

THE VASCULAR PLANTS OF THE DARZYBÓR ECOLOGICAL SITE IN POZNAŃ

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Abstract. The Darzybór ecological site is a protected object which plays exceptionally important economical and recreational as well as ecological functions. Despite changes caused by anthropo-pressure, Darzybór belongs to objects distinguished for their remarkable floristic value. The total of 540 taxons of vascular plants, from 78 families and 282 genera grow here. It is one of the last refuges in the city giving shelter and protection to rare and endangered plant species, of which 12 are under legal protection and 8 are considered as threatened species in the region of Wielkopolska. 174 species can be found on red lists of which 166 are considered as species threatened for the city of Poznań. The total of 14 trees with monumental dimensions, 13 – with dimensions close to monumental and 60 trees described as ‘splendid’ trees were inventoried. Eleven most valuable trees were proposed to be placed under legal protection as nature monuments.

Key words: vascular plants, flora of Poznań, Darzybór

INTRODUCTION

Anthropo-pressure affects not only areas situated in the city centre but it also begins to exert a noticeable impact on areas situated relatively far from it, at the outskirts. Developing housing estates, industry and agriculture swallow up successive green enclaves making it increasingly urgent to put the most valuable natural objects under active protection. One of such areas is the Darzybór ecological site situated in the Michałowka river valley, the largest object of this type in Poznań. It was established in 1994 with the aim to protect well preserved fragments of mixed coniferous forests and meadow plants. A considerable distance from Poznań centre and rather poor transportation caused that until recently the area was not heavily frequented. At the present time, when new housing estates have been established in Nowa Wieś and Zalasewo, close to the discussed ecological site, the picturesque Darzybór has become an attractive place of rest and recreation for their inhabitants.

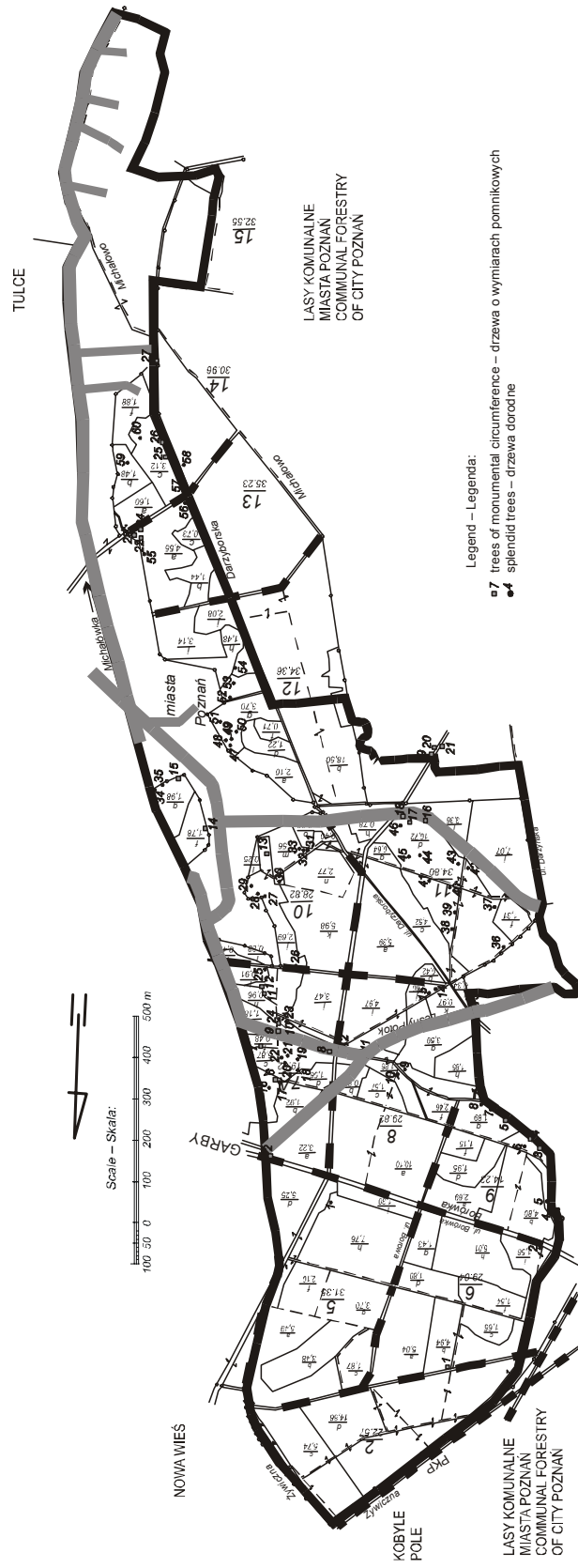


Fig. 1. Boundaries and waters of the Darzybór ecological site and the distribution of the most valuable trees
 Rys. 1. Granice użytku ekologicznego Darzybór oraz rozmieszczenie najcenniejszych drzew

The greatest amount of information concerning the flora of the Michałówka valley can be found in the Rudnicka [1963] study, in which 676 species of vascular plants and 64 mosses are mentioned. Earlier few floristic data from Darzybór or its neighbourhood were quoted by Ritschl [1850], Szafarkiewicz [according to Stecki and Pietkiewicz 1931] and Szulczewski [1951]. Investigations of meadow communities of the Michałówka valley were carried out by Szyda [1957], Gnus [1961] and Grynja [1962]. New and recent information about the flora of the Michałówka valley, including Darzybór, can be found in Jackowiak [1990, 1992, 1993] and Śliwa and Jackowiak [2002] publications.

The extent of changes in the flora of the Michałówka valley (Darzybór, Michałowo and Sławie) is well illustrated by a large number of extinct species as well as species which are not found anymore [Rudnicka 1963, Jackowiak 1992, 1993]. The first group include *Minuartia viscosa*, *Orchis coriophora*, *O. militaris*, *O. ustulata*, *Peucedanum cervaria*, *Salix ×staerkeana*, *Viola rupestris*, and the second one – *Agrimonia procera*, *Anthericum ramosum*, *Campanula trachelium*, *Cirsium acaule*, *Dactylorhiza majalis*, *Lathraea squamaria*, *Lepidium virginicum*, *Listera ovata*, *Minuartia viscosa*, *Platanthera bifolia*, *Polygonum mite*, *Potentilla alba*, *Ranunculus aquatilis*, *R. lanuginosus*, *Rhinanthus minor* and *Trifolium montanum*.

As the documentation of the Darzybór ecological site was incomplete, the main aim of the author was to conduct an inventory of its flora, and then to evaluate its floristic values, on the basis of the obtained data.

STUDY AREA

The Darzybór ecological site is situated in the south-eastern outskirts of the city of Poznań in the district and commune of Poznań. The object borders with villages Nowa Wieś, Zalasewo, Garby and Kleszczewo, situated in the Swarzędz and Tulce communes and occupies the area of 330 ha, of which about 300 ha constitute forests of the Babki Forest District and working circle [Raport... 1994, Plan... 1999]. The boundaries and waters of the site are presented on Figure 1. The surface waters which are situated within the confines of the examined object include: the Michałówka River and its 18 right-bank tributaries. In their majority, the above-mentioned tributaries flowing through the area of the ecological site are short drainage ditches dewatering meadows in the Michałówka valley which are dry during most parts of the year. Longer tributaries deserving mention are: Leśny Potok and Polny Rów rivers. A detailed description of Darzybór waters was prepared by Gołdyn in Wrońska-Pilarek et al. [2003].

METHODS

The floral inventory of the object was carried out in the period from March to October 2003. Names of plant species are given according to Mirek et al. [1995] and Seneta and Dolatowski [2004]. The floristic statistical characteristics was conducted using the Jackowiak [1993] and Żukowski et al. [1995] study. In relation to the last study, frequency classes of species occurrence were modified. So, the number of localities amounted to, respectively: I – very rare species (1-5), II – rare (6-10), III – frequent (11-

20), IV – very frequent (21-40), V – common (> 40). The classification of socio-ecological groups is given after Jackowiak [1993]. The “special care” species comprised: species under legal protection [Rozporządzenie... 2004], those placed on “red lists” – national [Lista roślin... 1992] and local (Wielkopolska region) [Ginące... 1995], as well as those threatened in the city of Poznań [Jackowiak 1993]. The classification of species according to the degree of hazard was adopted after Żukowski and Jackowiak [Ginące... 1995]. Also after Jackowiak [1993], potentially liable to danger (P) and potentially endangered (PR) species were added. In addition, ‘unthreatened’ and ‘not on the list’ (N) categories were added.

Seven test plots of 0.25 ha were established on the area of the ecological site with the aim to analyse the structure of breast height diameter. All trees with breast height diameter over 15 cm were analysed.

The inventory of the thickest trees involved the inspection of stands along a 50 m wide transect running from north to south in the sub-compartments of the entire object. These trees were assigned to the following three groups: trees with monumental diameters [according to Instrukcja... 1996, Ruciński 1998], trees with diameters close to monumental: 140-159 cm – *Pyrus communis*, 180-199 cm – *Carpinus betulus*, 200-219 cm – *Ulmus laevis*, *Betula pendula*, 200-224 cm – *Alnus glutinosa*, 220-249 cm – *Fraxinus excelsior*, 280-309 cm – *Quercus petraea*, 340-379 cm – *Q. robur*, *Populus* sp. (dead tree, species identification impossible) and splendid trees which distinguish themselves by remarkable dimensions or beautiful shape. The scale of health condition of trees was adopted after Kamiński and Czerniak [2000]. The approximate age of trees was determined on the basis of stand description from 1999.

RESULTS

Floral species composition and statistics

Within the boundaries of the Darzybór ecological site, 540 taxons of vascular plants derived from 78 families and 282 genera, including 5 pteridophytes, 8 coniferous species and 526 mono- and dicotyledonous species were found to occur. The families which are the richest in species are *Asteraceae*, *Poaceae*, *Rosaceae*, *Fabaceae*, *Caryophyllaceae*, *Lamiaceae*, *Cyperaceae*, *Apiaceae* and *Brassicaceae*, *Scrophulariaceae*, *Salicaceae*, *Polygonaceae*, *Ranunculaceae*. The total of 363 species derive from these 13 families which constitutes 67.2% of all the vascular plants occurring in the examined object. The number of species in individual families ranges from 1 to 64. The majority, i.e. 58 families, are represented by 1 to 5 species, of which 30 families are represented by only one species. There are 8 families from which more than 20 species derive.

The native flora is represented by 79.8% of all taxons, with apophytes outnumbering spontaneophytes. Alien species constitute 20.2% of the flora and in this group, archeophytes and kenophytes predominate over ephemeroxytes (Fig. 2). The flora of the examined site is dominated by very rare and rare species (84.2%), while frequent species make up only 10.9%. Very frequent and common species constitute only 4.8% of the flora (Fig. 3). Hemikryptophytes are the most numerous among living forms (41.9%), while fanerophytes (19.6%), terophytes (19.1%) and kryptophytes (14.1%) are fairly numerous with chamephytes (5.4%) being the least numerous.

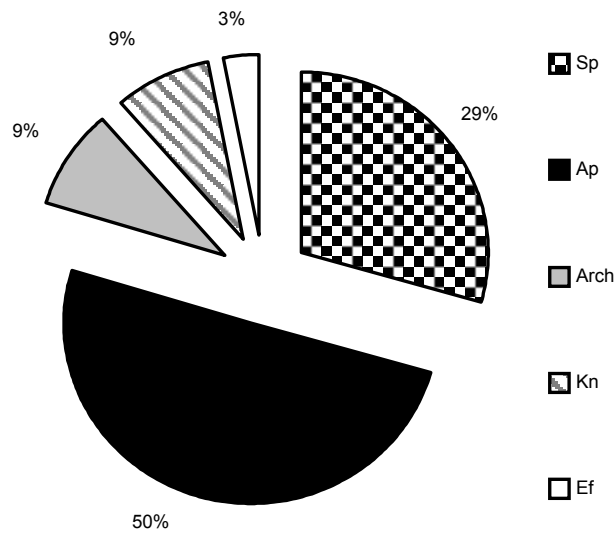


Fig. 2. Percentage participation of species in geographical-historical groups. Sp – spontaneophytes, Ap – apophytes, Arch – archeophytes, Kn – kenophytes, Ef – efemerophytes

Rys. 2. Procentowy udział gatunków w grupach geograficzno-histerycznych. Sp – spontaneofity, Ap – apofity, Arch – archeofity, Kn – kenofity, Ef – efemerofity

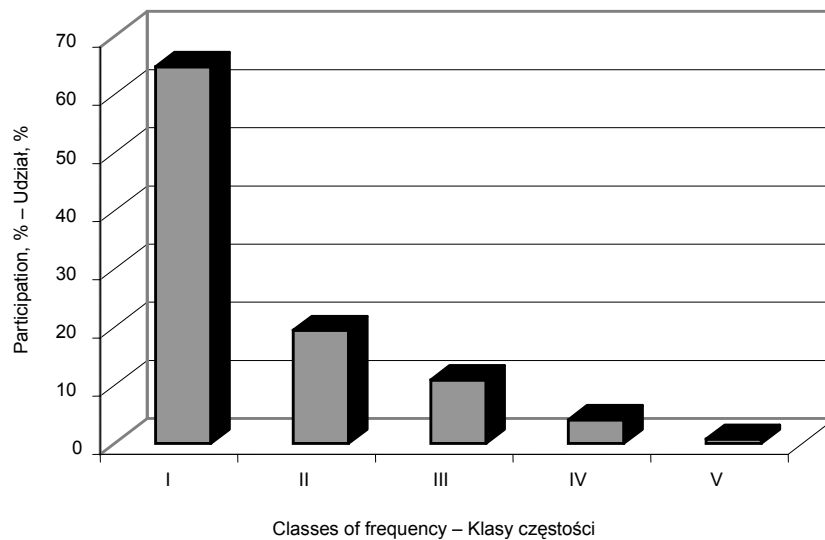


Fig. 3. Percentage participation of species in frequency classes. I – very rare, II – rare, III – frequent, IV – very frequent, V – common

Rys. 3. Procentowy udział gatunków w stopniach częstosci. I – bardzo rzadki, II – rzadki, III – częsty, IV – bardzo częsty, V – pospolity

The most numerous species on the floristic list of the examined area are plants of fertile broad-leaved forests and bush communities, acid mixed oak forests, mixed coniferous forests and post-clearing vicariant communities of meadows and pastures as well as fresh and moderately wet meadows. There are also numerous species associated with dry, sandy swards, riparian forests and thickets, rush communities as well as water, marshy alder forests, low, intermediate and high peats, wet meadows and herbaceous communities as well as thermophilic perennial ruderal communities. Terrestrial communities occurring on wet or moist sites as well as short-term, pioneering ruderal communities are the poorest with regard to the number of plant species (Fig. 4).

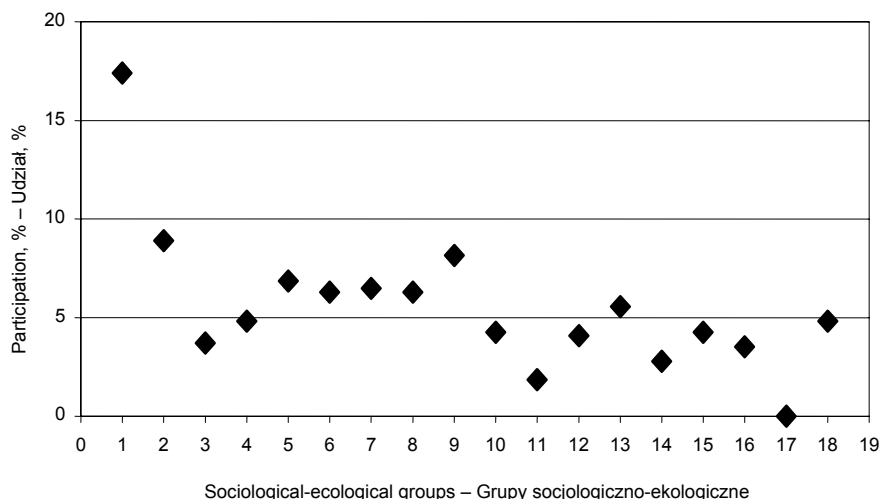


Fig. 4. Percentage participation of species in sociological-ecological groups [according to Jackowiak 1993]

Rys. 4. Procentowy udział gatunków w grupach socjologiczno-ekologicznych [według Jackowiaka 1993]

Rare and threatened species

The total of 174 “special care” species is found to grow within the confines of the Darzybór ecological site and most of them are plants from the list of species threatened for the city of Poznań (166). Twelve of them are under legal protection and 8 belong to plants threatened in the Wielkopolska region (Table 1). The distribution of plants under legal protection is shown on the map (Fig. 5).

More than half of the “special care” species belong to the group of plants potentially liable to danger (P), while endangered species (V) have a much lower share. Species representing the remaining categories make up a negligible proportion (Fig. 6). Most of the plants from this group (76%) occur in fewer than 5 locations, 16% – in 6 to 10 locations, 6% – in 11 to 20 locations while 2% of the described species is found in more than 20 locations.

Table 1. Legally protected species and rare and threatened species of Wielkopolska of the Darzybór ecological site

Tabela 1. Gatunki chronione oraz rzadkie i zagrożone w Wielkopolsce użytku ekologicznego Darzybór

Species name Nazwa gatunkowa	Raunkiaer's group Grupa Raunkiaera	Frequency Częstość	Category of threat Kategoria zagrożenia		Geographical-historical group Grupa historyczno-geograficzna	Sociological-ecological group Grupa socjologiczno-ekologiczna
			Poznań	Wielkopolska		
<i>Asarum europaeum</i> L.	H	III	V	–	Sp	1
<i>Convallaria majalis</i> L.	G	III	P1	–	Sp	2
<i>Dianthus carthusianorum</i> L.	C	I	–	–	Ap	5
<i>Dianthus deltooides</i> L.	C, H	I	–	–	Ap	5
<i>Epipactis helleborine</i> (L.) CRANTZ	G	I	–	*	Ap	1
<i>Frangula alnus</i> MILL.	N	IV	P1	*	Sp	6
<i>Hedera helix</i> L.	Ch, N	I	–	*	Ap	1
<i>Helichrysum arenarium</i> (L.) MOENCH	H	I	–	*	Ap	5
<i>Hepatica nobilis</i> Miller	H	I	V	–	Sp	1
<i>Primula veris</i> L.	H	I	V	–	Sp	4
<i>Ribes nigrum</i> L.	N	I	P1	–	Sp	6
<i>Viburnum opulus</i> L.	N	I	P1	–	Sp	1
<i>Acer campestre</i> L.	M	II	–	R	Ap	1
<i>Carex distycha</i> HUDS.	G	I	V	V	Sp	6
<i>Corydalis intermedia</i> (L.) MÉRAT	G	I	V	R	Sp	1
<i>Crataegus rhipidophylla</i> GAND.	N	I	I	R	Sp	1
<i>Lathyrus palustris</i> L.	H	I	V	V	Sp	8
<i>Populus nigra</i> L.	M	I	–	R	Ap	7
<i>Rubus seebergensis</i> PFUHL ex SPRIB.	N	I	–	R	Sp	2
<i>Silaum silaus</i> (L.) SCHINZ & THELL.	H	I	P1	V	Sp	8

Bold fonts – legally protected species.

Pogrubienie – gatunki objęte ochroną prawną.

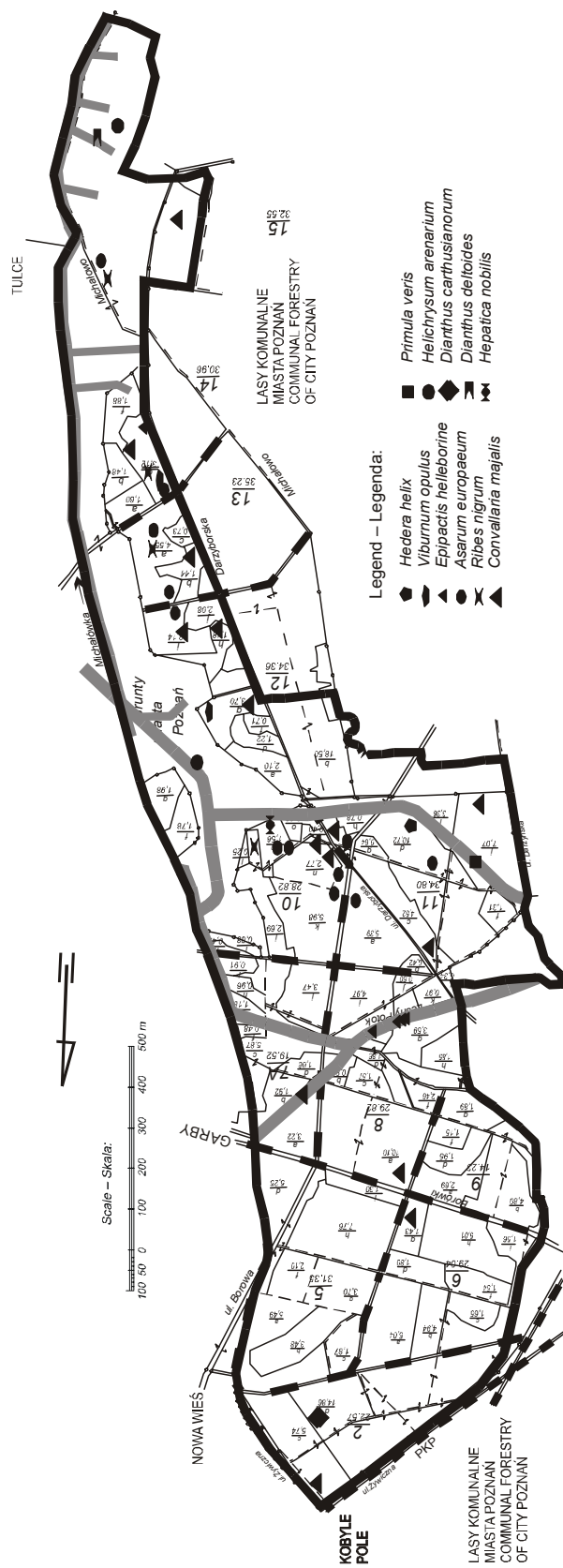


Fig. 5. Distribution of legally protected species
Rys. 5. Rozmieszczenie gatunków objętych ochroną prawną

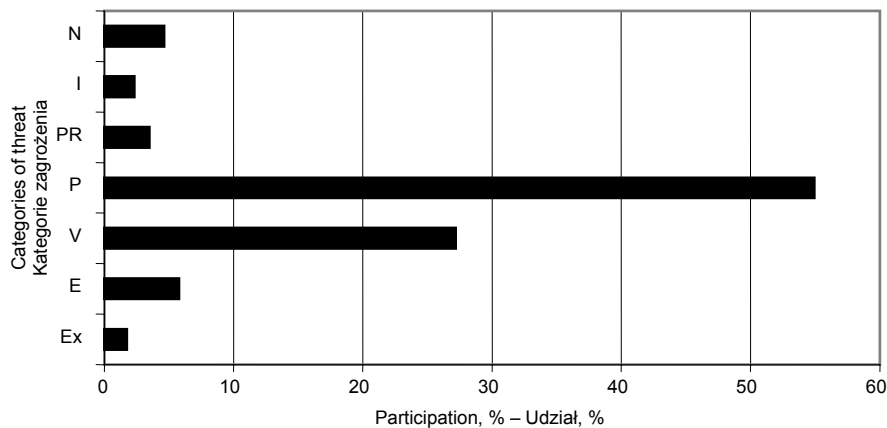


Fig. 6. Percentage participation of rare and endangered species in the categories of threat. Ex – extinct-missing, E – dying out, V – endangered, P – potentially liable to danger, PR – potentially endangered, I – endangered uncertain, N – unthreatened

Rys. 6. Procentowy udział gatunków rzadkich i zagrożonych w kategoriach zagrożenia. Ex – wymarłe, E – wymierające, V – zagrożone, P – potencjalnie narażone, PR – potencjalnie zagrożone, I – zagrożone niepewne, N – niezagrożone

Dendroflora

Dendroflora of the Darzybór ecological site comprises 110 taxons, which make up 20.4% of all vascular plants of the examined object, of which 53 taxons are trees, 46 (41.8%) – bushes, 6 (5.5%) – plant which have both types of growth, 4 (3.6%) – dwarf shrubs and low bushes and 1 (0.9%) – climbers [Wrońska-Pilarek and Stasik in Wrońska-Pilarek et al. 2003].

The examined area is dominated by pine stands, whereas stands growing on fertile sites of broad-leaved forests occupy a significantly smaller territory. Fragments of stands with the species composition most similar to the natural one can be found in sub-compartments 5 h, 7Ac, 9 g, 10 j m, 11 d, 12 a, g, 14 c and 15 a. *Pinus sylvestris* introduced on former farmsite is the dominant species in stands growing in the Darzybór and it is accompanied by, less frequently *Betula pendula* and *Populus tremula*. Also *Prunus serotina* and *Robinia pseudoacacia*, derived from North America, occur in many places. Species associated with the dynamic group of oak-hornbeam as well as riparian and alder forests are found to occur on the fertile sites of broad-leaved forests. They include, among others: *Quercus robur*, *Q. petraea*, *Acer platanoides*, *A. pseudoplatanus*, *Carpinus betulus*, *Tilia cordata*, *Ulmus laevis*, *Alnus glutinosa*, *Fraxinus excelsior* and less frequently *Populus alba*, *P. nigra*, *Acer campestre*, *Prunus padus*. As for the bush layer, the most frequent plants are *Sambucus nigra*, *Amelanchier spicata* (from North America), *Frangula alnus*, *Rubus idaeus*, *Sorbus aucuparia* and *Corylus avellana*. *Crataegus monogyna*, *Euonymus europaeus*, *Ribes uva-crispa*, *Rosa canina*, *Rubus plicatus*, *Salix cinerea* and *S. purpurea* can also be found fairly frequently, with *Prunus spinosa*, *Ribes nigrum*, *Viburnum opulus* occurring sporadically.

Introduced species constitute 35.5% of the dendroflora of the examined object (of which 25.5% are kenophytes and 10% – ephemerophytes. Rapidly expanding species

derived from North America, *Prunus serotina*, *Amelanchier spicata*, *Robinia pseudoacacia*, *Quercus rubra* and *Acer negundo*, are dominant. *Pinus rigida*, *P. strobes*, *P. banksiana*, *Fraxinus pennsylvanica*, *Aesculus hippocastanum*, *Juglans regia*, *Prunus cerasifera* and *P. mahaleb* can be found growing singly or in small groups. Other alien species growing outside their natural boundaries include *Fagus sylvatica*, *Larix decidua*, *Picea abies* or *Tilia platyphyllos*.

The average age of stands is 60-70 years, with the youngest ones a few years old and the oldest – 150 years old. The most numerous stands belong to the medium age class. Young and fairly old stands – up to 120 years of age – are quite numerous. The rarest are old stands, more than 121-160 years old. The height of trees ranges from 15 to 25 m (79.8%), with the average height being 18 m. Trees measuring 5.1-15 m are much less frequent (14.9%). The lowest (0.1-5 m – 4.4%) and the highest height classes (25.1-30 m – 0.9%) are represented by very few trees. The total number of 757 trees was qualified for the structure analysis of the breast height diameter. Their breast height diameters ranged from 15 to 68 cm, with 16.1-22 cm and 24.1-36.0 cm being the most frequent ones. The frequency of the thickest trees is small and decreases proportionally to the increase of diameter (Fig. 7).

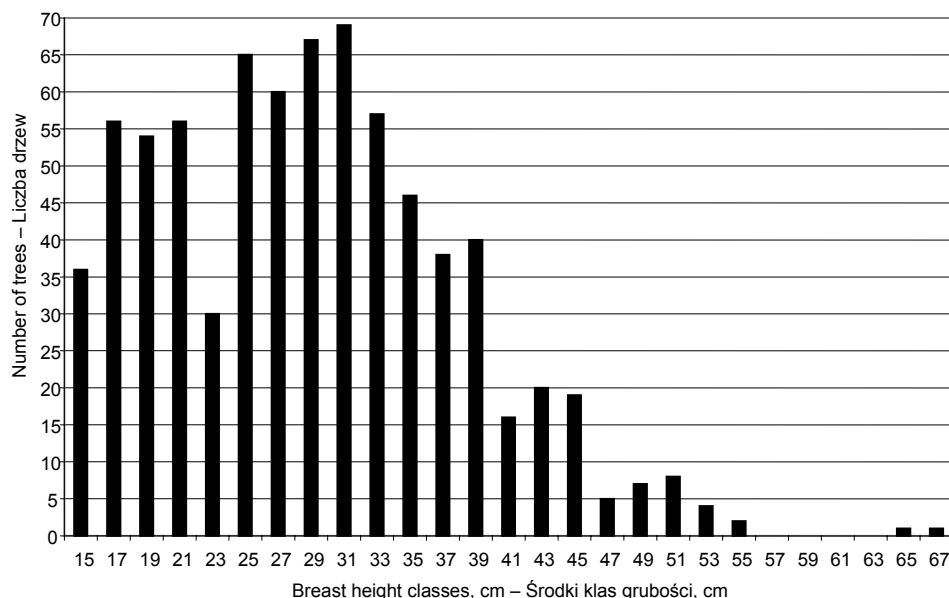


Fig. 7. Breast height diameter structure of trees defined on the basis of 7 trial areas

Rys. 7. Struktura pierśnic drzew przedstawiona na podstawie 7 powierzchni próbnych

Within the confines of the examined object, the authors found 4 species of arborescent plants under legal protection, 8 species from the red list for Wielkopolska (Table 1), x as well as 22 plants from the list of species considered rare and endangered for the city of Poznań.

The performed inventory identified 14 trees of monumental dimensions, 13 – with dimensions close to monumental and 60 magnificent trees (Table 2, Fig. 1). Trees considered

Table 2. Trees of monumental circumference and trees with circumference close to monumental of the Darzybór ecological site

Tabela 2. Drzewa o obwodach pomnikowych i zbliżonych do pomnikowych użytku ekologicznego Darzybór

No on map Nr na mapie	Subcompartment Pododdział	Species name Nazwa gatunkowa	Circumference Obwód cm	Health condition Stan zdrowotny
24	13 a	<i>Alnus glutinosa</i> (L.) GAERTN.*	239	5
12	7A c	<i>Alnus glutinosa</i> (L.) GAERTN.	214	5
22	13 a	<i>Alnus glutinosa</i> (L.) GAERTN.	206	5
23	13 a	<i>Alnus glutinosa</i> (L.) GAERTN.	202	5
11	7A c	<i>Alnus glutinosa</i> (L.) GAERTN.	200	5
27	14 d	<i>Betula pendula</i> ROTH	213	5
17	11 d	<i>Carpinus betulus</i> L.	181	5
3	9 c	<i>Crataegus monogyna</i> JACQ.*	138	5
16	11 d	<i>Fraxinus excelsior</i> L.*	290	5
9	7A c	<i>Fraxinus excelsior</i> L.*	278	4
10	7A c	<i>Fraxinus excelsior</i> L.*	264	3
26	14 c	<i>Fraxinus excelsior</i> L.*	260	5
21	Borowa Str.	<i>Fraxinus excelsior</i> L.	239	3
7	7A c	<i>Malus domestica</i> BORKH*	145	5
25	14 c	<i>Padus serotina</i> EHRH.*	116	5
2	7A c	<i>Populus</i> sp.	355	0
18	11 d	<i>Prunus avium</i> (L.) L.*	190	4
14	10 f	<i>Prunus avium</i> (L.) L.*	150	4
19	Borowa Str.	<i>Pyrus communis</i> L.*	161	5
20	Borowa Str.	<i>Pyrus communis</i> L.	155	5
1	6 b	<i>Quercus petraea</i> (MATT.) LIEBL.	292	5
15	10 g	<i>Quercus robur</i> L.*	382	5
13	10 j	<i>Quercus robur</i> L.	357	2
6	7A c	<i>Quercus robur</i> L.	342	5
5	9 c	<i>Quercus robur</i> L.	340	3
4	9 c	<i>Salix fragilis</i> L.*	438	1
8	7A c	<i>Ulmus laevis</i> PALL*	229	4

*Trees of monumental circumference, bold fonts – trees proposed as nature monuments.

*Drzewa o wymiarach pomnikowych, pogrubienie – drzewa proponowane do objęcia ochroną pomnikową.

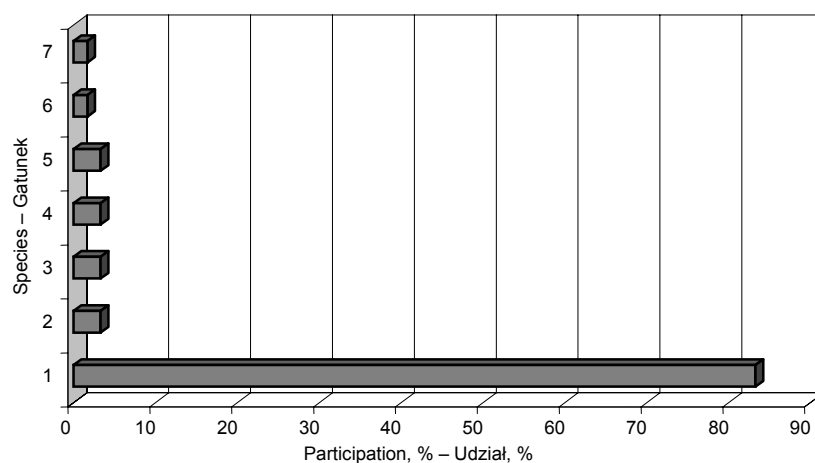


Fig. 8. Splendid trees of the Darzybór ecological site. 1 – *Quercus robur*, 2 – *Alnus glutinosa*, 3 – *Fraxinus excelsior*, 4 – *Picea abies*, 5 – *Ulmus laevis*, 6 – *Pinus sylvestris*, 7 – *Robinia pseudoacacia*

Rys. 8. Drzewa okazałe użytku ekologicznego Darzybór. 1 – *Quercus robur*, 2 – *Alnus glutinosa*, 3 – *Fraxinus excelsior*, 4 – *Picea abies*, 5 – *Ulmus laevis*, 6 – *Pinus sylvestris*, 7 – *Robinia pseudoacacia*

as monumental or close to monumental usually attain dimensions of *Fraxinus excelsior*, *Quercus robur* and *Alnus glutinosa*. Eleven of the most valuable trees were selected to be placed under legal protection. The thickest trees identified in the Darzybór ecological site comprise: a dying *Salix fragilis* with 438 cm in circumference, *Q. robur* of 382 cm circumference and a dead poplar tree which is impossible to identify with 355 cm in circumference. Magnificent trees include primarily *Q. robur*. The share of the remaining species is negligible (Fig. 8).

SUMMARY AND PROTECTION RECOMENDATIONS

The Darzybór ecological site is a protected object which fulfills exceptionally important economical and recreational as well as ecological functions. It is one of the major enclaves of greenery in this part of Poznań with outstanding natural value in which many precious, disappearing and threatened plant species can still be found and where some of them can find their last refuge within the boundaries of the city.

One of the basic issues associated with the protection of the flora and vegetation in the Darzybór ecological site is the advanced degeneration process of the majority of its phytocoenoses caused by the applied forest and agricultural management systems and changes in the habitat properties resulting from the lowering of ground waters. Still another form of synanthropisation of flora, at the present time very important, is recreation. Such factors as sward trampling, fragmentation of phytocoenoses in the result of the development of a dense network of roads and paths or accidental sowing of frequently undesirable plant species by drivers, ramblers or cyclists all contribute to the deformation of the native flora. This becomes evident in the advantage of apophytes over

spontaneophytes, considerable share of plants of foreign origin, expansion of neophytes, disappearance of valuable plant species (following changes in water relations, soil degradation or cutting mature stands, frequently employing clear-cutting), presence of numerous forest monocultures (primarily pine) as well as the incorrect species composition of part of the stands and plantations.

In order to guarantee appropriate protection for the flora of the examined area, it appears necessary:

1. To introduce a ban on the destruction of plants and introduction of foreign plant species.

2. To recommend populations of species of "special care" by protecting communities in which they occur and periodical control of the state of their population.

3. To create proper target species composition of stands and plantations by the introduction of native species adjusted to habitat conditions prevailing in the ecological site and divided into: recommended species – appropriate for the accepted forest type; tolerated – ecologically alien and planned for elimination – geographically alien, especially from the group of invasive neophytes (*Prunus serotina*, *Amelanchier spicata*, *Robinia pseudoacacia* – in the first place).

4. To protect the few remaining old forests.

5. To place 11 specific, most valuable trees of monumental character under protection, not to cut trees with dimension similar to monumental trees as well as magnificent trees of *Quercus robur* with the circumference over 300 cm and *Pinus sylvestris* trees growing in the 5h compartment.

6. Not to remove dead trees from the forest as they provide food and shelter for many organisms.

7. To recommend and, if possible, introduce trees and bushes of the mesophyllic brushwood forming the natural forest boundary.

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ROŚLINY NACZYNIOWE UŻYTKU EKOLOGICZNEGO DARZYBÓR W POZNANIU

Streszczenie. Użytek ekologiczny Darzybór jest obiektem chronionym, pełniącym niezwykle ważne funkcje gospodarcze i rekreacyjne, a także ekologiczne. Pomimo zmian spowodowanych antropopresją, Darzybór należy do obiektów wyróżniających się znacznymi walorami florystycznymi. Rośnie tu 540 taksonów roślin naczyniowych z 78 rodzin i 282 rodzajów. Użytek jest jedną z ostatnich w mieście ostoi rzadkich i zagrożonych gatunków roślin. 12 gatunków podlega ochronie prawnej, a 8 należy do zagrożonych w Wielkopolsce. Na czerwonych listach znajdują się 174 gatunki, w tym 166 na liście roślin zagrożonych dla miasta Poznania. Zinventaryzowano 14 drzew o wymiarach pomnikowych, 13 o wymiarach zbliżonych do pomnikowych oraz 60 „okazałych”. 11 najcenniejszych drzew wytypowano do objęcia ochroną prawną w formie pomników przyrody.

Słowa kluczowe: rośliny naczyniowe, flora Poznania, Darzybór

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