivalis*) has not yet evaluated status of threat in the region.

Contribution of the valuable species to the conserved natural habitats

53 of the taxa represent the diagnostic species of Natura 2000 habitats, that are the subjects of conservation in the research area. Their participation is presented in Fig. 3.

The most of the relevant species is connected with grassland formations (together 19 taxa). Among them, 9 species represent semi-natural dry grasslands (6210), e.g.: *Linum austriacum*, *Oxytropis pilosa*, *Prunella grandiflora*, or *Scabiosa columbaria*. Furthermore, 4 taxa are associated with *Molinia* meadows (*Dianthus superbus*, *Inula salicina*, *Ophioglossum vulgatum*, and *Tetragonolobus maritimus*), 3 species belong to the priority

habitat of xeric sand grasslands (*Allium scorodoprasum*, *Helichrysum arenarium*, and *Hieracium echinoides*), 2 taxa are related to hydrophilous tall herb fringe communities (*Angelica archangelica* subsp. *litoralis* and *Cucubalus baccifer*), and 1 (*Trisetum flavescens*) comes from lowland hay meadows.

Species that are diagnostic to mires are numerous. The priority habitat of calcareous fens (7210) is represented by 7 taxa: *Carex disticha*, *Cladium mariscus*, *Liparis loeselii*, *Schoenus nigricans*, *Carex buxbaumii*, *Menyanthes trifoliata*, and *Orchis palustris*, whereas 8 species are connected to the alkaline fens habitat (7230), e.g.: *Carex lepidocarpa*, *Dactylorhiza majalis*, *Epipactis palustris*, and *Juncus subnodulosus*.

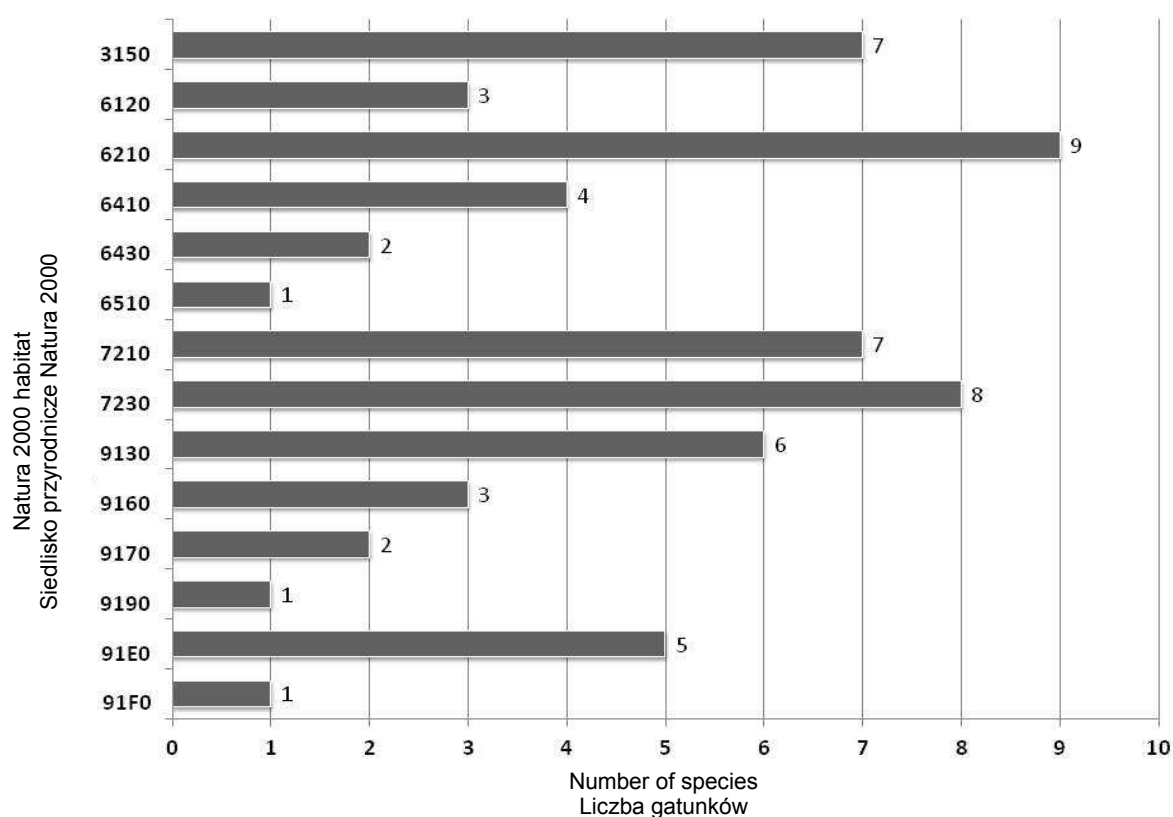


Fig. 3. Participation of diagnostic species of Natura 2000 habitats in the rare taxa of the Dolina Płoni i Jezioro Miedwie (Płonia Valley and Miedwie Lake) Special Area of Conservation (PLH 320006)

Explanations – see Table 1.

Rys. 3. Udział gatunków wskaźnikowych siedlisk przyrodniczych Natura 2000 wśród rzadkich taksonów wyróżnionych na obszarze obszaru Natura 2000 Dolina Płoni i Jezioro Miedwie (PLH 320006)
Objaśnienia – jak w Tabeli 1

Forest habitats are represented by 18 species. Among them, 6 species are diagnostic to beech forests (habitat 9130), these are: *Actaea spicata*, *Allium ursinum*, *Epipactis helleborine*, *Galium odoratum*, *Hedera helix*, and *Hepatica nobilis*. Moreover, 5 taxa were found in the priority habitat of alluvial forests (91E0): *Chaerophyllum hirsutum*, *Populus nigra*,

Ribes nigrum, *Veronica montana*, and *Frangula alnus*. The rest of the forest habitats is associated with less species. 3 taxa are connected with Sub-Atlantic and medio-European oak or oak-hornbeam forests (e.g. *Corydalis intermedia* and *Corydalis solida*), 2 species are related to oak-hornbeam forests (9170), e.g. *Campanula latifolia*, 1 indicates the riparian mixed forests (*Acer campestre*), and 1 – acidophilous oak woods (*Galium odoratum*).

The fewest taxa originates from the freshwater habitats. There were 7 taxa recorded in the research area, that are characteristic eutrophic lakes with Magnopotamion or Hydrocharition – type vegetation (3150). These are: *Ceratophyllum submersum*, *Hippuris vulgaris*, *Najas marina*, *Nuphar lutea*, *Nymphaea alba*, *Utricularia vulgaris*, and *Zannichellia palustris*.

Threats of the species in the context of Natura 2000 habitats conservation

The currently in force conservation management plan for the Dolina Płoni i Jezioro Miedwie (Płonia Valley and Miedwie Lake) Special Area of Conservation (PLH 320006) was established in 2014 (Zarządzenie... 2014).

The existing and potential threats that have been identified are similar as the threats against the national populations of the species presented in this paper. Mostly they are related to the reduction of habitats of those taxa. The exception accounts for few species that are endangered with the direct harvesting with regard to their medicinal properties, e.g. *Ribes nigrum*, *Frangula alnus*, *Hepatica nobilis*, *Galium odoratum*, and *Helichrysum arenarium* (Kaźmierczakowa and Zarzycki 2001, Piękoś-Mirkowa and Mirek 2006).

Freshwater habitats

Freshwater habitats have the greatest area contribution to all habitats that are subjects of conservation of the discussed Natura 2000 site, however the hard oligo-mesotrophic waters with benthic vegetation of *Chara* spp. (3140) are definitely predominant with the coverage of 3696.94 ha. The overall assessment value of this habitat is excellent (A), whereas its future prospects have been evaluated good (B). The habitat 3150, which covers the area of 929.28 ha, on the other hand, have obtained significant value (C) in the overall assessment, while its future prospects have been estimated average or reduced – C (Natura 2000 Standardowy... 2003).

The major threats to the freshwater habitats of the research area include eutrophication of surface water and potential introduction of invasive species (particularly the herbivorous fish species), as well as the construction of sports and recreational infrastructure. Therefore, the main conservation objectives for the freshwater habitats involve the exclusion of the increased supply of nutrients from the river catchment basin, upkeep of native ichthyofauna, and – in case of oxbow lakes – preservation of their hydrological connection with river (lack of hydraulic structures). Implementation of those objectives should be realised through the regulation of the wastewater management, and inspection of fish farming, especially in the field of new fish introduction (Zarządzenie... 2014). Water pollution and its excessive tourist use is also one of the main threats announced for the national populations of valuable plant species characteristic of the habitat 3150, e.g. for *Nuphar lutea* and *Nymphaea alba* (Piękoś-Mirkowa and Mirek 2006).

Natural and semi-natural grassland habitats

Among the grassland habitats, only the lowland hay meadows (6510) cover the significant area (1989.23 ha) – other types of natural habitats have minor area participation within the site. However, in the terms of overall assessment of their conservation status, the semi-natural dry grasslands (6210) and *Molinia* meadows lay out the best – their value has been estimated good (B) with the simultaneous good value (B) of future prospects. The other habitats of the grassland formations have been evaluated significant (C value) in the overall assessment, and average or reduced (C value) – the priority habitat 6120 and habitat 6510, and excellent (A value) – the habitat 6430, in the future prospects assessment (Natura 2000 Standardowy... 2003).

Essential threats to the grassland habitats are related to the change in the grasslands management, and on the other hand, to the alteration in land management.

The major threat to both xeric sand calcareous grasslands (priority habitat 6120), and semi-natural dry grasslands (habitat 6210), is the tree and shrub succession. It is caused by natural factors, such as accumulation of the organic matter and the lack of original agents to erode the slopes – which would rejuvenate the habitat, as well as the anthropogenic ones, e.g. the abandonment of herding by landowners. Furthermore, the intensification of agriculture and the nutrients flow connected with it, contributes to the degradation of grassland habitats. Consequently, the main conservation objective for grassland formations of the discussed Natura 2000 site, is the preservation of their area coverage and the counteraction to ecological succession, which would be implemented through protection against land management change, as well as through the low-intensity grazing management practice, mowing management practice, or the grazing or mowing management practice, with the emergency mechanical or chemical shrub removal (Zarządzenie... 2014). Habitat overgrowth and reduction is being announced the most frequent cause of the decline of populations of the valuable plant species characteristic to habitats 6120 and 6210, since they require direct sunlight and they are extremely vulnerable to, even minor, shading (Piękoś-Mirkowa and Mirek 2006).

Molinia meadows (habitat 6410) are also endangered by overgrowing of reed beds and scrub or trees encroachment caused by the lack of mowing. Still, too intense harvest management is not beneficial for them as well. Overmowing or planting so-called “precious” grass species undoubtedly contributes to their floristic degradation. Meadows are also threatened by the change in their land use – transformation into arable land or even housebuilding estates. Moreover, the change in the hydrological improvement – land amelioration and drainage is a substantial threat. The conservation objective established for *Molinia* meadows is the preservation of their biological diversity and area coverage in the conditions of traditional harvest management and not degraded water conditions, which should be applied through the upkeep or restoration of the low-intensity mowing management practice and shrub removal when necessary. Autumnal mowing every 2–3 years, with hay collection, is recommended (Zarządzenie... 2014). The change in the land management and habitats drainage are also reported to be the main threats to the valuable plant species characteristic to *Molinia* meadows (Piękoś-Mirkowa and Mirek 2006).

In addition, lowland hay meadows (6510) are endangered by similar threats, however they are less vulnerable to drainage, while hydrophilous tall herb fringes (habitat 6430) are mostly threatened by river maintenance, particularly the river engineering and cutting-out thickets together with fringe communities. The conservation objective corresponding with those habitats is the sustenance of their area coverage (Zarządzenie... 2014).

Raised bogs, mires, and fens

The area of mires of the discussed site is slight. The priority habitat of calcareous fens (7210) features the greatest cover amongst them – 131.29 ha. It has been evaluated good (B value) in the overall assessment, and average or reduced (C value) in the future prospects estimation. The petrifying springs priority habitat (7220) has also gained good value (B) in the overall assessment, however their future prospects have been estimated excellent (A value), despite the habitat's slight area cover (only 0.3 ha). Lastly, the natural habitat 7230 has obtained significant overall value (C) and average or reduced (C) future prospects value (Natura 2000 Standardowy... 2003).

The major threats to the mire habitats of the discussed area include activities connected with hydrological improvement, particularly drainage and amelioration. Also eutrophication contributes to their degradation – it speeds up the habitats' overgrowth with reed beds and shrubs. In addition, another unfavourable factor is tourism, along with the construction of the recreational infrastructure. Given these points, the conservation objective for mires of the discussed site is the preservation of high water level, which enables the peat-formation process, as well as it prevents soil degradation, and helps to improve water quality, which should contribute to the sustenance of the characteristic species composition of the habitats. This objective should be implemented through habitats protection against reed beds and thicket succession, and against the land use change. Low-intense mowing management practice is recommended for those habitats – mowing every 3–4 years, along with biomass collection (Zarządzenie... 2014). The main threats to the national populations of the discussed valuable species characteristic to mires, that are being announced are also the land drainage and habitats overgrowth with reed bed vegetation (Kaźmierczakowa and Zarzycki 2001, Piękoś-Mirkowa and Mirek 2006).

Forests

The greatest area cover among the forest habitats of the discussed area has the priority habitat 91E0 of alluvial forests with *Alnus glutinosa* and *Fraxinus excelsior* (683.73 ha). Together with the habitats: 9110, 9160, 9170, and 9190 it has been evaluated good (B value) in the overall assessment and good (B value) in the future prospects estimation. Habitats 9130, 91F0, and 91I0 however have gained significant value (C) in the overall assessment, whereas their future prospects has been estimated as average or reduced (9130 and 91F0), and good (91I0) according to the Standard Data Form (Natura 2000 Standardowy... 2003).

The forest habitats are under the direct influence of the management of the National Forest Holding "State Forests". The improper forest management is manifested by the removal of coarse woody debris and dying trees, which leads to the decline in biological diversity and in the xylophagous biota. Furthermore, the unfavorable factor is the simplification of the age-structure of forests and degradation of their floristic composition. The lastly mentioned factor particularly refers to the habitats: 9130, 9160, and 9170, because

the forestry habitats classification does not distinguish between beech forests and oak-hornbeam forests. Also plantation of conifers, mainly pine may cause a threat to forest habitats, and in the case of the acidophilous oak woods – plantation of beech. Similarly, introduction of the species geographically and ecologically unfamiliar to the area endangers forest habitats, e.g. introduction of oak, spruce, and larch to the beech forests, planting spruce, larch, and pine in oak-hornbeam forests, or even establishing poplar plantations in alluvial forests. Among the natural factors that endanger forest habitats, the main one is the spread of the invasive species – both in the canopy and woody understory (northern red oak, black locust, ashleaf maple, and wild black cherry), as well as in the herbaceous understory layer (invasive species of the *Impatiens* and *Reynoutria* genus). In order to protect forest habitats of the discussed area, the Regional Directorate of State Forests in Szczecin have been obliged to include the appropriate regulations in the forest management plans, that would guarantee habitats conservation (Regulation Zarządzenie... 2014).

CONCLUSIONS

1. Among the 745 vascular plant species recorded within the Dolina Płoni i Jezioro Miedwie (Płonia Valley and Miedwie Lake) Special Area of Conservation (PLH 320006), 93 taxa have high conservation value. They include protected species, as well as taxa of high risk of extinction, endangered or rare in Poland, or in West Pomerania. More than a half of them constitute the indicators of natural habitats that are the subjects of conservation in the discussed site. The most numerous are the species characteristic to grassland habitats.
2. The major threats to the discussed species include: eutrophication, improper water management, secondary succession caused by the abandonment of traditional agricultural methods, and simplification of the age- and species-structure of woods as a consequence of forest management. They all result in the decrease of habitats biological diversity.
3. Probably, the grassland and mire habitats conservation objectives might be the most difficult to achieve, because of the constant decrease in profitability of agriculture, particularly in its traditional form which is the most advantageous for the mentioned ecosystems. Instruments extremely helpful in these habitats conservation, might be the various types of motivational subsidies, such as the agri-environmental programme, that would compensate the economical loss for individual farmers. Additionally, it would be recommended to make the not used land, possessed by the Agricultural Property Agency, accessible to the interested entities in order to proceed the active conservation practices.
4. Freshwater habitats conservation objectives are not the easiest to implement as well. However, the perspective of achieving them is optimistic, because of the improved water management legal regulations, and possibility to control the fish farming. The fact that they cover a large area is also helpful.
5. Forest habitats conservation objectives might be the relatively easiest to implement, since the forest management plans must be adjusted to their requirements. However, control of the spread of the invasive species might be a problem.
6. Proper management within the site, compatible with its conservation objectives, will undoubtedly contribute to the preservation of populations of valuable plant species, as well as the remaining natural values of the area. The cooperation of the site's administrator, the local government, the landowners, and other institutions, as well as the continuous ecological education of the society, is necessary to achieve the conservation goals.

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Abstract. The Dolina Płoni i Jezioro Miedwie (Płonia Valley and Miedwie Lake) PLH 320006 is one of the most valuable Natura 2000 sites in West Pomerania. It has been established to protect 17 types of natural habitats, 2 plant species, and 4 animal species. The aim of this study was the selection of the most valuable vascular plant species found in this site. From the 745 species recorded within the research area, 93 taxa of high environmental value have been chosen. Among them, there are legally protected species, as well as the taxa endangered with extinction perspective, vulnerable and rare to Poland and West Pomerania. More than a half of the valuable species constitute the indicators of natural habitats protected in the site. The most numerous are the species characteristic for natural and semi-natural grassland habitats. The major threats to the selected taxa include: eutrophication, improper water management, secondary succession caused by the abandonment of traditional agricultural methods, and simplification of the age- and species-structure of woods, which all result in the decrease of habitats biological diversity.