TREES WITH MONUMENTAL DIMENSIONS IN THE SOUTH-WESTERN PART OF THE POZNAŃ AGGLOMERATION

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(Received: November 30, 2017. Accepted: December 21, 2017)

ABSTRACT. The research was carried out within three forest-park complexes located in the south-western part of the Poznań city, which once had the status of ecological uses. The aim of the work was to inventory a dendroflora for the selection of trees with monumental dimensions. In addition, changes in the participation of monumental trees in local vegetation over the last 12 years had been analysed. During the current inventory, 58 monumental specimens were recorded in three afforestation complexes. Most of them grew at Leszczyńska street (31 specimens), and the least at Tyniecka street (6). Since 2004 tree trunk perimeters had increased on average of 18.5 cm. All activities, including conservation works, undertaken in the three described afforestation complexes, or in the immediate vicinity, should lead to the preservation of these objects, their protection against devastation and to expose their most valuable fragments.

KEY WORDS: dendroflora, tree monuments, urban greenery, Poznań

INTRODUCTION

In the south-western part of Poznań city, in the valley of Junikowski stream, there is an area of closed excavations of the former Poznań clay mines. Clay exploitation was carried out for the needs of local brickworks from the late nineteenth century up to the seventies of the last century (KANIECKI et al. 1993). The natural habitats occurring here have been subjected to far-reaching degradation. However, this area until now has been a habitat of rare plant and animal species (JACKOWIAK 1995, LUDWICZAK 1995, KLUZA-WIELOCH et al. 2006, WROŃSKA-PILAREK et al. 2016a).

Due to its natural values, the area from 1994 to 2000 was under the legal protection and two ecological uses ("Kopanina I" – 58 ha and "Kopanina II" – 68 ha), were established (KLUZA-WIELOCH et al. 2006). Currently efforts are being made to restore this form of nature protection, based on the floristic and faunistic studies, updated in 2016 (WROŃSKA-PILAREK et al.

2016a). This area characterised by a high environmental and geomorphological diversity has been interested in scientists for many years. Flora and fauna researches were studied here, among others: URBAŃSKI (1930), RAFALSKI & URBAŃSKI (1932), DZIABASZEWSKI (1962), OLEJNICZAK & SZELĄG (1980), RUDAWSKI & KUSIAK (1994), BURCHARDT & SZELĄG-WASILEWSKA (1995), PTASZYK (1995, 2003), KLUZA & MACIEJEWSKA (1998, 1999), KRÓL et al. (1998), KLUZA et al. (1999), WŁOSIK-BIEŃCZAK (2000a, b), PTASZYK et al. (2002), ŚMIEŁOWSKI & DZIĘCIOŁOWSKI (2002), MACIEJEWSKA-RUTKOWSKA et al. (2008), KLUZA-WIELOCH & MACIEJEWSKA-RUTKOWSKA (2009, 2010, 2015), MACIEJEWSKA-RUTKOWSKA & KLUZA-WIELOCH (2014).

The area is rather wet but also includes three forest-park complexes. The aim of the research was to carry out an up-to-date inventory of trees with monumental dimensions in the area described above and to compare current results with previous data (KLUZA-WIELOCH & MACIEJEWSKA-RUTKOWSKA 2008).

METHODS

There are three afforestation complexes on the area of former ecological uses „Kopanina I” and „Kopanina II” located in the south-western part of Poznań (Fig. 1). Currently they have a nature of forest parks. The first one is located at Wykopy street, within the former use „Kopanina I” and covers an area of about 3.5 ha. The other two are located on the former use „Kopanina II”. Smaller, with an area of about 1 ha, is located near Tyniecka street, and a larger one, with an area of about 6 ha at Leszczyńska street.

Research on trees with monumental dimensions was made in 2004 and 2016. The trunk perimeters were measured at breast height (130 cm). A tape measure of 10 m was used for the measurements. The qualification of the individual trees was made on the basis of tables containing the values of the lower perimeter limits, classifying them as monumental trees (PIETRZAK-ZAWADKA 2015). In 2016 the health condition of trees was also determined, and their exact geographical location was given by means of GPS (Table 1). A modified tree health scale was used, originally developed by PACYNIAK & SMÓLSKI (1973),

where respectively: 0 – means dying specimens, 1 – trees with more than 75% dead crown, 2 – specimens with more than a half dead crown, 3 – specimens having at least 25% dead crown and largely attacked by pests, 4 – trees with partially dying thinner branches in the upper part of the crown, with the presence of few plant or animal pests, 5 – completely healthy trees, without any losses in crown or presence of pests. Trunk growths for individual trees over the last 12 years were calculated, including their average as well as minimum and maximum values. The three examined objects were also compared according to the species and numerical composition of trees with monumental dimensions. Species names were given according to MIREK et al. (2002).

RESULTS

The results of field studies are summarised in Table 1. The comparison of the species and numerical composition of trees with monumental dimensions among the three examined objects appears that the most such specimens are currently located in the afforestation at Leszczyńska street, and the least

Fig. 1. The area of former ecological uses: 1 – „Kopanina I” with afforestation at Wykopy street; 2, 3 – „Kopanina II” with afforestations at Tyniecka street and Leszczyńska street. The map was made by Andrzej Batycki, based on underley obtained from the Geopoz company

Table 1. List of trees with monument dimensions within the former ecological uses "Kopanina I" and "Kopanina II" in comparison with data from the literature (inventory works made 26–30.09.2016)

No	Species	Family	Perimeter at the height of 1.3 m (cm)		Health condition (0–5)	Geographical localization
			2004	2016		
Kopanina I – Wykopy street						
1	<i>Acer platanoides</i>	Aceraceae	224*	236	5	N 52°22'20.7" E 16°51'02.5"
2	<i>Acer platanoides</i>	Aceraceae	249	267	5	N 52°22'20.7" E 16°51'02.7"
3	<i>Acer platanoides</i>	Aceraceae	225*	240	5	N 52°22'20.8" E 16°51'02.1"
4	<i>Acer platanoides</i>	Aceraceae	239	254	4	N 52°22'20.8" E 16°51'01.0"
5	<i>Acer platanoides</i>	Aceraceae	252	274	5	N 52°22'21.2" E 16°51'01.0"
6	<i>Acer saccharinum</i>	Aceraceae	273	289	4	N 52°22'24.0" E 16°51'06.7"
7	<i>Aesculus hippocastanum</i>	Hippocastanaceae	330	–	–	–
8	<i>Alnus glutinosa</i>	Betulaceae	225	–	–	–
9	<i>Alnus glutinosa</i>	Betulaceae	320	–	–	–
10	<i>Alnus glutinosa</i>	Betulaceae	234	–	–	–
11	<i>Fraxinus excelsior</i>	Oleaceae	366	392	5	N 52°22'20.0" E 16°51'03.8"
12	<i>Juglans regia</i>	Juglandaceae	213	234	3	N 52°22'18.1" E 16°51'04.3"
13	<i>Juglans regia</i>	Juglandaceae	210	–	–	–
14	<i>Populus ×canadensis</i>	Salicaceae	400	412	3	N 52°22'20.7" E 16°50'59.9"
15	<i>Populus ×canadensis</i>	Salicaceae	415	423	3	N 52°22'23.6" E 16°51'06.6"
16	<i>Populus ×canadensis</i>	Salicaceae	376*	403	3	N 52°22'19.3" E 16°51'08.4"
17	<i>Populus ×canadensis</i>	Salicaceae	440	–	–	–
18	<i>Salix alba</i>	Salicaceae	394	462	2	N 52°22'20.9" E 16°51'00.1"
19	<i>Ulmus laevis</i>	Ulmaceae	275	293	4	N 52°22'20.7" E 16°51'02.2"
20	<i>Ulmus laevis</i>	Ulmaceae	275	301	4	N 52°22'19.0" E 16°51'02.1"
21	<i>Ulmus laevis</i>	Ulmaceae	311	335	5	N 52°22'17.3" E 16°51'05.8"
22	<i>Ulmus laevis</i>	Ulmaceae	264	308	4	N 52°22'17.8" E 16°51'03.1"
23	<i>Ulmus laevis</i>	Ulmaceae	225	257	4	N 52°22'18.3" E 16°51'02.2"
24	<i>Ulmus laevis</i>	Ulmaceae	230	252	4	N 52°22'17.4" E 16°51'06.0"
25	<i>Ulmus laevis</i>	Ulmaceae	250	272	4	N 52°22'17.3" E 16°51'06.0"
27	<i>Ulmus laevis</i>	Ulmaceae	223*	245	4	N 52°22'22.7" E 16°51'04.8"
28	<i>Ulmus laevis</i>	Ulmaceae	–	272	4	N 52°22'20.8" E 16°51'01.7"
29	<i>Ulmus laevis</i>	Ulmaceae	440	–	–	–
30	<i>Ulmus laevis</i>	Ulmaceae	325	–	–	–
Kopanina II – Tyniecka street						
1	<i>Acer platanoides</i>	Aceraceae	240	258	4	N 52°21'38.0" E 16°51'49.8"
2	<i>Acer platanoides</i>	Aceraceae	227*	235	5	N 52°21'38.2" E 16°51'49.7"
3	<i>Acer platanoides</i>	Aceraceae	234*	255	5	N 52°21'38.0" E 16°51'50.1"
4	<i>Acer platanoides</i>	Aceraceae	228*	236	5	N 52°21'35.5" E 16°51'48.4"
5	<i>Acer platanoides</i>	Aceraceae	240	256	5	N 52°21'35.5" E 16°51'48.7"
6	<i>Acer platanoides</i>	Aceraceae	226*	232	5	N 52°21'36.6" E 16°51'47.1"
7	<i>Fraxinus excelsior</i>	Oleaceae	250	–	–	–
8	<i>Salix alba</i>	Salicaceae	230	–	–	–
Kopanina II – Leszczyńska street						
1	<i>Acer saccharinum</i>	Aceraceae	333	341	4	N 52°21'39.4" E 16°52'37.1"
2	<i>Acer saccharinum</i>	Aceraceae	234*	250	4	N 52°21'42.3" E 16°52'38.8"
3	<i>Acer saccharinum</i>	Aceraceae	293	300	4	N 52°21'43.0" E 16°52'38.1"
4	<i>Acer saccharinum</i>	Aceraceae	331	345	4	N 52°21'41.5" E 16°52'38.2"
5	<i>Acer saccharinum</i>	Aceraceae	295	336	4	N 52°21'40.0" E 16°52'37.4"
6	<i>Acer saccharinum</i>	Aceraceae	328	340	4	N 52°21'39.4" E 16°52'37.1"
7	<i>Acer saccharinum</i>	Aceraceae	312	324	4	N 52°21'40.7" E 16°52'37.5"
8	<i>Acer negundo</i>	Aceraceae	298	327	4	N 52°21'37.3" E 16°52'35.5"
9	<i>Acer negundo</i>	Aceraceae	290	–	–	–
10	<i>Acer negundo</i>	Aceraceae	287	–	–	–
11	<i>Acer platanoides</i>	Aceraceae	285	–	–	–
12	<i>Acer pseudoplatanus</i>	Aceraceae	284	300	5	N 52°21'39.7" E 16°52'38.7"
13	<i>Acer pseudoplatanus</i>	Aceraceae	280	298	5	N 52°21'41.1" E 16°52'38.3"

No	Species	Family	Perimeter at the height of 1.3 m (cm)		Health condition (0–5)	Geographical localization
			2004	2016		
14	<i>Acer pseudoplatanus</i>	Aceraceae	236	–	–	–
15	<i>Alnus glutinosa</i>	Betulaceae	240	250	4	N 52°21'38.8" E 16°52'36.4"
16	<i>Alnus glutinosa</i>	Betulaceae	248	264	4	N 52°21'38.1" E 16°52'24.2"
17	<i>Alnus glutinosa</i>	Betulaceae	253	–	–	–
18	<i>Alnus glutinosa</i>	Betulaceae	260	–	–	–
19	<i>Betula pendula</i>	Betulaceae	188*	202	4	N 52°21'42.2" E 16°52'31.7"
20	<i>Fagus sylvatica</i>	Fagaceae	235	256	5	N 52°21'40.3" E 16°52'36.5"
21	<i>Fraxinus excelsior</i>	Oleaceae	262	278	5	N 52°21'43.4" E 16°52'32.6"
22	<i>Fraxinus excelsior</i>	Oleaceae	239*	252	4	N 52°21'42.5" E 16°52'32.3"
23	<i>Fraxinus excelsior</i>	Oleaceae	–	327	5	N 52°21'37.3" E 16°52'35.5"
24	<i>Fraxinus excelsior</i>	Oleaceae	–	330	5	N 52°21'37.6" E 16°52'35.7"
25	<i>Pinus sylvestris</i>	Pinaceae	180	–	–	–
26	<i>Populus ×canadensis</i>	Salicaceae	391*	406	4	N 52°21'41.2" E 16°52'31.3"
27	<i>Populus ×canadensis</i>	Salicaceae	392*	408	3	N 52°21'41.3" E 16°52'31.2"
28	<i>Populus ×canadensis</i>	Salicaceae	383*	401	4	N 52°21'41.1" E 16°52'31.6"
29	<i>Populus ×canadensis</i>	Salicaceae	403	411	3	N 52°21'41.9" E 16°52'33.4"
30	<i>Populus ×canadensis</i>	Salicaceae	539	–	–	–
31	<i>Populus ×canadensis</i>	Salicaceae	417	–	–	–
32	<i>Populus ×canadensis</i>	Salicaceae	412	–	–	–
33	<i>Populus ×canadensis</i>	Salicaceae	445	–	–	–
34	<i>Salix alba</i>	Salicaceae	308	335	3	N 52°21'39.1" E 16°52'37.1"
35	<i>Salix alba</i>	Salicaceae	304	318	4	N 52°21'33.3" E 16°52'38.8"
36	<i>Salix alba</i>	Salicaceae	340	356	3	N 52°21'39.1" E 16°52'37.9"
37	<i>Salix alba</i>	Salicaceae	385	401	3	N 52°21'42.5" E 16°52'38.8"
38	<i>Salix alba</i>	Salicaceae	390	404	4	N 52°21'44.0" E 16°52'40.2"
39	<i>Salix alba</i>	Salicaceae	430	–	–	–
40	<i>Salix alba</i>	Salicaceae	335	–	–	–
41	<i>Salix alba</i>	Salicaceae	330	–	–	–
42	<i>Salix alba</i>	Salicaceae	514	–	–	–
43	<i>Salix alba</i>	Salicaceae	430	–	–	–
44	<i>Salix alba</i>	Salicaceae	325	–	–	–
45	<i>Salix alba</i>	Salicaceae	305	–	–	–
46	<i>Salix alba</i>	Salicaceae	335	–	–	–
47	<i>Salix alba</i>	Salicaceae	307	–	–	–
48	<i>Salix alba</i>	Salicaceae	346	–	–	–
49	<i>Ulmus minor</i>	Ulmaceae	230	248	4	N 52°21'39.8" E 16°52'35.1"
50	<i>Ulmus minor</i>	Ulmaceae	232	250	4	N 52°21'42.0" E 16°52'31.3"
51	<i>Ulmus minor</i>	Ulmaceae	224*	240	4	N 52°21'38.8" E 16°52'36.4"
52	<i>Ulmus minor</i>	Ulmaceae	215*	229	4	N 52°21'41.5" E 16°52'29.6"

* A tree that did not reach monumental dimensions in 2004.

– Trees that did not survive until 2016 were also given.

at Tyniecka street. Compared to the research from 2004, when a total of 66 monumental trees were recorded, at present 58 were found.

Compared to 2004, within the afforestation at Wykopy street, seven trees with monumental dimensions disappeared. Currently, there were no three black alder trees, two elm trees and one chestnut tree and one black walnut tree. While in 2016 five trees were noted, that were not included in the previous inventory and had recently reached the appropriate dimensions of their breast height. These were two common maples and one Canadian poplar and one white elm. During the current inventory, 21 trees with monumental dimensions grew on this studied

area. They belonged to seven species of six genera. White elms were one of the most frequently found within magnificent trees at Wykopy street.

Currently there are six trees of common maple with monumental dimensions in the afforestation at Tyniecka street. Four of them at the previous inventory have not yet reached monumental dimensions. In 2004, only four monumental trees were recorded in this area, two of which (European ash and white willow) have not survived to the present.

During current inventory within the object at Leszczyńska street 31 trees with monumental dimensions were described. They belonged to 10 species of seven genera. Compared to the previous

inventory (2004) 21 trees with monumental dimensions, including 10 white willows, four Canadian poplars, two ash maples and two black alders and individual specimens of common maple, sycamore maple and Scots pine, disappeared. In turn, during the last inventory works, 10 magnificent trees were recorded, which were either not shown in 2004, or in the meantime had reached the dimensions giving them the status of monumental trees. There were three Canadian poplars, three European ashes, two field elms and a silver maple and silver birch.

The comparison of the tree perimeters given in the 2004 (KLUZA-WIELOCH & MACIEJEWSKA-RUTKOWSKA 2008) with the data obtained in 2016 shows that tree trunks increased on average by 18.5 cm over twelve years. The largest growth was noted in the size of a specimen of white willow (68 cm), and the smallest in the common maple (6 cm). Compared to the other two afforestation complexes, the trees near Wykopy street were characterised by the largest growth of trunk perimeter.

Generally, in all three investigated areas the trees were on average in good condition. Most trees with monumental dimensions was classified to the fourth class of health (31 trees). They were characterised by only partially dying thinner branches in the upper parts of the crowns and by the presence of few plant or animal pests. 17 trees were completely healthy (5th class). Next nine trees were classified to the 3rd range of health. Only one tree (white willow) was to a large extent dead (2nd class). The trees growing in the afforestation near Tyniecka street were distinguished by the best condition (5th and 4th classes). A monumental tree in the weakest condition (2nd class) grew in the afforestation complex at Wykopy Street. The most often willows and poplars were in poor health condition and on the other hand Norway and sycamore maples, ashes and beech were the healthiest.

DISCUSSION

Currently, there are 32 natural monuments in the Poznań city, including three erratic boulders, eight avenues, five groups of trees and 16 individual trees. Together it consists of 903 monument trees, of which 748 grow in alleys, 139 in groups and 16 individually. Monumental trees in Poznań belong to 31 taxa (26 species, four hybrids and one variety), classified into 23 genera. The trees of horse chestnut (*Aesculus hippocastanum*), London plane (*Platanus ×hispanica*) and small-leaved lime (*Tilia cordata*; WRONSKA-PILAREK et al. 2016b) are the most common.

The number of nature monuments in Poznań is too small. This mainly applies to the individual trees. Therefore, 58 trees with monumental perimeters, growing in the described area, could be a significant supplement to the list of the most valuable trees in Poznań, after being protected in the form of natural

monuments. Their presence significantly increases the natural value of the area. The occurrence of such valuable natural objects may contribute to the re-emergence of this area as a form of protection that is ecological uses.

The latest valuations of the former ecological uses “Kopanina I” and “Kopanina II” proved the described area to be very valuable in respect of nature (KLUZA-WIELOCH et al. 2006, WRONSKA-PILAREK et al. 2016a). Especially natural or semi-natural ecosystems of the object are very important for preserving biodiversity of Poznań city. It has high landscape and tourist values. It is distinguished by floristic richness (113 phytoplankton taxa, 54 bryophyte species, over 540 species of vascular plants, including 11 protected species, over 140 species of rare and endangered plants in Wielkopolska region and Poznań, and 58 trees with monumental dimensions in three forest and park complexes). The vegetation of the area is varied up to 65 plant communities, including 20 rare and endangered associations. The rich and valuable fauna (23 species of molluscs, 14 species of fish, 12 taxa of amphibians and 8 reptiles, 23 species of breeding birds and numerous migratory taxa and 13 species of mammals) (KLUZA-WIELOCH et al. 2006) is also the value of the described area. Additionally, it is worth mentioning the important didactic functions of the object for children and youth of different types of schools.

CONCLUSIONS

In current study totally 58 trees representing 13 species were found, that should be considered natural monuments in the examined afforestation complexes. The following taxa were the most often observed: *Acer platanoides* (11 trees), *Ulmus laevis* (9), *Acer saccharinum* (8), *Populus ×canadensis* (7) and *Salix alba* (6). Current investigation showed the object to be a valuable natural element of the south-western part of the Poznań city in reference to the dendroflora.

Most of the actually described trees with monumental dimensions in the studied area is in good condition.

Over 12 years from the previous inventory the trunk perimeter at the breast height has grown on average by over 18 cm. The largest growth of trunk was recovered at white willow.

The weather conditions in the last decade, in particular strong winds, resulted in extensive damages in habit of many old trees, leading even to their extinction. Nevertheless, the three areas of urban greenery studied are still of great natural value, as there are many trees with quite a large perimeter, which in a few years may achieve monumental dimensions.

All activities, including conservation works, directly undertaken in three described afforestation complexes or in their immediate vicinity should

lead to the preservation of these objects, protection against devastation and to display the most valuable parts of the stand.

ACKNOWLEDGEMENTS

The study was supported by the Departments of Botany and Forest Botany, the Poznań University of Life Sciences.

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- For citation:** KLUZA-WIELOCH M., WROŃSKA-PILAREK D., MACIEJEWSKA-RUTKOWSKA I. (2017): Trees with monumental dimensions in the south-western part of the Poznań agglomeration. *Steciana* 21(4): 139–145. doi: 10.12657/steciana.021.017