

THE VASCULAR PLANTS OF THE FORMER ECOLOGICAL SITE “BOGDANKA” IN BOGDANKA RIVER VALLEY IN POZNAŃ

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Abstract. In contrast to other natural objects situated within boundaries of the city of Poznań, the former ecological site “Bogdanka” distinguishes itself by its exceptional floristic values. The flora of this object comprises 527 taxons of vascular plants derived from 91 families and 295 genera, of which 180 can be found on rare and threatened species lists. In addition, 15 species under legal protection as well as 34 species from all country and regional lists of rare and endangered species occur here. The most valuable floristic elements include: *Iris sibirica*, *Galium odoratum*, *Hierohloë odorata*, *Trollius europaeus* or *Dianthus superbus*. Several trees with monumental or close to monumental circumferences as well as splendid trees can also be found in this site. The area should regain its protected status as soon as possible.

Key words: vascular plants, flora of the city of Poznań, Bogdanka River valley

INTRODUCTION

Set against the background of natural objects situated within the boundaries of the city of Poznań, the Bogdanka River valley belongs to areas distinguished for the occurrence of plant sites and communities most similar to natural. It constitutes an important element of ring and wedge-shaped systems of urban greeneries which form part of the north-western (Golęcin) wedges of green areas [Janyszek et al. 2002].

The Bogdanka River valley flora is relatively well-recognised and investigations here were carried out by naturalists of various specialisations. The earliest floristic publications date back to the end of the 19th century and their authors were German botanists Ritschl [1850], Pfuhl [1894, 1895, 1896] and Miller [1895, 1897]. The idea of protection of the Bogdanka River valley was very strongly supported by professor Adam Wodziczko [Wodziczko 1932, Wodziczko et al. 1938]. After the war, investigations within the framework of more comprehensive studies on the flora of Poznań and Wielkopolska were conducted here, among others, by Szweminówna [1949], Krawie-

cowa [1951], Szulczewski [1951] and Szafran [1959]. More recent floristic data come from papers published by Jackowiak [1990, 1992, 1993], Wrońska-Pilarek et al. [1999], Janyszek et al. [2002] and Kryszak et al. [2009].

The conviction held by many Poznań naturalists regarding remarkable values of the Bogdanka valley was fully confirmed in 1982 by Aleksander Łukasiewicz who included this place in the most valuable areas of the region of the city of Poznań. Conferring such a high status on this area is by no means accidental. It is one of few, if not the only, places on the floristic map of Poznań in which sites of many rare and disappearing plant species have been preserved. It is, therefore, not surprising that the area came under protection in the form of an ecological site “Bogdanka” (Resolution of the Poznań City Council; CV/610/94; 10.05.1994) which was established with the aim to protect vegetation of flood-plain forest character as well as to preserve the current method of utilisation and protection against excessive anthropopressure [Raport... 1994].

Unfortunately, the above site no longer exists because, as a result of changes in the Bill on Nature Protection from December, 7th 2000 (Dz.U. 2001, nr 3, poz. 21), only 4 out of 22 ecological sites established in Poznań still exist [Kurek and Szczepanowski 1998]. Only objects which are situated within boundaries of current valid local development plans established after the year 2000 have kept their status and include the following ecological sites: “Główna”, “Wilczy Młyn”, “Fort V Lechicka” and “Olszak I” [Projekt... 2006]. Indisputable natural values of the object in question cause that it should regain its protected position as soon as possible. An addition argument in favour of its high rank is the fact that the Bogdanka and Warta rivers constitute an ecological corridor of the city of country rank (Poznań Warta area – 25K). At the same time, they constitute one of the elements of the European ecological network – Econet PI [Studium... 2008].

The aim of the presented investigations was to: carry out an inventory of the then ecological site “Bogdanka”, evaluate its floristic values and to elaborate a preliminary estimation of threats and protection recommendations from the point of view of establishing an appropriate protection strategy of this object. The inspection conducted in the former object “Bogdanka” in June 2010 showed that no significant changes in the ownership status of this region took place (its small fragments are now privately-owned) and, therefore, no changes in its management occurred. Therefore, it seems that the presented results of floristic investigations remain valid.

Due to the limitations concerning the length of this article, it does not contain, among others, the list of inventoried vascular plants, maps of distribution of rare and endangered species or the most valuable trees and bushes, as well as other lists and diagrams. These materials can be found in the manuscript [Wrońska-Pilarek et al. 1999] containing full floristic description of the examined object and which served as the basis for the preparation of this article.

STUDY AREA

The area of the former “Bogdanka” ecological site can be found in the north-western part of the city of Poznań, in the district of Jeżyce. It is situated in the Bogdanka River catchment basin and that is why the area, together with the river, was included in the north-western (Golęcín) wedge of greenery extending from the Citadel through Sołacz, Golęcín along the Bogdanka right to the Lake Kiekrz.

The ecological site encompassed the valley of the Bogdanka water course from Biskupińska St. down to the Lake Rusalka, an artificial reservoir formed in place of an old brick plant (Fig. 1). The examined object occupied the area of 165 ha of which about 105 ha were administered by Communal Forests (at present, Board of Municipal Greeneries in Poznań; the Strzeszynek Forest Range and Psary Wilderness) and the remaining 60 ha belong either to the State Treasury or are privately-owned [Raport... 1994].

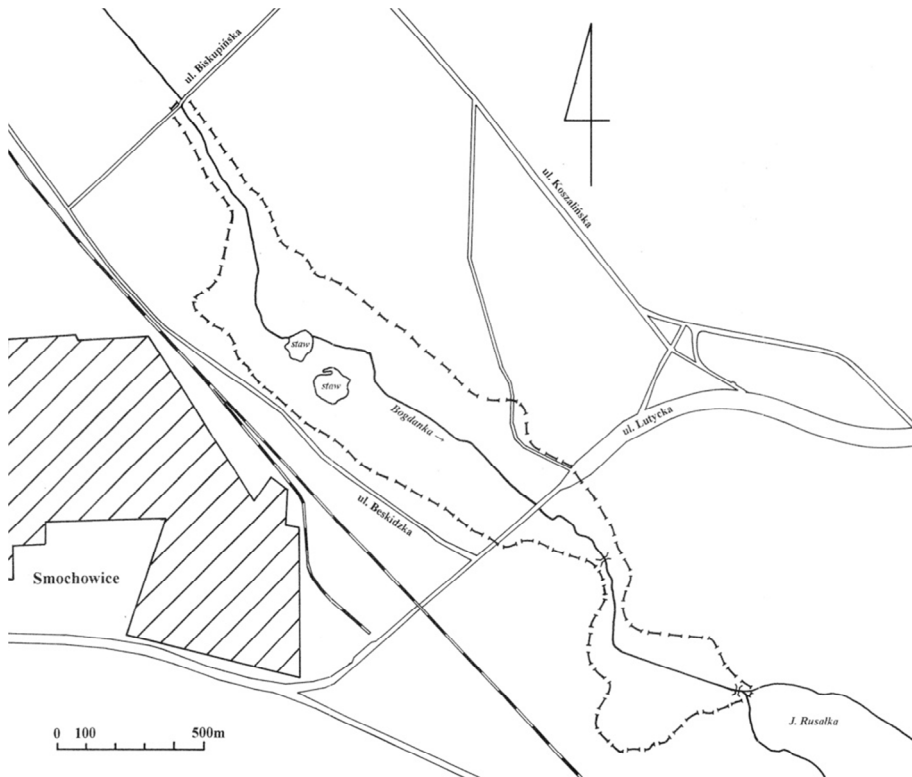


Fig. 1. Boundaries and waters of the former "Bogdanka" ecological site
Rys. 1. Granice i wody byłego użytku ekologicznego „Bogdanka”

A transit road (Lutycka St.) passes through the central part of the described object and tourist tracks run along its peripheries. Two fish ponds can be found in compartments 70h and 70n.

METHODS

Floral inventory was performed in the period from March to October 1998 and 1999. Names of plant species were given after Mirek et al. [2003] and Seneta and Dolatowski [2009].

Statistical characterisation of the flora was carried out on the basis of Jackowiak [1993] and Żukowski et al. [1995] publications, while the classification of socio-ecological groups was given according to Jackowiak [1993]. Classification of taxons included in the group of “special care” species was conducted on the basis of principles which are commonly adopted today in the field of flora protection both at home and abroad [Lucas and Synge 1978, Olaczek 1985, Ławrynowicz and Olaczek 1988]. The discussed group included: all species growing in the examined area under legal protection and found on the so called red lists: domestic [Lista... 1992] and Wielkopolska [Żukowski and Jackowiak 1995], as well as rare and endangered species in the city of Poznań [Jackowiak 1993]. Bearing in mind the local character of experiments, the division of species according to degrees of danger given for Wielkopolska and Poznań by [Żukowski and Jackowiak 1995] was adopted. Hazard categories were additionally supplemented with species potentially endangered (P) and potentially threatened (PR) distinguished by Jackowiak [1993].

Ten sample plots 50 × 50 m were established on the examined area for studies on dendroflora. They were situated in an ash-alder flood-plain, in a currant alder carr forest, in degraded fragments of central European hornbeam and in forest cultures. On each plot, all trees with breast-height diameter over 15 cm were measured and heights of several trees representative for a given plot were also recorded. Measurement results obtained on sample plots were supplemented with observations from the entire area under investigations in order to obtain an objective picture of its dendroflora.

The inventory of the thickest trees involved belt review of stands along 50 m wide transects running from the north to south of the entire object. These trees were allocated into one of the following three groups of: monumental circumference [Instrukcja... 1996, Ruciński 1998], nearly monumental circumference (with circumference 10% smaller than monumental) and splendid trees (irrespective of circumference but of unusual shape and other exceptional features). The scale of health condition of trees was adopted after Kamiński and Czerniak [2000].

RESULTS

The general characteristics of the flora

On the small area of the former ecological site “Bogdanka” extending on 165 ha, 527 taxons of vascular plants derived from 91 families and 295 genera can be found. For comparison, Jackowiak [1993] gives the total of 1223 species of tracheophytes from the entire city of Poznań.

The inventoried plants include: pteridophytes (12 species from 5 families), conifers (4 taxons from the *Pinaceae* family) and mono- and dicotyledons (511 species), which make up 97% of the entire flora.

The number of species in individual families ranges from 1 to 56. Out of 91 inventoried families, 70 families are represented by 1-5 species and only 6 families comprise more than 20 species. Families most abundant in species include: *Poaceae*, *Asteraceae*, *Rosaceae* as well as *Cyperaceae*, *Fabaceae*, *Caryophyllaceae*, *Lamiaceae* and *Brassicaceae*. The above mentioned families comprise 260 species which constitute half of the entire tracheophyte flora. Similar family patterns comprising the greatest number of

species were presented by Pawłowska [1972] for the flora of Poland and, regionally, by Żukowski et al. [1995] for Wielkopolski National Park.

The most numerous groups in the examined object are species occupying from one to several sites, i.e. very rare (306 – 58%) and rare (100 – 19%) species. Also, dispersed species occupying 11-20 sites constitute a relatively high proportion (72 – 14%). The least numerous are species growing in many sites, i.e. frequent (32 – 6%), very frequent (12 – 2%) and common (5 – 1%).

The flora of the examined object is dominated by plants of native origin – 424 species (81%), i.e. spontaneophytes (183 – 35%) and apophytes (241 – 46%). Alien species (104) constitute 19% of the total flora. Species permanently settled, i.e. archeophytes (7%) and kenophytes (10%) prevail in this group, whereas ephemorophytes (2%) appear sporadically and disappear quickly.

From among all living forms, hemicryptophytes (223 species – 42%) are most numerous with fanerophytes (104 – 20%), cryptophytes (89 – 17%) and terophytes (82 – 16%) represented on a similar level and chamephytes occurring with the lowest frequency (29 – 6%). In comparison with the Raunkiaer spectrum developed for Polish flora by Kornaś and Medwecka-Kornaś [1986], a relatively high proportion of trees and bushes (fanerophytes), at somewhat lower than average proportion of annual plants, (terophytes) draws attention.

The inventoried species were allocated to 18 sociological-ecological groups [Jackowiak 1993] and their proportion in individual groups ranged from 3 to 80 (1-15%; Fig. 2).

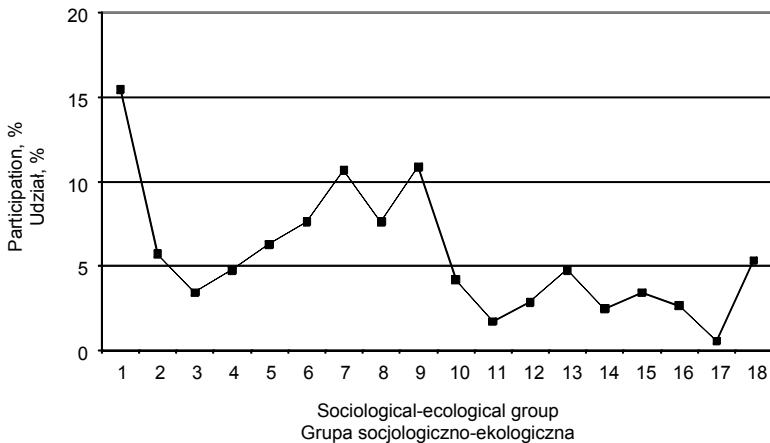


Fig. 2. Participation of species in sociological-ecological groups [according to Jackowiak 1993]

Rys. 2. Udział gatunków w grupach socjologiczno-ekologicznych [wg Jackowiaka 1993]

Majority of the species occur in 7 sociological-ecological groups and their proportion exceeds 5%. They are represented by 29 to 57 species. The remaining 11 groups are represented by 3 to 25 species. The most numerous plants on the prepared list from the examined object include: species of fertile deciduous forests and bush communities, riparian forests and shrubs, rush and water communities, as well as fresh and moderately wet meadows. There are also many species associated with marshy alder forest,

as well as wet meadows and herbaceous communities. Ruderal weeds, terophytes communities occurring on wet and moist sites, as well as pioneer ruderal communities are the least numerous.

Dendroflora

The inventoried dendroflora comprises 104 taxons from 18 families, including 47 tree taxons, 49 bushes and 8 taxons occurring in both forms. The naturally varied species composition of the dendroflora of the investigated area was enriched and, to a considerable extent, influenced by man. A significant part of the examined district comprises forest cultures on former agricultural land with *Pinus sylvestris* and *Betula pendula* by far the most dominant. Apart from several-year-old stands with *P. sylvestris* with admixtures of such species alien for Wielkopolska or the rest of the country as *Larix decidua*, *P. nigra* or *Sorbus intermedia*, young pine forest can also be found.

Despite the fact that woody plants are dominated by native species (61), there is also a sizeable (43) group of alien species. This considerable proportion of species of foreign origin can be attributed to the position of the area within the boundaries of a large city. Many species were dragged here, with part of them introduced on purpose within frameworks of experiments associated with the cultivation of trees and bushes of foreign origin. Few fragments of the described area are characterised by species composition similar to natural. The most common plants are deciduous trees associated with riparian, hornbeam and alder swamp forest communities.

The total of 48 taxons was inventoried on the 10 sample plots selected for studies on dendroflora. Out of them, the following plants: *Acer platanoides*, *A. pseudoplatanus*, *Alnus glutinosa*, *Betula pendula*, *Carpinus betulus*, *Prunus padus*, *P. serotina*, *Quercus robur*, *Sambucus nigra*, *Sorbus aucuparia* and *Tilia cordata* belong to very frequent species whose populations develop dynamically, yield natural regenerations and have proportional share of individual generations in the height strata. *Corylus avellana*, *Crataegus rhipidophylla*, *Fraxinus excelsior*, *Humulus lupulus* and *Viburnum opulus* belong to the frequent species.

The most common among foreign species is *Prunus serotina*, but *Robinia pseudoacacia*, as well as many *Populus ×canadensis* trees and *Pinus nigra* were also planted here. The following native species found in the area: *Larix decidua*, *Fagus sylvatica*, *Sorbus intermedia*, *Tilia platyphyllos* and *Picea abies* occur in Wielkopolska outside their natural range. Last but not least, it is worth stressing that one of the rarest tree species is the native *Quercus petraea*, a species that is considered endangered in the entire city of Poznań.

Numerous communities of mesophyllic shrubs can be found in the examined area. They are most frequently made up of *Corylus avellana*, *Prunus spinosa*, *Crataegus monogyna*, *C. rhipidophylla*, *Euonymus europaeus*, *Sambucus nigra*, *Prunus padus*, *Frangula alnus*, *Cornus sanguinea*, *Prunus serotina*, less frequently of *Lonicera tatarica*, *Rosa rubiginosa* and *R. dumalis*, *Rubus plicatus*, *Syringa vulgaris*, *Robinia pseudoacacia* and others. Osier shrubs with *Salix cinerea*, *S. aurita*, *S. pentandra* and *S. rosmarinifolia* occur somewhat less frequently.

Molinia meadows are found growing in *Alnus glutinosa* and *Betula pendula* young stands, while *Populus tremula* thickets occur on perimeters of ash-alder flood plains.

Young stands prevail with average age of 50-60 years; the age of the oldest trees does not exceed 120 years [Opis... 1993-2002]. They are found growing mainly in the

ash-alder flood plain and currant alder carr along the section of the river from the Rusalka Lake to Lutycka St.

The results of the stand breast height diameter structure analyses on individual sample plots revealed that breast heights ranged from 14 to 77 cm (average 29 cm). Relatively biggest breast height diameters were recorded in: *Quercus robur*, *Alnus glutinosa*, *Populus ×canescens*, *P. ×canadensis* and *Betula pendula*.

Among dendrologic peculiarities already mentioned by Prof. Władysław Danielewicz is the only specimen of a little known native birch – *Betula pendula* f. *obscura* growing close the area of studies in compartment 72w as well as single trees of *Carpinus orientalis* found by a road in hazel shrubs in compartment 72l. This species originates from south-eastern Europe, Asia Minor and Iran.

As mentioned above, young stands prevail in the examined region and, therefore, relatively very few trees attain measurements fulfilling the requirements expected from monuments of nature, although several specimens were identified which deserve to be covered by this form of protection. Most frequently, monumental circumferences were reached by *Alnus glutinosa*. A numerous group of beautiful specimens of this species is found in a currant alder carr and ash-alder flood-plain forest growing in the Bogdanka River valley along the section from Lutycka St. to the river outlet into the Lake Rusalka. The circumferences of the most splendid of *A. glutinosa* trees range from 250 to 280 cm. Specimens of *Betula pendula* (230 cm), forked *Prunus serotina* (125 and 116 cm), as well as splendid *Pyrus communis* (209 cm) were found in the same forest complex. A beautiful tree of *Prunus padus* (142 cm) was found behind a pond by a road in compartment 70w, while going further towards Lutycka St., an interesting specimen of *Prunus cerasifera* (241 cm) can be found.

There are some other trees in the examined area which, although they do not have monumental circumferences, they deserve protection due to their interesting shape and very good health condition. This group of trees include, among others, a beautiful *Tilia platyphyllos* growing in compartment 70z, a triple-trunk *Fraxinus excelsior* of a picturesque shape (121, 142 and 168 cm) found in compartment 69b, fine-looking *Populus alba* growing along the Bogdanka River not far from Lutycka St., as well as several specimens of *Alnus glutinosa* from the alder carr and ash-alder flood-plain mentioned at the beginning of this description.

“Special care” species

From among the total number of 527 taxons described from the examined area, 180 taxons can be found on lists of rare and endangered species (Table 1). Out of this number, 29 species are under legal protection or belong to threatened species in our country or in Wielkopolska [Rozporządzenie... 2004, Jackowiak 1993], while 175 species are plants classified by Jackowiak [1993] as endangered in the area of the city of Poznań.

Dominant among the examined flora are: potentially endangered (112 – 62%), endangered (47 – 26%) and dying (13 – 7%) species; the proportion of the remaining species is: extinct – 4 (2%), potentially endangered – 1 (1%) and of uncertain threat 3 (2%; Fig. 3).

The total of 15 species was identified as legally protected in Poland, of which 7 species are under strict protection, while the remaining 8 – under partial protection [Rozporządzenie... 2004].

Table 1. The list of rare and endangered species
Tabela 1. Wykaz gatunków rzadkich i zagrożonych

Species name Nazwa gatunkowa	Living form Forma życiowa	Frequency Klasa częstotliwości	Threat category Kategoria zagrożenia		Historical-geographical group Grupa historyczno-geograficzna	Sociological-ecological group Grupa socjologiczno-ekologiczna
			Poznań	Włkp.		
1	2	3	4	5	6	7
<i>Acer campestre</i> L.	M	III		R	Ap	1
<i>Adoxa moschatelina</i> L.	G	III	P		Sp	1
<i>Ajuga reptans</i> L.	H	II	P		Sp	1
<i>Alchemilla monticola</i> OPIZ	H	I	E		Sp	9
<i>Alnus incana</i> (L.) MOENCH	M	I	P		Sp	6
<i>Anemone nemorosa</i> L.	G	I	P		Sp	1
<i>Anemone ranunculoides</i> L.	G	II	P		Sp	1
<i>Angelica sylvestris</i> L.	H	IV	P		Ap	1
<i>Arabis glabra</i> (L.) BERNH.	H	I	V		Sp	4
<i>Asarum europaeum</i> L.	H	I	V	*	Sp	1
<i>Athyrium filix-femina</i> (L.) ROTH	H	I	V		Sp	1
<i>Berula erecta</i> (HUDS.) COVILLE	Hy	V	P		Sp	7
<i>Betonica officinalis</i> L.	H	I	V	V	Sp	2
<i>Blysmus compressus</i> (L.) PANZ. ex LINK	G	I	P		Sp	6
<i>Brachypodium sylvaticum</i> (HUDS.) P. BEAUV.	H	II	P		Sp	1
<i>Briza media</i> L.	H	II	P		Sp	9
<i>Butomus umbellatus</i> L.	Hy	I	P		Ap	7
<i>Calamagrostis arundinacea</i> (L.) ROTH	H	I	V		Sp	2
<i>Calamagrostis canescens</i> (WEBER) ROTH	H	I	V		Sp	6
<i>Callitriche cophocarpa</i> SENDTN.	Hy	I	P		Ap	7
<i>Caltha palustris</i> L.	H	IV	P		Sp	8
<i>Campanula glomerata</i> L.	H	I	P		Sp	4
<i>Campanula patula</i> L.	H	I	V		Sp	9
<i>Campanula trachelium</i> L.	H	I	E		Sp	1
<i>Cardamine amara</i> L.	H	IV	P		Sp	1

Table 1 – cont. / Tabela 1 – cd.

1	2	3	4	5	6	7
<i>Cardamine pratensis</i> L.	H	I	P		Ap	9
<i>Carex acuta</i> L.	G, Hy	I	P		Sp	6
<i>Carex acutiformis</i> EHRH.	G, Hy	II	P		Sp	6
<i>Carex appropinquata</i> SCHUMACH.	H	I	V		Sp	6
<i>Carex dystans</i> L.	H	I	V		Sp	6
<i>Carex flacca</i> SCHREBER	G	I	P		Sp	8
<i>Carex flava</i> L.	H	I	V		Sp	6
<i>Carex nigra</i> (L.) REIHARD.	G	II	P		Sp	6
<i>Carex pallescens</i> L.	H	I	E		Sp	2
<i>Carex panicea</i> L.	G, H	I	P		Sp	6
<i>Carex paniculata</i> L.	H	I	P		Sp	6
<i>Carex pilulifera</i> L.	H	I	V		Sp	2
<i>Carex pseudocyperus</i> L.	Hy, H	II	V		Sp	6
<i>Carex riparia</i> CURTIS	Hy, H	III	P		Sp	6
<i>Carpinus betulus</i> L.	M	IV	P		Sp	1
<i>Ceratophyllum demersum</i> L.	Hy	I	P		Sp	7
<i>Chrysosplenium alternifolium</i> L.	H	I	V		Sp	6
<i>Cicuta virosa</i> L.	H	I	P		Sp	6
<i>Cirsium oleraceum</i> (L.) SCOP.	H	IV	P		Ap	8
<i>Cirsium palustre</i> (L.) SCOP.	H	II	P		Sp	8
<i>Cirsium rivulare</i> (JACQ.) ALL.	H	I		E	Sp	6
<i>Cladium mariscus</i> (L.) POHL	G, Hy	I	V	R	Sp	6
<i>Cornus sanguinea</i> L.	N	V	P		Sp	1
<i>Crataegus rhipidophylla</i> GAND.	N	III	I	R	Sp	1
<i>Crepis paludosa</i> (L.) MOENCH	H	III	P		Sp	8
<i>Cuscuta epithimum</i> (L.) L.	Tp	I	V	V	Sp	9
<i>Cynosurus cristatus</i> L.	H	I	V		Sp	9
<i>Dactylorhiza majalis</i> (Rchb.) Hunt et Summerh.	G	I	P	V	Sp	8
<i>Dianthus superbus</i> L.	H	I	P	V	Sp	8
<i>Echium vulgare</i> L.	H	II			Ap	13
<i>Eleocharis acicularis</i> (L.) ROEM. & SCHULT.	Hy	I	Ex		Sp	11
<i>Eleocharis palustris</i> (L.) ROEM. & SCHULT.	Hy	I	P		Ap	6
<i>Equisetum fluviatile</i> L.	Hy	III	P		Sp	7
<i>Equisetum variegatum</i> SCHLEICH.	G	I	E	V	Sp	6

Table 1 – cont. / Tabela 1 – cd.

1	2	3	4	5	6	7
<i>Eriophorum angustifolium</i> HONCK.	G, Hy	I	P		Sp	6
<i>Eriophorum latifolium</i> HOPPE	H	I	V	V	Sp	6
<i>Euonymus europaeus</i> L.	N	III	P		Sp	1
<i>Eupatorium cannabinum</i> L.	H	V	P		Sp	7
<i>Euphrasia rostkoviana</i> HAYNE	T, pp	I	V		Sp	9
<i>Festuca gigantea</i> (L.) VILL.	H	III	P		Sp	1
<i>Filipendula ulmaria</i> (L.) MAXIM.	H	V	P		Sp	8
<i>Filipendula vulgaris</i> MOENCH	H	I	V		Sp	4
<i>Frangula alnus</i> MILL.	N	VI	P	*	Sp	6
<i>Galeobdolon luteum</i> HUDS	C	I	V		Sp	1
<i>Galium boreale</i> L.	H	I	P		Sp	8
<i>Galium odoratum</i> (L.) SCOP.	H	I		*	Sp	1
<i>Galium palustre</i> L.	H	III	P		Sp	6
<i>Galium uliginosum</i> L.	H	I	P		Sp	8
<i>Geranium palustre</i> L.	H	III	P		Sp	8
<i>Geum rivale</i> L.	H	II	P		Sp	8
<i>Glyceria fluitans</i> (L.) R. BR.	Hy	I	P		Sp	7
<i>Glyceria maxima</i> (HARTM.) HOLMB	Hy	I	P		Sp	7
<i>Helichrysum arenarium</i> (L.) MOENCH	H	I		*	Ap	5
<i>Hierohloë odorata</i> (L.) P. BEAUV.	G	I	V	E	Sp	8
<i>Hippuris vulgaris</i> L.	Hy	I	Ex		Sp	7
<i>Hydrocharis morsus-ranae</i> L.	Hy	I	P		Sp	7
<i>Hydrocotyle vulgaris</i>	H	I	V		Sp	6
<i>Hypericum tetrapterum</i> FR.	H	I	P		Sp	8
<i>Impatiens noli-tangere</i> L.	T	III	E		Sp	1
<i>Iris pseudacorus</i> L.	Hy, G	II	P		Sp	6
<i>Iris sibirica</i> L.	G	I	Ex	E	Sp	8
<i>Juncus alpinus</i> VILL.	H	I	Ex		Sp	6
<i>Lamium maculatum</i> L.	H	II	V		Sp	1
<i>Lemna triscula</i> L.	Hy	I	P		Sp	7
<i>Listera ovata</i> (L.) R. BR.	G	I	V	V	Sp	1
<i>Lotus uliginosus</i> SCHKUHR	H	I	P		Sp	8
<i>Luzula campestris</i> (L.) DC.	H	I	P		Sp	9
<i>Luzula multiflora</i> (RETZ.) LEJ.	H	I	P		Sp	2

Table 1 – cont. / Tabela 1 – cd.

1	2	3	4	5	6	7
<i>Luzula pilosa</i> (L.) WILLD.	H	I	V		Sp	2
<i>Lychnis flos-cuculi</i> L.	H	V	P		Sp	8
<i>Lysymachia nummularia</i> L.	C	II	P		Sp	6
<i>Lysymachia thyrsoflora</i> L.	H, Hy	I	V		Sp	6
<i>Lysymachia vulgaris</i> L.	H	III	P		Sp	8
<i>Maianthemum bifolium</i> (L.) F.W. SCHMIDT	C	II	P		Sp	1
<i>Melica nutans</i> L.	G, H	I	V		Sp	1
<i>Mentha aquatica</i> L.	H, Hy	IV	P		Sp	7
<i>Mentha verticillata</i> L.	H	I	P		Sp	10
<i>Menyanthes trifoliata</i> L.	Hy, G	I	P		Sp	6
<i>Mercurialis perennis</i> L.	G, H	I	E		Sp	1
<i>Milium effusum</i> L.	H	III	V		Sp	1
<i>Moehringia trinervia</i> (L.) CLAIRV.	T, H	III	P		Sp	1
<i>Molinia caerulea</i> (L.) MOENCH	H	VI	P		Sp	8
<i>Mycelis muralis</i> (L.) DUMORT.	H	III	P		Sp	1
<i>Myriophyllum verticillatum</i> L.	Hy	I	V		Sp	7
<i>Nardus stricta</i> L.	H	II	E		Sp	2
<i>Nasturtium officinale</i> R. BR.	Hy	I	E	V	Sp	7
<i>Nuphar lutea</i> (L.) SIBTH. & SM.	Hy	I	V	*	Sp	7
<i>Nymphaea alba</i> L.	Hy	I	V	*	Sp	7
<i>Oenanthe aquatica</i> (L.) POIR.	Hy, H	I	P		Sp	7
<i>Oxalis acetosella</i> L.	G, H	III	V		Sp	1
<i>Paris quadrifolia</i> L.	G	II	V		Sp	1
<i>Parnassia palustris</i> L.	H	I	P		Sp	8
<i>Pedicularis palustris</i> L.	H, pp	I	E	V	Sp	6
<i>Petasites hybridus</i> (L.) GAERTN., B. MEY. & SCHERB.	G, H	I	PR		Ap	8
<i>Peucedanum palustre</i> MOENCH	H	I	P		Sp	6
<i>Pimpinella major</i> (L.) HUDS.	H	I	P		Sp	9
<i>Pinus sylvestris</i> L.	M	IV	P		Sp	2
<i>Polygala comosa</i> SCHKUHR	H	I	V		Sp	9
<i>Polygonum bistorta</i> L.	G, H	IV	P		Sp	8
<i>Potamogeton crispus</i> L.	Hy	I	P		Sp	7
<i>Potentilla erecta</i> (L.) RAEUSCH.	H	I	P		Sp	8

Table 1 – cont. / Tabela 1 – cd.

1	2	3	4	5	6	7
<i>Potentilla palustris</i> (L.) SCOP.	C	I	P		Sp	6
<i>Primula veris</i> L.	H	I	V	*	Sp	4
<i>Prunus padus</i> L.	M	V	P		Sp	1
<i>Pteridium aquilinum</i> (L.) KUHN	G	I	V		Sp	2
<i>Pulmonaria obscura</i> DUMORT.	H	III	E		Sp	1
<i>Quercus petraea</i> (MATT.) LIEBL.	M	I	V		Sp	2
<i>Ranunculus circinatus</i> SIBTH.	Hy	I	V		Sp	7
<i>Rhamnus catharticus</i> L.	N	II	P		Sp	1
<i>Ribes nigrum</i> L.	N	III	P	*	Sp	6
<i>Ribes spicatum</i> ROBSON	N	III	P		Sp	1
<i>Rosa rubiginosa</i> L.	N	I	E		Sp	4
<i>Rosa sherardii</i> DAVIES	N	I	V		Ap	1
<i>Rumex hydrolapathum</i> HUDS.	Hy, H	I	P		Sp	7
<i>Salix aurita</i> L.	N	I	I		Sp	6
<i>Salix pentandra</i> L.	M., N	I	I		Sp	6
<i>Salix rosmarinifolia</i> L.	N, Ch	I	P		Sp	6
<i>Sanquisorba officinalis</i> L.	H	I	P		Sp	8
<i>Scripus lacustris</i> L.	Hy, G	I	P		Sp	7
<i>Scripus silvaticus</i> L.	G	III	P		Sp	8
<i>Scrophularia nodosa</i> L.	H	III	P		Sp	1
<i>Scrophularia umbrosa</i> DUMORT.	H, Hy	I	P		Sp	7
<i>Scutellaria galericulata</i> L.	H	III	P		Sp	6
<i>Selinum carvifolia</i> (L.) L.	H	I	P		Sp	8
<i>Serratula trinctoria</i> L.	G, H	I	V		Sp	8
<i>Silene nutans</i> L.	H	I	E		Sp	4
<i>Solidago virgaurea</i> L.	H	I	P		Sp	2
<i>Sparganium erectum</i> L. em. RCHB.	Hy	I	P		Sp	7
<i>Spirodela polyrhiza</i> (L.) SCHLEID.	Hy	I	V		Sp	7
<i>Stachys sylvatica</i> L.	H	I	P		Sp	1
<i>Stellaria nemorum</i> L.	H	II	V		Sp	1
<i>Succisa pratensis</i> MOENCH	H	II	P		Sp	8
<i>Thalictrum flavum</i> L.	H	I	P		Sp	8
<i>Thalictrum minus</i> L.	H	I	P		Sp	4
<i>Thelypteris palustris</i> SCHOTT	G	I	P		Sp	6

Table 1 – cont. / Tabela 1 – cd.

	1	2	3	4	5	6	7
<i>Trifolium montanum</i> L.		H	I	E		Sp	4
<i>Triglochin palustre</i> L.		H	I	P		Sp	6
<i>Trollius europaeus</i> L.		H	II	V	V	Sp	8
<i>Typha angustifolia</i> L.		Hy, H	II	P		Ap	7
<i>Typha latifolia</i> L.		Hy, H	II	P		Ap	7
<i>Utricularia vulgaris</i> L.		Hy	I	V		Sp	6
<i>Vaccinium myrthillus</i> L.		Ch	I	V		Sp	2
<i>Valeriana dioica</i> L.		H	III	P	V	Sp	6
<i>Valeriana officinalis</i> L.		H	I	P	I	Sp	8
<i>Verbascum nigrum</i> L.		H	I	V		Sp	4
<i>Veronica anagalis-aquatica</i> L.		H	I	P		Sp	7
<i>Veronica beccabunga</i> L.		C, Hy	VI	V		Sp	7
<i>Veronica officinalis</i> L.		C	I	P		Sp	2
<i>Veronica spicata</i> L.		H, C	I	P		Ap	5
<i>Viburnum opulus</i> L.		N	VI	P	*	Sp	1
<i>Vicia sepium</i> L.		H	I	P		Sp	1
<i>Vicia sylvatica</i> L.		H	I		R	Sp	4
<i>Viola canina</i> L.		H	II	P		Sp	2
<i>Viola reichenbachiana</i> JORD. ex BOREAU		H	II	P		Sp	1
<i>Viola riviniana</i> RCHB.		H	I	V		Sp	2

Wlkp. – Wielkopolska, M – megafanerophytes, N – nanofanerophytes, C – herb chamephytes, G – geophytes, H – hemicyptophytes, Ch – arborescent chamephytes, Hy – hydrophytes, T – terophytes, p – parasite, pp – halfparasite; I – very rare species, II – rare, III – sparse, IV – frequent, V – very frequent, VI – common; Ex – extinct-missing species, E – dying out, V – endangered, R – rare, P – potentially liable to dangers, PR – potentially endangered, I – endangered uncertain, * – not endangered, Sp – spontaneophytes, Ap – apophytes; sociological-ecological groups according to Jackowiak [1993].

Wlkp. – Wielkopolska, M – megafanerofit, N – nanofanerofit, C – chamefit zielny, G – geofit, H – hemikryptofit, Ch – chamefit zdrewniały, Hy – hydrofit, T – terofit, p – pasożyt, pp – półpasożyt; I – gatunek bardzo rzadki, II – rzadki, III – rozproszony, IV – częsty, V – bardzo częsty, VI – pospólny; Ex – gatunki wymarłe, E – wymierające, V – narażone, R – rzadkie, P – potencjalnie narażone, PR – potencjalnie zagrożone, I – o nieokreślonym zagrożeniu, * – niezagrożone, Sp – spontaneofity, Ap – apofity; grupy socjologiczno-ekologiczne według Jacowiaka [1993].

Table 2 compares categories of threat of legally protected plant species in Poland, in Wielkopolska and in the city of Poznań. Majority of the described group of species is not endangered in the entire area of Poland except *Dianthus superbus* and *Iris sibirica* which have in Poland the status of endangered species as well as *Hierohloë odorata* considered to be a rare species. From regional point of view, the same taxons are granted a higher rank; *Iris sibirica* and *H. odorata* are treated in Wielkopolska as dying species,

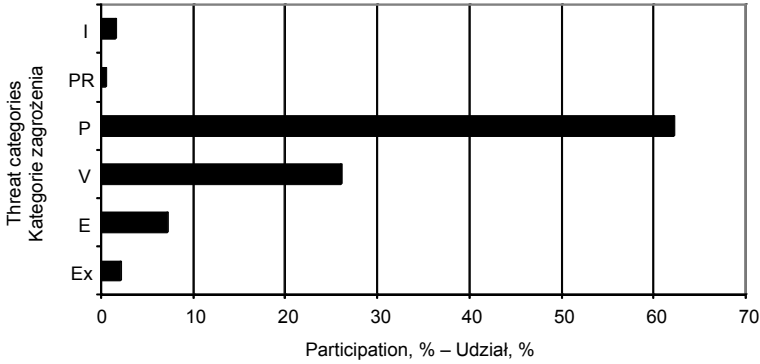


Fig. 3. The percentage participation of rare and endangered species in Poznań in the categories of threat: I – endangered uncertain, PR – potentially endangered, P – potentially liable to danger, V – endangered, E – dying out, Ex – extinct-missing

Rys. 3. Procentowy udział gatunków rzadkich i zagrożonych w Poznaniu w kategoriach zagrożenia: PR – potencjalnie zagrożone, P – potencjalnie narażone, V – zagrożone, E – wymierające, Ex – wymarłe

Table 2. The comparison of the threat categories of legally protected species
Tabela 2. Zestawienie kategorii ochrony i zagrożenia gatunków podlegających ochronie prawnej

Species name Nazwa gatunkowa	Protection category Kategoria ochrony		Threat category – Kategoria zagrożenia											
	CH	Ch	Polska			Wlkp.			Poznań					
			V	R	*	E	V	*	Ex	V	P	*		
<i>Asarum europaeum</i>		■			■			■			■			
<i>Dactylorhiza majalis</i>	■				■			■					■	
<i>Dianthus superbus</i>	■		■					■						■
<i>Frangula alnus</i>		■			■				■					
<i>Galium odoratum</i>		■									■			
<i>Helichrysum arenarium</i>		■			■				■					■
<i>Hierohloë odorata</i>	■			■				■				■		
<i>Iris sibirica</i>			■					■			■			
<i>Listera ovata</i>	■				■				■				■	
<i>Nuphar lutea</i>	■				■				■				■	
<i>Nymphaea alba</i>		■							■					
<i>Primula veris</i>		■											■	
<i>Ribes nigrum</i>		■							■					■
<i>Trollius europaeus</i>	■								■			■		
<i>Viburnum opulus</i>		■											■	

Wlkp. – Wielkopolska, CH – strict protection, Ch – partially protection, V – endangered, R – rare, * – not endangered, E – dying out species, Ex – extinct-missing, P – potentially liable to danger.

Wlkp. – Wielkopolska, CH – ochrona ścisła, Ch – ochrona częściowa, V – zagrożone, R – rzadkie, * – niezagrożone, E – bezpośrednio zagrożone (wymierające), Ex – wymarłe, P – potencjalnie zagrożone.

while *Dactylorhiza majalis*, *Dianthus superbus*, *Listera ovata* and *Trollius europaeus* are considered here as endangered taxa. The only species considered in Poznań as an unthreatened species is *Helichrysum arenarium*, whereas the remaining plants were classified as endangered, potentially endangered or extinct.

Prof. Władysław Danielewicz, together with the author of this article, identified an *Iris sibirica* site considered to be extinct in our city [Jackowiak 1993]. The last information about its occurrence in Poznań come from the 18th century from Miller who collected this plant in 1896 [after Jackowiak 1993]. The second interesting achievement of Władysław Danielewicz was the discovery of *Galium odoratum* site not recorded in Poznań before. When talking about disappearing species, it is worth mentioning that a site of *Schoenus ferrugineus*, which belongs to this group, was not found. This above species was collected from the experimental area in 1851 by Ritschl [after Jackowiak 1993], while in the last century Wodziczko et al. [1938] and Szulczewski [1951] wrote about it. All attempt to find *Carex elata* recorded in Poznań by Schönke in 1854 and in Gołęcin by Pfuhl [1895] failed.

Rare and endangered species are represented by two geographic-historical groups, namely: spontaneophytes – 166 species (92%) and apophytes – 14 species (8%).

The performed inventory showed that, in the case of the examined object, 79%, i.e. 143 species of rare and endangered plants occurred only on 10 sites, 18% (32 species) – on 11 to 40 sites, while 5 species (only 3%) occupied 40 and more sites.

SUMMARY AND PROTECTION RECOMENDATIONS

In contrast to other natural objects, the former ecological site "Bogdanka" distinguishes itself by extraordinary floristic values. In the examined area, the total of 527 taxa of vascular plants occur, of which 180 are found on lists of rare and endangered species, primarily for the city of Poznań. There are also 15 species under legal protection as well as 34 species from the domestic and regional lists of rare and endangered plants. Floristic peculiarities of the examined object, i.e. species which have the only or one of few sites in Poznań, include: *Iris sibirica* and *Galium odoratum* – species classified by Jackowiak [1993] as extinct in Poznań, *Iris sibirica*, *Trollius europaeus* and *Hierochloë odorata* – species seriously endangered both in Wielkopolska and Poznań. Among woody plants, *Betula pendula* f. *obscura* and *Carpinus orientalis* deserve attention. In addition, several trees with monumental circumferences were found.

From the floristic point of view, the most valuable fragments of the examined area include: a currant alder carr and ash-alder flood-plain forest situated in the Bogdanka River valley along the section from Lutycka St. to the river outlet into the Lake Rusałka, as well as extensive *Molinia* meadows extending along the river in the central part of the former ecological site. The site environment found there, provide optimal conditions for the development of many valuable rare and disappearing species.

Relatively strong anthropogenic impacts are visible in the flora of the examined object as confirmed by the occurrence of significant proportions of apophytes (241 species – 46% of total flora) which occur or are permanently associated with strongly transformed sites or even attain their optimal development in them, as well as nearly 20% proportion of species of foreign origin. Human interference is particularly

conspicuous when we examine carefully species composition of woody plants where many elements alien to our dendroflora were introduced.

- Ban on plant destruction and picking, as well as prohibition of the introduction of species of foreign origin. It would be advisable to remove gradually from the stands of the ecological site species of alien origin.

- Maintenance of water relations on flood plains, alder carr and wet meadows as they provide sanctuary for the majority of valuable plant species occurring on the examined area. It is also important not to afforest meadows that have already been dried because the appearing areas of *Molinia caerulea*, as well as self-seeding of pioneer *Alnus glutinosa* and *Betula pendula* eliminate herbaceous plants characteristic for these communities. For this reason, in order to protect meadow species biodiversity, it would be advisable to cut them.

- Protection of water and rush vegetation occurring in the neighbourhood of two ponds. It should be considered if there are possibilities of cutting down on numbers of anglers who litter the shores of the reservoirs, trample them and destroy plants growing there.

- Appropriate management of stand structure by the introduction into their composition of exclusively native species suitable for site conditions prevailing on a given area. This refers to the cultivations, as well as forest culture stands. Species of foreign origin (e.g. *Larix decidua*, *L. ×eurolepis*, *Fagus sylvatica*, or *Quercus rubra*), should not be introduced into cultivations.

- Maintenance of the natural forest boundary with species sequence occurring in this zone.

- Leaving dead trees in forests as they provide breeding ground for many plant species.

- Placing the most valuable, specified trees of monumental character, as well as magnificent specimens under protection. Carrying out on these trees all necessary care and sanitary treatments.

- Undertaking actions with the aim to maintain and protect populations of rare and disappearing plant species. This objective can be achieved thanks to: protection of communities in which the described species occur, periodical control of the state of their populations, introduction of the rarest species onto the neighbouring areas (this refers, in particular to *Iris sibirica*, *Galium odoratum*, *Hierohloe odorata*, *Trollius europaeus*, *Dianthus superbus*). It is also worth considering if individual specimens of these species could not be transferred to botanical or dendrologic gardens for their reproduction and reintroduction into the ecological site.

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**ROŚLINY NACZYNIOWE BYŁEGO UŻYTKU EKOLOGICZNEGO
„BOGDANKA” POŁOŻONEGO W POZNANIU
W DOLINIE RZEKI BOGDANKI**

Streszczenie. Na tle innych obiektów przyrodniczych położonych w granicach miasta Poznania, były użytek ekologiczny „Bogdanka” wyróżnia się wyjątkowymi walorami florystycznymi. Na florę obiektu składa się 527 taksonów roślin naczyniowych z 91 rodzin i 295 rodzajów, z których 180 znajduje się na listach gatunków rzadkich i zagrożonych. Występuje tu 15 gatunków objętych ochroną prawną oraz 34 gatunki z krajowej i regionalnej listy roślin rzadkich i zagrożonych. Do najcenniejszych należą *Iris sibirica*, *Galium odoratum*, *Hierohloë odorata*, *Trollius europaeus* czy *Dianthus superbis*. Rośnie tu kilkanaście drzew o obwodach pomnikowych lub zbliżonych do pomnikowych oraz drzew okazałych. Teren jak najszybciej powinien uzyskać ponownie status ochronny.

Słowa kluczowe: rośliny naczyniowe, flora Poznania, dolina Bogdanki

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