Silviculture in the City

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Advancing management of urban forested natural areas: toward an urban silviculture?

Max R Piana, Clara C Pregitzer, and Richard A Hallett

Cities worldwide are engaging in large-scale greening projects motivated by the wide range of documented ecological, economic, and social benefits of urban forests. Urban forested natural areas are a critical component of the total urban forest but are often overlooked and typically lack formal management frameworks. One approach to addressing this deficiency may be to borrow from traditional ecological management frameworks and practices (that is, silviculture). Although urban forested natural areas share similarities with rural forests, the impacts of urbanization on forest stand dynamics may require modification of these methods and in some cases development of novel silvicultural guidelines. We present an urban silviculture framework through which we synthesize emerging research and identify challenges and opportunities for advancing goal setting, assessments, and on-the-ground management strategies. Adapting silvicultural practices to cities can improve the long-term sustainability of urban forests and establish management approaches that address future conditions in forests across the urban–rural continuum.

Front Ecol Environ 2021; doi:10.1002/fee.2389

Urban forests are commonly defined as “all trees in the city”, a characterization that does not distinguish between site type and structure (NUCFAC 2015). We suggest that the urban forest can be broken down into subcategories of site types that individual basis by arborists, often exist within a closed tree pit or mowed lawn, and are replaced when they die. Arborists have well-defined management guidelines that focus on safety and sustainability within the confines of the built environment (as
Defining the “urban forest”

“All trees in the city”
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Urban forested natural areas (forests in cities)

Proposed definition of urban forested natural areas: landscapes where (1) trees are the dominant vegetation type, (2) natural regeneration and establishment of woody species can occur and is often the dominant form of woody plant recruitment, (3) there is no regular human-directed maintenance activity or disturbance that limits the establishment of woody species (e.g. mowing).
Common, abundant, and important:

- Across all cities in the U.S., 84% of city parkland (>1.7 million acres) is natural areas (TPL 2017)
- In NYC, 50% of park users report experiencing nature ONLY in city parkland (Auyeung et al. 2015)
- May provide a disproportionate amount of the ecosystem services in urban landscapes (e.g. carbon storage and sequestration)
- Increasingly recognized for their support of local and regional biodiversity
How are forests in cities different (or not) from non-urban forests?

How are forests in cities different (or not) from non-urban forests?
How do we manage forests in cities?

Silviculture

Silviculture is the art and science of controlling the establishment, growth, composition, health, and quality of forests and woodlands to meet the diverse needs and values of landowners and society such as wildlife habitat, timber, water resources, restoration, and recreation on a sustainable basis. This is accomplished by applying different types of silvicultural treatments such as thinning, harvesting, planting, pruning, prescribed burning and site preparation. Intermediate treatments (thinning) are designed to enhance growth, quality, vigor, and composition of the stand after establishment or regeneration and prior to final harvest. Regeneration treatments (harvesting) are applied to mature stands in order to establish a new age class of trees. Regeneration methods are grouped into four categories: coppice, even-aged, two-aged, and uneven-aged.
“...it will be regarded as a matter of some national interest that such a record should be made and hereafter presented and continued. The Central Park would then form a Museum of Arboriculture arranged and catalogued suitably for profitable study”

F.L. Olmsted (1876)
Given the socio-ecological dynamics of cities, traditional forest assessments, objectives, and management strategies may need to be modified and novel silvicultural tools created.

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Toward an urban silviculture?

**Type mapping:** Identify and map forested natural area extent/community types at the city-scale, distinguish from other urban forest sub-types.

**Stand assessment:** Use stratified sampling of management units to characterize forest community, structure, condition, including human-impact (e.g. trample).

**Projective modeling:** Predict forest change and vulnerability associated with disturbances and management scenarios by integrating urban-specific data.

**Planning & Policy:** Ensure city-scale greening policy, planning and management goals include natural areas and timeframes adequate for silvicultural practices.

**Park Scale Management Goals:** Establish goals for individual parks or green spaces; engage large and diverse stakeholder community.

**Silvicultural prescription:** Assign stand-specific treatments and adaptive management plans that accommodate urban timeframes for decision making.

**Operational activities:** Implement and test traditional and urban adapted field treatments at stand/operational scale.

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Natural Areas Conservancy
New York City Ecological Assessment
Toward an urban silviculture?

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Baltimore Greenspace
www.baltimoregreenspace.org
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**Monitors & Evaluate**

For more information, visit the Forests in Cities Resource Library: https://fic.naturalareasnyc.org

Contact for Forests in Cities Network: sophie.plitt@naturalareasnyc.org
Rural Silviculture

Urban Silviculture

Arboriculture, Planning, Design

Knowledge Transfer

Knowledge Transfer
Northeast Urban Silviculture Workshop and Research Group

How does the urban social-ecological system interact with our potential to manage oak forests in cities?
Northeast Urban Silviculture Workshop
Urban and climate impacts, adaptive capacity, and vulnerability

A framework for adapting urban forests to climate change
Leslie Brandt1, Abigail Derby Lewis2, Robert Fahy3, Lydia Scott4, Lindsay Darling5, Chris Swanston1

ARTICLE INFO
Article history:
Received 5 February 2016
Revised in revised form 9 June 2016
Accepted 8 June 2016
Available online 23 June 2016

ABSTRACT
Planning urban trees and expanding urban forest canopy cover are often considered key strategies for reducing climate change impacts in urban areas. However, urban trees and forests can also be vulnerable to climate change through shifts in tree habitat suitability, changes in pests and diseases, and changes in extreme weather events. We developed a three-step framework for urban forest vulnerability assessment and adaptation that scales from regional assessment to local on-the-ground action. We piloted this framework in the Chicago region in 10 locations representing an urban-rural gradient across a range of environmental capacities. The majority of trees across a semi-rural county had low to moderate vulnerability to climate change, whereas the majority of urban trees in a more densely populated county had high vulnerability to climate change. Among these 10 pilot locations, urban tree vulnerability varied widely from city to city. The 10 pilot locations ranged in vulnerability largely due to differences in economic and organizational adaptive capacity. Adaptation actions related to tree locations varied to focus on increased biodiversity and restoration of natural disturbance regimes. However, adaptation actions in more developed areas also included incorporating new species or cultivars. Lessons learned from the pilot area can be used to inform future efforts in other urban areas.

Published by Elsevier Ltd.
Urban Forest Climate and Health Menu

Urban forest managers and allied professionals (such as planners, public works staff, tree wardens, and public health officials) need access to tools and information that provide guidance to reduce climate risks to urban forests and promote their beneficial functions. NIACS, American Forests, and partners developed a “menu” of actions that provide benefits for human health, climate adaptation, and carbon mitigation in urban forests.

› Download complete menu

› Download one-page menu handout

› Browse an online menu

Climate Adaptive Silviculture for the City: Practitioners and Researchers Co-create a Framework for Studying Urban Oak-Dominated Mixed Hardwood Forests


1 Northern Research Station, USDA Forest Service, Amherst, MA, United States; 2 Northern Research Station, USDA Forest Service, Queens, NY, United States; 3 Northern Research Station, USDA Forest Service, Baltimore, MD, United States; 4 Northern Research Station, Northern Institute of Applied Climate Science, USDA Forest Service, St. Paul, MN, United States; 5 Department of Ecology, Evolution and Natural Resources, Rutgers The State University of New Jersey, New Brunswick, NJ, United States; 6 The Forest School at the School of the Environment, Yale University, New Haven, CT
Northeast Urban Silviculture Network Research Topic: Re-establishing mast tree species in canopy gaps

What are the most effective pre- and post-planting treatments for minimizing invasive plants and establishing oak and other mast tree species?

- mechanical removal
- synthetic vs. organic herbicide
- using early successional trees to suppress invasive plant establishment
Northeast Urban Silviculture Network Research Topic: Climate adaptation and assisted migration for oak species
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Stillmeadow Community PeacePark and Forest:

https://stillmeadow.community/peaceparkproject
https://www.nrs.fs.fed.us/urban/sustainability/stillmeadow/
Stillmeadow today...
Stillmeadow in 1927...
Stillmeadow in 2018...
Site Challenges: EAB and Canopy Loss, Invasive Plants, Deer
A Community Forest
Restoration Work
Testing Novel Restoration Practices
Workforce Development and Education Opportunities
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Arboriculture, Planning, Design

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