PROTECTION OF ANCIENT TREES (VETERAN TREES) IN THE URBAN LANDSCAPE

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Abstract
Vegetation plays a crucial role in urban spatial structures, being a decisive factor for the local climate, environmental conditions, as well as the visual identity and ambiance of a space. Vegetation facilitates the development of a so-called "friendly space", which is essential for the sustainable growth of contemporary cities. Within the urban ecological system, trees are of paramount importance due to the volume of biomass they produce and their consequential environmental impact. Particularly significant are large and aged specimens, referred to as *ancient trees (veteran trees).* Contemporary research indicates that newly planted trees in current habitat conditions rarely reach the longevity of their mature predecessors.

Key words: old trees, landscape, cities, natural and cultural values

Introduction
In urban landscapes densely populated with architecture and technical infrastructure, **vegetation** holds a particularly vital role—determining the local climate, environmental parameters, and shaping the aesthetic and spatial identity. Vegetation contributes to the formation of **user-friendly spaces** that underpin **sustainable urban development**. **Trees** are central components of urban ecological systems, owing to the substantial biomass they produce and the scale of their environmental interactions. Among them, ***ancient*** or ***veteran trees*** stand out as the most valuable due to their size, age, and ecological function.
The preservation of existing natural assets, especially mature trees (often not officially recognized as natural monuments), is imperative as modern studies demonstrate that newly planted urban trees typically do not survive long enough to attain the characteristics of their older counterparts. The average lifespan of trees in urban environments is rapidly declining. Global studies suggest that in central urban zones, young trees survive no longer than 7–10 years post-planting (Foster, Blaine, 1978; Szczepanowska, 2001). The average lifespan of trees in cities is decreasing drastically with each decade. Studies conducted around the world indicate that in the centers of large cities, young trees are able to survive after planting for no more than 7-10 years (Foster, Blaine 1978, Szczepanowska, 2001). Dmuchowski and Badurek (2001) estimate, based on long-term research conducted in Warsaw, that trees planted in the city center rarely exceed 10 years of life. Simultaneously, trees planted after World War II are beginning to fail in Warsaw. Consequently, continual supplementation of tree cover is required, particularly in areas such as municipal greenery and along transport routes, where gaps are ecologically and visually disruptive.
Older trees, single or arranged in composed forms (e.g. large-scale alley systems), are often also an important carrier of spatial information – about the urban structure, its genesis, the culture and history of the place (Fortuna-Antoszkiewicz, 2019). As such, trees should be regarded as equal counterparts to architecture and technical infrastructure, meriting dedicated consideration in urban planning and management.

Author's research
The authors have conducted long-term research on the condition and transformation of **urban tree cover**, encompassing a broad spectrum of sites such as parks, squares, historic gardens, roadside greenery, riparian vegetation, and areas adjacent to public buildings and school grounds. The studies also included non-designed green areas, primarily located in Warsaw and other cities in Poland. For comparative purposes, the condition of urban and park tree populations in other European cities, such as Bila Tserkva in Ukraine, was also analyzed.
The research addressed multiple aspects, including: historical changes in spatial layouts involving vegetation - at both object and urban scale; the dynamics of transformation in park, roadside, and riverside tree stands; the application and performance of various tree species under different environmental conditions; the impact of technical infrastructure and modernization works on tree health, especially older urban trees classified as ***veteran trees***; the design and implementation of

plantings (Borowski i in. 2016, 2017; Fortuna-Antoszkiewicz, 2019; Łukaszkiewicz, 2019; Fortuna-Antoszkiewicz, Łukaszkiewicz, 2012, 2017, 2021; Fortuna-Antoszkiewicz i in. 2019, 2022; Łukaszkiewicz i in. 2018; Rosłon-Szeryńska i in. 2018). At the level of individual sites, the research methodology was based on:

- comprehensive analyses of local conditions (natural, functional, spatial);
- inventories of plant cover (e.g. repeated twice after a period of years), including, among others, identification of taxa, their distribution, individual dendrometric measurements of trees/shrubs (in accordance with the principles adopted by by the International Society of Arboriculture (ISA) and The Tree Register of the British Isles (TROBI);
- phytosociological assessments (based on phytosociological photos using the 5-point Braun-Blanquet scale), which served to determine the occurring plant communities and forecast the ecological stability of individual phytocoenoses.

To enhance the precision of the collected data, soil studies were carried out, including physicochemical analyses, pH testing, and assessments of soil compaction—conducted both in laboratory conditions and in the field using tools such as the CL-700A penetrometer by ELE International.

The health condition of selected trees was further evaluated using various methods: the condition assessment method by Dmuchowski and Badurek (2001); Roloff's vitality classification (1989); the Visual Tree Assessment (VTA) method (Mattheck and Breloer, 1994); the WID method (Visual Identification of Hazardous Trees) (Rosłon-Szeryńska, 2012). In selected cases, resistographic testing was performed using the E-400 GMBH Labor device to refine the diagnostic results.

Results

Global research into sustainable urban development highlights the need to implement dedicated urban infrastructure systems—complementary to traditional “grey infrastructure”—commonly referred to as **green infrastructure** (Wolf, 2003; Schwab, 2008). Urban green spaces have long been recognized as essential components of city planning, encompassing **open and biologically active areas** within the built environment.

Urban trees provide multifaceted benefits, as confirmed by interdisciplinary studies. Beyond **aesthetic value** (e.g., Ptaszycka, 1950; Tołwiński, 1963; Czarnecki, 1968; Niemirski, 1973, Czerwieniec, 1996), trees offer **health benefits** (Ulrich et al., 1991; Czerwieniec, 1996), **environmental services**, related to improving the functioning of the urban environment (Czerwieniec, 1996; McPherson, 2007), **social enrichment** (Czerwieniec, 1996; McPherson, 2007), and **economic returns** (Szczepanowska, 2009; Wolf, 2007, 2009). Long-term investment in urban trees mitigates costs in other sectors, such as stormwater management associated with “grey infrastructure” (Schwab, 2008). A lack of urban tree cover contributes to excessive surface runoff, often overburdening city drainage systems (Mitchell et al., 2001).

Trees understood as an element equal to technical infrastructure require special attention in the process of city planning (Schwab, 2008). In many European countries and the USA, the system of green areas often includes a stand structure on the public and private areas (Konijnendijk et al., 2006). Considering the specific, usually unfavourable conditions of the urban environment and strong anthropogenic pressure, all forms of vegetation – especially woodlands – must be subject to comprehensive management, including, among others, effective shaping of new facilities and plantings, as well as protection along with constant control and care of valuable existing resources (Majdecki, 1993).

Trees play a special role in urban areas – due to the amount of biomass produced and the related scale of impact on the environment. Among trees, the most important role is played by large and old individuals, the so-called ***veteran trees***. Such a single large urban tree is often the equivalent of several dozen young, newly planted ones, which will only reach optimal biocenotic and phytoremediation values after several decades (Fig. 1-2).

Fig. 1: A mighty ***Robinia pseudoacacia* L.** by the tram tracks / Wolska Street, Warsaw, Poland [photo: BFA]

Fig. 2: The rows of **small trees in containers** – summer street decoration / Nowy Świat Street, Warsaw, Poland [photo: BFA]

Plants' ability to absorb pollutants (with higher efficiency for PM12–PM96 than PM3–PM12 particles) is strongly correlated with **size**, with large trees being the most effective in phytoremediation. Efficiency also depends on species selection and structural composition of green systems (Bell, Treshow, 2004; Sadowiec, Gawroński, 2013). Historically valuable parks and avenues are they are **a natural/ecological enclave in cities**, due to their veteran trees and size, which enhances their impact on local microclimate (Fig. 3–6).

Fig. 3: A group of monumental **oaks (*Quercus robur* L)** age approx. 150-200 years / Natolin (18th century) Warsaw, Poland [photo: BFA]

Fig. 4: Mighty, ancient **oaks** in the vast park's interior / Park "Olexandria" (18th century), Bila Tserkva,Ukraine [photo: NB]

The presence of exceptional ***veteran trees*** - elite specimens with advanced age, vitality, and ornamental value - is critical due to:

- their **unique biological and visual characteristics** (e.g., exemplary crown structures in open-grown specimens).
- preserving biodiversity in the human environment and protecting valuable pure genetic resources.

Veteran trees are, therefore, **vital elements of natural and cultural heritage**. Yet they exist in a fragile biological equilibrium, vulnerable to human-induced changes such as:

- **changes in solar exposure conditions** (e.g. buildings density);
- **ground disturbance** in the root zone during technical works.

Fig. 5: Valuable **black pines (*Pinus nigra* Arn.)** as an exposed group, planted in the end of the 19th century / Park Ujazdowski, Warsaw, Poland [photo: BFA]

Fig. 6: A mighty **common beech variety 'Purpurea' (*Fagus sylvatica* L. 'Purpurea')**, about 200 years old / Żagań, Poland [photo; BFA]

The transformations taking place in the immediate vicinity of trees are the main cause of the accelerated deterioration of their condition, especially of the oldest specimens → significant weakening, inhibition of development, and gradual degradation with irreversible consequences.
Urban investments like road construction, if executed without spatial and environmental analysis, may lead to the loss of valuable mature trees and even entire compositional forms. The construction/modernization of a road (e.g. a street, a road in a park) near tree stands, using invasive solutions (including deep road trenching), n the name of slogans about the use of "modern technologies",may lead to the loss of valuable mature trees and even entire compositional forms (Fortuna-Antoszkiewicz, Łukaszkiewicz, 2021) (Fig. 7-8).

Fig. 7-8: Construction of a bicycle path next to the row of ***Quercus robur* 'Fastigiata'** / Pole Mokotowskie, Warsaw, Poland [photo: JŁ]

Empirical studies conducted on three species - *Acer platanoides* L., *Robinia pseudoacacia* L., and *Tilia cordata* Mill. - confirmed that roadworks negatively affect tree vitality. Trees exposed to ground disturbance in parks exhibited a **threefold reduction** in annual trunk increment compared to those in undisturbed conditions. Norway maples (*Acer platanoides* L.) reacted particularly clearly (Fortuna-Antoszkiewicz et al., 2022). While trees naturally slow their growth with age, environmental stress accelerates this decline dramatically. Damage from groundworks has **long-term impacts**, persisting over many years (Fortuna-Antoszkiewicz i in. 2022).

Conlusion

Our contemporary aesthetic sensitivity, and above all our wisdom and social maturity, is evidenced by the state of preservation of the "spatial legacy" of our *small homelands* – the most valuable historical fragments of the city with inalienable urban and compositional value. This "spatial legacy" is architecture, woven into the street grid, along with harmonious layouts of urban greenery and consciously shaped sequences of views.

The oldest (ancient) trees constitute an invaluable element of the historical heritage of urban planning and landscape of each city as **living relics** of human thought and actions in the past. Everything that surrounds us today - the characteristic, harmonious landscape and large, ancient trees - we owe to those who thought about the future of their cities and about the next generations. Therefore, our today's duty and general principle is to **protect and preserve** the timeless values of the landscape, including ***veteran trees.***

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Souhrn
O našem současném estetickém cítění a především o naší moudrosti a společenské vyspělosti svědčí stav zachování „prostorového dědictví“ našich malých domovů - nejcennějších historických fragmentů města s nezcizitelnou urbanistickou a kompoziční hodnotou. Tímto „prostorovým dědictvím“ je architektura, vetkaná do uliční sítě, spolu s harmonickým uspořádáním městské zeleně a vědomě utvářenými sledy pohledů.

Nejstarší (prastaré) stromy představují neocenitelný prvek historického dědictví urbanismu a krajiny každého města jako živé památky lidského myšlení a konání v minulosti. Za vše, co nás dnes obklopuje - charakteristickou, harmonickou krajinu a velké prastaré stromy - vděčíme těm, kteří mysleli na budoucnost svých měst a na další generace. Proto je naší dnešní povinností a obecnou zásadou chránit a zachovávat nadčasové hodnoty krajiny, včetně veteránských stromů.

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