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VASCULAR PLANTS OF "STRZESZYN" ECOLOGICAL SITE IN POZNAŃ

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Abstract. In comparison with other natural objects situated within the administrative boundaries of the city of Poznań, the "Strzeszyn" ecological site distinguishes itself by significant floristic values. The flora of this object includes 531 vascular plants deriving from 91 families and 296 genera, of which 20 species can be found on all-country and regional lists of disappearing and threatened plants. The most valuable floristic elements include *Dactylorchiza incarnata*, *Dianthus superbus*, *Epipactis palustris* and *Polypodium vulgare*. In addition, 12 trees of monumental or near monumental circumference were found to grow here as well as several dozen splendid trees.

Key words: vascular plants, flora of Poznań, Strzeszyn Lake

INTRODUCTION

Floristic values of areas adjacent to the Strzeszyn Lake, formerly called the Psarskie Lake as well as the Bogdanka River valley have been recognised for a long time by the leading botanists living in Wielkopolska. They were promoted, among others, by Adam Wodziczko, Franciszek Krawiec and Jarosław Urbański, so that already in 1936, the then Poznań provincial governor issued a decree according to which villages situated along the Strzeszyn Lake were covered by landscape protection program [Wodziczko et al. 1938]. Also at present, areas situated in the neighbourhood of the Strzeszyn Lake are considered among the most valuable natural areas situated within the confines of the city of Poznań with plant sites and communities close to natural ones [Łukasiewicz 1982]. In 1994, the City Council passed a resolution No. CV/610/94 establishing the "Strzeszyn" ecological site with the aim: "...to protect biotopes of low bogs, wet meadows, xerothermic swards as well as small forest and water biotopes".

Majority of scientists who investigated those areas focused on the most interesting species of plants occurring here [Vorverk 1914, Krawiec and Urbański 1930, Michalski 1931, Wodziczko 1932, Wodziczko et al. 1938, Szweminówna 1949, Krawiecowa 1951, Szulczewski 1951, Szafran 1959, Jackowiak 1990, 1993]. Consequently, the material

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available today allows only a superficial review of the flora of the examined region with special emphasis on the site documentation of rare and threatened taxons. Going through the collection and files of the Herbarium of the Section of Plant Taxonomy of Adam Mickiewicz University as well as unpublished scientific papers and the Wielkopolska Herbarium, Jackowiak [1993] found data about places of occurrence or herbarium specimens collected in 1920s and 1930s by Krawiec, Paczoski, Urbański, Tumm and Gołąb and in years 1960s and 1970s by Żukowski and Latowski.

The area of the Strzeszyn ecological site did not have a complete floristic documentation. In 2000, a manuscript [Wrońska-Pilarek et al. 2000] was prepared which contained a full floristic description of the examined object which served as the basis for the preparation of this elaboration. The principal aim of the performed investigations was: to carry out a floristic inventory of the site, to assess its natural value and to prepare an initial assessment of threats and protection recommendations.

Due to editorial regulations, this article does not contain a comprehensive list of inventoried vascular plants as well as maps of distribution of rare and threatened species and the most valuable trees and bushes. However, these materials can be found in the manuscript by Wrońska-Pilarek et al. [2000].

STUDY AREA

The "Strzeszyn" ecological site is situated in the north-western part of the city of Poznań, in Poznań commune, in the district of Jeżyce. It is situated in the catchment area of the Strzeszyn Lake, in the north-western (Golęcin) wedge of greenery which extends from the Citadel, through Sołacz, Golęcin, along the Bogdanka River down to the Kiekrz Lake. The boundaries of the object are presented in Figure 1.

The examined site covers the area of 114 ha, of which significant part is taken up by waters, primarily, the Strzeszyn Lake (34.9 ha) [Raport... 1995]. Most of the site area, i.e. about 80 ha, is administered by the Board of Municipal Greenery in Poznań. The site forms part of the Strzeszynek Forest Range and covers compartments 48, 49 and 52. The remaining 34 ha belong to the city of Poznań [Raport... 1994]. The area of floristic investigations was enlarged by the inclusion of areas directly adjacent to it, among others, part of the land which belongs to the Poznań Centre of Sport and Recreation (POSiR) and compartment 48r due to their considerable natural value.

METHODS

Flora inventory was carried out in the period from March to October 2000. The names of the plant species were given after Mirek et al. [2003] and Seneta and Dolatowski [2008]. The flora statistical characterisation was carried out on the basis of publications by Jackowiak [1993] and Żukowski et al. [1995]. The list of species of "special care" comprised: species covered by legal protection [Rozporządzenie... 2004], those found on "red lists" – all-country [Lista roślin... 1992] and Wielkopolska region [Żukowski and Jackowiak 1995], as well as those threatened in the area of the city of Poznań [Jackowiak 1992, 1993].

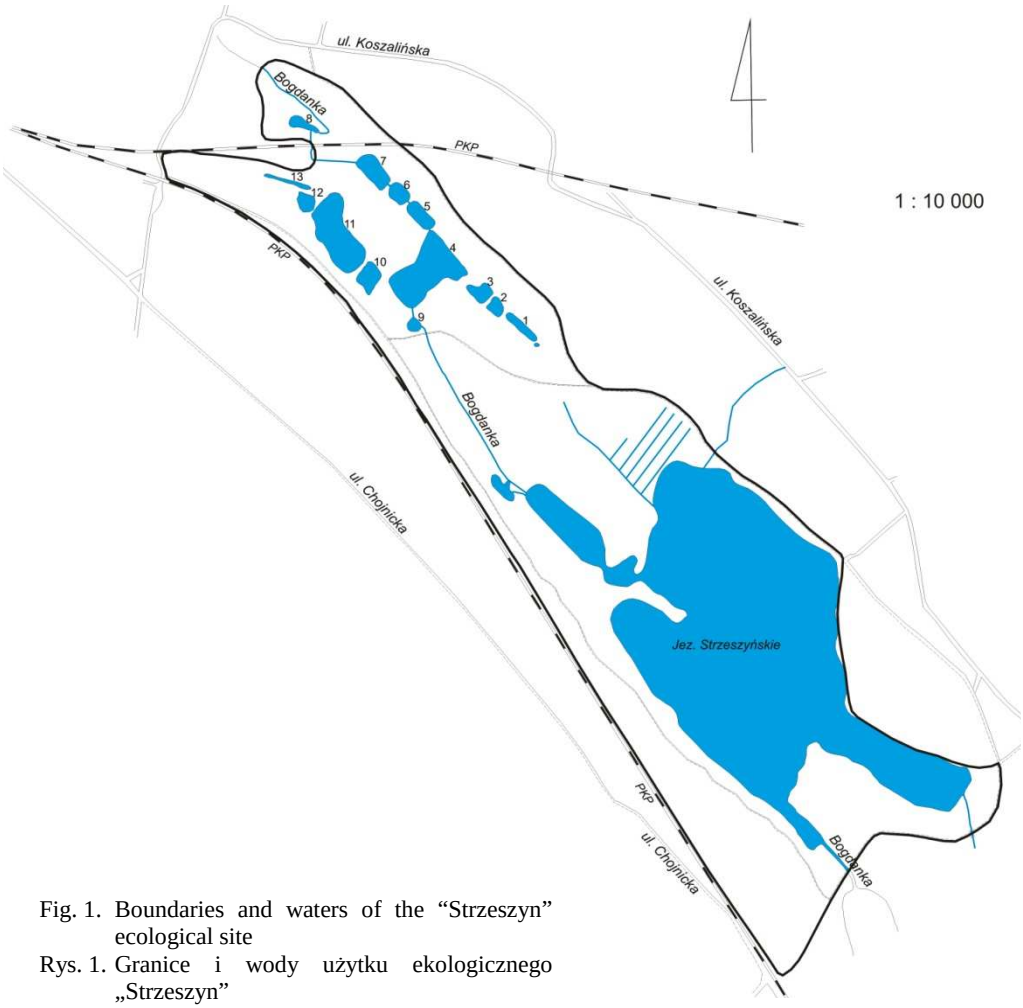

Fig. 1. Boundaries and waters of the "Strzeszyn" ecological site
Rys. 1. Granice i wody użytku ekologicznego „Strzeszyn"

The total of 15 experimental plots (0.25 ha) was marked off on the area of the examined site with the aim to conduct investigations on the breast height diameter and height stand structure. All trees were qualified for the breast eight diameter analyses. The plots were established in riparian stands and alder swamp forests, in forest cultures situated on oak-hornbeam sites and in forest cultures with *Pinus sylvestris* i *Betula pendula* and *Larix decidua*. Heights of several trees were measured on each experimental plot and their mean age was determined on the basis of the stand description from 1992.

The inventory of the thickest trees consisted in strip survey of stands along a 50 m wide transects running from north to south in sub-compartments of the entire object. The trees were assigned to three groups: trees with monumental circumferences [Instrukcja... 1996, Ruciński 1998], trees with circumferences close to monumental (circumferences 10% smaller than those of monumental ones) and splendid trees (regardless of their circumferences but of unusual appearance and other unusual features). The health status of trees was adopted after Kamiński and Czerniak [2000].

RESULTS

Flora description

The total of 531 taxons from 91 families and 296 genera were found to occur in the examined ecological site, including 5 fern species, 4 conifers as well as 522 mono- and dicotyledons.

The number of species in individual families ranges from 1 to 58 and the families richest in species comprise: *Asteraceae*, *Poaceae*, *Rosaceae*, *Fabaceae*, *Caryophyllaceae*, *Cyperaceae*, *Brassicaceae*, *Lamiaceae*, *Scrophulariaceae*, *Apiaceae and Salicaceae*. The total of 316 species derives from these 11 families which constitutes 59.5% of all the vascular flora of the examined object. Twenty species were found to derive from only 7 families. Generally speaking, families are represented by a small number of species (71 families comprise 1 to 5 species, of which 33 families are represented by only one species).

Very rare and rare species were found to be the most numerous group with regard to the number of sites. Dispersed species were found to occur at much smaller proportions. The least numerous species were frequent, very frequent and common species which constitutes only a small percentage of the total flora (Fig. 2).

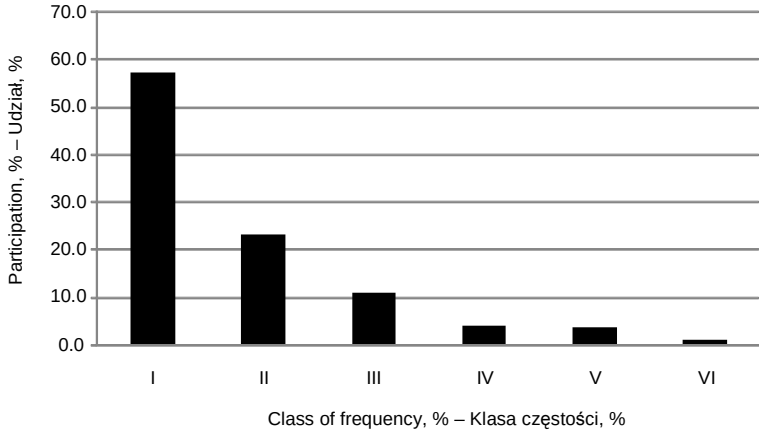

Fig. 2. Percentage participation of species in flora: I – very rare, II – rare, III – dispersed, IV – frequent, V – very frequent, VI – common
Rys. 2. Procentowy udział gatunków we florze: I – bardzo rzadkie, II – rzadkie, III – rozproszone, IV – częste, V – bardzo częste, VI – pospolite

Plants of indigenous origin (78.3%) were found dominant in the analysed flora and were represented by the total of 416 species, including 159 spontaneophytes and 257 apophytes, while foreign species constitute 21.7%, i.e. 115 taxons, of the flora including 53 kenophytes, 50 archeophytes and 12 ephemerophytes.

From among life forms, the most numerous ones were hemicryptophytes (212 species) with terophytes (104), fanerophyes (98) and cryptophytes (92) occurring less frequently and chamephytes (25 species) being the least frequent (Fig. 3).

The species found growing in the site belong to 18 sociological-ecological groups. The proportion of species from individual groups ranged from 2 to 75 (1 to 14%). Majority of them is associated with 8 sociological-ecological groups whose proportions exceed 5% (27--75 species). The remaining 10 groups are represented by 2 to 26 species. The most numerous species on the floristic list of the examined area are those of fertile broad-leaved forests and bush communities (group 1), forests and coastal scrubs, rush and water communities (group 7) as well as fresh and moderately wet meadows (group 9). There are also many species associated with swampy alders (group 6) as well as wet meadows and herbal communities (group 8). Groups 17 and 11 comprising ruderal weeds and terophytic communities occurring in wet and moist sites were the poorest in species (Fig. 4).

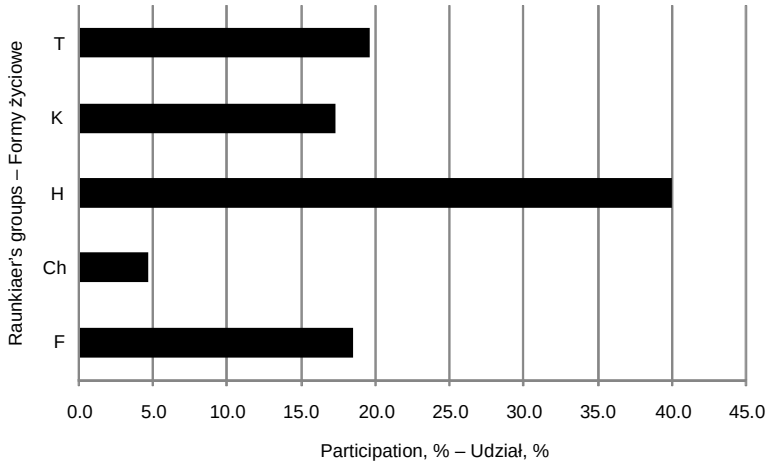

Fig. 3. Percentage participation of Raunkiaer's groups: F – fanerophytes, Ch – chamephytes, H – hemicryptophytes, K – cryptophytes, T – terophytes
Rys. 3. Udział form życiowych: F – fanerofity, Ch – chamefity, H – hemikryptofity, K – kryptofity, T – terofity

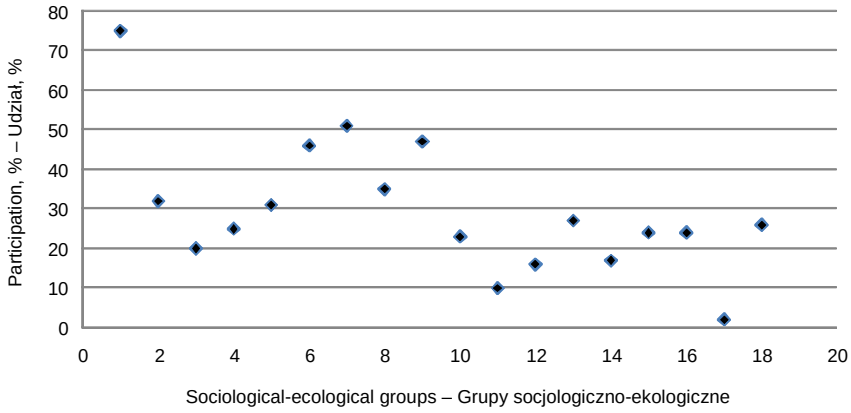

Fig. 4. Participation of species in sociological-ecological groups [Jackowiak 1993]

Rys. 4. Udział gatunków w grupach socjologiczno-ekologicznych [Jackowiak 1993]

"Special care" species

Out of 531 taxons of vascular plants, 165 species are found on lists of disappearing and threatened plants, primarily, (163 species) on the list prepared by Jackowiak (1993) for the city of Poznań. There are 15 legally protected plant species in the flora of the site, of which 7 are under strict protection and the remaining 8 are partially protected (Table 1). Majority of them is found in one or several places. Frequent species include: *Frangula alnus* and *Viburnum opulus*.

One place with *Polypodium vulgare* considered in our city as a dying species was found in the examined ecological site. There are four places in Poznań where this fern can still be found [Jackowiak 1993]. The last information about the site of this species occurring near the Strzeszyn Lake comes from Vorverk's publication [1914].

Table 1. Legally protected species
Tabela 1. Gatunki prawnie chronione

No Lp.	Species name Nazwa gatunkowa	Legally protected species Ochrona gatunkowa		Category of threat Kategoria zagrożenia							Fre-quency Częstość
				Polska		Wlkp.		Poznań			
		CH	Ch	V	*	V	*	E	V	P	*	
1	*Convallaria majalis* L.											**I**
2	*Dactylorhiza incarnata* (L.) Soo											**I**
3	*Dactylorhiza majalis* (Rchb.) Hunt et. Summerh.											**II**
4	*Dianthus superbus* L.											**I**
5	*Epipactis helleborine* (L.) Crantz											**II**
6	*Epipactis palustris* (L.) Crantz											**I**
7	*Frangula alnus* Mill.											**IV**
8	*Helichrysum arenarium* (L.) Moench											**II**
9	*Listera ovata* L.											**I**
10	*Nuphar lutea* (L.) Sibth. & SM.											**I**
11	*Nymphaea alba* L.											**II**
12	*Ononis spinosa* L.											**I**
13	*Polypodium vulgare* L.											**I**
14	*Ribes nigrum* L.											**I**
15	*Viburnum opulus* L.											**IV**

CH – strict protection, Ch – partially protection, V – endangered, * – unthreatened, E – dying out, P – potentially liable to danger, I – very rare, II – rare, IV – frequent.

CH – ochrona ścisła, Ch – ochrona częściowa, V – zagrożone, ∗ – niezagrożone, E – bezpośrednio zagrożone, P – potencjalnie zagrożone, I – bardzo rzadki, II – rzadki, IV – częsty.

Species rare (category R) in Wielkopolska include: *Acer campestre*, *Cladium mariscus*, *Crataegus rhipidophylla* and *Populus nigra*, whereas *Eriophorum latifolium* is treated as a threatened (category V) species in this region.

From among the threatened category, potentially threatened – P (63%) and threatened V (26%) species are represented most numerously, whereas dying – E (5%), potentially threatened (PR) and extinct – Ex (2% each) as well as of uncertain threat – I and unthreatened N (1% each) constitute a much smaller proportion.

Dendroflora

Woody plants comprise 98 species making up 18.5% of the entire flora of the examined object and include 48 tree species, 46 bushes and 4 species which can assume either of these forms.

Fragments of stands with the species composition resembling most the natural composition are preserved, primarily, in a narrow strip along the Strzeszyn Lake coast. The most frequent trees there are broad-leaved trees associated with riparian communities and alder swamp forests. Majority of the stands growing in the examined site were planted on former farmland and their species composition, to a considerable extent was influenced by man and is strongly distorted. Two pioneering species: *Pinus sylvestris* and *Betula pendula* were introduced in regions with poor site conditions.

The most numerous species are connected with riparian land, alder swamp and oak-hornbeam forests which cover a considerable part of the ecological site. They include, among others: *Alnus glutinosa*, *Prunus padus*, *Sambucus nigra*, *Frangula alnus*, *Viburnum opulus*, *Acer pseudoplatanus*, *Quercus robur*, *Carpinus betulus*, *Tilia cordata* and *Acer campestre*.

Bushes found on the examined area usually grow in communities of mesophilic brushwood which most frequently are made up of: *Sambucus nigra*, *Prunus serotina*, *Frangula alnus*, *Viburnum opulus*, *Corylus avellana*, *Crataegus monogyna*, *C. rhipidophylla*, *Lonicera xylosteum*, *Rhamnus catharticus*, *Euonymus europaeus*, *Cornus sanquinea*, and less frequently of *Rosa canina* and *R. dumalis*, *Rubus plicatus*, *Prunus spinosa* and others. Bushes as well as short trees also occur in osier brushwood with *Salix cinerea*, *S. aurita* and *S. pentandra* as their characteristic species.

Among woody plants, common, very frequent and frequent species are relatively rare and their total proportion is about 21.4%. Very rare and rare taxons are dominant and make up 78.6%.

Alien woody plants make up a relatively high proportion (reaching 43.9%), whereas indigenous trees and bushes constitute 56.1%. The most popular alien species is the expansive *Prunus serotina* but *Cornus sericea*, *Quercus rubra* and *Larix decidua*, which does not occur in Wielkopolska naturally, is also fairly numerous.

Very intensive penetration of the examined area by tourists causes that there are many 'dragged' species here, primarily, 'fugitives' from gardens and parks. This group is represented, among others, by: *Aesculus hippocastanum*, *Acer pseudoplatanus* 'Purpurascens', *Ailanthus altissima*, *Amorpha fruticosa*, *Caragana arborescens*, *Cornus*

sericea, *Fagus sylvatica* f. *purpurea*, *Juglans regia*, *Malus domestica*, or *Syringa vulgaris*. The above-mentioned species usually grow singly or in small groups and, therefore, do not exert a significant influence on the character of dendroflora.

In all, 544 trees were qualified to the analysis of the breast height diameter structure. Tree breast height diameters were found quite varied ranging from 9 cm to 111 cm (Fig. 5). Breast height diameters of 303 trees were allocated to classes from 9 to 23 cm, 168 trees were 23 to 43 cm thick and the thickness of the remaining 73 trees exceeded 43 cm. Low frequency was observed among the thickest trees which ranged from 1 to 7 specimens. The exception was the tree thickness class from 85 to 87 cm in which 22 trees were found.

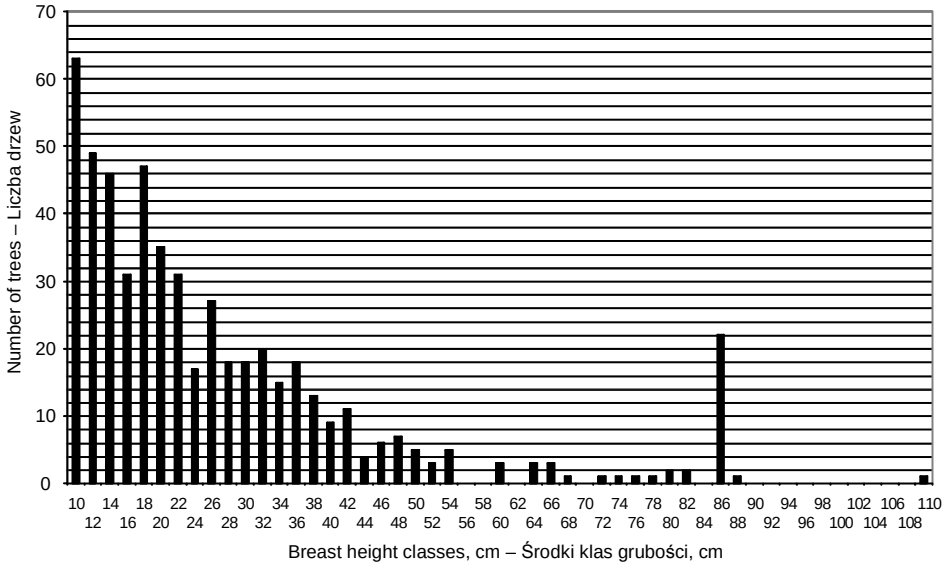

Fig. 5. The breast height structure of the trees defined on the basis of 15 trial areas
Rys. 5. Struktura pierśnic drzew przedstawiona na podstawie 15 powierzchni próbnych

The mean age of stands ranged from 50 to 55 years [Opis... 1992]. The youngest stands are a dozen years old, whereas the oldest ones with *Pinus sylvestris* are about 120 years old. The majority of stands in the examined site are 41 to 60 years of age (third age class) but stands of the second age class (20-40 years old) are also fairly frequent. Stands over 80 years of age are rare. The youngest, several-year old trees grow on plantations established in the south-western and western parts of the site.

The height of 76 trees was measured. The obtained results are very close to the data contained in the stand description from 1992. The mean height of measured trees was approximately 19 m with the smallest trees measuring 5-6 m and the tallest – 27 m. The most frequent heights of the trees growing on the examined ecological site ranged from 16 to 22 m.

Twelve trees with monumental or close to monumental circumferences were found (Table 2). Apart from the above-mentioned trees, there are 4 more specimens of trees

with monumental circumferences *Aesculus hippocastanum* (400 cm), *Betula pendula* (238 cm), and two trees *Populus* × *canadensis* (446, 430 cm), but unfortunately, because of their poor health condition, they cannot be shortlisted as monuments of nature. These trees require urgent sanitary treatment and care.

Table 2. The most valuable trees
Tabela 2. Najcenniejsze drzewa

No Lp.	Species name Nazwa gatunkowa	Circumference Obwód cm	Health condition's Stan zdrowotny
1	*Alnus glutinosa*	203*	5
2	*Alnus glutinosa*	190	**5**
3	***Alnus glutinosa***	242*	5
4	*Alnus glutinosa*	200*	5
5	*Alnus glutinosa*	225*	4
6	*Alnus glutinosa*	202*	4
7	***Populus nigra***	409*	5
8	*Prunus serotina*	148*	5
9	***Pyrus communis***	221	5
10	***Quercus robur***	292	5
11	*Tilia cordata*	277	5
12	***Tilia cordata***	343*	5

Bold fonts – trees proposed as nature monuments.
*Trees of monumental circumference.
Pogrubienie – drzewa proponowane do objęcia ochroną w formie pomnika przyrody.
*Drzewa o obwodzie pomnikowym.

Several young, splendid trees were found in the examined site which did not reach monumental circumferences yet, but which deserve fully appropriate protection because of their interesting form and very good health condition. This group of trees includes, among others: *Carpinus betulus* (146, 177 cm) and *Fagus sylvatica* (152 cm), several *Tilia platyphyllos* trees or several *Populus alba* trees (the thickest of them with 347 cm circumference and five others – over 250 cm).

A plot situated in the compartment 48r with its beautiful specimens of *Rhamnus catharticus* and *Crataegus monogyna* deserves particular attention and protection.

RECAPITULATION

In comparison with other natural objects situated within the confines of the city of Poznań, the Strzeszyn ecological site distinguishes itself by its floristic value as evi-

denced not only by the number of the described species but also by a significant proportion of legally protected plants as well as plants mentioned on all-country and regional lists of rare and threatened species. The diversified and rich flora of this object comprises 531 taxons of vascular plants which constitutes almost half of all vascular plants from the entire area of the city of Poznań mentioned by Jackowiak [1993].

The fragments of the examined site closest to natural and, hence, floristically most valuable are areas along the coastline of the Strzeszyn Lake of the *Fraxino-Alnetum* W. Mat (1952) and *Ribeso nigri-Alnetum* Sol.-Górn. (1975) 1987, as well as molinia meadows extending along the Bogdanka River in the north-eastern part of the ecological site. The site conditions found there provide optimal circumstances for the development of many valuable plant species. Twenty species of plants found on all-country and regional lists of disappearing and threatened plants occur on the examined area. Even though in the scale of the entire country or region, populations of the majority of them are not threatened, nevertheless their sites within the boundaries of the city are rather rare. The following species belong to the most valuable elements of the flora of the examined ecological site: *Dactylorchiza incarnata, Dianthus superbus, Epipactis palustris* and *Polypodium vulgare*.

Although the object situated within the confines of the city is heavily frequented by its inhabitants and is, therefore, under strong anthropo-pressure, its flora has so far managed to withstand human interference as confirmed by its species composition dominated by indigenous plant species. Obviously, this does not mean to say that natural floristic systems survived completely unaffected. Among domestic plant species, anthropophytes are nearly twice as numerous as spontaneophytes. A significant proportion of taxons of alien origin is also worrying of which two neophytes *Prunus seronina* and *Impatiens parviflora* are the 'most dangerous'. Man's negative impact is particularly conspicuous in the case of dendroflora. Numbers of tree and bush species of alien origin are nearly the same as those of indigenous species.

PROTECTION RECOMMENDATIONS

Prohibition of plant destruction and picking.

Ban on the introduction of alien plant species.

Appropriate formation of stand structure by the introduction into their composition of only indigenous species adapted to the site conditions prevailing on the area of the discussed ecological site. No species of alien origin should be introduced into cultivations (*Larix deciduas, L.* × *eurolepis, Fagus sylvatica* or *Quercus rubra*).

Whenever possible, gradual removal of trees and bushes of alien origin and their replacement by domestic species.

Encouragement of tree and bush species of mesophilic scrub forming the natural forest Bondary.

Leaving dead trees in the forest as they provide living environment for many plants and animals.

Protection of water and rushes associated with the Strzeszyn Lake and neighbouring ponds (especially *Cladium mariscus, Utricularia vulgaris, Nuphar lutea* and *Nymphea alba*). For this reason, it would be advisable to consider limiting the penetration of the

coasts of water reservoirs by anglers who pollute lakesides and trample the vegetation destroying or impairing plants.

Undertaking steps aiming at the preservation and protection of populations of rare and disappearing plant species. This can be achieved by: protection of communities in which the described species occur; periodical control of the condition of their population; introduction of the rarest species onto areas neighbouring with the ecological site; transfer of individual specimens to botanical or dendrological gardens where they could be reproduced and later on reintroduced into the ecological site.

Encouragement of the populations of rare and disappearing plant species by appropriate maintenance of water relations typical for riparian lands, alder swamp forests and wet meadows (primarily molinia meadows) which provide sanctuary for these plants. If these populations are to be maintained and developed, then these meadows cannot be allowed to dry and should be cut periodically.

Appropriate protection of sites and regular control of the condition of particularly valuable species which are represented on the examined area in one or two places and are equally rare in Poznań and in the region. This refers, in particular, to *Polypodium vulgare, Epipactis palustris* or *Dianthus superbus*. In the case of these species, their introduction into the neighbouring areas can be considered.

Protection of selected, most valuable trees of monumental character and splendid specimens. All necessary nursing and sanitary treatments should be carried out on these trees.

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ROŚLINY NACZYNIOWE UŻYTKU EKOLOGICZNEGO „STRZESZYN" W POZNANIU

Streszczenie. Na tle innych obiektów przyrodniczych położonych w granicach Poznania, użytek ekologiczny „Strzeszyn" wyróżnia się znacznymi walorami florystycznymi. Flora obiektu liczy 531 taksonów roślin naczyniowych z 91 rodzin i 296 rodzajów, w tym 20 gatunków umieszczonych na krajowych i regionalnych listach roślin ginących i zagrożonych. Do najcenniejszych elementów flory użytku należą *Dactylorchiza incarnata*, *Dianthus superbus*, *Epipactis palustris* i *Polypodium vulgare*. Rośnie tu 12 drzew o obwodach pomnikowych lub zbliżonych do pomnikowych i kilkanaście drzew okazałych.

Słowa kluczowe: rośliny naczyniowe, flora Poznania, Jezioro Strzeszyńskie

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