

Urban Silviculture: Reintegrating Forest Science into City Landscapes

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ABSTRACT

With over half of the world's population now living in cities, urban areas are under increasing pressure, from rising temperatures to shrinking green spaces and growing health concerns. Urban silviculture offers a practical and powerful way to make cities more livable, resilient, and sustainable. This article introduces the concept of urban silviculture, showing how it goes beyond simply planting trees to applying forest science for long-term city planning. It highlights key practices like choosing the right species, preparing soils, diverse planting designs, and involving local communities. Innovative techniques such as the Miyawaki method, creating fast-growing, dense mini-forests and the ancient Japanese Daisugi technique show how both modern and traditional knowledge can transform cityscapes. Urban silviculture is not just about trees; it's about connecting people to nature, supporting biodiversity, and making cities healthier and more enjoyable places to live.

INTRODUCTION

As global urbanization intensifies with over 56% of the world's population living in cities, urban environments face increasing challenges such as rising temperatures, declining air quality, habitat loss, and mental health strain. In response,

urban silviculture the application of forest science and silvicultural principles to urban and peri-urban landscapes has emerged as a transformative approach for making cities more livable, sustainable, and resilient.

Silviculture is defined as the art and science of controlling the establishment, growth, composition, health, and quality of forests to meet diverse needs (Smith *et al.*, 1997). It relies on the science of silvics, which focuses on how tree species grow and respond to their environments. While traditionally practiced in rural and commercial forest settings, silviculture is increasingly being adapted to the complexities of urban ecosystems, giving rise to a new paradigm: urban silviculture.

Evolution and Relevance of Urban Silviculture

Historically, urban forestry was limited to the planting of shade trees, ornamental greenery, or park maintenance. However, this view has shifted significantly. Urban silviculture now emphasizes scientific planting, tree diversity, species-site matching, structured maintenance, and ecological connectivity. It is not merely about greening but about embedding trees in urban infrastructure with long-term environmental, social, and economic goals.

Climate change and urban sprawl have accelerated the urgency of this field. Urban silviculture now addresses heat mitigation, air purification, stormwater regulation, carbon sequestration, biodiversity enhancement, and public health support, all within the spatial constraints of city landscapes (Gill *et al.*, 2007).

Key Urban Silvicultural Practices

Urban silviculture includes:

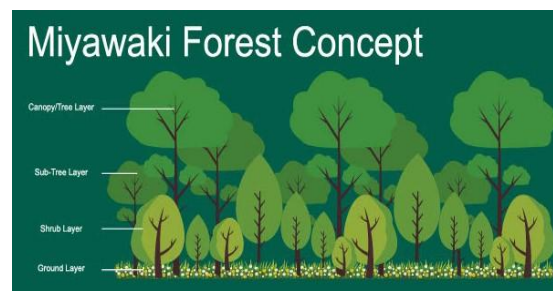
- **Species Selection:** Use of native, drought-tolerant, and pollution-resistant species suited to urban microclimates, because these species can be adopted easily to the local climate.
- **Soil and Site Preparation:** Amending compacted soils, ensuring adequate drainage, and using structural soils in paved

areas for the trees that can survive in urbanized conditions.

- **Diverse Planting Designs:** Incorporating linear plantings, green corridors, pocket parks, and rooftop forests as a part of conservation and proper utilization of space.
- **Tree Maintenance:** Structured pruning, mulching, adequate watering schedules, and disease monitoring should be done as required.
- **Community Involvement:** Public participation in planting, stewardship, and education initiatives is important to build civic support and creating awareness can encourage youth to participate in green urbanization.

Innovative Approaches in Urban Silviculture:

1. Miyawaki Method



The **Miyawaki method**, developed by Japanese botanist Akira Miyawaki, creates dense, biodiverse mini-forests using only native species planted at high density. These forests grow rapidly—up to 10 times faster than conventional plantations—and become self-sustaining in 2–3 years. The method is especially effective in urban environments with limited space and degraded soils (Miyawaki, 2004). In India states like Kerala, Tamil Nadu, Maharashtra, Telangana, Gujarat, and Meghalaya and other countries Europe, and Southeast Asia have widely adopted this method for rapid ecological restoration.

2. Daisugi Technique



The **Daisugi technique**, developed in 15th-century Kyoto, involves pruning Japanese cedar trees so that multiple straight vertical shoots grow from a single base. Originally used for producing straight timber without felling the tree, Daisugi is now recognized for its aesthetic, sustainable, and space-efficient characteristics—making it ideal for ornamental and functional use in urban green spaces (Hongo, 2021).

Why Urban Silviculture Matters?

1. **Climate Resilience:** Urban trees reduce surface temperatures, moderate microclimates, and sequester carbon dioxide—contributing to urban climate mitigation (Bowler *et al.*, 2010).
2. **Public Health:** Proximity to green spaces has been associated with improved mental health, reduced stress, lower cardiovascular risks, and enhanced physical activity (Maas *et al.*, 2006). Urban silviculture integrates such spaces into densely populated settings.
3. **Biodiversity and Ecological Connectivity:** Urban forests, when planned with silvicultural knowledge, support pollinators, birds, and small mammals by creating a habitat for them to survive. They also link fragmented habitats, thereby supporting ecological resilience.
4. **Livability and Urban Design:** Trees improve aesthetic appeal, reduce noise, filter air pollutants, and increase property

values. Silvicultural planning ensures that these benefits are maximized and sustained over decades.

CONCLUSION

Urban silviculture is a forward-looking discipline that applies traditional forestry knowledge to contemporary urban challenges. With growing climate uncertainties, ecological degradation, and rising urban populations, cities must shift from ornamental planting to science-based tree management. Techniques like the Miyawaki and Daisugi methods demonstrate how both modern and historical practices can be adapted for high-impact urban greening.

To foster healthier, more resilient urban environments, urban silviculture must move from the periphery to the center of urban planning, infrastructure, and policy.

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