



## DENDROFLORA OF THREE COMPLEXES OF AFFORESTATIONS IN SOUTH-WESTERN PART OF POZNAŃ

MAGDALENA KLUZA-WIELOCH, IRMINA MACIEJEWSKA-RUTKOWSKA

M. Kluza-Wieloch, Department of Botany, Agricultural University of Poznań,  
Wojska Polskiego 71 C, 60-625 Poznań, Poland, e-mail: kluza@au.poznan.pl

I. Maciejewska-Rutkowska, Department of Natural Forestry Foundation, Agricultural University of Poznań,  
Wojska Polskiego 71 D, 60-625 Poznań, Poland, e-mail: irminamr@au.poznan.pl

(Received: June 2, 2008. Accepted: July 7, 2008)

**ABSTRACT.** The main aim of the work was to take stock of three groups of afforestations within the ecological uselands “Kopanina I” and “Kopanina II” and in their direct neighbourhood. Species composition and number of specimens of each species were determined. The proportional participation of particular species and families among the three investigated objects was also compared. Basing on breast-height girth the specimens were indicated to be classified as nature monuments. Together 26 species of trees belonging to 13 families were noted. The trees of *Alnus glutinosa* were most often met and then of *Acer negundo* and *Robinia pseudoacacia*. From among 4032 trees, that had been measured, 58 were classified to be protected as nature monuments. Current investigations proved the area of ecological uselands to be an unusually valuable ecosystem, nearing former natural environment. So this vegetation enclave within Poznań should be saved from devastation, among others through execution of plans of nature protection.

**KEY WORDS:** dendroflora, tree monuments, ecological uselands, Poznań

## INTRODUCTION

In 1994 two new ecological uselands “Kopanina I” and “Kopanina II” were set up in the south-western part of Poznań. They are situated along the valley of the Junikowski stream, within the districts: Rudnicze, Kopanina and Świerczewo and together comprises of about 126 ha (KRÓL et AL. 1998). Both objects are a refuge of many threatened species of birds and of unique, in the scale of the region moist meadows, low peat-bogs and various flora of moist and wet habitats (LUDWICZAK 1995).

In a part of the valley of the Junikowski stream there is a system of watery clay-pits, called by the inhabitants of Poznań “szachty”, from German word “Schacht” (what means pit-schaft, mine, pit; KRÓL et AL. 1998). The ponds were excavated in the turn of XIX and XX centuries, as a result of exploitation of ceramic resources (varve loam and boulder clay). These activities, carried on for about 100 years, had a strong influence on present topographic features and on diversity of environment (KANIECKI 1995). As far back as in 70’s of XX century it had been thought to be one of the most valuable semi-natural ecosystem within Poznań and its neighbourhood and in effect the ecological uselands, mentioned above, were formed in the valley of the Junikowski stream (PTASZYK et AL. 2002).

Till now within the area of ecological uselands the works referring to the vascular flora (KRÓL et AL. 1998),

hydrobiological assessment of clay-pits (BURCHARDT and SZELĄG-WASIELEWSKA 1995) and ornithology (PTASZYK 1995) have been carried out. These studies should be completed with dendrological listing, because within the area of ecological uselands and their direct neighbourhood there are three complexes of afforestations, including initial forms of forests and fragments of old park plantings.

The main aim of the work was to carry out taxonomical analysis of three complexes of afforestations and tree grithings.

## STUDY OBJECTS

The area of the investigation included three complexes of afforestations near the following streets: Wykopy, Tyniecka and Leszczyńska. The first tree stand is situated within the area of ecological useland “Kopanina I” and the others are placed within the ecological useland “Kopanina II” or in its direct neighbourhood (Fig. 1, 2).

The complex on the Wykopy street comprises natural tree stand, pond about 1.2 ha large and mansion, built in about 1875 (GRAF 1995), with old park 5.5 ha large, having apiary. Besides, there are also two orchards (KRÓL et AL. 1998). All those properties belong to the Komorowski’s family. Relatively wide area of meadows isolates this complex from buildings near the Fabiańska



FIG. 1. The ecological uselands “Kopanina I” and “Kopanina II” within the area of Poznań

street and numerous clay-pits separate it from the ecological useland “Kopanina II” and the Głogowska street. Then the complex borders with the area of former copper smelter, now occupied by a private business enterprise.

The complex on the Tyniecka street consists of a small-size park with common species of trees and shrubs and with many old fruit trees, undoubtedly being the remains of a previous orchard. The object borders with the buildings of old brick-field. Besides, it is enclosed with arable land and wet meadows.

The complex on the Leszczyńska street, within the area of the former brick-field, is the most extensive. It has a character of a forest park, adjoining a housing estate from the east, the area, of a town called Luboń from the south-west and large water clay-pits from west and north. Numerous, but considerably smaller ponds with islands and peninsulas are also present in the central part of the complex. They are divided by systems of dams, former roads built for transporting raw material to the brick-field (KRÓL et AL. 1998).

METHODS

The investigations were carried out in 1999-2004. The land division of particular objects was adapted to significant diversity of topographic features. The com-

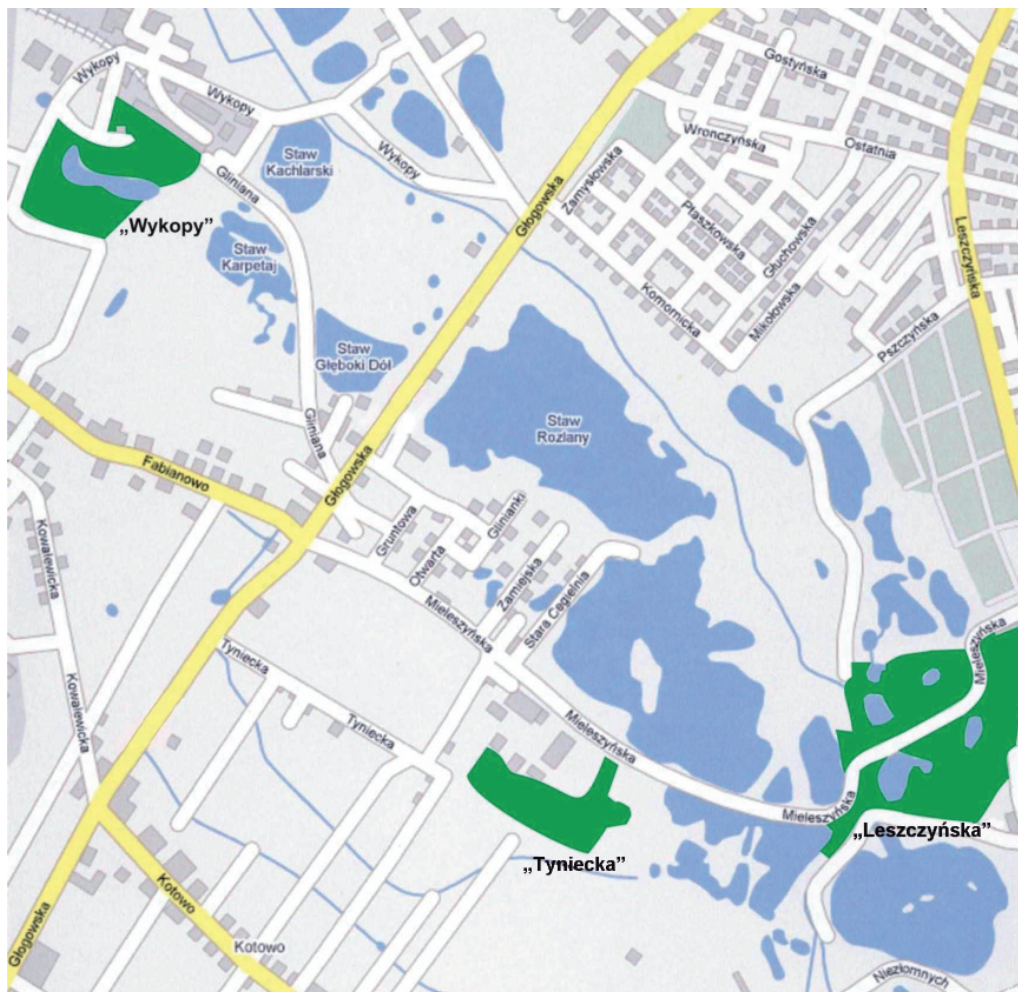


FIG. 2. Localization of the complexes of tree stands on the Wykopy, Tyniecka and Leszczyńska streets

plex on the Tyniecka street was divided into four squares according to the internal paths. Similarly, the complex on the Leszczyńska was divided into four sections. The paths running along the Junikowski stream and across the park from the Leszczyńska street were the borderlines here. The object on the Wykopy street was divided into six sections in accordance with characteristic elements, as roads, paths, the pond bank and plantings of fruit trees.

For each object the stock-taking of trees was done. The specimens of breast-height girth more than 25 cm were measured (MAJDECKI 1993), with a tape measure 10 m long. Due to extensive area of the study and great number of trees, the distances among the specimens were not determined. The measurements of some trees were passed over, because they grew in inaccessible places (as boggy ground, deep and dangerous banks of ponds). Species terminology following MIREK et AL. (2002) was applied.

The results of stock-taking were shown in Table 1, with specified ranges of tree-girth (25 cm). Then the proportional participation of particular species for each object was determined and comparison of the species composition and of number of specimens of particular taxa among three investigated objects was carried out.

Basing of the tables with the minimum value of tree-girth for monument trees (PAWLACZYK 2000) specimens worth protection were selected. The data were placed in Table 2, together with the values of tree girth and localizations of chosen trees.

## RESULTS

In the complex on the Wykopy street 1262 trees were measured and 20 species belonged to 12 families were noted (Table 1). The most often recorded taxon was *Robinia pseudoacacia* with 323 specimens (25.6% participation in tree stand). *Alnus glutinosa* (228 specimens – 18.1%), *Acer negundo* (195 – 15.5%), *A. platanoides* (175 – 13.9%), *Ulmus laevis* (129 – 10.2%), *Ulmus minor* (53 – 4.2%), *Tilia cordata* (30 – 2.4%), *A. campestre* (25 – 2.0%), *Populus xcanadensis* (19 – 1.5%), *Morus alba* (16 – 1.3%), *Fraxinus excelsior* (13 – 1.0%), *Quercus robur* (11 – 0.9%), *Salix alba* (11 – 0.9%), *Juglans regia* (10 – 0.8%), *A. saccharinum* (7 – 0.6%), *Betula pendula* (5 – 0.4%), *A. pseudoplatanus* (4 – 0.3%), *Aesculus hippocastanum* (4 – 0.3%), *Larix decidua* (3 – 0.2%) and *Pinus sylvestris* (1 – 0.1%) were the other species in accordance with frequency occurrence. Besides, there were some species of fruit-trees within area of two orchards, as: *Malus domestica*, *Cerasus vulgaris*, *Persica vulgaris*, *Armeniaca vulgaris*, *Prunus domestica* and *Pyrus communis*. From among the most common species the thickest trunks were noted at *A. glutinosa* (with the most often range of tree girth 1.01-1.25 m), *R. pseudoacacia* (0.76-1.00 m), *U. laevis* (0.51-0.75 m), *A. negundo* and *A. platanoides* (0.25-0.50 m for both species of *Acer*). Besides, 18 individuals representing eight species were classified as monumental trees (Table 2). There were nine trees of *U. laevis* with one specimen having tree girth up to 4.4 m, three of *A. glutinosa*, two of *J. regia* and individual ones

TABLE 1. Detailed stock-taking of the complexes of tree stands on the Tyniecka (T), Wykopy (W) and Leszczyńska (L) streets

Breast-height girth (m)	Species (number of specimens in given range)																							
	<i>Acer campestre</i>			<i>Acer negundo</i>			<i>Acer platanoides</i>			<i>Acer pseudo-platanus</i>			<i>Acer saccharinum</i>			<i>Aesculus hippocastanum</i>			<i>Alnus glutinosa</i>			<i>Betula pendula</i>		
	T	W	L	T	W	L	T	W	L	T	W	L	T	W	L	T	W	L	T	W	L	T	W	L
0.25-0.50		12			69	109	87	56	62	3		49		2			8		9	64				
0.51-0.75	1	5			66	122	49	54	26	2		22		2		3	4		28	123				1
0.76-1.00	3	8			35	63	21	28	13	1		8		1			3		33	138		2		2
1.01-1.25	2				10	27	6	12	11	2	2	7		1			2		61	147		2		2
1.26-1.50					10	16	12	10	2	2	1	6		1		1	6		43	147		1		6
1.51-1.75					1	8	11	4	2			2		1	2	1	4		38	104				4
1.76-2.00					2	3	2	4	2	1	1	3			3		2		11	49				3
2.01-2.25						3		4		1		1			4	1	1		3	17				1
2.26-2.50					1		5	3				2				2	1		2	3				
2.51-2.75						1								1						2				
2.76-3.00						1			1			1				2								
3.01-3.25					1											1								
3.26-3.5																2								
3.51-3.75																	1							
3.76-4.00																								
4.01-4.25																								
4.26-4.50																								
4.51-4.75																								
Number of specimens	6	25	-	-	195	353	193	175	119	12	4	101	-	7	16	5	4	31	-	228	794	-	5	19
Together	31			548			487			117			23			40			1 022			24		

Breast-height girth (m)	Species (number of specimens in given range)																										
	<i>Betula pubescens</i>			<i>Fagus sylvatica</i>			<i>Fraxinus excelsior</i>			<i>Juglans regia</i>			<i>Larix decidua</i>			<i>Morus alba</i>			<i>Pinus sylvestris</i>			<i>Populus alba</i>			<i>Populus ×canadensis</i>		
	T	W	L	T	W	L	T	W	L	T	W	L	T	W	L	T	W	L	T	W	L	T	W	L	T	W	L
0.25-0.50							2	2	55							2			1	2				3			1
0.51-0.75							2	2	26					1		4				2			3		1	1	
0.76-1.00						1	6	2	5					1		7				33			1		1	2	
1.01-1.25			3				3	2	7			1				2				23					1		
1.26-1.50			5			3	7	3	7		3			1		1				4			1			1	
1.51-1.75			2				4	1	6		2									2			2			3	
1.76-2.00			1			2	1	1	3		2									2				1	2	5	
2.01-2.25			1				1		3		2												1		1	1	
2.26-2.50						1	3		4																	3	
2.51-2.75									1																	5	
2.76-3.00																										4	
3.01-3.25																										3	
3.26-3.5																										3	
3.51-3.75																										2	
3.76-4.00																										6	
4.01-4.25																										1	
4.26-4.50																										1	
4.51-4.75																										1	
Number of specimens	-	-	12	-	-	7	29	13	117	-	10	-	-	3	-	16	-	-	1	68	-	-	11	1	19	40	
Together	12			7			159			10			3			16			69			11			60		

Breast-height girth (m)	Species (number of specimens in given range)																										
	<i>Quercus robur</i>			<i>Robinia pseudoacacia</i>			<i>Salix alba</i>			<i>Salix caprea</i>			<i>Sorbus aucuparia</i>			<i>Tilia cordata</i>			<i>Ulmus glabra</i>			<i>Ulmus laevis</i>			<i>Ulmus minor</i>		
	T	W	L	T	W	L	T	W	L	T	W	L	T	W	L	T	W	L	T	W	L	T	W	L	T	W	L
0.25-0.50		1		9	27	28			2						6	5	7			5			15			15	127
0.51-0.75				5	54	34			13			1		1	1	5	8		6		35			3		86	
0.76-1.00		1		3	77	32		2	21			1		1	4	1	6		1		19			10		56	
1.01-1.25		2		2	57	39		1	22						3	2	5				21			6		39	
1.26-1.50		1		5	50	14		3	12						7	6	8				13			5		26	
1.51-1.75		3		11	30	8			15						6	4	12				12			3		23	
1.76-2.00		1		8	16	2		1	15						4	5	7				6			7		10	
2.01-2.25		1		1	7	4	1	2	16						1	2	5				2			1		5	
2.26-2.50		1		1	3	2			6								3				1			1		2	
2.51-2.75				1	2			1	4												1					2	
2.76-3.00									3								1				1						
3.01-3.25									4												2						
3.26-3.5									2																		
3.51-3.75									1																		
3.76-4.00									6														1				
4.01-4.25																											
4.26-4.50								1																			
4.51-4.75																											
Number of specimens	-	11	-	46	323	163	1	11	142	-	-	2	-	-	2	32	30	62	-	-	12	-	129	-	-	53	374
Together	11			532			154			2			2			124			12			129			427		

TABLE 2. The list of trees with the trunks of the largest breast-height girth

No.	Species	Lower limit of tree girth (cm)	Value of tree girth (cm)	Remarks
1	2	3	4	5
on the Wykopy street				
1.	<i>Acer saccharinum</i>	250	273	in front of mansion, at the wall of old copper smelter
2.	<i>Aesculus hippocastanum</i>	300	330	part of park beyond mansion, near descent to island
3.	<i>Alnus glutinosa</i>	225	225	surroundings of pond, from the main road of park
4.	<i>Alnus glutinosa</i>	225	320	beside pond, from side of older orchard
5.	<i>Alnus glutinosa</i>	225	234	beside pond, from side of younger orchard
6.	<i>Fraxinus excelsior</i>	250	366	along road to younger orchard
7.	<i>Juglans regia</i>	200	210	younger orchard
8.	<i>Juglans regia</i>	200	213	younger orchard
9.	<i>Populus ×canadensis</i>	400	440	along main road of park
10.	<i>Populus ×canadensis</i>	400	400	along main road of park
11.	<i>Populus ×canadensis</i>	400	415	in front of mansion, at the wall of old copper smelter
12.	<i>Salix alba</i>	150	394	along main road of park
13.	<i>Ulmus laevis</i>	225	275	part of park beyond mansion
14.	<i>Ulmus laevis</i>	225	275	along road to island
15.	<i>Ulmus laevis</i>	225	311	along road to island
16.	<i>Ulmus laevis</i>	225	264	beside pond, from side of younger orchard
17.	<i>Ulmus laevis</i>	225	325	beside pond, from side of younger orchard
18.	<i>Ulmus laevis</i>	225	225	beside pond, from side of younger orchard
19.	<i>Ulmus laevis</i>	225	230	beside pond, from side of younger orchard
20.	<i>Ulmus laevis</i>	225	250	between pond and younger orchard
21.	<i>Ulmus laevis</i>	225	440	in younger orchard, beyond apiary
on the Tyniecka street				
1.	<i>Acer platanoides</i>	225	240	tree belt along wall of old brick-field
2.	<i>Acer platanoides</i>	225	240	tree belt from side of field
3.	<i>Fraxinus excelsior</i>	250	250	along main road of park
4.	<i>Salix alba</i>	150	230	depression of area near old brick-field
on the Leszczyńska street				
1.	<i>Acer saccharinum</i>	250	333	surroundings of house
2.	<i>Acer saccharinum</i>	250	293	surroundings of house
3.	<i>Acer saccharinum</i>	250	312	surroundings of house
4.	<i>Acer saccharinum</i>	250	295	surroundings of house
5.	<i>Acer saccharinum</i>	250	328	surroundings of house
6.	<i>Acer saccharinum</i>	250	460	surroundings of house
7.	<i>Acer negundo</i>	250	298	along road to Luboń town
8.	<i>Acer negundo</i>	250	290	along road, being border of park
9.	<i>Acer negundo</i>	250	287	along the Junikowski stream
10.	<i>Acer platanoides</i>	225	285	surroundings of house
11.	<i>Acer pseudoplatanus</i>	225	284	surroundings of house
12.	<i>Acer pseudoplatanus</i>	225	230	along main path of park (II)
13.	<i>Acer pseudoplatanus</i>	225	236	along main path of park (II)
14.	<i>Alnus glutinosa</i>	225	240	along the Junikowski stream
15.	<i>Alnus glutinosa</i>	225	248	along main path of park (I)
16.	<i>Alnus glutinosa</i>	225	260	pond near main path (II)
17.	<i>Alnus glutinosa</i>	225	253	pond near main path (II)
18.	<i>Fagus sylvatica</i>	200	235	surroundings of house

1	2	3	4	5
19.	<i>Fraxinus excelsior</i>	250	262	pond near main path (II)
20.	<i>Pinus sylvestris</i>	150	180	path from side of Luboń towm
21.	<i>Populus ×canadensis</i>	400	539	along the Junikowski stream
22.	<i>Populus ×canadensis</i>	400	417	pond near main path (II)
23.	<i>Populus ×canadensis</i>	400	403	pond near main path (II)
24.	<i>Populus ×canadensis</i>	400	445	pond near main path (II)
25.	<i>Populus ×canadensis</i>	400	412	along pine tree stand
26.	<i>Salix alba</i>	150	430	along the Junikowski stream
27.	<i>Salix alba</i>	150	340	from side of Świerczewo housing estate
28.	<i>Salix alba</i>	150	335	surroundings of the Junikowski stream
29.	<i>Salix alba</i>	150	330	surroundings of the Junikowski stream
30.	<i>Salix alba</i>	150	514	from side of Świerczewo housing estate
31.	<i>Salix alba</i>	150	430	surroundings of the Junikowski stream
32.	<i>Salix alba</i>	150	325	surroundings of the Junikowski stream
33.	<i>Salix alba</i>	150	390	surroundings of the Junikowski stream
33.	<i>Salix alba</i>	150	308	along main path of park (I)
34.	<i>Salix alba</i>	150	305	along main path of park (I)
35.	<i>Salix alba</i>	150	335	along main path of park (II)
36.	<i>Salix alba</i>	150	307	along main path of park (II)
37.	<i>Salix alba</i>	150	304	along main path of park (I)
38.	<i>Salix alba</i>	150	385	along main path of park (I)
39.	<i>Salix alba</i>	150	346	surroundings of house
40.	<i>Ulmus minor</i>	225	232	pond near main path (II)
41.	<i>Ulmus minor</i>	225	230	surroundings of house

of *A. saccharinum*, *A. hippocastanum*, *F. excelsior* and *S. alba*. Besides, there were three trees of *P. ×canadensis* having imposing trunks.

Within the complex on the Tyniecka street 325 specimens were taken stock. At the same time nine species from six families (Aceraceae, Fabaceae, Hippocastanaceae, Oleaceae, Salicaceae and Tiliaceae) were noted (Table 1). The most often recorded species was *Acer platanoides*, with 193 specimens (59.4% participation in tree stand). Other species were represented by a considerably smallest number of specimens and in accordance with the frequency occurrence there were: *R. pseudoacacia* (46 – 14.2%), *Tilia cordata* (32 – 9.8%), *Fraxinus excelsior* (29 – 8.9%), *Acer pseudoplatanus* (12 – 3.7%), *Prunus domestica* (11), *Malus domestica* (7), *Aesculus hippocastanum*, (5 – 1.5%), *Cerasus vulgaris* (5 – 1.5%), *Pyrus communis* (2), *Salix alba* (1 – 0.3%) and *Populus ×canadensis* (1 – 0.3%). Only four specimens were recorded with the size adequate for monumental trees: two ones of *F. excelsior* and single ones of *A. platanoides* and *S. alba* (Table 2). Besides, two fruit-trees, the remains of former orchard: *M. domestica* and *P. avium* had great size of trunks (with the ranges of tree girth 1.76-2.00 m and 1.51-1.75 m, respectively), too.

Then 2445 trees, representing 20 species from 11 families (Aceraceae, Betulaceae, Fabaceae, Fagaceae, Ulmaceae, Salicaceae, Oleaceae, Pinaceae, Tiliaceae, Hippocastanaceae, Rosaceae) were observed within the complex on the Leszczyńska street (Table 1). *Alnus glutinosa* (794 specimens – 32.4% participation in tree

stand), *Ulmus minor* (374 – 15.3%) and *Acer negundo* (353 – 14.4%) were the most common species. At the same time most often *A. glutinosa* had the ranges of tree girth 1.01-1.25 m and 1.26-1.5 m, while the others trees were on the average much thinner (*U. minor* 0.25-0.50 m and *A. negundo* 0.51-0.75 m). The following species had more than 100 trees: *Robinia pseudoacacia* (163 – 6.7%), *Salix alba* (142 – 5.8%), *A. platanoides* (119 – 4.9%), *Fraxinus excelsior* (117 – 4.8%) and *A. pseudoplatanus* (101 – 4.1%). The other taxa were rarely noted, as follows: *Pinus sylvestris* (68 – 2.8%), *Tilia cordata* (62 – 2.5%), *Populus ×canadensis* (40 – 1.7%), *Aesculus hippocastanum* (31 – 1.3%), *Betula pendula* (19 – 0.8%), *A. saccharinum* (16 – 0.7%), *B. pubescens* (12 – 0.5%), *Ulmus glabra* (12 – 0.5%), *P. alba* (11 – 0.4%), *Fagus sylvatica* (7 – 0.3%), *Salix caprea* (2 – 0.1%) and *Sorbus aucuparia* (2 – 0.1%). This complex comprised the greatest number of specimens with the size appropriate for monumental trees. Among from 36 specimens representing 10 species, there were 15 ones of *S. alba* with the tree girth range 3.05-5.14 m, six of *A. saccharinum*, four of *A. glutinosa*, three of *A. pseudoplatanus*, three of *A. negundo* and single ones of *A. platanoides*, *F. sylvatica*, *F. excelsior* and *P. sylvestris*. Besides, five specimens *P. ×canadensis* with large tree girth were noted.

Basing on the stock-taking of all investigated objects 26 species from 13 families were recorded and 4032 specimens of tree-girth more than 25 cm were measured (Table 1).

Aceraceae family was the most strongly represented (29.9%). In respect of numbers next families were: Betulaceae (26.2%), Ulmaceae (14.1%), Fabaceae (13.2%), Salicaceae (5.6%), Oleaceae (3.9%), Tiliaceae (3.1%) and Pinaceae (1.8%). Fagaceae, Moraceae, Juglandaceae and Rosaceae were the rarest ones.

Within the whole investigated area the trees of *Alnus glutinosa* were most often noted (1022 specimens – 25.3% participation in tree stands). *Acer negundo* (548 – 13.6%), *Robinia pseudoacacia* (532 – 13.2%), *A. platanoides* (487 – 12.1%) and *Ulmus minor* (427 – 10.6%) were the next species, with accordance of frequent occurrence. The participation in the tree-stands of the other species counted at most some percent (*Tilia cordata* – 3.1%, *A. pseudoplatanus* – 2.9%, *Pinus sylvestris* – 1.7%, *Populus xcanadensis* – 1.5%, *Aesculus hippocastanum* – 1.0%, *A. campestre* – 0.8%, *Betula pendula* – 0.6%, *A. saccharinum* – 0.6%, *Morus alba* – 0.4%, *Betula pubescens* – 0.3%, *Ulmus glabra* – 0.3%, *P. alba* – 0.3%, *Quercus robur* – 0.3%, *Juglans regia* – 0.2%, *Fagus sylvatica* – 0.2%, *Larix decidua* – 0.1%, *Salix caprea* – 0.05%, *Sorbus aucuparia* – 0.05%; Table 1).

The study showed the common species of all investigated objects were: *Acer platanoides*, *A. pseudoplatanus*, *Aesculus hippocastanum*, *Fraxinus excelsior*, *Populus xcanadensis*, *Robinia pseudoacacia*, *Salix alba* and *Tilia cordata*. In greatest number among species mentioned above *A. platanoides* appeared on the Tyniecka street and *R. pseudoacacia* on the Wykopy street. The other species predominated in the tree stand on the Leszczyńska street. *Acer campestre* was a common species of objects on the Tyniecka and Wykopy streets and *A. negundo*, *A. saccharinum*, *Alnus glutinosa*, *Betula pendula*, *Pinus sylvestris* and *Ulmus minor* were present both in the object on the Wykopy street and the Leszczyńska street. There was no common species of the complexes on the Tyniecka and Leszczyńska streets. On the other hand *Juglans regia*, *Larix decidua*, *Morus alba*, *Quercus robur* and *Ulmus minor* were only noted on the Wykopy street and *Betula pubescens*, *Fagus sylvatica*, *Populus alba*, *Salix caprea*, *Sorbus aucuparia* and *Ulmus glabra* were observed near the Leszczyńska street. There was no specific species of the object on the Tyniecka street (Table 1).

Among all measured trees the greatest number of specimens – 854 – had the tree-girth in range 0.25–0.50 m. Together 84 specimens were found with the tree girth more than 2.5 m and from that 14 trees had the measurements in the range 3.76–4.00 m. The trunks of *Acer negundo*, *Larix decidua*, *Salix caprea*, *Sorbus aucuparia*, *Ulmus glabra* and *U. laevis* usually contained in range 0.51–0.75 m; of *Morus alba*, *Pinus sylvestris*, *Robinia pseudoacacia* and *S. alba* – 0.76–1.00 m; of *Alnus glutinosa* – 1.01–1.25 m; of *Betula pendula*, *B. pubescens*, *Fagus sylvatica* and *Juglans regia* – 1.26–1.50 m; of *Quercus robur* and *Tilia cordata* – 1.51–1.75 m, of *A. saccharinum* – 2.01–2.25 m and of *Populus xcanadensis* – 2.51–2.75 m. Some species were not in evidence in first and next classes of tree-girth. It might showed lack of restocking within particular complexes. And so *A. campestre*, *A. pseudoplatanus*, *A. saccharinum*, *Aesculus hippocastanum*, *P. xcanadensis* and *Salix alba* had no young specimen in one or in two complexes and *B. pendula*, *B. pubescens*, *F. sylvatica*, *Juglans regia*, *L. decidua*,

*S. caprea* and *S. aucuparia* did not have any juvenile trees within all the investigated objects.

Together 58 trees were worthy to be protected (Table 2). They included 55 native species (*Salix alba* – 17 specimens, *Ulmus laevis* – 9, *Alnus glutinosa* – 7, *Fraxinus excelsior* – 3, *Acer platanoides* – 3 and *A. pseudoplatanus* – 3, *Pinus sylvestris* – 1) and three alien ones (*Juglans regia* – 2, *Aesculus hippocastanum* – 1). Besides, eight specimens of *Populus xcanadensis* were of sizeable trunks.

## DISCUSSION AND CONCLUSIONS

According to JACKOWIAK (1993) flora of Poznań consisted of 1223 species of vascular plants, including 92 taxa of mega- and nanophanerophytes. However, the author did not mention *Acer saccharinum*, *Larix decidua*, *Morus alba* and *Populus xcanadensis*, which were observed in presented investigations. On the other hand some species characteristic for flora of Poznań, such as: *Padus avium*, *P. serotina*, *Populus tremula*, *Quercus petraea*, *Q. rubra* and *Tilia platyphyllos*, were not found within the area of the studied objects.

Detailed studies on the vegetation of ecological uselands were carried out in 90's of the last century. KRÓL et AL. (1998) observed 328 species of vascular plants, including 63 taxa of trees and shrubs. The presence of *Acer campestre*, a rare species in Wielkopolska region was stated (ŻUKOWSKI and JACKOWIAK 1995). The current stock-taking of dendroflora revealed 26 species from 13 families, with *Alnus glutinosa*, *Acer negundo* and *Robinia pseudoacacia* as the most common trees on the whole area of investigations. In the present study *Larix decidua* and *Morus alba* were noted within ecological uselands "Kopanina I" and "Kopanina II" (near the Wykopy street) for the first time. However, KRÓL et AL. (1998) did not analyse typical park plantings. On the other hand *Populus tremula*, *Salix cinerea*, *S. fragilis*, *S. purpurea*, *Abies alba*, *Picea abies*, *Pinus nigra*, *Tilia platyphyllos* and *Fraxinus pennsylvanica* were not taken into account in the current study, because four first species grew beyond the limits of tree-stand complexes and the others did not meet the assumption of the work.

*Alnus glutinosa* and some species of *Salix* genus predominated in the dendroflora of ecological uselands "Kopanina I" and "Kopanina II". Those taxa were connected with the riparian and alder forests, which had been prevailed in the described area before the period of intensive colonization and urbanization (JACKOWIAK 1995). Besides, *Robinia pseudoacacia*, *Acer negundo*, *A. platanoides*, *A. pseudoplatanus*, *Ulmus minor*, *U. laevis* and *Tilia cordata* were relatively often observed in the tree stands of "Kopanina I" and "Kopanina II". Two species of the gymnosperms: *Pinus sylvestris* forming sparse tree stand on the Leszczyńska street and *Larix decidua*, growing in the park on the Wykopy street were also noted. The tree stands within the investigated objects had a rich layer of shrubs, the most often consisting of *Sambucus nigra*, *Crataegus monogyna*, *Symphoricarpos albus* and *Hedera helix*. The last species covered a large area in the park on the Wykopy street.

In the closest neighbourhood of "Kopanina I" and "Kopanina II" another ecological useland "Dębina" is

situated. From the north-east it is limited by the Warta river and within its area of 260 ha there are four ponds, being ox-bow lakes of Warta (ŚLIWA 2002). The dendroflora of "Dębina" is formed by deciduous trees, connected with oak-hornbeam, elm-ash and alder forests, being the remains of previous vegetation growing along the river (WOJTERSKI et AL. 1974). For the first time its value, as the greatest forest area within Poznań, including splendid, old oak was described by WODZICZKO (1936). Presently *Carpinus betulus*, *Acer platanoides*, *A. campestre*, *Tilia cordata*, *Ulmus laevis*, *Alnus glutinosa*, *Fraxinus excelsior* and *Quercus robur* are the most often observed here. The alien species of the Wielkopolska region, as *Picea abies* and the species introduced by man, as *Pinus sylvestris* are also present. The shrub layer is well developed (JAROS and ŚLIWA 2003).

The area of the ecological useland "Dębina" as well as "Kopanina I" and "Kopanina II" are often visited by inhabitants of Poznań especially in spring and summer (JAROS and ŚLIWA 2003). All the three objects are represented in the environment closely related to the natural one. The riparian forest in "Dębina" and spontaneous plantings of *Alnus glutinosa* along the Junikowski stream, within area of "Kopanina I" and "Kopanina II" confirm this remark (WOJTERSKI et AL. 1974, JACKOWIAK 1995).

As far back as in interwar period of the last century, the urban green areas within Poznań were protected, especially remainders of afforestations within the town. The stock-tacking of nature monuments was also carried out (WODZICZKO 1936). Besides, the idea was created of forming of green wedges and of circles connecting them and dividing Poznań from suburban housing estates. One of the smaller green wedges, with designed walking roads was conducted from the Łazarz district, across the Świerczewo district (the area of present investigation) all the way down to the Góreckie Lake (CZARNECKI 1933). Ecological useland, as a form of nature protection is a continuation of those activities. It requires taking into consideration of this area in the local plan of spatial management of town and in land registration (PAWLACZYK and JERMACEK 1995). Detailed directions applying to the valley of the Junikowski stream have been formulated in the latest plan of Poznań. They mainly refer to the principles of management, aiming at the arrangement of the described area and preservation of natural environment in good condition. Undoubtedly the maintenance of the existing building and limitation of its height and construction of sewer system are the most important ones (MIERZEJEWSKA 2001). These assumptions may allow to eliminate supply of sewage to the Junikowski stream and to some clay-pits. Numerous, illegal waste dumps, polluting surface and underground waters should be also eliminated (KANIECKI et AL. 1995).

Localizations of the workshops and wholesale firms or any other arduous activity connected with intensification of car traffic are excluded within "Kopanina I" and "Kopanina II" (MIERZEJEWSKA 2001). Detailed directions for the tree stands on the Wykopy and Leszczyńska streets are also worked out. Renewal and elaboration of principles of ecological conversation are planned here.

The works within the described area should protect against environmental degradation and set off its most valuable fragments (KANIECKI et AL. 1995). Inclusion of the valley of the Junikowski stream in the project of the Ecological Ring of Poznań, called Natural By-pass of Poznań, has been also proposed (RASZKA 2003). Presence of numerous ponds and rich vegetation in the valley of the Junikowski stream are conducive to forming recreation areas for Poznań. Due to adequate management they may take the strain of tourist traffic from the Wielkopolski National Park (AST 2001). However, planned functions of recreations have to be submitted to the ecological requirements of environmental protection (KANIECKI et AL. 1995).

Unfortunately, development of the Głogowska street will diminish the area of both ecological uselands, including the number and area of some ponds. Besides, the current of the Junikowski stream will be broken during the period of road works. Just now heavy building equipment is gathered in the western part of the most valuable forest complex on the Leszczyńska street. This elaboration may have historical meaning, especially for the tree stand of the mentioned complex since there exists some danger due to the situations.

Current investigations proved the area of ecological uselands to be an unusually valuable ecosystem, nearing former natural environment. So this vegetation enclave within Poznań should be saved from devastation, among others through execution of plans of nature protection.

## REFERENCES

- AST R. (2001): Kształtowanie przestrzeni regionów i miast. Wybrane zagadnienia. Wyd. Politechniki Poznańskiej, Poznań: 75-76.
- BURCHARDT L., SZELĄG-WASIELEWSKA E. (1995): Ocena hydrobiologiczna glinianek w dolinie Strumienia Junikowskiego. In: Dorzecze Strumienia Junikowskiego. Stan obecny i perspektywy. Ed. A. Kaniecki. Konf. Nauk. Poznań, 6 listopada. Wyd. Sorus, Poznań: 63-70.
- CZARNECKI W. (1933): Zielen w przyszłym Poznaniu. Wyd. Okręg. Kom. Ochr. Przyr. na Wlkp. i Pom. 4: 45-50.
- GRAF R. (1995): Zmiany stosunków wodnych w dorzeczu Strumienia Junikowskiego związane z kopalnictwem. In: Dorzecze Strumienia Junikowskiego. Stan obecny i perspektywy. Ed. A. Kaniecki. Konf. Nauk. Poznań, 6 listopada. Wyd. Sorus, Poznań: 17-21.
- JACKOWIAK B. (1993): Atlas rozmieszczenia roślin naczyniowych w Poznaniu. Pr. Zakł. Takson. Rośl. UAM 2. Pozn. Bogucki Wyd. Nauk., Poznań.
- JACKOWIAK B. (1995): Wstępna charakterystyka szaty roślinnej doliny Strumienia Junikowskiego. In: Dorzecze Strumienia Junikowskiego. Stan obecny i perspektywy. Ed. A. Kaniecki. Konf. Nauk. Poznań, 6 listopada. Wyd. Sorus, Poznań: 71-76.
- JAROS R., ŚLIWA P. (2003): Użytek ekologiczny Dębina. Wydział Ochrony Środowiska, Urząd Miasta Poznań, Poznań.
- KANIECKI A. (1995): Wstęp. In: Dorzecze Strumienia Junikowskiego. Stan obecny i perspektywy. Ed. A.



- Kaniecki. *Konf. Nauk. Poznań*, 6 listopada. Wyd. Sorus, Poznań: 5-9.
- KANIECKI A., BURCHARDT L., KASPRZAK K., PTASZYK J. (1995): Podsumowanie interdyscyplinarnych badań w zlewni Strumienia Junikowskiego. In: *Dorzecze Strumienia Junikowskiego. Stan obecny i perspektywy*. Ed. A. Kaniecki. *Konf. Nauk. Poznań*, 6 listopada. Wyd. Sorus, Poznań: 101-105.
- KRÓL S., KLUZA M., MACIEJEWSKA M. (1998): Wykaz roślin naczyniowych i ich ugrupowania ekologiczne w dolinie Strumienia Junikowskiego w Poznaniu. *Rocz. AR Pozn.* 301, *Ogrodn.* 26: 49-78.
- LUDWICZAK J. (1995): Zlewnia Strumienia Junikowskiego w Miejscowym Planie Zagospodarowania Przestrzennego miasta Poznania. In: *Dorzecze Strumienia Junikowskiego. Stan obecny i perspektywy*. Ed. A. Kaniecki. *Konf. Nauk. Poznań*, 6 listopada. Wyd. Sorus, Poznań: 99-105.
- MAJDECKI L. (1993): Ochrona i pielęgnowanie drzew i drzewostanów parkowych. In: *Ochrona zabytkowych założeń ogrodowych*. PWN, Warszawa: 184-186.
- MIERZEJSKA L. (2001): Tereny zielone w strukturze przestrzennej Poznania. *PTPN, Poznań*: 125-126.
- MIREK Z., PIĘKOŚ-MIRKOWA H., ZAJĄC A., ZAJĄC M. (2002): Flowering plants and pteridophytes of Poland. A checklist. Vol. 1. Biodiversity of Poland. – Krytyczna lista roślin naczyniowych Polski. T. 1. Różnorodność biologiczna Polski. In: *W. Szafer Institute of Botany, Polish Academy of Sciences, Kraków*.
- PAWLACZYK P. (2000): Zasady ochrony przyrody w lasach gospodarczych. Propozycja społeczna. Wydawnictwo Lubuskiego Klubu Przyrodników, Świebodzin: 34-35.
- PAWLACZYK P., JERMACEK A. (1995): *Poradnik ochrony przyrody*. Wydawnictwo Lubuskiego Klubu Przyrodników, Świebodzin: 111-115.
- PTASZYK J. (1995): Awifauna doliny Strumienia Junikowskiego. In: *Dorzecze Strumienia Junikowskiego. Stan obecny i perspektywy*. Ed. A. Kaniecki. *Konf. Nauk. Poznań*, 6 listopada. Wyd. Sorus, Poznań: 94-98.
- PTASZYK J., DZIABASZEWSKI A., PAWŁOWSKI A. (2002): Dolina Strumienia Junikowskiego. In: *Kronika miasta Poznania. Wśród zwierząt i roślin*. Wydawnictwo Miejskie, Poznań: 276-290.
- RASZKA B. (2003): Propozycje działań naprawczych i kompensacyjnych w odniesieniu do przestrzeni przyrodniczej Poznańskiego Przełomu Warty. In: *Poznański przełom Warty w planowaniu systemów ekologicznych*. Bogucki Wyd. Nauk., Poznań: 112-117.
- ŚLIWA P. (2002): Wzdłuż Warty, czyli uroki Dębiny. In: *Kronika Miasta Poznania 3. Wśród zwierząt i roślin*. Wydawnictwo Miejskie, Poznań: 264-275.
- WODZICZKO A. (1936): Stan badań nad roślinnością Wielkopolski i zadania na przyszłość. *Ochrona przyrody w Wielkopolsce*. Wyd. Okręg. Kom. Ochr. Przyr. na Wlkp. i Pom. 6: 72-77.
- WODZICZKO A., KRAWIEC F., URBAŃSKI J. (1938): *Pomniki i zabytki przyrody Wielkopolski. Powiat Poznański*. Wyd. Okręg. Kom. Ochr. Przyr. na Wlkp. i Pom. 8: 313-360.
- WOJTERSKI T., BALCERKIEWICZ S., LESZCZYŃSKA M., PIASZYK M. (1974): Szata roślinna jako wskaźnik do zagospodarowania doliny Warty w Poznaniu dla celów rekreacyjnych. *Bad. Fizj. Pol. Zach.* 26: 143-163.
- ŻUKOWSKI W., JACKOWIAK B. (1995): Lista roślin naczyniowych ginących i zagrożonych na Pomorzu Zachodnim i w Wielkopolsce. Part 1. In: *Ginące i zagrożone rośliny naczyniowe Pomorza Zachodniego i Wielkopolski*. Ed. W. Żukowski, B. Jackowiak. *Pr. Zakł. Takson. Rośl. UAM Pozn.* 3. Bogucki Wyd. Nauk., Poznań: 10-92.

For citation: Kluza-Wieloch M., Maciejewska-Rutkowska I. (2008): Dendroflora of three complexes of afforestations in south-western part of Poznań. *Rocz. AR Pozn.* 387, *Bot.-Stec.* 12: 101-109.