

PASSPORTIZATION OF GREENERY IN THE CASTLE PARK OF ŠENOV

Marie PASTRŇÁKOVÁ¹, Andrea KUBACZKOVÁ¹, Simona VOZNICOVÁ¹, Barbara STALMACHOVÁ¹

¹ HGF, VSB – Technical University of Ostrava, Czech Republic;

marie.pastrnakova.st@vsb.cz

ABSTRACT

In today's Europe, passporting is mainly carried out by private landscaping companies, which offer their customers a complete appreciation of their property on the market. From the private sector of individuals, this is not a frequent phenomenon in our country. In the Czech Republic, this trend is limited mainly by the financial situation of the majority of the population. These services are thus used in the state sector by the administration of parks and greenery, which must keep records of all costs of maintaining public greenery.

The inventory of greenery is discussed abroad mainly in connection with forest management, which, in contrast to orchard evaluation, broadens its horizons to other attributes, including substance flows, soil erosion, the amount of biomass and the amount of excavated material. With the growing consumption of wood and the global problems related to this issue, the ecological value of greenery, which is often introduced into legislation, is being emphasized in EU countries, but also in the Western world.

The thesis focuses on the passportization of vegetation greenery in the Šenov Chateau Park. It deals mainly with a new method of evaluation, which consists of calculations using a professional calculator prepared by the Agency for Nature and Landscape Protection. Furthermore, this thesis deals in detail with the changes that have taken place since the last inventory within the revitalization of the Castle Park, which was carried out by Ing. Petr Ondruška. At the end of the thesis, there is a map and a proposal for further care. Lists of taxa can be viewed in the appendices, which are a guide for the entire evaluation.

Keywords: Inventory of woody plants; Passportization of greenery; Orchard value; Valuation of woody plants; Šenov Chateau Park.

1 INTRODUCTION

In the past twenty years, the valuation of trees in the Šenov Chateau Park has been carried out in several phases, during which the overall inventory of tree species has been processed, degraded and diseased parts of the stand have been cut down, trees have been treated and new trees and shrubs have been planted.

The chateau park in Šenov is a very important landscape element, which is culturally enriched by the building of the Elementary Art School, formerly a part of the castle, a fountain and also the building of the Church of God's Providence, which is called the "pearl of Silesia". Therefore, in the past, emphasis was placed on preserving this park and preventing inappropriate activities that could lead to a threat to the park's orchard value.

Between 2012 and 2013, the park underwent a passportization of tree species, landscaping elements and a treatment proposal that reflected the long-term maintenance of the park.

2 METHODS AND STUDY SITE

2.1 Legislative requirements

In the Czech Republic, the scope and method of inventory is determined by Government Regulation No. 247/2009 Coll. It is carried out on inventory squares distributed in a regular network of 2x2 km. At the same time, the legislation defines the processing and evaluation of non-forest stands in the amendment to Act No. 114/1992 Coll., on Nature and Landscape Protection, as amended, which stipulates by the implementing legislation in particular the illegal interventions in tree species that are in conflict with the requirements for their protection. The treatment and permitting of tree felling are dealt with in Section 8 of Decree No. 395/1992 Coll., as amended [1, 2].

Biological assessment according to Decree No. 395/1992 Coll. includes:

- a) description and evaluation of biological elements of the landscape (with special emphasis on specially protected parts of nature),
- b) the characteristics of the proposed intervention, including, in particular,
 - basic administrative data
 - technical and economic data,
 - expected direct effects on plants and animals
 - expected indirect effects on plants and animals, including potential risks,
 - a description of the measures proposed to prevent, reduce, eliminate and, where appropriate, compensate for negative effects;
 - proposal for monitoring of negative impacts,
 - summary and conclusions [1, 2].

The legislation also mandates that the content of the evaluation should also include a comparison of possible variants of the intended intervention with the proposal of optimal variants [1, 2].

2.2 Semi-quantitative inventory procedures

Orchard and biological evaluation of tree species uses taxation, descriptive and qualitative data to determine the following attributes: the number of species and their number, dimensions, health condition and aesthetic value of individual tree species in the given area. In this type of inventory, both scientific and Czech taxa names are used, with each individual being assigned a serial number. It is necessary to know the inventoried area thoroughly [3].

All woody plants and tree stands must be fixed in the field, i.e., surveyed and transferred to a map or plan at the appropriate scale. For mapping, which is used in inventory surveys, e.g., in the Lednice-Valtice area, cadastral maps at a scale of 1:1000 are most often used, while the degree of accuracy is still determined, which should not exceed a deviation of 100 mm in geometrically designed landscaping. However, if the freely designed landscaping is inventoried, in the 1980s it was possible to tolerate a deviation of up to 1 m, because the deviation of 100 mm could not be achieved in any other way than with the help of costly geodetic instruments. Nowadays, however, GPS devices are available that completely minimize deviations [3].

In the field, the worker takes a working map suitable for drawing, in which fixed points are marked for better orientation in space, e.g., a wall, sewerage, road, important solitary tree species, etc. [3].

As part of the preparations, which take place before the actual measurement, the levels of detail with which the drawing will be carried out are determined. It is recommended that the number of tree species on the map should not exceed 500 (maximum 1000) and at the same time that the number of stands should not exceed 50 (maximum 100), because if the numbers are too high, the plans become confusing [3].

A very important part of the inventory is the correct taxonomic classification. However, there are certain obstacles that can lead to incorrect species classification, e.g. the time of year, which specifically in the genus *Salix* makes it impossible to survey the inflorescences, where the distinguishing feature is the number of stamens in the flower. Therefore, it is possible to use the attribute sp. (species) [3].

2.2.1 Taxation data

These attributes are characterized by basic dendrometric data, which include the height of the tree, the base of the crown, the width of the crown and the enumerated thickness of the trunk. Taxation data are measured in metres, with the exception of the enumerated trunk thickness, which is determined at a height of 1.3 metres from the ground and its unit is centimeters [3].

The most technical way to measure the height of woody plants is to measure with a Blume-Leiss altimeter. However, Christen's altimeter with tracer was used in the castle park. This is attached to the base of the trunk and aimed at a sufficient distance with the entire habit of the tree in Christen's altimeter, on the scale of which the height of the tree is read. The advantage of this measurement lies in its accuracy with a maximum deviation of 0.5 m. In free-growing stands, this value is from a practical point of view unnecessary, due to the constant growth of trees, especially young individuals. To facilitate the entire procedure, a height scale is therefore used, which is indicated in intervals of five meters, i.e., 0-5 m, 5- 10 m, 10- 15 m, 15- 20 m, 20- 25 m, 30- 35 m, 35- 40 m [3].

The base of the crown or the setting of branches on the trunk is a taxonomic attribute expressing the lowest point of the attachment of branches to the trunk, or the lowest live shoots with leaves [3].

The width of the crown is measured by the perpendicular projection of the crown to the ground, taking care to measure the branches growing furthest into the surrounding space, especially since the width of the crown is an indication of the involvement of the stand. After measuring, the individual tree species are proportionally drawn into inventory maps using circles that express the crown widths in scale [3].

The actual trunk thickness is a circumferential value that is measured at a height of 130 cm (so-called chest height) above the ground using a band. If the measurement at such a height is prevented by a lower setting of the branches on the trunk, it is possible to measure lower. However, this figure shall be recorded in the table as a note [4].

2.2.2 Descriptive data

Descriptive data aim to characterize the age and developmental stage of an individual. The age of a woody plant is a very characteristic set of traits that each individual has very individually. It mainly depends on whether it is a taxon with a shorter lifespan or a species with a long and slow growth. The maximum age of each individual depends on many factors, so it is not possible to define exactly how old they can be. The table below shows the approximate values that each tree species live for. The importance of the age stage assessment lies primarily in the recognition of the dendrological potential of the entire stand [5].

Table 1. Maximum age of individual tree species [5]

Wood	Maximum Age
Alnus incana	50 years
Sorbus air	80 – 100 years
Populus tremula, Betula pendula, Prunus avium	100 years
Acer platanoides	150 years
Fagus sylvatica, Picea abies	200 – 300 years
Acer pseudoplatanus	500 years
Pinus cembra, Taxus baccata	1000 years

To classify the age stage, a table of age categories based on individual stages of development is used [4].

Table 2. Classification of age categories according to individual stages of development, [4]

Age	Denomination	Characteristics
1	New planting	Signs and manifestations of declining predominate
2	Full-grown plantings	Established planting not yet stabilized, signs of intensive care or its absence, foundation of crown architecture
3	Stabilized adolescent individual	Completion of typical characteristics for a given taxon (habit, bark...), significant elongation growth, often the beginning of fruiting
4	Adult	Evolved individual with taxon characteristics
5	Veteran	Breakdown of the structure of the individual with accompanying manifestations (loss of skeletal branches, onset of natural pathogens)

Other authors give an estimate of the age stage of an individual using age categories determined schematically (e.g.: 0 - 10, 11-20, 21 - 40, 41-60, 61 - 100, 101 and more) [4].

When classifying a tree species from the point of view of its developmental stage, it is possible to proceed according to a table with five basic classification groups.

Table 3. Developmental stage of woody plants, [4]

Classification level	Characteristic
1	Sprouting specimen with predominant signs of declining at the site
2	An attached individual for whom the absence of care is not threatening
3	A stabilized adolescent who no longer needs intensive care
4	An adult individual already exceeding the period of culmination of annual growth that is already capable of generative reproduction
5	An old individual who already shows clear signs of decay

Qualitative data characterize the quality of woody plants in terms of vitality, health and degree of damage. These parameters are usually highly dependent on the individual's habitat and professional care [4].

The vitality of an individual can be evaluated mainly by the quality of foliage and the shaping of branches. These conditions undoubtedly have an impact on the overall viability of the woody plant. The evaluation itself focuses on shape malformations, especially of the main branches. These shape degenerations can often express the lack of vitality of the woody plant, which can also manifest itself in insufficient foliage [4].

Table 4. Vitalite, [4]

Degree of vitality	Characteristic
1	Trees fully vital
2	trees with slightly reduced vitality, manifestations of reduced vitality may be temporary
3	trees with moderately reduced vitality, partial improvement can be expected if external negative influences are reduced
4	Trees with severely reduced vitality cannot usually be expected to improve
5	Trees without manifestations of physiological vitality

Another parameter evaluating the change from normal within the whole stand is the state of health. Its evaluation takes place both within the individual and its overall condition, but also from the observation of the stand and taking into account the influence between individuals on each other, mainly due to the imminent risk of transmission of diseases and pests [3].

The degree of damage is evaluated on four levels – mechanical damage to the trunk, damage to the crown, occurrence of rot and cavities, as well as a decrease in static stability [4].

In most cases, damage to the trunk is caused by external mechanical damage, which can result in infection with wood-decaying fungi. As a result, the statics of the tree may be disturbed. The most common cause of trunk damage is disturbance by game (e.g. grinding of antlers) and human activities (e.g. poor care) [4].

In bad weather conditions or poor care, the crown is damaged. Its most common manifestations include the appearance of dry branches. Šimek appeals to the inventor to distinguish these branches from those that have arisen in accordance with the laws of crown growth [4].

Within the framework of static stability, the tilt of the tree is mainly assessed, which occurs due to the fluctuation of the center of gravity or uneven branching, which can lead to breaking and the subsequent occurrence of rot and cavities. The evaluation of static stability is based on the knowledge of taxa and the influence of the age stage [4].

Table 5. Damage and defects of woody plants, [4].

Degree of damage	Characteristic
1	damage or defects of minimal extent without significant impact on the existence of the individual
2	damage or defects of a significant extent, the existence is not immediately endangered - but often conditioned by the implementation of the cultivation measure
3	damage or defects of a critical extent, existence in imminent danger

2.2.3 Landscaping value

The overall aesthetic, landscaping and landscaping value is expressed by the orchard value of the woody plant. It is recommended to differentiate tree species by colour when drawing them in the map parts, five colours are used: 1 – red, 2 – blue, 3 – green, 4 – brown, 5 – yellow, with 1 being the most important in terms of orchards and landscapes [3].

2.3 Passportization of greenery

The task of the passportization of greenery is to define the basic areas of greenery and then to analyze the composition of technical and vegetation elements. The whole procedure depends on the preparation of documents, the analysis of the assignment and the correct choice of methodology. After that, the carrying out worker is sent to a field survey, where his task is to determine the current state of the greenery elements (inventory of greenery) and technical elements. The data obtained by the worker is electronically processed and evaluated. The aim is to provide clear documentation that further serves the greenery manager to manage it, and in which the greenery manager obtains not only all the necessary quantitative data on vegetation and technical elements and attributes of spatial units, such as land parcels, demarcated basic areas, etc., but also all map data that capture the spatial orientation of vegetation and technical elements [6].

It is recommended to update the passportization of greenery after about two or three years. The most common contracting authorities include state administration and self-government bodies as well as all institutions that administer public green areas. The service is not very financially advantageous for private owners, but still, if the customer is interested in an overview of his property, there are a number of companies on the market that will certainly provide his services [6].

2.4 Inventory of woody plants in the Šenov Chateau Park

The inventory of tree species was carried out according to the methodology of the Agency for Nature Conservation and Landscape Protection in the Czech Republic based on the methodologies of Machovec and Šimek, and at the same time it was based on data compiled during the revitalization of Šenov Chateau Park, which was carried out by Ing. Ondruška [7].

Documentation on the revitalization of Šenov Chateau Park, which was lent by the Department of the Environment based in the building of the Municipal Office in Šenov, and the electronic version of the revitalization in the ArchiCad program, lent by Ing. Ondruška from Ateliér Dubnice [7], were used.

The map parts used, serving as base maps of the inventory and passportization of the Šenov Chateau Park, were prepared for the Town of Šenov by Ing. arch. Kamil Zezula. The measurement was carried out using a fifty-meter textile band and a two-meter height batten. To evaluate the dendrometric parameters, a calculator and database application MyPrice from the www.nature.cz website, prepared by the Nature Conservation Agency of the Czech Republic, were used. The map parts were made in the ArchiCad program. A digital camera NIKON MH-53 was used to take the pictures.

Ocenění stromu dle metodiky AOPK ČR ve verzi 2013			
Specifikace stromu			
Taxon: vybrat ze seznamu		povinné políčko	
Průměr kmene: <input type="text"/>	cm (min. 10)	povinné políčko	?
Přidat kmen			
Výška: <input type="text"/>	m		?
Výška nasazení koruny: <input type="text"/>	m		?
Průměr koruny: <input type="text"/>	m		?
Fyziologická vitalita: <input type="text"/>	výborná	povinné políčko	?
Zdravotní stav: <input type="text"/>	výborný	povinné políčko	?
Odstraněná část koruny: <input type="text"/>	%		?
Památný strom: <input type="text"/>	ne		
Atraktivita umístění stromu: <input type="text"/>	vysoká		?
Růstové podmínky: <input type="text"/>	nevhodné	povinné políčko	?
Prvky se zvýšeným biologickým potenciálem:	<input type="checkbox"/> rozštěpnuté dřevo a třísky <input type="checkbox"/> dutiny <input type="checkbox"/> houbova <input type="checkbox"/> suché větve <input type="checkbox"/> poškození kůry <input type="checkbox"/> výtok mízy <input type="checkbox"/> zlomené větve <input type="checkbox"/> dutinky <input type="checkbox"/> plodnice hub	<input type="checkbox"/> má extenzivní charakter <input type="checkbox"/> má extenzivní charakter <input type="checkbox"/> má extenzivní charakter <input type="checkbox"/> má extenzivní charakter	?
Biologický význam stanoviště	<input type="text"/>	scitěrný strom	?
Vypočítat hodnotu			

Figure 1. Web interface of the calculator for calculating the value of wood, [8].

2.5 Delimitation of the area of interest

Chateau Park in Šenov, district Ostrava, formerly Frýdek Místek district, is located on plot No. 2/1. This plot is oriented north of the national road Ostrava - Havířov, at a distance of about 50 m. The area of interest is about 5 hectares.

There are three buildings within the park - the rectory building, the church and the preserved part of the castle, which currently serves as an art school building. The area of interest is quickly accessible and generally fits into the built-up area system.

From the point of view of access roads, the monitored area is doing very well. There are several paved access roads leading to the park, which were repaved and made accessible in previous revitalizations:

1. The asphalt access road to the church and the parish office, which continues around the southern part of the park and is accessible in both directions.
2. Asphalt access road from the Technical Services to the building of the former chateau, which is connected to the road to the Municipal Office.
3. A pedestrian paved walkway that enters the park in its eastern part, and passes through its center. If necessary, it can also be used by cars.



Figure 2. Šenov Chateau Park, view to the west of the Church of God's Providence

3 RESULTS

The largest representation of *Rosa hybrida* was 265 specimens in the Šenov park, followed by *Acer platanoides* 136 pcs, *Acer platanoides* 136 pcs, *Tilia cordata* 54 pcs, *Fraxinus excelsior* 51 pcs, *Carpinus betulus* 39 pcs. Collection, i.e., prized dendrological specimens occurred in the following numbers: *Liriodendron tulipifera* 3 pcs, *Gleditschia triacanthos* 1 pc, *Gymnocladus dioica* 1 pc.

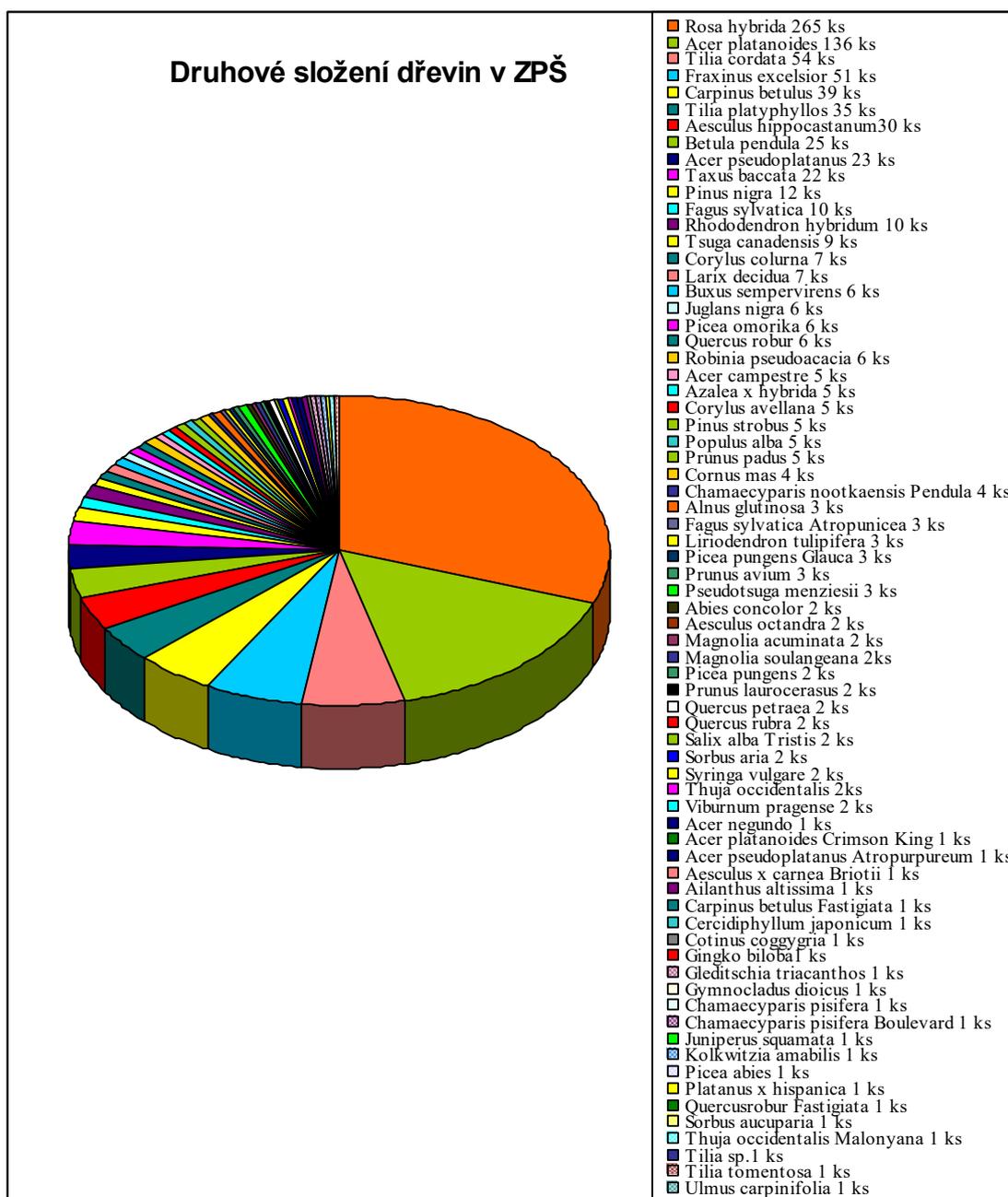


Figure 3. Species composition of woody plants in the Šenov Chateau Park

The growth of trees can be seen from the following picture. Fraxinus excelsior 35 m, Abies concolor 33 m, Aesculus hippocastanum 33 m, Tilia cordata 33 m and Tsuga canadensis 33 m reached the highest height. Figure 5 shows the dependence of crown size on tree height. It follows from the figure that the dependence of the width of the crown on the height of the tree does not apply in every case. These attributes are influenced by the position of the trees relative to each other and the conditions of the habitat.

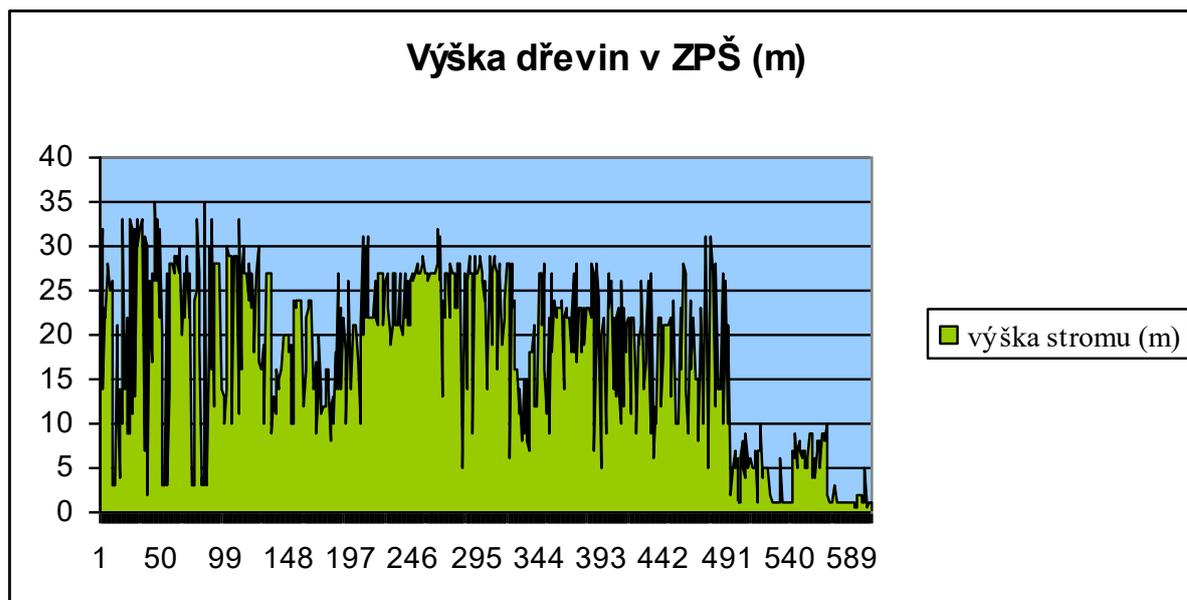


Figure 4. Species composition of woody plants in the Šenov Chateau Park

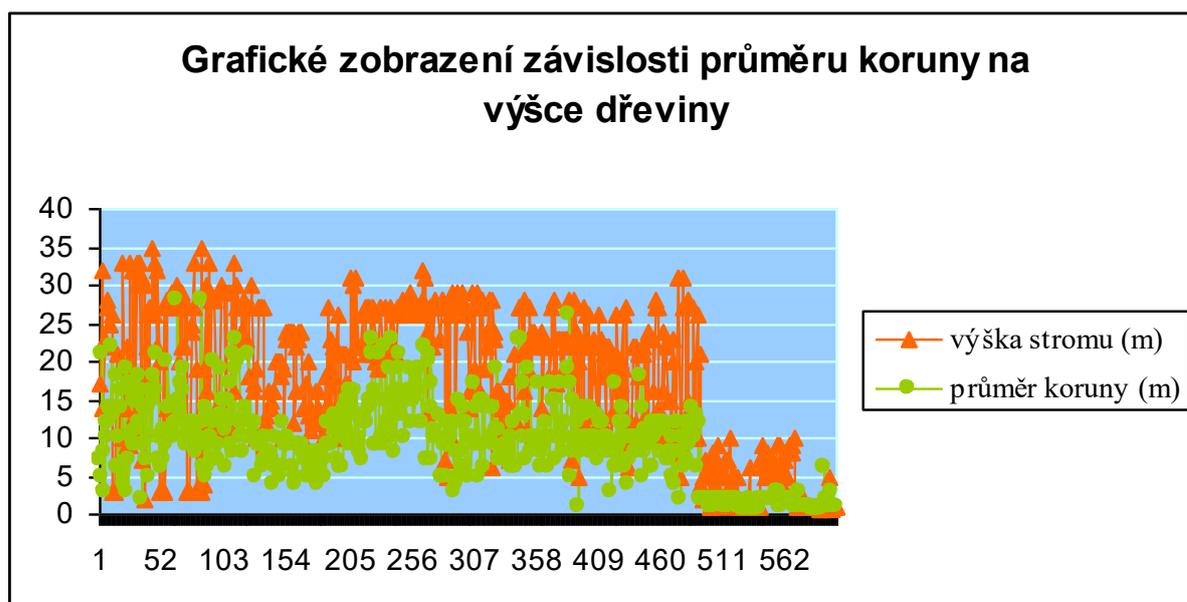


Figure 5. Dependence of crown diameter on tree height in Šenov Chateau Park

Each evaluated tree species was drawn on the map and marked with the appropriate serial number. The total value of the Chateau Park was estimated at CZK 71,602,943, while the orchard elements were evaluated at CZK 305,856 and the orchard value of the trees was estimated at CZK 71,297,087.

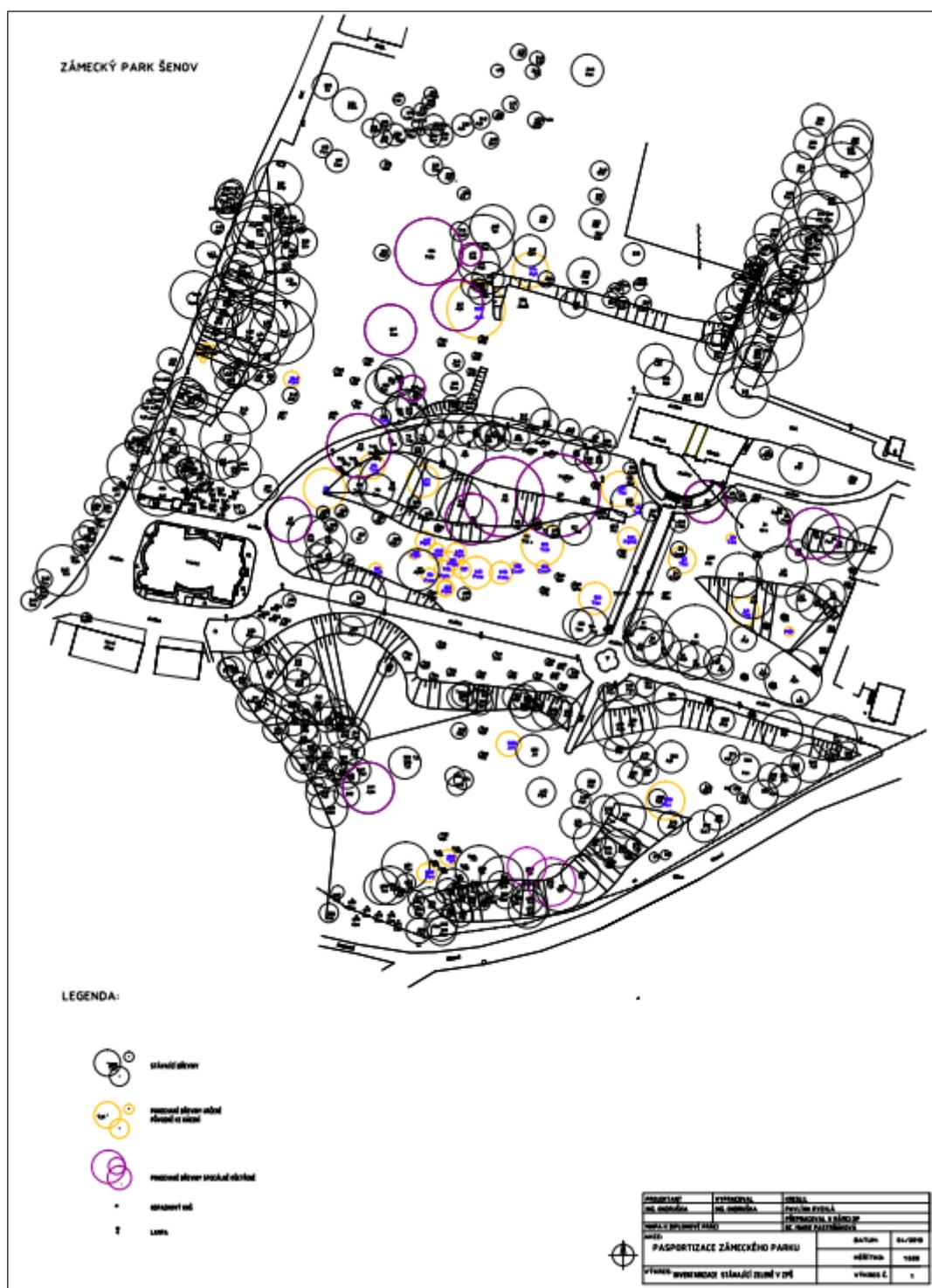


Figure 6. Map drawing of woody plants in the Šenov Chateau Park

4 DISCUSSION

The chateau park in Šenov fulfils aesthetic, historical, entertaining, relaxation, noise protection and hygienic functions due to the adjacent Ostrava – Havířov thoroughfare. It provides a home for some animal species, of which we can name *Sciurus vulgaris* and *Strix aluco*. The park is cared for annually by municipal maintenance workers, who carry out the necessary pruning of trees, mowing of grass areas and maintenance of perennial beds.

Operational care following the inventory assessment should be based on the requirements of tree species. The aim of maintenance is to gradually and systematically maintain the value of the park so that both biotic and abiotic elements are preserved [9, 10].

5 CONCLUSION

After a repeated inventory, it was found that the architect's intentions were not respected in the park. The contractor did not implement the planting that was proposed. Nevertheless, the park is cared for by the city's technical services. I positively evaluate the effort to increase species diversity of invertebrates, birds and small mammals that are tied to decaying wood. Since the last inventory, there has been a change in approach to dying trees that are left in the park to provide a habitat for species that use tree cavities [7, 10, 11].

A positive maintenance approach is also manifested in the protection of the park from invasive species, which are regularly eliminated in the park by mowing. I attribute the introduction of Reynoutria species to the automobile traffic that lines the south side of the park, and which contributes significantly to the introduction of invasive species [12].

The results of the inventory showed that further care should consist of the following measures: Treatment of old and diseased trees, regular pruning of bushes, educational pruning of trees and shrubs, brightening of crowns, rejuvenation of old trees and shrubs, regular pruning of flowering vines, regular pruning and wintering of roses, regeneration of damaged grass areas.

REFERENCES

- [1] Czech Republic. Decree No. 395/1992 Coll., implementing certain provisions of Act of the Czech National Council No. 114/1992 Coll., on Nature and Landscape Protection. In: *Collection of Laws of the Czech Republic*. 1992, c. 395. Available from: <http://csth.teraristika.cz/csth/vyh1395.htm>
- [2] Czech Republic. Act of the Czech National Council on Nature and Landscape Protection. In: *Collection of Laws of the Czech Republic*. 1992, c. 114. Available from: <https://www.zakonyprolidi.cz/cs/2014-199>
- [3] MACHOVEC, J. *Orchard dendrology*. Prague: State Pedagogical Publishing House, 1982. ISBN 17-608-82.
- [4] ŠIMEK, P. *Concept of lecture syllabus: Passport of greenery*. Lednice: MZLU, 2007.
- [5] HECKER, U. *Nature Guide: Trees and shrubs*. vyd. 2. REBO Productions, 2009. ISBN 978-80-255-0291-4.
- [6] Passport of greenery. *Green project* [online]. [cited 2013-03-21]. Available at: <http://www.green-project.cz/sluzby/pasportace-zelene.htm>
- [7] ONDRUŠKA, P. *Inventory and Landscaping Evaluation of the Chateau Park in Šenov, Frýdek - Místek District*. Krnov, 1999.
- [8] Kolařík et al. *Caring for Trees Growing Outside the Forest Part 1 and 2*. Filed to:2003
- [9] PIRO, B. *Establishment and maintenance of greenery - 1*. Prague: State Pedagogical Publishing House, 1984.
- [10] RANDRUP, T. B., for KONIJNENDIK, C. C. *Urban Forestry and Urban Greening*. Elsevier, 2002., s 1–4. Available at: <http://www.sciencedirect.com/science/article/pii/S1618866704700023>
- [11] HURYCH, V. *Ornamental trees for gardens and parks*. Prague: Květ, 2003
- [12] ŠVEHLÁKOVÁ, H., STALMACHOVÁ, B., NOVÁKOVÁ, J., OLSZEWSKI, P., GRABOWSKI, J. & NEUSTUPA, Z. *Guide to determining invasive plant species in Orlová and Mszane*. Ostrava: IMAGE STUDIO, 2019. ISBN 978-80-907502-0-3.