

CHAPTER 12

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THE PRESERVATION AND MODIFICATION OF TREE COMMUNITIES IN THE ACADEMIC CAMPUS KORTOWO IN OLSZTYN

Introduction

Kortowo is a suburb of Olsztyn, situated in the south of the town. It contains a university campus - a distinctly separate part of the town. Most of the university research and educational institutions as well as other organisations affiliated with the University of Warmia and Mazury are seated in Kortowo. Kortowo I is a common name of the northern part of the whole suburb, bordered by Warszawska Street to the east, a military unit to the north, Kortowskie Lake to the west and the Kortówka River to the south (*Miejscowy Plan ...* 2003).

This area has an interesting history. In 1884-1889, it was developed as a large hospital compound, possessing interesting architecture, complete technical facilities, a large landscape garden, access to a lake, own church and a cemetery. The spatial plan took advantage of and further developed the rules of a layout that could be defined as axially centralized (Fig. 1). The park area had been nearly finished by 1883. In 1950, the Higher School of Agriculture, in 1972 renamed into the University of Agriculture and Technology, became a new host of Kortowo. The buildings of the former psychiatric hospital were turned into a campus, which in the later years has been frequently expanded and today houses the University of Warmia and Mazury (RZEMPOŁUCH 2005).

The area analyzed in this paper is characterized by a large cover of trees representing different species and origin. It is now subjected to much man-made stress and undergoes continuous modifications. For this reason, tree assemblages in Kortowo have been carefully studied.

The green areas in this part of Kortowo are taken care of by the Żak Student Aid Foundation and the Property and Green Areas Maintenance Department, two institutions which directly respond to the University of Warmia and Mazury in Olsztyn. The foundation has

published a brochure containing an inventory of the areas it supervises (KIEWLAK, KRAWIEC 2001). The brochure, however, contains only names of species and their location on visualization maps. Having analyzed this inventory, it was concluded to be outdated and inaccurate. The Maintenance Department, which takes care of the remaining part in Kortowo I, does not have any documentation on the state of preservation of the green areas in the analyzed part of the town. From some informal interviews with the staff, however, the author has learnt that in 1985 an inventory of the green areas was made but has been lost since then. All other available results of relevant studies performed in Kortowo I are fragmentary, outdated or inconsistent.

In 2008, for the first time, a complete and detailed dendrological inventory of Kortowo I, including the tree stand management, was prepared (ANTOLAK et al. 2008) at the Chair of the Landscape Architecture and Agritourism. The field and chamber studies went on for three months (May, June and July). Initially, a geodetic base map covering the analyzed area was obtained and updated. In the field, 1:250 scale maps were used. The preliminary field work included photographic documentation and elaborating the main principles for making an inventory over such a large area (55 ha). This stage was of key importance to the course of the further field and chamber studies. The detailed inventory consisted of the determination of the location of species and their detailed description alongside a list of suggested sanitation and tree nursing treatments, all comprised in a previously prepared inventory table. In the field, all trees whose trunks at the height of 130 cm measured over 20 cm in perimeter were marked alongside smaller trees and even tree seedlings in the park. All planted ornamental plants were also marked. For each tree, a Polish and Latin species name was determined (MIREK et al. 2002), and sometimes also a plant variety. The following were measured: trunk perimeter, crown span (m) and plant height (m). In addition, the health of each tree was described, including deadwood in the crown, the lean of the tree, the crown's asymmetry, number of leading branches, type of the crown's spread, defects and deformation of the trunk, trunk and root regrowths, deposits of organic matter and water on a tree, as well as presence of foreign bodies, pathogens and parasites, damaged or exposed root system, presence of bird nests or nesting boxes, etc. Remnants of trees, such as tree trunks or rootstocks found in the park

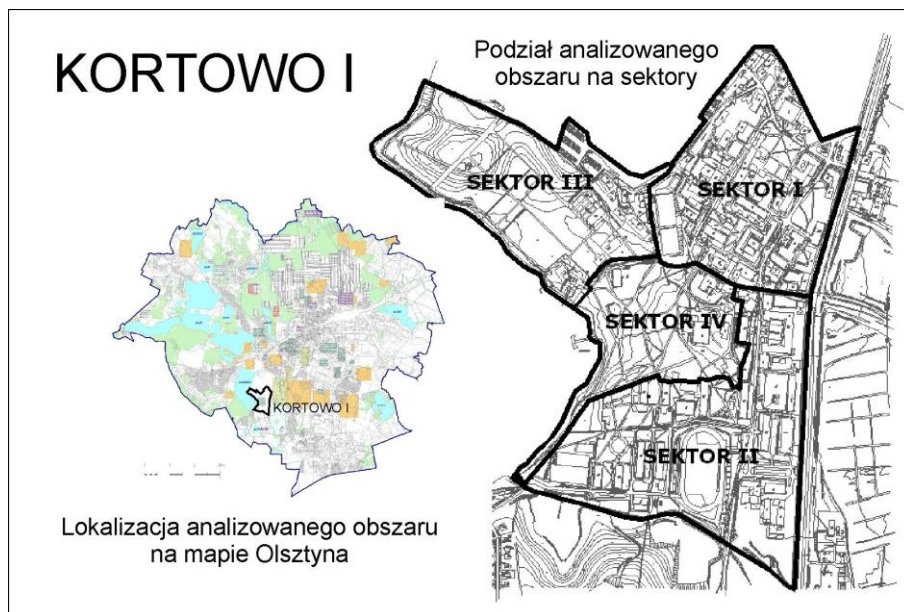


Fig. 2. Location of the analyzed area in Olsztyn and its division into sectors. *Source: own data.*

were also recorded as they could aid the reconstruction of the historic layout of the park. In addition, the inventory contained dead and dying specimens. Finally, all shrubs were marked in the field study. When they constituted a clear set (row, hedge, group), they were assigned one inventory number. For each shrub, the Polish and Latin name of the species was determined (MIREK et al. 2002) and, whenever possible, a variety. The crown's spread was measured for individual specimens or else the size of a group of shrubs, as well as the height of plants were given. When a shrub had distinct leaders, their perimeter was measured at a height of 1.3 m (in cm) or else they were assigned to a perimeter class (e.g. 2-10 cm). Analyzing groups of shrubs, whenever possible, the number of specimens of each species was counted. Nursing recommendations and necessary treatments that the shrubs should undergo were also suggested.

In order to make the whole information more readable and to recognize the described trees and shrubs in the field, the whole area was divided into four sectors, which differ from one another in the function they perform, type of planted trees and shrubs, type of buildings, etc. (Fig. 2).

Sector I – the borders of this sector are delineated by an area owned by the Military Property Agency to the north, Warszawska Street to the east, Prawocheńskiego Street to the south and Heweliusza Street to the west.

Sector II – the borders of this sector are delineated approximately by the hornbeam path to the north and fragments of Prawocheńskiego and Oczapowskiego Streets, Warszawska Street to the east, the Kortówka River to the south and the pavement along Kortowskie Lake to the west.

Sector III – the borders of this sector are delineated by the area of a former military zone to the north, Heweliusza Street to the east, the Parkowy Stream, flowing along the street which leads to Kortowska Marina, to the south and Kortowskie Lake to the west.

Sector IV – the area of Professor Wanic Park with its immediate surroundings to the east and the waterfront of Kortowskie Lake to the south.

Based on the detailed information obtained during the field studies, conclusions have been drawn regarding the health condition of the tree communities, statistical analyses of the trees and shrubs included in the inventory were made and recommendations regarding how to maintain the green areas were put forth. With respect to the management of the tree communities, most of the detailed suggestions indicated selection of diseased and dead trees as well as other objects or groups of trees or shrubs which should be removed because of their ill health or inability to grow well in specific habitat conditions. In addition, the scope of sanitation and nursing treatments which should be conducted in each sector has been specified.

Sector I

This sector is located in the north-eastern part of the whole analyzed area, and covers 13 ha. Its borders encompass the oldest built-up area of Kortowo, which today serves research and educational functions. The tree stand growing in this sector is highly diverse in species and age. In total, 1 651 objects, including 1 065 single trees, were inventoried. The area reveals high biological diversity, comprising 119 species of trees, shrubs, small shrubs and creepers. The dominant species in tree communities is *Acer platanoides* (25.9%). Relatively common are *Acer pseudoplatanus* (8.2%), *Tilia cordata* (7.9%) and *Betula pendula* (6.8%) (tab. 1).

Among more recently planted trees, coniferous plants dominate, especially ornamental ones like creeping species of *Juniperus* spp. and round and tall varieties of *Thuja occidentalis*.

Table 1
Age and species specification of the ten most common species of trees in sector I

No	Species	Perimeter at 1.3 m height (in cm)					Number of trees in sector I	%
		< 40	41-90	91-150	151-300	> 300		
1	<i>Acer platanoides</i> L.	41	68	91	71	5	276	25,9
2	<i>Acer pseudoplatanus</i> L.	11	15	36	24	1	87	8,2
3	<i>Tilia cordata</i> Mill.	9	14	26	33	2	84	7,9
4	<i>Betula pendula</i> Roth	6	13	33	20	0	72	6,8
5	<i>Robinia pseudoacacia</i> L.	11	23	20	6	0	60	5,6
6	<i>Quercus robur</i> L.	3	1	8	35	4	51	4,8
7	<i>Fagus sylvatica</i> L.	7	0	11	23	6	47	4,4
8	<i>Fraxinus excelsior</i> L.	8	9	19	8	0	44	4,1
9	<i>Carpinus betulus</i> L.	6	12	13	6	0	37	3,5
10	<i>Picea abies</i> (L.) H. Karst.	11	7	9	9	0	36	3,4
						Sub-total:	794	74,6
						Others:	271	25,4
						Total:	1065	100,0

Source: own data.

The health condition of the trees and shrubs in this sector is highly varied. The tree stand growing in the centre of the sector is in the best health state. There, new ornamental plants are most common, while old trees are scarce. The worst health condition was determined for the avenue lined with *Acer platanoides* and *Acer pseudoplatanus* growing along the car park at Heweliusza Street. In this sector, there were 13 dead and 39 disease-stricken trees, whereas 482 trees had visibly dry branches in the crown and 79 trees were determined to be gradually drying up from the top downwards (deadwood) and 92 plants had visible damage to the trunk (most often wounds filled with rotting wood). Evident asymmetry of the crown was observed in 701 trees. In the sector, the following nursing treatments should be conducted: sanitation removal of deadwood, protection of trunk

wounds and formation trimming of shrubs. In total, 57 objects for removal were determined in this area. They were divided into three categories – trees which should be cut down immediately (10 trees), trees that should be removed (15 trees) and trees that could possibly be removed (32 trees). These are either dying or diseased trees, or else trees choked up by other plants, which have no chance to develop and, by growing in excessively compact groups, they disturb the growth of other, more valuable species.

Sector II

This sector is located in the south-eastern part of the whole analyzed area and covers 16 ha. Within this sector, there are university buildings, used for research and education, built in a later period of the development of Kortowo. There are also student residence houses, sports and recreation facilities, football fields, tennis courts and a gym. At the outflow of the Kortówka River to Kortowskie Lake, facilities of an experiment established in 1956 by professor Przemysław Olszewski, can be seen. This is an experimental method for reclamation of a eutrophic lake. The area of Sector II is separated from Warszawska Street with a protective green belt, which can perfectly well deafen the noise and absorb the pollution from one of the town's busiest streets. The land inclines naturally towards a sandy beach on Kortówkie Lake. The whole area is surrounded by the waters of Kortowskie Lake and the Kortówka River. In total, 1 903 objects were inventoried in the whole sector, including 1 116 single trees. The tree communities were highly varied in species composition. There are 9 monuments of nature located in the sector. The dominant species among trees are *Alnus glutinosa* (14.8%) and *Acer platanoides* (14.3%). There are also numerous *Tilia cordata* (7.6%), *Fraxinus excelsior* (7.5%), *Larix decidua* (5.9%) and *Populus nigra 'Italica'* (5.7%) (tab.2). Of special interest in this part of the sector are foreign species, such as *Phellodendron amurense* and *Gleditsia triacanthos*. The trees growing along the Kortówka River are totally dominated by *Alnus glutinosa*. The accompanying species are *Salix caprea*, *Salix fragilis*, *Fraxinus excelsior*, *Ulmus minor*, *Ulmus gabra*, *Tilia cordata* and *Quercus robur*. The green belt along Warszawska Street is a multi-species row of trees and shrubs. The lower part (between 2 and 6 m) has been dominated by *Prunus cerasifera*. The accompanying species in the whole layer are *Ulmus*

glabra, seedlings of *Acer platanoides* and *Tilia cordata*. The higher layer is composed of mainly *Acer palatanoides*, *Fraxinus excelsior*, *Tilia cordata*, *Ulmus glabra*. The accompanying species are *Acer pseudoplatanus* and *Betula pendula*. Besides, the sector is characterized by a large diversity of introduced ornamental plants.

Table 2

Age and species specification of the ten most common species of trees in sector II

No	Species	Perimeter at 1.3 m height (in cm)					Number of trees in sector II	%
		< 40	41-90	91-150	151-300	> 300		
1	<i>Alnus glutinosa</i> (L.) Gaertn.	26	59	46	34	0	165	14,8
2	<i>Acer platanoides</i> L.	40	99	15	6	0	160	14,3
3	<i>Tilia cordata</i> Mill.	11	43	28	3	0	85	7,6
4	<i>Fraxinus excelsior</i> L.	24	50	6	4	0	84	7,5
5	<i>Larix decidua</i> Mill.	10	29	23	4	0	66	5,9
6	<i>Populus nigra</i> L. 'Italica'	2	0	30	32	0	64	5,7
7	<i>Betula pendula</i> Roth	15	7	21	4	0	47	4,2
8	<i>Robinia pseudoacacia</i> L.	16	25	5	0	0	46	4,1
9	<i>Acer pseudoplatanus</i> L.	6	22	9	7	0	44	3,9
10	<i>Quercus robur</i> L.	7	20	8	8	0	43	3,9
						Sub-total:	804	72,0
						Others:	312	28,0
						Total:	1116	100,0

Source: own data.

The plants in this sector are in good health (photo 1). The plants in the housing and college areas undergo regular nursing treatments. They are trimmed, formed, rejuvenated and, whenever necessary, cured. The plants introduced along the Kortówka as well as self-sown plants are in a much worse condition. The poorest health state was demonstrated by the trees growing along Warszawska Street, where many specimens are attacked by harmful entomofauna, and many show damaged trunks as well as dry main and side branches. In the sector, 11 dead and 127 diseased or infested trees were found. In addition, 336 trees have visible dry branches in the crown and 90 plants were diagnosed to suffer from gradually progressing decline. 132 trees have visible trunk damage. The asymmetric crown occurs in

272 cases and 317 trees are leaning. The nursing treatments that the trees should undergo are primarily sanitation and rejuvenating trimming, removal of deadwood and pruning of limb stumps. Based on the inventory made, 36 trees were selected to be cut down. They are mainly dead and dying trees or trees severely infested by pests and diseases.

Sector III

The sector which covers 15 ha is located in the north-western part of Kortowo I. The area can be divided into such distinctly different parts as the Experimental Garden, Kortowska Marina and a housing estate at Heweliusza Street. This sector lies on Kortowskie Lake and the waterfront is hardly accessible except the section occupied by the marina, where the shore has been regulated. A narrow shoreline belt is densely overgrown with riparian plants.

In total, 990 objects have been inventoried in the sector, including 779 single trees. The dominant tree species was *Acer platanoides* (22.3%). Other frequently found tree species are *Fraxinus excelsior* (17.1%), *Alnus glutinosa* (12.6%), *Alnus incana* (9.1%) and *Picea abies* (7.2%) (tab. 3). The plants growing along the lake shore are quite uniform in species composition. The most common trees there are *Alnus glutinosa*, *Alnus incana*, *Fraxinus excelsior* and *Salix* spp. Slightly above this area, there are also specimens of *Acer platanoides* and *Aesculus hippocastanum*. Other species occur only sporadically. The trees in the Experimental Garden grow in two main rows. One of these tree rows, which runs from the north-east to the south-west, divides the garden into two parts. The other row of trees, along the fence, runs from the north-west to the south-east. The dominant species in both rows are *Acer platanoides* and *Picea abies*. The accompanying species are *Acer pseudoplatanus*, *Fraxinus excelsior*, *Quercus robur* and *Tilia cordata*. Most of the trees have been planted, as it is suggested by the spatial composition and similar age of all the plants. On a little hill, in the middle of the garden, there is a group of trees growing in an oval ring, which forms a natural dominant sight. This tree community is dominated by *Acer platanoides*, *Tilia cordata*, *Acer pseudoplatanus* and *Quercus robur*. In the garden, there are also rows of planted fruit trees, mainly *Malus domestica*, *Cerasus vulgaris* and *Pyrus* spp. The trees growing around the marina are dominated by impressive specimens of *Alnus glutinosa*

and recently planted ornamental plants. Although there are only a few trees near the blocks of flats at Heweliusza Street, some are extremely interesting. Noteworthy is an impressive oak, *Quercus robur*, measuring 490 cm in diameter, as well as *Acer platanoides*, 312 cm in diameter, two specimens of *Carpinus betulus*, 159 and 179 cm in diameter, and six specimens of *Tilia cordata*, from 231 to 370 cm in diameter (some of these trees have been topped). South of the buildings, there is a large *Corylus colurna*, 195 cm in diameter. Three types of shrub communities are distinguishable in this sector. There are natural shrub communities, experimental groups of shrubs in the Experimental Garden, and ornamental shrubs planted near the marina and the blocks of flats.

Table 3

Age and species specification of the ten most common species of trees in sector III

No	Species	Perimeter at 1.3 m height (in cm)					Number of trees in sector III	%
		< 40	41-90	91-150	151-300	> 300		
1	<i>Acer platanoides</i> L.	30	67	47	29	1	174	22,3
2	<i>Fraxinus excelsior</i> L.	26	50	44	13	0	133	17,1
3	<i>Alnus glutinosa</i> (L.) Gaertn.	7	39	25	27	0	98	12,6
4	<i>Alnus incana</i> (L.) Moench.	6	43	21	1	0	71	9,1
5	<i>Picea abies</i> (L.) H. Karst.	5	15	30	6	0	56	7,2
6	<i>Tilia cordata</i> Mill.	2	13	10	10	2	37	4,7
7	<i>Aesculus hippocastanum</i> L.	1	10	15	7	0	33	4,2
8	<i>Acer pseudoplatanus</i> L.	1	8	9	7	0	25	3,2
9	<i>Populus simonii</i> Carr	0	0	9	10	1	20	2,6
10	<i>Quercus robur</i> L.	4	7	0	6	2	19	2,4
						Sub-total:	666	85,5
						Others:	113	14,5
						Total:	779	100,0

Source: own data.

The health condition of the shrubs and trees growing in this sector is not satisfactory. The plants around the marina are in the best condition. The trees and shrubs around the blocks of flats at Heweliusza Street are in a relatively good health state. The main

problem is the incorrect topping and pruning of older trees. However, the health condition of the trees growing along the lake shore is unsatisfactory (photo 2). All specimens of *Aesculus hippocastanum* found in this area are heavily attacked by *Casaria ohridella*. Most of the specimens of *Fraxinus excelsior* are burdened with deadwood. Many of the trees belonging to this species are dying. In the lakeshore belt, many trees have toppled down, breaking other, valuable trees growing nearby. Numerous old specimens of *Alnus glutinosa* and *Alnus incana* in this sector have rotten roots and can be blown over by wind. Likewise, rows of trees and shrubs in the Experimental Garden are not in a good health condition. Here, the main problem is the compactness of the plant communities. Moreover, most of the specimens of *Acer platanoides* and *Acer pseudoplatanus* have been attacked by *Rhytisma acerinum* (an early stage of tar spot of maple tree leaves). Most *Picea abies* are infested by *Ips typographus*. Some trees have been tied to a fence with a wire, which inhibits their further growth. 41 dead and 42 badly diseased or attacked by pests have been identified in the sector. 288 trees have visible dry branches in the crown and 163 have deadwood. 213 trees have visible trunk damage. Asymmetric crowns have been noticed in 160 cases. It was worrying to observe many trees with strongly inclined trunks, which in many cases disturbs the static balance of a tree. In the whole sector, there are 231 leaning plants, including 125 strongly inclined ones. Several nursing treatments should be carried out in the sector, aiming at enhancing the health condition of the tree stands. The main ones are sanitation trimming and removal of foreign bodies from trees (removal of deposited organic matter and water, untying of barbed wire), placing traditional and pheromone insect traps, removal of infested trees, hanging nesting boxes for birds. 166 trees in the whole sector have been chosen to be cut down. They are divided into three groups: to be removed urgently (13 trees), to be removed (116 trees) and to be possibly removed (37 trees). Among the trees which should be urgently cut down are mainly *Picea abies* specimens, which can contribute to a rapid spread of *Ips typographus* over other trees. Other trees indicated to be removed are the fallen ones, which endanger the static balance of other trees. The list also contains dead and dying trees as well as diseased and choked-up plants, which have no chance to develop, as they grow in compact communities and disturb the growth of other, more valuable species. The trees which may be

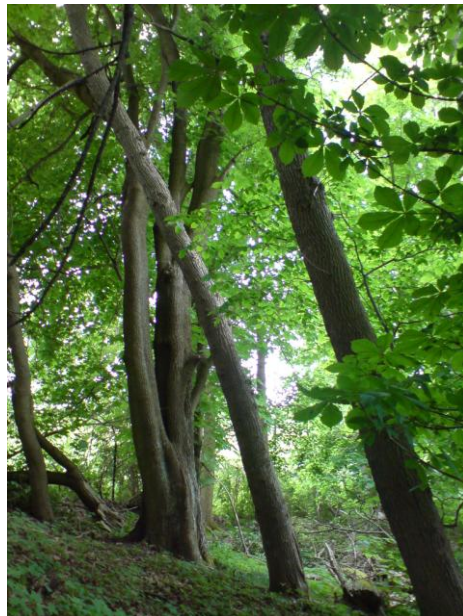
removed are the ones, which have small chances of growing well, but their removal can be postponed.

Sector IV

This sector is situated in the centre of the analyzed area and covers 11 ha. Its core is the old park, named after Professor Wanic (photo 3). The sector also comprises some of the shore of Kortowskie Lake (photo 4) and a small compound of buildings containing a Sports Hall and a former boiler house. The park was part of the layout of the Psychiatric Hospital and is now on the statutory list of historic buildings and areas. According to the local law (*Miejscowy Plan ... 2003*), it can functionally join a planned botanic garden. It is not permitted to raise any permanent constructions in the park. The park is visited by many students during each academic year and by children staying in the halls of residence during summer holiday. In the park, there are remains of a buildings, i.e. foundations, today overgrown with self-sown plants. Until 2009, there was also an indoor tennis court. The shore of Kortowskie Lake is the most frequently visited part of this sector. It encompasses a guarded bathing area with a sandy beach and, in some distance from the beach, a pier. In total, 3 024 objects have been inventoried in the sector, including 2 438 single trees. 51 tree species were counted. The biological diversity in the sector can be described as satisfactory. The dominant species is *Carpinus betulus* (18.9%), owing to an impressive strolling path lined with these trees and found in the southern part of the park (tab. 4). In other parts of the park, there are few specimens of this species. Practically, in all parts of the park there are trees belonging to *Acer platanoides* (14.0%), an expansive species which grows very fast and can overpower other plants. Most of the specimens of this species are young trees. In the central part of the sector, a large share of *Ulmus glabara* (10.3%), *Tilia cordata* (8.8%), *Quercus robur* (6.3%), *Acer pseudoplatanus* (5.5%) and *Betula pendula* (5.0%) was noticed. Near the lake shores, in turn, many specimens of *Fraxinus excelsior* (7.3%) and *Alnus glutinosa* (5.0%) were found. The northern part of this sector contains a large group of *Fagus sylvatica*, containing impressively big trees. There are many interesting tree species and varieties found in Sector IV. Noteworthy are varieties of *Fagus sylvatica*, e.g. recently planted var. *Pendula* and a big and healthy



Phot.1. Arrangement of the plants near the student residence house number 7. *Source: M. Antolak, July 2008*



Phot.2. Poor condition of the trees growing along the bank of the Kortowskie Lake. *Source: M. Antolak, May 2008*



Phot.3. Historical park in Kortowo. *Source: M. Antolak, July 2008*



Phot.4. Beach in Kortowo with the green area in the background.
Source: M. Antolak, July 2008

specimen of var. *Purpurea*. Something of a dendrological curiosity is a specimen of *Metasequoia glyptostroboides*, growing in a small land depression, close to a former indoor tennis court. Other interesting trees comprise large specimens of *Pinus strobus*, *Thuja occidentalis* and, slightly younger, *Corylus colurna*. Special attention should be drawn to the hornbeam-lined walking path, mentioned earlier. The fancifully entwined limbs of old trees create an incredible atmosphere of mystery and are one of the most interesting sites in the park. In sector IV, there are 34 species of shrubs. The most common ones are *Spiraea x vanhouttei*, planted in rows, and *Taxus x media*, *Philadelphus* or *Aronia melanocarp*, growing singly or in groups. Other species of shrubs occur only sporadically.

Table 4

Age and species specification of the ten most common species of trees in sector IV

Nc	Species	Perimeter at 1.3 m height (in cm)					Number of trees in sector IV	%	
		< 40	41- 90	91- 150	151- 300	> 300			
1	<i>Carpinus betulus</i> L.	160	255	46	1	0	462	18,9	
2	<i>Acer platanoides</i> L.	131	89	76	46	0	342	14,0	
3	<i>Ulmus glabra</i> Huds.	119	111	21	1	0	252	10,3	
4	<i>Tilia cordata</i> Mill.	39	72	56	48	0	215	8,8	
5	<i>Fraxinus excelsior</i> L.	10	31	77	60	0	178	7,3	
6	<i>Quercus robur</i> L.	32	13	29	76	3	153	6,3	
7	<i>Acer pseudoplatanus</i> L.	7	81	38	7	1	134	5,5	
8	<i>Betula pendula</i> Roth	17	14	55	37	0	123	5,0	
9	<i>Alnus glutinosa</i> (L.) Gaertn.	15	52	38	17	0	122	5,0	
10	<i>Picea abies</i> (L.) H. Karst.	64	2	23	17	0	106	4,3	
							Sub-total:	2087	85,6
							Others:	351	14,4
							Total:	2438	100,0

Source: own data.

A widespread occurrence of diseases and pests on trees in the park whas been demonstrated. The major health hazard is posed by *Gossyparia spuria* on trees belonging to the genus *Ulmus*. Most of the trees of the genus *Tilia* are infested by *Eriophyoidea* of the genus *Eriophyes*. In crowns of *Betula pendula* there are numerous

individuals of *Viscum album*, and on branches and trunks of these trees there are many tumor-like growths. Many trees are bent and can be fallen by a wind. Many of the trees which belong to the genera *Alnus* and *Salix*, growing near the lake shore have rotten roots. The worst situation is in the southern part of the park, where trees are quite often fallen by a wind. The shrubs growing there are also in bad health condition. Most shrubs have become old and need rejuvenating trimming or replacement. In this sector, there are 62 dead objects and 120 severely diseased or infested by pests. 952 trees have visible dry branches in the crown and 266 have deadwood. 479 trees and shrubs have visible trunk damage (most often, in the form of deep wounds or rotten trunk). Asymmetric crowns were found in 1 114 cases. Another worrying observation is that many trees have leaning trunks. Altogether, there are as many as 671 leaning plants in this sector. Several nursing treatments should be carried out to improve the health condition of plants in the sector. Additionally, the structure of the park should be thinned and the species composition ought to be corrected by eliminating a large share of *Larix decidua*, *Robinia pseudoacacia* and *Betula pendula* (photophilous plant species). The specimens in good health and able to grow well should only be left. Numerous self-sown seedlings should be removed from the undergrowth. Additionally, the remaining shrubs should be rejuvenated by trimming or replaced. It would also be a good thing to enhance the biological diversity of the park, considering the fact that it will be incorporated into the structure of a future botanic garden. The above treatments aim at improving the structure of the park, which resembles a dry-ground tree community. In the last sector, there are 321 indicated to be removed.

The whole analyzed area covers 55 ha and is characterized by a large share of tree-covered land. During the field study completed in 2008, 7 568 plant objects were inventoried, of which 5 398 were single trees. The most common species was *Acer platanoides* (17.6%). Other frequently encountered species are *Carpinus betulus* (9.3%), *Fraxinus excelsior* (8.1%) and *Tilia cordata* (7.8%). The area called Kortowo I is characterized by a large species diversity and varied origins of the plants. The biodiversity of this area has been assessed as high (about 160 species of trees and shrubs). However, ten most common species make up 74.5% of all the trees growing in this area (tab. 5).

Table 5

Age and species specification of the ten most common species
of trees in Kortowo I

No	Species	Perimeter at 1.3 m height (in cm)					Number of trees	%
		< 40	41-90	91-150	151-300	> 300		
1	<i>Acer platanoides</i> L.	242	323	229	152	6	952	17,6
2	<i>Carpinus betulus</i> L.	166	267	59	9	0	501	9,3
3	<i>Fraxinus excelsior</i> L.	68	140	146	85	0	439	8,1
4	<i>Tilia cordata</i> Mill.	61	142	120	94	4	421	7,8
5	<i>Alnus glutinosa</i> (L.) Gaertn.	48	150	109	78	0	385	7,1
6	<i>Ulmus glabra</i> Huds.	142	137	29	3	0	311	5,8
7	<i>Acer pseudoplatanus</i> L.	25	126	92	45	2	290	5,4
8	<i>Quercus robur</i> L.	46	41	45	125	9	266	4,9
9	<i>Betula pendula</i> Roth	42	34	110	61	0	247	4,6
10	<i>Robinia pseudoacacia</i> L.	54	100	40	15	0	209	3,9
						Sub-total:	4021	74,5
						Others:	1377	25,5
						Total:	5398	100,0

Source: own data.

This large dendrological assembly has certain health problems, undergoes many transformations and, in many cases, calls for urgent nursing treatments. The major problems are visible leaning of trees (1 506 specimens) and trunk damage (1 498 specimens). Besides, there are 186 dead trees. In total, 580 trees and shrubs were indicated to be cut down. The transformations that the tree community undergoes are mainly anthropogenic ones. The actions undertaken now to keep the dendoflora of Kortowo I are limited to current maintenance treatments and introduction of new ornamental plants. However, these activities lack plan and coherence. The tree stands need gradual restructuring and a long-term tree planting plan. Otherwise, the structure of this interesting dendrological set will continue to worsen.

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