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Monument trees in the Kampinos National Park (Central Poland): A review

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ABSTRACT

The paper presents the history of the protection of trees with special values, the current state of monument trees and the preliminary description of trees meeting the minimal circumference criteria to be regarded as natural monuments in the Kampinos National Park (KNP). The study was conducted in the years 2017–2019. In the KNP, there are 69 living trees with a status of natural monuments. Most of them are oaks – 56 specimens, Scots pine – 6 specimens, small-leaved lime – 5 specimens and European hornbeam and European ash – 1 specimen each. Among all, 27 trees grow individually and the other 42 grow in 7 groups. About 200 trees were recognised as meeting the minimal circumference criteria to be regarded as natural monuments. The thickest size tree in the KNP is the black poplar with a circumference of 805 cm, growing in the enclave of Ruska Kępa, and the thickest monument tree in the KNP area is Dąb Kobędzy (Kobendza Oak) with a circumference of 582 cm. Almost a half of the living monument trees (34 specimens) are situated in Kampinos Forest District. In Kromnów, there are 20, and in Laski Forest District 15 specimens of monument trees are mapped. Living monument trees were found in 15 (out of 17) forest subdistricts. The highest number of monument trees was found in Rózin Forest Subdistrict (16) and in Wilków Forest Subdistrict (10). The lowest number – one specimen per forest subdistrict – was found in six forest subdistricts (Dąbrówka, Grabina, Janówek, Krzywa Góra, Rybitew and Zamczysko). In total, there are around 300 specimens of natural monuments and trees meeting the minimal circumference criteria to be regarded as natural monuments, which means that there is one tree of this category for each 125 ha surface of the KNP.

KEY WORDS

Kampinos Forest, very large trees, venerable trees, natural monument, nature conservation

INTRODUCTION

Since the dawn of time, trees distinguished by enormous sizes and original forms have aroused admiration, respect and fear in people. In many cultures and religions, the cult of trees was widespread and played an important role in the life of contemporary societies. But a long time ago, faith in holiness and the supernatural power of trees passed away. However, the interest and admiration for unusual trees have remained unchanged, and it was manifested in mythological beliefs to the fascination presented in paintings, sculptures and literary works (Wiśniewski and Kielczewski 2004). Currently, large-sized trees, unique and often legendary specimens, are the subject of numerous scientific studies and are protected by law, e.g. as monuments of nature (among others, Pacyniak 1992; Szczepkowski et al. 2002; Grzywacz and Pietrzak 2013; Grzywacz et al. 2017, 2018).

According to the Polish Nature Conservation Act of 16 April 2004 (art. 40.1), nature monuments are individual creations of living and inanimate nature or their clusters of particular natural, scientific, cultural, historical or landscape value and with individual features that distinguish them among other formations, stately sized trees, shrubs of native or alien species, springs, waterfalls, karst spring, rocks, ravines, erratic boulders and caves (Ust. Ochr. Przyr. Dz. U. 1614, 2018). In addition, in the Regulation of the Minister of the Environment of 2017, the minimum trunk circumferences at a height of 130 cm for individual types and species of trees were specified (Regulation 2017).

Often, the manner and scope of natural resource management by humans affect the number of trees of considerable size that can become monuments. Particularly, intensive robbery and exploitation of the Kampinos Primeval Forest tree stands took place after the fall of the January Insurrection (1863) and during both world wars. At that time for the areas of the Kampinos Primeval Forest, it was a period when often timber was obtained without respecting the rotation and stand age annual allowable cut adopted at a given time. Poor forest habitats of the Primeval Forest caused the stands growing in the dunes or wetlands to not achieve high quality and site index value. Due to the natural and historical conditions in the Kampinos Primeval Forest, there are currently not too many

stately and aged trees in the Kampinos National Park (KNP) (Zaręba 1978).

Within the KNP, there are both monumental trees and specimens of monumental value. Most trees that are natural monuments or meet the criteria of monument trees are left to ecological processes, and after their dying out they are left for natural decay. The exceptions are trees near hiking trails and buildings where, in the event of the destruction of a large branch, arborist care is allowed to ensure safety in tourist traffic. At present, there is no current compact and comprehensive inventory regarding monumental trees and trees meeting the criterion of the thickness of the monument of nature in KNP.

The aim of the present study is the chronological presentation of the history of the protection of outstanding trees (including natural monuments), the current state of the trees possessing the status of a natural monument (number, species, location) and preliminary characterisation of trees with monumental dimensions in the KNP.

MATERIAL AND METHODS

The presented analyses were concerned with areas within the administrative boundaries of KNP, taking into account various forms of land ownership. The data for the presented analysis were obtained from various sources. The scientific publications regarding the described issue, official documents, forest management plans made for the period 1947–1956 (Plan ... 1947a, b), 1956–1965 (Plan ... 1956), the protection plans of KNP (Plan... 1967, 1995), unpublished materials of KNP, diploma theses (Cwalina 2004; Borek 2006; Kulińska 2006; Borońska 2007), Central Register of Nature Conservation Forms (GDOŚ 2019) and unpublished data of the authors of this study were used. The verification of the condition of monumental trees (alive, dead) in the field and their measurements were carried out in the years 2017–2019. The trunk circumference was measured with a measuring tape at a height of 1.3 m in accordance with commonly used principles (Regulation ... 2017), and the height of the trees was determined using the Suunto altimeter. The scientific names of trees were given according to Mirek et al. (2002).

RESULTS AND DISCUSSION

The preservation of trees in the Kampinos Primeval Forest

Roman Kobendza was the initiator and spokesman of the establishment of the KNP, and he was probably the first one who paid attention to distinctive trees and postulated their protection in the Kampinos Primeval Forest. In his elaboration dated from 1924 titled Project of the reserve in the Kampinos Primeval Forest, there were identified three Scots pine trees *Pinus sylvestris* L., where one of them was characterised by umbrella-like shape and was growing in Łasica river. The tree was briefly described by the following features: height 5 m, crown width 10 m, age at least 100 years, and circumference at the base 2.5 m; the scientist presented a black and white photograph of the tree. In addition, he listed as well two hornbeams *Carpinus betulus* L. in Narty locality and drew attention to two taxa, a dark birch *Betula obscura* Kotula and boreal shrub leather-leaf *Chamaedaphne calyculata* (L.) Moench, deserving urgent protection.

In the letter dated 22 October 1931 addressed to the authorities of Warsaw titled In the protection of the Kampinos Primeval Forest, Kobendza (1931) wrote: Individual trees should also be subject to absolute protection because of their age or peculiar shape form of growth. Such protection is deserved among others, to an old pine with a chapel with a one-sided crown on the border of the village of Górki in the crossroad of the road to Kampinos at Grabina (states property); old hornbeam by the road to Kampinos from Narty (states property); old oak *Querus* sp. with a chapel at Krzywa Góra on the border of swamps and dune embankment (states property); old oaks near the forester's lodge in Pociecha (states property); oak next to the gamekeepers' lodge called Zamość, towards the north direction (states property); a number of older oaks on the dune hill from 'Zamczyska' towards the east, (states property); Scots pine umbrella-shaped in Łasicy village on the Bzura river, which is an extremely original and unique specimen, so far not only in the forest primeval territory but also in Poland (private property).

In the inventory of very old lindens (*Tilia cordata* Mill.) in Poland published by Środoń in 1935, there was information about the old linden growing near the forester's lodge in Sieraków Forest Subdistrict (FS), which

was tangled with oak boughs (today it could be difficult to find the remains of these trees and even indicate the location more accurately) and two with linden tree avenues by the roads from Zawady to Łazy and from Zawady to Pasikonía (Środoń 1935).

Immediately after the Second World War, Jadwiga and Roman Kobendza (1945) proposed to protect 14 objects representing individual trees, groups of trees and avenues in addition to about 100 specimens of dark birches (*Betula pendula* subsp. *obscura*) already protected in the Sieraków reserve and 9 European larches in the Rybitew FS covered by reserve protection by the Reserve Department of the General Directorate of State Forests.

Inventory of monument trees in Kampinos National Park

After the insertion to the Polish law and practice of the term of nature monument in the Nature Conservation Act of 1949, the first tree monuments of nature in the KNP were established on the basis of the decision of the Head of Agriculture and Forestry Department of the Presidium of the Provincial National Council in Warsaw of January 12, 1962, e.g. Sosna Powstańców 1863 r. (Pine of Insurgents 1863); (Orzeczenie ... 1962). In the book of Bobiński and Chociłowski (1967), an additional eight trees – nature monuments (including six oaks near Roztoka village) – were described. In addition to several trees already recognised in the first years after the establishment of the KNP as monument trees of nature, attention was also paid to other particular specimens. Heymanowski (1975) wrote about the sycamore maple tree *Acer pseudoplatanus* L. growing near the service settlement of the Grabina FS as it follows: a beautiful, tall specimen with a cutting diameter – 123 cm (circumference about 370 cm – authors' attention), age about 115 years and height – about 16 m. In 1965, the storm overturned the described specimen.

The first slightly comprehensive elaboration regarding monument nature trees appeared in the KNP Forest Management Plan for 1967/68–1976/77 in the chapter titled Description of monuments of nature and rare plants (Plan ... 1967), where an inventory of trees worth protecting because of the size or their form shaped by the environment was included. In total, 37 items (individual trees and tree groups) were listed. Noteworthy is the mention of Scots pine specimen about 140 years

old, 22.5 m high and trunk diameter 62 cm at a height of 1.3 m with old wild beehive openings in the Kromów Forest District (FD) (219Ah forest compartment). Nowadays, this Scots pine specimen does not exist and in the KNP there are no other trees with wild beehive kept in the past (Heymanowski 1970).

A more detailed inventory of data on trees – nature monuments and trees deserving monument tree status in the Kampinos Primeval Forest, including the KNP, can be found in the KNP Protection Plan from 1995 (Plan ... 1995). The elaboration describes the number of 1,139 monument trees (including avenues with a large number of trees in the park buffer zone), representing 18 species, including KNP areas with a buffer zone. A division into three groups of objects was applied: approved nature monuments reported to the Provincial Nature Conservator (PNC) and candidates for nature monuments (not reported to PNC). In the above-mentioned elaboration, the data on nature monument trees within the KNP were distinguished. In the KNP, 129 trees with monument tree values were indicated (108 oaks, 8 small-leaved lindens, 4 common maples *Acer platanoides* L., 3 ash trees *Fraxinus excelsior* L., 2 white poplars *Populus alba* L. and 1 of European white elm *Ulmus leavis* Pall., common hornbeam, aspen and Scots pine). In 2002, as part of the nationwide inventory of the thickest trees in national parks, the KNP administration reported 33 trees, representing 10 species (growing within the borders and buffer zone of the park). The current growth dimension characteristics of these trees were described. In the inventory of 100, the stoutest trees growing in Polish national parks, KNP (including the buffer zone) represents 18 specimens belonging to 5 species (white, black and Canadian poplars *P. alba*, *P. nigra* L. and *P. x canadensis* Moench, pedunculate oak *Quercus robur* L. and small-leaved lime). In the top 20, there were 10 trees from KNP (including the buffer zone), including two of the stoutest ones. Among them are the now-defunct white poplar from Leszno with a circumference of 1122 cm and a black poplar with a circumference of 800 cm (Kusiak and Węgiel 2002). In the 2002 elaboration by Baraniuk and Lubański (2002), there were listed 1258 trees of characteristic monumental values in the area of KNP and its surroundings. In 2010, KNP employees elaborated another list of trees with the values of nature monuments. In total, 1289 such trees were found in the park and abroad (buffer zone and its im-

mediate vicinity). Furthermore, 156 trees were found in the KNP, with 139 on the land owned by the KNP and 17 on other landowner properties.

In the Annex to Regulation No. 21 of the Masovian Voivode of July 31, 2009, regarding the establishment of nature monuments located in the Warszawa Zachód Powiat, it is listed among others a group of monumental oak trees (Dęby Ławskie) from the 30 trees (Regulation ... 2009). Natural processes result in fewer and fewer trees. Although dead lying trees do not cease to be a monument of nature, with time they decay and disappear from the landscape. Currently, in the group of monumental oaks in Ławy village, there are 15 live trees with circumferences from 270 to 500 cm. The two thickest oaks with circumferences of 410 and 500 cm are so-called fork-trees. In both cases, one part of the tree was dead or broken. The change in the number of living trees is also visible in other places, as it is including in the cluster of Dęby Roztockie. Within the remaining five-tree group, two specimens are alive with circumferences of 425 and 340 cm. Recently, growing on the border of the Polesie and Wilków Forest Sub-district, Dęby Poleskie is a large stable number group of trees consisting of 14 nature monuments, where the circumferences are in the range 215–445 cm.

Current status of trees – monuments of nature in Kampinos National Park

On the basis of the analysis of available documentation and after field verification, the number of live nature monument trees within the KNP is 69 specimens. It covers 56 oaks, 6 Scots pines, 5 small-leaved lime, and 1 each of European hornbeam and European ash (Tab. 1). Separately as single trees, 27 grow; the remaining 42 grow in 7 groups.

Although, the percentage surface share of oak in the stand KNP is approximately 10% and this places the species in third place in ranking in terms of share in stands, oak is the most represented type of nature monument tree, from a total number of 56 individual trees. Among the thickest trees, six oaks reached a circumference of over 500 cm: Dąb Kobendza (Kobendza Oak) – 582 cm, oak at Posada Dembowskie (village) – 550 cm, oak in Sieraków – 511 cm, oak in Grabina – 510 cm, Dąb Powstańców 1863 r. (Oak of Insurgents 1863) – 522 cm and oak in Zaborów (forest department 249h) – 500 cm. Dąb Leśniczego (Forester Oak) in

Table 1. Number of trees – natural monuments (live trees) by species in the forest subdistricts of the Kampinos National Park

Forest Subdistrict	Species of tree					Total
	<i>Quercus robur</i>	<i>Pinus sylvestris</i>	<i>Tilia cordata</i>	<i>Carpinus betulus</i>	<i>Fraxinus excelsior</i>	
Dąbrówka	1					1
Grabina	1					1
Janówek	1					1
Kampinos	7			1		8
Krzywa Góra	1					1
Lipków	4		4		1	9
Polesie	7 (incl. 4 Dęby Poleskie)					7
Przyćmień	2	4				6
Różin	15		1			16
Rybitew		1				1
Sieraków	3					3
Wiersze	2					2
Wilków	10 (Dęby Poleskie)					10
Zaborów	2					2
Zamczysko		1				1
Total	56	6	5	1	1	69

Granica (617 cm) was included among the oaks that reached a circumference of more than 600 cm. However, the circumference measurements for this tree were not carried out in accordance with accepted measurement methods. Dąb Leśniczego was probably formed from the fusion of three individual trees. Two individual trees were fused directly together. However, the branching between the third trunk is below 130 cm. In this case, the measurement should be made separately for each trunk. The obtained circumferences are as follows: 429 and 350 cm. Furthermore, in this way, measurements were carried out utilizing dendrological expertise for this tree in 2018. The tree is worthy of attention among others due to its measurement problems and its shape as well as the kinds of protection used to reduce the possibility of damage. Three-stemmed Dąb Leśniczego in Granica, despite a significant decay of wood in the trunks and the presence on one of them, numerous sporocarps of the *Daedalea quercina* (L.) Pers., which is the perpetrator of brown wood rot, should have sufficient tilting stability after performing appropriate treatments (Kowalczyk and Kowalczyk 2018). In the forest settlement area located in the

eastern part of Granica, there are still four pedunculate oaks listed in the Register of Nature Monuments. Their circumferences and height are as follows: 512 cm and 26 m, 379 cm and 26 m, 367 cm and 24 m (dying specimen with defoliation of about 90%), and 336 cm and 26 m. Oak on the field in the village Kępiaste is another tree that during its life exceeded a trunk circumference of 600 cm. The circumference for this tree was in the range of 620–636 cm. However, due to advanced wood decomposition processes, part of the trunk has disintegrated and currently, the circumference of the tree is 467 cm.

Monument oaks grow in towns, near settlements and inside forest complexes. In the Krzywa Góra Strict Protected Area (SPA), Kobendza Oak is the thickest oak in the KNP forest area. It is also the thickest monument tree in KNP. The protection of this tree was courted by Professor Roman Kobendza before World War II. The tree has a trunk with a circumference of 582 cm and height 31 m. It is a specimen of a tree that has a scientifically proven age – about 300 years (Ufnalski 2005). However, the thickest oak in the Kampinos Primeval Forest region grows in the buffer zone of KNP, in the

village of Śladów. It is a pedunculate oak called Dąb Obrońca (Defender Oak). The trunk circumference is 695 cm and the height of the tree is 20 m. The age of the tree is estimated at about 300 years. It ranks fourth among the thickest oaks growing in Polish national parks (Kusiak and Węgiel 2002). In Przyćmień Forest Subdistrict, Dąb Św. Teresy (Saint Teresa Oak) is a famous monumental pedunculate oak in KNP. The tree consists of two branched trunks below 130 cm, one of which reached a circumference of 290 cm and the other 314 cm. The tree is about 20 m high and the crown is greatly reduced as a result of care treatments. Due to the natural processes, there is a visible strong weakening of the tree, which was shown in the evaluation of the defoliation reaching 60%.

Despite the fact that Scots pine definitely dominates in the species composition of KNP stands, the number of natural monument trees is small – 6. The thickest specimen called Sosna Królowej Bony (Queen Bona Pine) is by circumference 335 cm, height 23 m, and estimated age about 220 years. The tree grows in the area of the Narty Strict Protected Area (SPA) on Górczańska Droga. The most famous Scots pine, a natural tree monument, is Sosna Powstańców 1863 r. (Pine of Insurgents 1863), which grew on the edge of the Górki village. In the 1930s, the tree was described as a beautiful landscape of Scots pine with a one-sided crown, which was grown next to the chapel and had a holy picture suspended on it (Kobendza and Kobendza 1945). The Scots pine was broken in 1984. The circumference of tree was estimated at approximately 250 cm, height 20 m and age about 190 years. In the 1960s, Kobendzina (1966) estimated the age of pine at around 170 years. Up until now, the remains of the tree can be visible in the place where it grew, next to three tall wooden crosses.

In terms of the number of natural monuments, small-leaved lime is the third tree species. The most impressive small-leaved lime is characterised by 496 cm circumference and 25 m height, and it grows in the village of Szymanówek. The second largest specimen of this species grows in the Lipków FS; it has a circumference of 430 cm.

In the earlier cited ordinance of the Masovian Voivode from 2009, it is also mentioned European ash, which grows by the road in the village of Buda and has a diameter of 335 cm, and European hornbeam, with

a circumference of 340 cm and a height of 22 m, growing close to four oak monument trees at the service settlement in Granica.

An interesting specimen of the monument tree was the largest common juniper *Juniperus communis* L. in the KNP with a tree-like form called Jałowiec Królewski (Royal Juniper), now dead, growing in the village of Korfowe near Kampinos. This specimen was 9 m high and 84 cm in circumference.

It is also worth mentioning the thickest trees growing in the buffer zone of KNP. Currently (2019), the thickest tree growing in the buffer zone of KNP is a specimen of black poplar from Kromnów, called Topola Nadwiślańska or Topola Kromnowska (Vistula-River Black Poplar or Kromnowska Black Poplar), which is 844 cm in circumference and 36 m high. The tree grows by Road No. 575, behind the Vistula river embankment. In the near distance, another natural tree monument was growing, the magnificent Dąb Nadwiślański (Vistula-River Oak), which fell over in 2011 (Zarzyński and Tomusiak 2014).

Trees with monument tree dimensions

Within the KNP exist many trees with monumental dimensions and having no formal status as a natural monument. Their number was estimated at about 200 individual trees. Probably one of such trees is the thickest pine in KNP, with one trunk, growing in the Kromnów FS, in a 70-year-old pine stand. Probably, this specimen is a remnant of a previous stand generation; it reached a circumference of 362 cm and a height of about 14 m. An even thicker specimen of multi-stem pine (four fused trunks) is found in the Sieraków Forest Subdistrict. The circumference of fused trunks is close to 450 cm (below 1.3 m). In the area of the Sieraków FS, there are still single-stem pines, whose circumferences reach and even exceed 300 cm. In several locations, there are trees whose circumference exceeds 250 cm, e.g. in Kaliszki SPA or Granica SPA, where one of the most magnificent pines has a circumference of 285 cm.

At the Narty SPA named after Stanisław Richter, there were two grand and aged hornbeams, whose circumferences were 325 and 365 cm, and their age was estimated at about 300 years. One of them broke in June 2019. It is believed that these are specimens of the oldest representatives of their species not only in Masovia but also in Poland.

In the KNP enclave in Ruska Kępa at the Vistula river, several magnificent black and white poplars grow, which meet the criterion of a minimum perimeter for the monument tree of nature, which is estimated for these species at 350 and 300 cm, respectively. In 2002, two white poplar trees from Ruska Kępa with a circumference of 690 cm and 670 cm were submitted for the competition for the thickest trees in national parks, which proved to be record-breaking as far as dimension is concerned (Kusiak and Węgiel 2002). In 2019, the thickest white poplar possessed a trunk with a circumference of 635 cm. It is affected by *Laetiporus sulphureus* (Bull.) Murrill and *Fomes fomentarius* (L.) Fr., which signals the advanced stage of decomposition of wood inside the trunk. Several black poplar trees have reached even larger size dimensions. The thickest specimen of this species has attained 805 cm in circumference (trunk with numerous burls) (Fig. 1), while two other specimens exceeded 700 cm in circumference (785 and 715 cm). On the trunk of the second one of these trees, there is the label of Monument of Nature Tree, but no document confirming the monumental status of this specimen was found in the analysed materials. The thickest European white elm in KNP, characterised by a trunk circumference of 480 cm as well as several magnificent white willows *Salix alba* L. of which the thickest one is 555 cm in circumference, also grow in this location.

Although black alder is the second largest sharing composition species in the proportion of tree species in the KNP, not one individual monument of nature was established within the borders. Within the KNP, several black alders have been inventoried that meet or have dimensions close to the required minimum circumference for the nature tree monument (250 cm for this species). This includes the Debły SPA, where there are several trees with circumferences exceeding 220 cm, of which the thickest have reached 280 cm in circumference.

Birch occupies the fourth place in terms of percentage ranking in KNP tree stands. For this kind of species, as a nature monument tree, specimens of birch exceeding the minimum value of 200 cm in circumference can be found in many places. For example, several individual trees were inventoried in the Sieraków SPA. The thickest specimen was 240 cm in circumference.

Specimens of other tree species also reach sizes qualifying them as trees – monuments of nature. The



Figure 1. The thickest tree in the KNP – a black poplar with a circumference of 805 cm, growing in the enclave of Ruska Kępa (Photo A. Szczepkowski, 13 Oct. 2019 r.)

second largest European white elm (311 cm circumference) grows in Grabina FS in the vicinity of Nowe Budy. In KNP probably, the thickest Norway maple grows in Granica, in the yard of a forest settlement, with a circumference of 260 cm and a height of 19.5 m.

On the territory of KNP, there are also many old and majestic fruit trees. In the village of Wólka near the monumental Dąb Mariewski (Mariewski Oak, circumference 472 cm), the specimen of common pear *Pyrus communis* L. grows, which is characterised by a circumference of 310 cm, twice bigger than the minimum circumference for monumental pears (150 cm).

In KNP, it is worth paying attention to dark birch, which belongs to Central European subendemites with the natural range covering mainly Poland, the Czech Republic, Slovakia and Ukraine (Franiel 2009). It occurs locally – singly or in small clusters throughout the area of KNP. One of the most impressive specimens of dark birch grows close to the bicycle path between Izabelin and Truskaw (trunk circumference of 116 cm, diameter at breast height approximately 38 cm). The second one (circumference 120 cm) is a slightly thicker specimen, located by the black trail in the vicinity of the Jazłowiecka Path. An interesting specimen of dark birch, with two fused trunks and a circumference of 250 cm and a height of 19 m, was inventoried in the Sieraków SPA (Borek 2006).

Distribution of monumental trees and trees with monumental values in Kampinos National Park

Almost half (34 specimens) of live monument trees were inventoried at Kampinos FD and 20 were found in the Kromnów FD and 15 monument trees in the Laski FD. Most of the nature monument trees occur within the borders of Różin and Wilków FS 16 and 10. A relatively large representation of this category of trees occurs in Forest Subdistricts: Lipków (9), Kampinos (8), and Przyćmień (6) (Fig. 2). In 10 forest subdistricts, there were found from 1 up to 4 nature monument trees

(Tab. 1). In Kaliszki and Kromnów Forest Subdistricts, there are no natural monument trees. Except for a few of them, the vast majority of nature monument trees grow on KNP owned land. The total number of trees of nature monuments and those meeting the criterion of a minimum circumference for a nature monument tree is about 300. It shows that one tree from this category can be expected on average within about 125 ha of the area of KNP.

The density of the distribution of nature monument trees and trees with monumental values in Polish national parks is very diverse. Part of the national parks has been inventoried for the presence of trees of monumental dimensions in the diploma theses completed in the Department of Forest Protection and Ecology of the Warsaw Agricultural University. For comparison, in one of the best preserved lowland forests in Europe, in the former Strict Reserve of the Białowieża National Park (approximately 4,700 ha), the average density of nature monument trees is close to 2 pcs/ha (Grzywacz et al. 2017, 2018). In the Drawieński National Park (approximately 11,536 ha), one nature monument tree is estimated on approximately 27 ha (Ber 2007); in the Bory Tucholskie National Park (approximately 4,613 ha), on about 70 ha (Bartoszewicz 2004); and in the Poleski National Park (about 9,761 ha), on about 185 ha (Ciasnocha 2005).

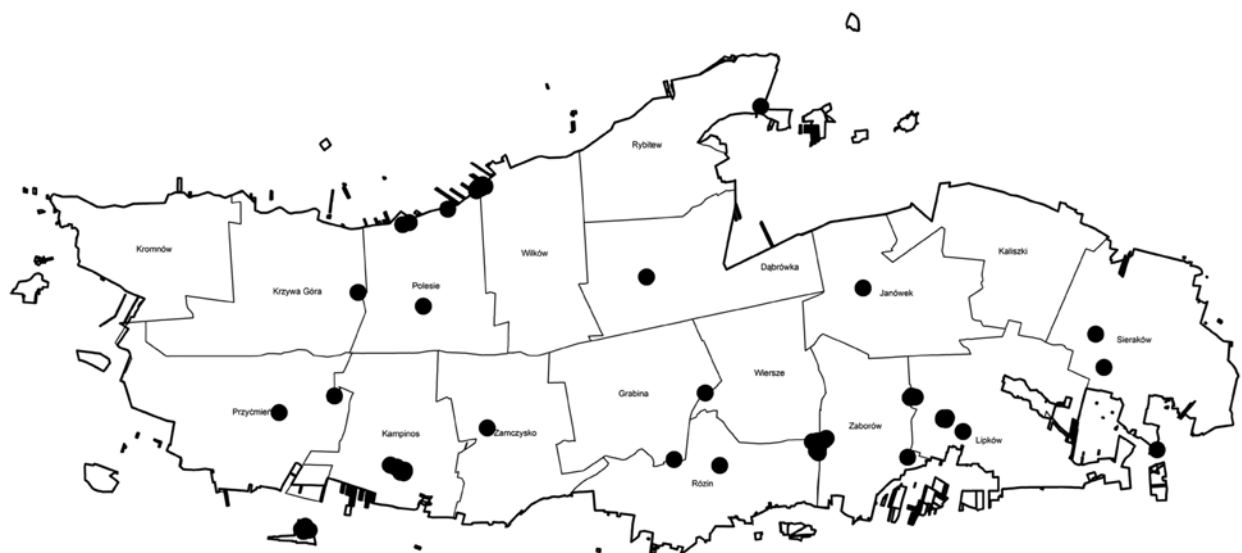


Figure 2. Schematic arrangement of monument trees in the area of Kampinos National Park

CONCLUSIONS

Within the KNP, with the status of a natural monument tree, there were 69 live trees inventoried. The most represented were oaks – 56, Scots pines – 6, small-leaved lindens – 5 and European hornbeam and ash, 1 for each species. Among all, 27 trees grow individually, and the other 42 grow in 7 groups. Almost half (34 specimens) of live monument trees were inventoried at Kampinos FD, and 20 were found in the Kromnów FD and 15 monument trees in the Laski FD. There were inventoried just over 200 trees that meet the minimum size of the circumference for the natural monument and probably is not a completed list.

Trees of considerable size are an integral part of natural forests. They possess an important role in shaping the structure, dynamics and function of these forests. They are involved in an exceptional ecological process both during their lifetime and after death. The presence of stately trees (natural monument size trees) lends forests the shape of primeval ecosystem physiognomy.

Including the KNP, the national park is the highest form of nature protection in Poland. All nature is protected, and at present, other lower-level forms of nature protection measures are not being established such as the natural monument tree. However, for landscape, cultural and social reasons, trees with distinctive dimensions and forms undoubtedly deserve special attention. The oldest trees are witnesses of natural environmental changes that have occurred in the past decades as well as many historical events of local and national importance.

Due to the multifunctional roles that the largest trees fulfil, they should be subject to systematic inventories also in the territories of national parks.

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REFERENCES

- Baraniuk, A., Lubański, A. 2002. Sędziwe drzewa Puszczy Kampinoskiej. *Puszcza Kampinowska*, 1 (33), 3–7.
- Bartoszewicz, T. 2004. Stan zdrowotny drzew pomnikowych w Parku Narodowym „Bory Tucholskie” oraz wytyczne do ich pielęgnowania. Master thesis. SGGW, Warszawa.
- Ber, D. 2007. Trees of monumental size in Drawa National Park (in Polish with English summary). Engineering thesis. SGGW, Warszawa.
- Bobiński, J., Chociłowski, L. 1967. W ostępach podstołecznej puszczy. PWRiL, Warszawa.
- Borek, M. 2006. Trees of monumental size in Laski Forest Inspectorate in Kampinos National Park (in Polish with English summary). Engineering thesis. SGGW, Warszawa.
- Borońska, A. 2007. The trees – the candidates for monument of nature within the preservation area of Kampinos National Park (in Polish with English summary). Engineering thesis. SGGW, Warszawa.
- Ciasnocha, M. 2005. State of trees and shrubs – candidates for nature monuments in Poleski National Park (in Polish with English summary). Master thesis. SGGW, Warszawa.
- Cwalina, D. 2004. Ocena wartości pomnikowych dębów Kampinoskiego Parku Narodowego. Master thesis. SGGW, Warszawa.
- GDOŚ. 2019. Centralny Rejestr Form Ochrony Przyrody. Available at <http://crfop.gdos.gov.pl/CRFOP/search.jsf> (access on 30.10.2019 r.)
- Grzywacz, A., Pietrzak, J. 2013. Drzewa – pomniki przyrody. Polskie Towarzystwo Leśne, Warszawa.
- Grzywacz, A., Keczyński, A., Szczepkowski, A., Bielak, K., Drozdowski, S., Bolibok, L., Brzeziecki, B. 2017. Trees of monumental sizes. In: *The Forests of the Strict Reserve of Białowieża National Park* (ed.: A. Keczyński). Wydawnictwo DRAGON Sp. z o.o., Białowieża Park Narodowy, 213–245.
- Grzywacz, A., Keczyński, A., Szczepkowski, A., Bielak, K., Bolibok, L., Buraczyk, W., Drozdowski, S., Gawron, L., Szeligowski, H., Zajączkowski, J., Brzeziecki, B. 2018. Monumental trees in the Strict Reserve of the Białowieża National Park (in Polish with English summary). *Sylwan*, 162 (11), 915–926. DOI: <https://doi.org/10.26202/sylwan.2018117>

- Franiel, I. 2009. Problemy taksonomiczne *Betula obscura* (Betulaceae) – przegląd literatury. *Fragmenta Floristica et Geobotanica Polonica*, 16 (1), 27–32.
- Heymanowski, K. 1970. From studies on bee-keeping in Mazowsze (XV–XVIIIth century) (in Polish with English summary). *Sylvan*, 114 (4), 29–53.
- Heymanowski, K. 1975. Materials for the reconstruction of the natural composition of forest stands at the Kampinos National Park (in Polish with English summary). *Sylvan*, 119 (3), 37–51.
- Kobendza, R. 1924. Projekt rezerwatu w puszczy Kampinoskiej. *Las Polski*, 5, 161–170.
- Kobendza, R. 1931. Pismo do Biura Planu Regionalnego Warszawy „W sprawie ochrony Puszczy Kampinoskiej”.
- Kobendza, J., Kobendza, R. 1945. Materiały przyrodnicze do projektu rozplanowania Puszczy Kampinoskiej. Spółdzielnia Wydawnicza Czytelnik, Warszawa.
- Kobenzina, J. 1966. Puszcza Kampinowska. Wiedza Powszechna, Warszawa.
- Kowalczyk, W., Kowalczyk, T. 2018. Ekspertyza dendrologiczna wykona przy wykorzystaniu sonicznego tomografu Picus 3Q74 Exp oraz zestawu urządzeń Treequintetic i programu Arbostat drzewa pomnikowego – „Dąb Leśniczego” rosnącego na terenie posesji przy Leśniczówce w miejscowości Granica w obszarze Kampinoskiego Parku Narodowego. KPN, Izabelin.
- Kulińska, A. 2006. Trees of monumental dimensions in Kampinoski National Park, Kampinos District (in Polish with English summary). Master thesis. SGGW, Warszawa.
- Kusiak, W., Węgiel, A. 2002. Najgrubsze drzewa polskich parków narodowych. *Przegląd Leśniczy*, 9, 12–14.
- Mirek, Z., Piękoś-Mirkowa, H., Zając, A., Zając, M. 2002. Flowering plants and pteridophytes of Poland. A checklist. W. Szafer Institute of Botany, PASC, Kraków.
- Orzeczenie nr 144 Kierownika Wydziału Rolnictwa i Leśnictwa Prezydium Wojewódzkiej Rady Narodowej w Warszawie z dnia 12 stycznia 1962 roku.
- Pacyniak, C. 1992. Najstarsze drzewa w Polsce. Wydawnictwo PTTK „Kraj”, Warszawa.
- Plan gospodarczy prowizorycznego urzędzenia na okres 1947/48 r. – 1956/57 r. (a) Stan na 1.X.1947 r. Część I. Nadleśnictwo Państwowe Laski. Dyrekcja Lasów Państwowych Okręgu Warszawskiego w Siedlcach.
- Plan gospodarczy prowizorycznego urzędzenia na okres 1947/48 r. – 1956/57 r. (b) Stan na 1.X.1947 r. Część I. Nadleśnictwo Państwowe Kampinos. Dyrekcja Lasów Państwowych Okręgu Warszawskiego w Siedlcach.
- Plan Urzędzenia Gospodarstwa Leśnego Nadleśnictwa Kromnów na okres od 1.I.1956 do 31.XII.1965 r. Warszawski Okręg Lasów Państwowych w Siedlcach.
- Plan Urzędzenia Gospodarstwa Leśnego Nadleśnictwa Laski na okres od 1.I.1956 do 31.XII.1965 r. Warszawski Okręg Lasów Państwowych w Siedlcach.
- Plan Urzędzenia Gospodarstwa Leśnego Kampinoskiego Parku Narodowego na lata 1967/68–1976/77.
- Plan ochrony Kampinoskiego Parku Narodowego. 1995. Załącznik do operatu ochrony ekosystemów lądowych oraz wybranych elementów flory. Arkusze ewidencyjne pomników przyrody.
- Rozporządzenia nr 21 Wojewody Mazowieckiego z dnia 31 lipca 2009 roku w sprawie ustanowienia pomników przyrody położonych na terenie powiatu warszawskiego zachodniego.
- Rozporządzenie Ministra Środowiska z dnia 4 grudnia 2017 r. (poz. 2300) w sprawie kryteriów uznawania tworów przyrody żywej i nieożywionej za pomniki przyrody.
- Szczepkowski, A., Tomusiak, R., Zarzyński, P. 2002. The History of Baublys – an Attempt at Evaluating Some Dendrometric Characteristics of the most Famous Oak Tree in the History of Lithuania. *Baltic Forestry*, 8 (1), 35–41.
- Środoń, A. 1935. Inwentaryzacja zabytkowych lip w Polsce. *Ochrona Przyrody*, 15, 95–129.
- Ufnalski, K. 2005. Wyniki pomiaru Dębu Kobendzy w KPN. KPN, Izabelin.
- Ustawa z dnia 7 kwietnia 1949 r. o ochronie przyrody. Dz.U. nr 25, poz. 180. 1949.
- Ustawa z dnia 16 kwietnia 2004 r. o ochronie przyrody. Dz.U. poz. 1614. 2018.
- Wiśniewski, J., Kielczewski, B. 2004. Kulturotwórcza rola lasu. Wydawnictwo Akademii Rolniczej, Poznań.
- Zaręba, R. 1978. Puszcze, bory i lasy Polski. PWRiL, Warszawa.
- Zarzyński, P., Tomusiak, R. 2014. 90 drzew – okazy niezwykłe. CILP, Warszawa.