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STUDY ON THE HEALTH STATUS OF TREES IN THE USAMV BUCHAREST CAMPUS

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ABSTRACT

The study explores the importance of urban vegetation, focusing on the campus of the University of Agronomic Sciences and Veterinary Medicine in Bucharest (USAMV). The 37-hectare campus serves as a biodiversity core in the heart of the city, supporting a diverse range of plant species that contribute to a favorable microclimate and support of local biodiversity.

The inventory and monitoring of campus trees was done using the TreePlotter Inventory software, an advanced tool that allows the collection and analysis of data on the condition and distribution of vegetation. The results showed that most trees were in excellent or good condition. The conclusions reveal the importance of using the results of the study to develop a landscape management plan for the next 10 years.

INTRODUCTION

In an era marked by urban expansion and sustainability challenges, the efficient management of urban vegetation has become essential for maintaining quality of life and ecological balance in cities (Sanders & de Vries, 2017). Dendrological vegetation, particularly trees in urban spaces, plays a crucial role not only in enhancing urban aesthetics but also in providing significant ecological benefits, such as carbon capture, reduction of the urban heat island effect, and improvement of air quality (McPherson et al., 2016).

In this context, university campuses serve not only as centres of education and research but also as important biodiversity refuges in urban environments. The campus of the University of Agronomic Sciences and Veterinary Medicine of Bucharest, located in Sector 1 on Mărăști Boulevard, spans 37 hectares and includes a remarkable diversity of dendrological species. This diversity contributes to the creation of a favourable microclimate and supports biodiversity amid a densely populated city (Nowak & Dwyer, 2018).

Accurate inventory and monitoring of these plant resources are essential for implementing effective management and conservation strategies. To this end, TreePlotter Inventory software was used, an advanced tool for tree inventory and management, which allows for detailed data collection and analysis regarding the condition and distribution of trees (Davies et al., 2017).

The main objective of this study is to assess the condition of the dendrological vegetation in the Agronomy-Herăstrău campus, identifying both existing species and their health status. Additionally, the study aims to analyze the ecological and monetary benefits these trees provide, thus contributing to the development of a sustainable management strategy for this important urban green space (Peper et al., 2015).

MATERIAL AND METHODS

The inventory study of the dendrological vegetation in the USAMV Bucharest campus was conducted using the TreePlotter Inventory software, which is globally recognized as a comprehensive application for tree inventory, field data collection, and data management. The application allows for the extraction of standard and customizable reports, complete work history, advanced queries on datasets, map sharing, client account management and customization, and the addition of unlimited users. The application can be used on any web-enabled device, and it supports the upload of Shapefile or CAD files into the TreePlotter INVENTORY or PARKS applications. Additionally, it can calculate and evaluate tree value, assess trees based on risk level, and calculate the eco-benefits of trees (both ecological and monetary benefits).

The study area included the Agronomy - Herăstrău campus of the University of Agronomic Sciences and Veterinary Medicine of Bucharest, which encompasses educational facilities (Faculty of Agriculture, Faculty of Animal Production Engineering, Faculty of Horticulture, Faculty of Land Reclamation, Faculty of Biotechnologies, Faculty of Management, Hortinvest Research Center, Career Counseling and Orientation Center, Floriculture House, Horticultural Machinery Workshop), a sports hall, football and tennis courts, a canteen and restaurant, dormitories, a church, a plant shop, greenhouses, and a vegetation house, a demonstration field, an orchard, a vineyard, a nursery, a botanical garden and dendrological park, parking lots, and garages.

In the study process, both young and mature tree specimens from the USAMV Bucharest campuses were analyzed and inventoried, requiring specialized knowledge for the correct identification of the scientific name of the species and cultivar based on several criteria: the habitus of the dendrological specimen, bark, morphological characteristics of the leaf, and characteristics of flowers and fruits. Additionally, observations were made regarding the tree's condition: excellent, good, fair, poor, or if the specimen was dead. The tree's condition was determined based on observations related to abiotic factors (water deficit, nutrient deficiency, phytotoxicity, mechanical damage, lightning, saturated soil), diseases and pests, and visual observations (cracks, deadwood, cavities, broken branches, leaning trunk, weak branch attachment, dominant tree, excessive pruning, co-dominant branches, topped tree).

Furthermore, photographs were taken with the mobile phone's camera for each specimen to capture the plant's habitus, as well as detailed photographs of characteristics to identify the species and cultivar by leaf, bark, flower, and fruit. For tree specimens exhibiting issues, detailed photos of these problems were also taken.

RESULTS AND DISCUSSIONS

At the University of Agronomic Sciences and Veterinary Medicine of Bucharest's Agronomy – Herăstrău campus, tree species in the green spaces

adjacent to educational buildings, dormitories, sports fields, roads, paths, and other structures were inventoried, excluding fruit trees from the demonstration fields.

Following the input of data for each dendrological species on campus into the TreePlotter Inventory software, statistics were extracted regarding species and genus distribution, the ratio between deciduous and coniferous specimens, the proportion of invasive species, trunk diameter, tree health, and ecosystem benefits.

Using the TreePlotter Inventory software and specialized knowledge, 2,972 specimens of dendrological tree species were identified and inventoried, reflecting a high diversity with trees from 64 genera and 187 species and cultivars (Figure 1).

The analysis of tree health showed that a high percentage of trees are in excellent (47%) and good (44%) condition. Fewer than 10% of the trees are in reasonable or poor condition, and only 1% are dead (Figure 2).

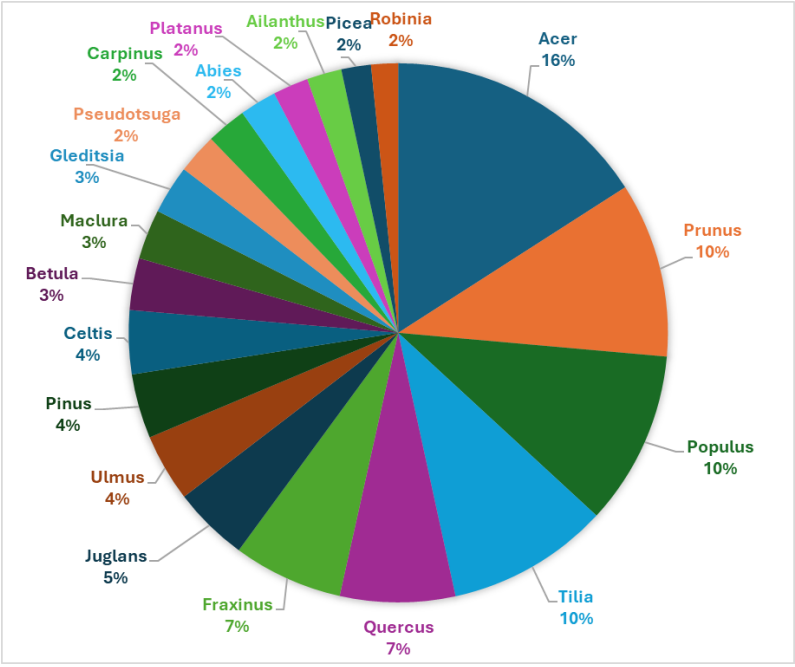

Figure 1 – Genera share (source: TreePlotter Inventory)

Results on tree health were consolidated using the TreePlotter Inventory application, and the condition of trees for the top 10 genera with the highest number of specimens was analyzed based on the collected data (Table 1). The following results were obtained:

- *Populus*: 242 specimens in excellent condition, 9 in good condition, and 2 in reasonable condition.
- *Acer*: 58 specimens in excellent condition, 66 in good condition, 2 in reasonable condition, 4 in poor condition, and 1 dead specimen.
- *Prunus*: 33 specimens in excellent condition, 62 in good condition, 13 in reasonable condition, 2 in poor condition, and 1 dead specimen.

- *Quercus*: 24 specimens in excellent condition, 60 in good condition, 3 in reasonable condition, 3 in poor condition, and 1 dead specimen.
- *Fraxinus*: 12 specimens in excellent condition, 56 in good condition, and 4 in reasonable condition.
- *Juglans*: 46 specimens in excellent condition, 6 in good condition, 2 in reasonable condition, 2 in poor condition, and 5 dead specimens.
- *Carpinus*: 14 specimens in excellent condition and 37 in good condition.
- *Platanus*: 22 specimens in excellent condition and 28 in good condition.
- *Betula*: 20 specimens in excellent condition, 20 in good condition, 2 in reasonable condition, and 1 in poor condition.
- *Abies*: 14 specimens in excellent condition, 18 in good condition, 1 in reasonable condition, and 1 in poor condition.

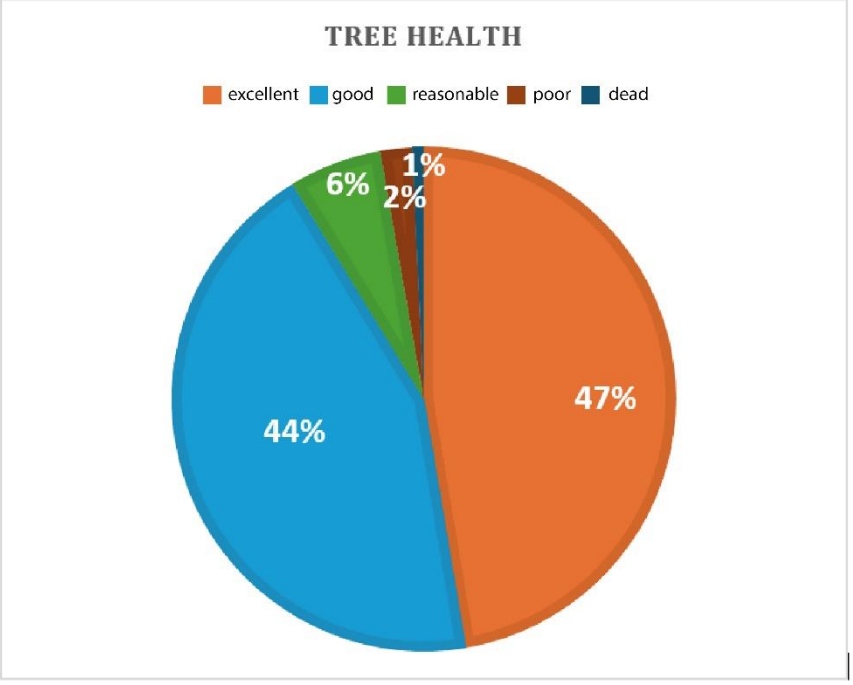

Figure 2 – Tree health (source: TreePlotter Inventory)

Additionally, data regarding the condition of trees in each category and their numbers were compiled. It was found that in the category of trees in excellent condition, almost half of all evaluated trees are from the genus *Populus* (41%), followed by *Acer* (10%), *Juglans* (8%), *Tilia* (6%), and *Prunus* (6%). In the category of healthy trees, the most numerous are from the genus *Tilia* (19%), *Acer* (12%), *Quercus* (11%), *Prunus* (11%), and *Fraxinus* (10%). In the category of trees in reasonable health, those most affected are from the *Tilia* (23%), *Prunus* (20%), and *Ulmus* (9%). Trees with poor health are few, and the most common are from the genus *Acer* (16%), *Pinus* (12%), and *Quercus* (12%) (Figure 3). In total, 10 dead tree specimens were identified, 5 of which belong to the genus *Juglans* (Figure 4).

Table 1

Tree Health – First 20 genera (source: TreePlotter Inventory)

Scientific name	Excellent	Good	Reasonable	Poor	Dead	Total
Abies	14	18	1	1	0	34
Acer	58	66	2	4	1	131
Ailanthus	4	5	1	1	0	11
Betula	20	20	2	1	0	43
Carpinus	14	37	0	0	0	51
Chamaecyparis	1	11	3	2	0	17
Fraxinus	12	56	4	0	0	72
Gleditsia	9	9	2	0	0	20
Juglans	46	6	2	2	5	61
Picea	15	10	2	0	0	27
Pinus	6	15	3	3	0	27
Platanus	22	28	0	0	0	50
Platycladus	1	15	1	2	0	19
Populus	242	9	2	0	0	253
Prunus	33	62	13	2	1	111
Pseudotsuga	20	5	2	1	1	29
Quercus	24	60	3	3	1	91
Thuja	6	9	2	0	1	18
Tilia	38	104	15	1	0	158
Ulmus	7	12	6	2	0	27

Observations on the condition of inventoried tree species noted issues potentially caused by biotic or abiotic factors, as well as visual observations. Overall, the dendrological vegetation in the USAMV Bucharest campus is in good condition. However, some issues caused by abiotic factors were identified, most notably water deficit due to the lack of a drip irrigation system for all dendrological vegetation. There were also specimens suffering from nutrient deficiencies, phytotoxicity, and mechanical damage (Figure 5). Few dendrological species face problems with diseases and pests, but the most frequently encountered issues are bacterial canker, foliar insects, and fungi (Figure 6).

Visual observations of the dendrological vegetation revealed that the most common problems are areas where the wood is dry and requires maintenance and rejuvenation pruning, cavities, cracks, leaning trunks, and broken branches (Figure 7).

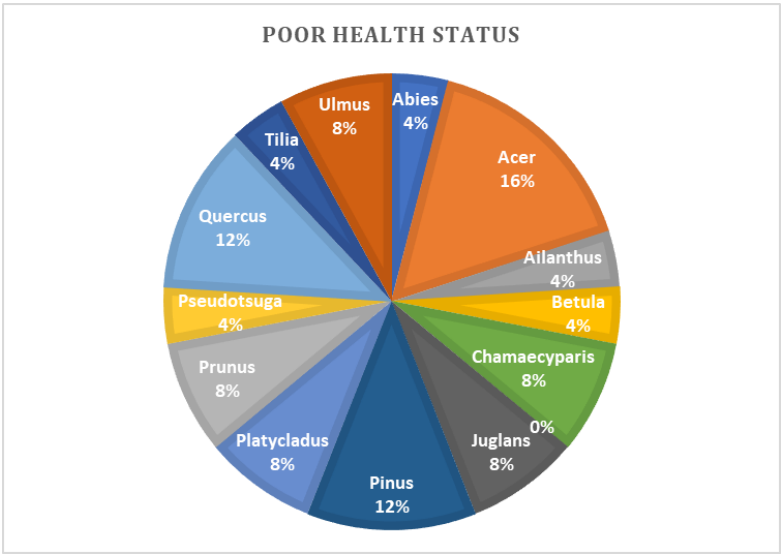

Figure 3 – Share of species with poor health status (source: TreePlotter Inventory)

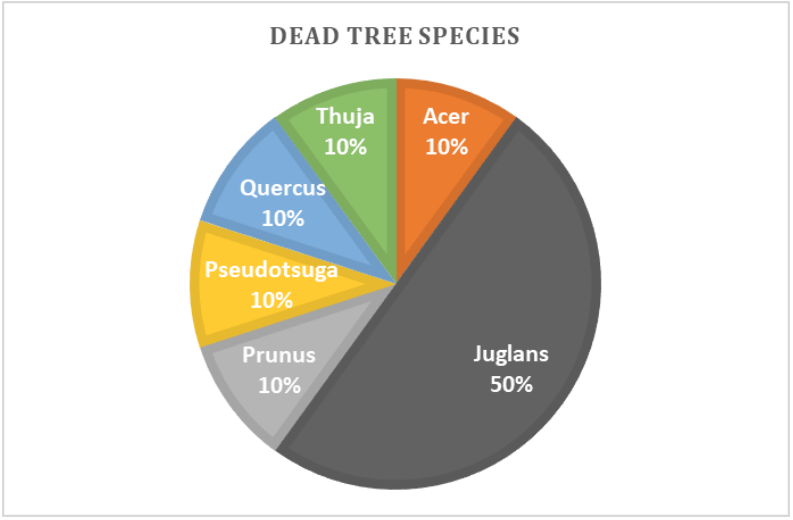

Figure 4 – Share of dead tree species (source: TreePlotter Inventory)

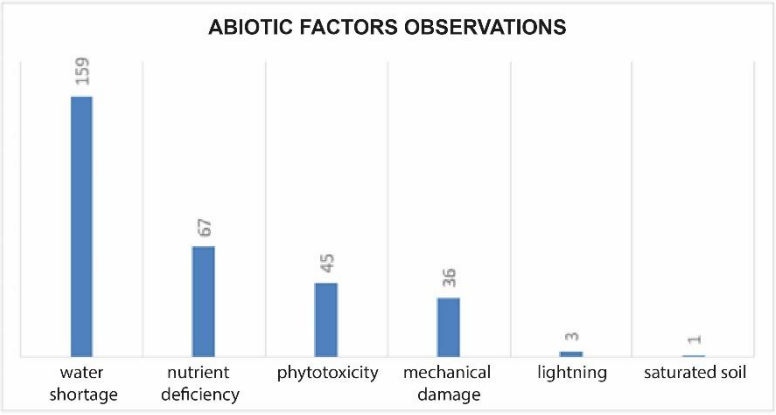

Figure 5 – Observations of abiotic factors (source: TreePlotter Inventory)

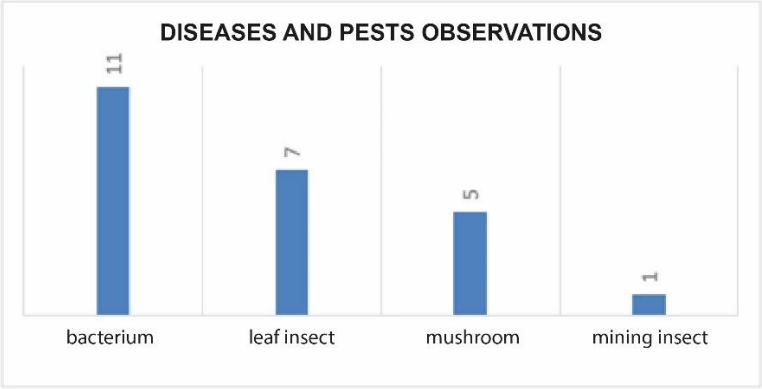

Figure 6 – Disease and pest observations (source: TreePlotter Inventory)

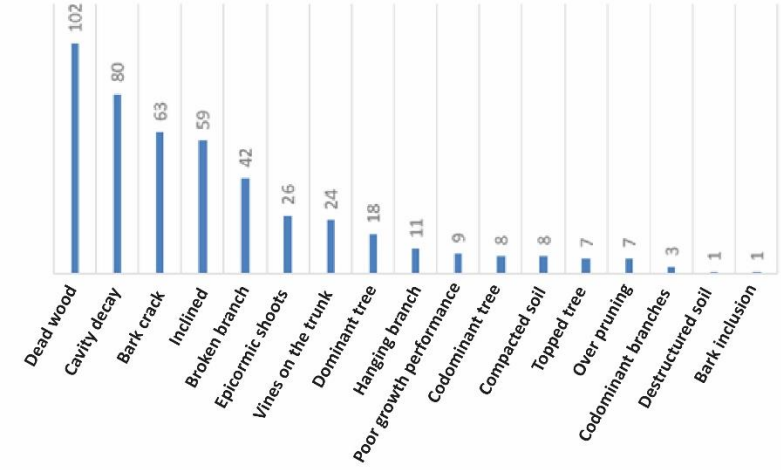

Figure 7 – Visual observations (source: TreePlotter Inventory)

CONCLUSIONS

The inventory study of the dendrological vegetation at the USAMV Bucharest, Agronomie-Herăstrău campus, has highlighted significant characteristics of this urban green space. Firstly, the campus stands out for its exceptionally high plant biodiversity, showcasing a diverse range of plant species compared to other urban areas in Bucharest. This biodiversity is an indicator of a healthy and balanced ecosystem, which positively contributes to the urban landscape and the surrounding environmental quality.

The overall condition of the vegetation in the Agronomie-Herăstrău campus is assessed as good to very good. This suggests that the vegetation is well-maintained and benefits from favourable conditions for growth. The healthy appearance of the vegetation is crucial for maintaining a functional and attractive urban ecosystem.

It is recommended to implement a continuous monitoring system for the dendrological vegetation in the Agronomie-Herăstrău campus. This monitoring will enable the collection of additional data to complete the partial information obtained so far. Periodic evaluation of the structure and condition of the vegetation will provide valuable insights for adjusting and optimizing vegetation management. A well-designed monitoring system will ensure the early detection of potential issues and contribute to maintaining the health and diversity of the vegetation.

By implementing these recommendations, the development and maintenance of a healthy and well-managed urban green ecosystem will be supported, thereby contributing to the continuous improvement of the urban environment and the quality of life for the community.

REFERENCES

Davies, Z.G., Edmondson, J.L., Heinemeyer, A., Leake, J.R. și Gaston, K.J., 2017. Mapping an urban ecosystem service: Quantifying above-ground carbon storage at a city-wide scale. *Journal of Applied Ecology*, 54(1), pp. 148-158.

McPherson, E.G., van Doorn, N.S. și Peper, P.J., 2016. Urban tree database and allometric equations. *General Technical Report PSW-GTR-253*, Albany, CA: U.S. Department of Agriculture, Forest Service, Pacific Southwest Research Station.

Nowak, D.J. și Dwyer, J.F., 2018. Understanding the Benefits and Costs of Urban Forest Ecosystems. *In: Urban and Community Forestry in the Northeast*, Springer, pp. 25-46.

Peper, P.J., McPherson, E.G., Simpson, J.R., Gardner, S.L., Vargas, K.E. și Xiao, Q., 2015. *Tree Guide for the Midwest USA*. Davis, CA: Center for Urban Forest Research, USDA Forest Service.

Sanders, J. și de Vries, S., 2017. How green is your campus? An overview of green space and its importance in urban settings. *Urban Forestry & Urban Greening*, 23, pp. 44-51.