

The Sustainable Urban Forest

A Step-by-Step Approach

Penn State Extension – Community Forestry Management
Lunchtime Webinar – August 15, 2017

Michael Leff
← ECOLOGICAL CONNECTIONS →




Sustainability ...

← ECOLOGICAL CONNECTIONS →

“... creates and maintains the conditions under which humans and nature can exist in productive harmony, that permit fulfilling the social, economic, and other requirements of present and future generations.”

– EPA



What makes the urban forest ‘Sustainable’?

← ECOLOGICAL CONNECTIONS →

*“Essentially, **everything** needed to assure that it achieves and maintains a healthy overall extent and structure sufficient to provide the desired benefits, or ecosystem services, over time.”*



What’s an ‘urban forest’?




What’s an ‘urban forest’?

- ▶ All vegetation layers – canopy, understory, shrub, herbaceous
- ▶ Street, park, and private trees – plus natural areas
- ▶ Where trees are *not* – but could be (grass, paved, buildings, all land uses)




What’s an ‘urban forest’?



- ▶ All vegetation layers – canopy, understory, shrub, herbaceous
- ▶ Street, park, and private trees – plus natural areas
- ▶ Where trees are *not* – but could be (grass, paved, buildings, all land uses)
- ▶ The entire urban ecosystem – including air, soil, and water




ECOLOGICAL CONNECTIONS




The Sustainable Urban Forest Guide

- I. Exploring the Urban Forest
- II. Setting the Stage
- III. Covering the Canopy
- IV. Gathering the Information
- V. Constructing the Community Framework
- VI. Conducting the Evaluation: Measuring Success
- VII. Developing & Implementing the Plan

ECOLOGICAL CONNECTIONS

Part I – Exploring the Urban Forest

ECOLOGICAL CONNECTIONS

Part I – Exploring the Urban Forest







ECOLOGICAL CONNECTIONS

Part I – Exploring the Urban Forest





ECOLOGICAL CONNECTIONS

Part II – Setting the Stage

What is a Sustainable Community?

The path to sustainability is different for every community – but the common elements are a **healthy environment, a strong economy, and the well-being of the people living in the community.** When sustainability areas are addressed in tandem with each other, they have a powerful, positive effect on the quality of life and future of a community. By overlapping work in these areas, efficiencies emerge and better results are achieved.

– STAR (Sustainability Tools for Assessing and Rating Communities), www.starcommunities.org





ECOLOGICAL CONNECTIONS

'Greenworks' Sustainability Framework


15 specific targets in five broad areas:
 > Energy / Environment / Equity / Economy / Engagement

One target: "Increase tree coverage toward 30 percent canopy in all neighborhoods"

One action (of more than a dozen): "plant more trees on school grounds"

Also helps advance 6 other targets:

- reduce citywide building energy use
- reduce greenhouse gas emissions
- improve air quality
- enhance green infrastructure
- provide outdoor amenities
- create green jobs





← ECOLOGICAL CONNECTIONS →

Tree benefits = Ecosystem services

Economic benefits

- Save energy
- Increase property values
- Boost commercial activity
- Support green jobs

Environmental benefits

- Improve air and water quality
- Reduce greenhouse gases
- Mitigate temperature extremes
- Support biodiversity

Social benefits

- Promote public health
- Revitalize neighborhoods
- Promote social equity
- Provide a sense of place

← ECOLOGICAL CONNECTIONS →

Part III – Covering the Canopy

← ECOLOGICAL CONNECTIONS →

Why assess canopy and set goals?

- ▶ Adopt overall tree canopy cover goal
- ▶ Set finer goals for neighborhoods
- ▶ Quantify tree benefits / ecosystem services
- ▶ Prioritize where to enhance those services
- ▶ Identify critical canopy to preserve or protect
- ▶ Other good reasons...

← ECOLOGICAL CONNECTIONS →

How to set and prioritize canopy goals

- ▶ One method:
“3 Ps” framework based on these questions...
 1. What is physically **possible**?
 2. What is socially **preferable**?
 3. What is the **potential** plantable space?
- ▶ Involves spatial and numerical datasets - but also hinges on full stakeholder involvement

← ECOLOGICAL CONNECTIONS →

Part IV – Gathering the Information

Key Ingredients

Forest Resource Assessments

- ❑ Field-based inventories and assessments (“bottom-up”)
- ❑ Tree canopy assessments (“top-down”)

Plans, Practices, Programs, and Policies

- ❑ Urban Forest Management Plan (UFMP)
- ❑ Maintenance plans for public trees
- ❑ Regional plans
- ❑ Community tree programs
- ❑ Municipal urban forestry policies
- ❑ Etc.

Databases and other information

- ❑ Stakeholders
- ❑ Funding
- ❑ Maps
- ❑ Etc.

← ECOLOGICAL CONNECTIONS →

Forest Resource Assessments

- ▶ **“Bottom-up”** approach – uses field data collected “on the ground” to measure physical structure of the forest
- ▶ **“Top-down”** approach – uses aerial or satellite images to analyze tree canopy and other land cover

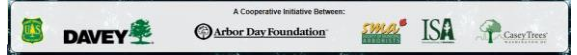


Forest Resource Assessments

- ▶ **“Bottom-up” approach** – uses field data collected “on the ground” to measure physical structure of the forest
- ▶ **“Top-down” approach** – uses aerial or satellite images to analyze tree canopy and other land cover
- ▶ **“Best” approach** – some of both



www.itreetools.org



APPENDIX A – RESOURCES

The following resources match the list of “Key Ingredients” outlined in Part IV, Gathering the Information. Refer to that section for brief descriptions of each category where needed.

Plans, Practices, Programs, and Policies

- **Urban Forest Management Plan (UFMP):**
 - **Nationwide** – i-Tree Assessment Reports, USDA Forest Service <http://www.itreetools.org/resources/reports.php>
 - **Ann Arbor, MI** – “Urban & Community Forest Management Plan” (2014) <http://www.a2gov.org/departments/field-operations/forestry/Pages/UFMP.aspx>
 - **Austin, TX** – “Austin’s Urban Forest Plan: A Master Plan for Public Property” (2014) <http://austintexas.gov/page/urban-forest-plan>
 - **California** Urban Forests Council and Inland Urban Forest Council – “Urban Forest Management Plan Toolkit” <http://ufmptoolkit.com>
 - **Charlottesville, VA** – “Urban Forest Management Plan” (2009) <http://www.charlottesville.org/Modules/ShowDocument.aspx?documentid=1397>



Part V – Constructing the Community Framework



“We cannot separate sustainable urban forests from the people who live in and around them. ...

Sustainable urban forests are not born, they are made.

They do not arise at random, but result from a community-wide commitment to their creation and management.

Obtaining the commitment of a broad community, of numerous constituencies, cannot be dictated or legislated.

It must arise out of compromise and respect.”

– Clark et al, A Model of Urban Forest Sustainability, Journal of Arboriculture, 1997



Some stakeholders to consider

Municipal Departments & Agencies <ul style="list-style-type: none"> • Forestry • Parks & Recreation • Natural Resources • Environment • Shade Tree Commission • Sustainability • Planning • Community Development • Economic Development • Housing 	<ul style="list-style-type: none"> • Transportation • Public Works • Public Utilities • Water • Energy • Police • Fire • Health • Education • Emergency Planning & Management
Stakeholders in Other Sectors <ul style="list-style-type: none"> • Regional and state agencies <ul style="list-style-type: none"> • Regional agencies • Park districts, forest preserves • Conservation districts • Transportation agencies • Public health agencies • State urban forestry council • SOG, ODF, etc. • Localities <ul style="list-style-type: none"> • Residential homeowners • Homeowner Associations • Institutional, commercial, and industrial • Businesses <ul style="list-style-type: none"> • Utility service companies • Architects and tree care companies • Landscape architects • Design and civil engineers • Contractors • Ecological restoration practitioners • Green industry employees • Small business associations 	<ul style="list-style-type: none"> • Chamber of commerce • Corporate sponsors • General public • Community and neighborhood groups • Faith groups • Tree planting volunteers • Electrical utilities • Tree advocacy groups • Bike trail coalitions • “Friends of” park groups • Watershed partnerships • Community development organizations • Environmental justice organizations • Other related nonprofits • Academics <ul style="list-style-type: none"> • Community colleges with tree or horticultural programs • Local universities where students and faculty seek research and other projects • Extension Service





← ECOLOGICAL CONNECTIONS →

Part VI – Conducting the Evaluation: Measuring Success

Categories: Trees and Forest

Community Framework

Resource Management Approach

← ECOLOGICAL CONNECTIONS →

Journal of Arboriculture 23(1), January 1987 17

A MODEL OF URBAN FOREST SUSTAINABILITY



by James R. Clark, Neida P. Matheny, Genie Cross and Victoria Wake

Abstract: We present a model for the development of sustainable urban forests. The model applies general principles of sustainability to urban trees and forests. The overall level of the model is that sustainable urban forests require a healthy tree and forest resource, community-wide support and a comprehensive management approach. For each of these components, we present criteria and indicators for assessing their status at a given point in time. The most significant outcome of a sustainable urban forest is to maintain a maximum level of net environmental, ecological, social, and economic benefits over time.

Creation and management of urban forests to achieve sustainability is the long-term goal of urban foresters. The notion of sustainability in urban forests is poorly defined in both scope and application. Indeed, the question of how to define sustainability, and even whether it can be defined, is an open one (S, 152). At a simple level, "a sustainable system is one which survives or economic and environmental). Measer (14) described sustainability as the "overlap between what is ecologically possible and what is societally desired by the current generation", recognizing that both will change over time.

Therefore, our approach integrates the resource (forests and their component trees) with the people who benefit from them. In so doing, we acknowledge the complexity of both the resource itself and the management programs that influence it. We also recognize that communities will vary in both the ecological possibilities and societal desires.

Defining Sustainability
In developing a model of sustainable urban forests, we first examined how other sustainable

← ECOLOGICAL CONNECTIONS →

Criteria and Indicators for Strategic Urban Forest Planning and Management

W. Andy Kenney, Philip J.E. von Wassenor, and Alexander L. Sohal

Criteria	Community Framework				Key Indicators	Comments/References
	Issue	Major Issue	Goal	Objective		
4. Public agency coordination	Coordination among agencies and organizations	Inter-agency cooperation and communication	Established working relationships and a shared vision	Established working relationships and a shared vision	Number of inter-agency meetings; number of agencies involved in planning process	See Kenney et al. (2002) for a list of agencies and their roles in the planning process.
5. Involvement of large private and institutional landholders	Participation in planning	Participation in planning	Participation in planning	Participation in planning	Number of meetings; number of landholders involved	See Kenney et al. (2002) for a list of landholders and their roles in the planning process.
6. Citizen involvement	Participation in planning	Participation in planning	Participation in planning	Participation in planning	Number of meetings; number of citizens involved	See Kenney et al. (2002) for a list of citizens and their roles in the planning process.
7. Neighborhood action	Participation in planning	Participation in planning	Participation in planning	Participation in planning	Number of meetings; number of neighborhoods involved	See Kenney et al. (2002) for a list of neighborhoods and their roles in the planning process.
8. Utility cooperation	Participation in planning	Participation in planning	Participation in planning	Participation in planning	Number of meetings; number of utilities involved	See Kenney et al. (2002) for a list of utilities and their roles in the planning process.
9. Green industry cooperation	Participation in planning	Participation in planning	Participation in planning	Participation in planning	Number of meetings; number of green industry partners involved	See Kenney et al. (2002) for a list of green industry partners and their roles in the planning process.
10. Regional collaboration	Participation in planning	Participation in planning	Participation in planning	Participation in planning	Number of meetings; number of regional partners involved	See Kenney et al. (2002) for a list of regional partners and their roles in the planning process.






← ECOLOGICAL CONNECTIONS →

Part VI – Conducting the Evaluation: Measuring Success

Category: Trees and Forest

Targets:

- T1 – Relative tree canopy cover
- T2 – Age diversity (size class distribution)
- T3 – Species diversity
- T4 – Species suitability
- T5 – Publicly owned trees (trees managed "intensively")
- T6 – Publicly owned natural areas (trees managed "extensively")
- T7 – Trees on private property



← ECOLOGICAL CONNECTIONS →

Part VI – Conducting the Evaluation: Measuring Success

Category: Community Framework

Targets:

- C1 – Municipal agency cooperation
- C2 – Utilities cooperation
- C3 – Green industry cooperation
- C4 – Involvement of large private and institutional landholders
- C5 – Citizen involvement and neighborhood action
- C6 – General appreciation of trees as a community resource
- C7 – Regional collaboration



← ECOLOGICAL CONNECTIONS →

Part VI – Conducting the Evaluation: Measuring Success

Category: Resource Management Approach

Targets:

- R1 – Tree inventory
- R2 – Canopy cover assessment and goals
- R3 – Environmental justice and equity
- R4 – Municipality-wide urban forest management plan
- R5 – Municipality-wide urban forestry funding
- R6 – Municipal urban forestry program capacity
- R7 – Tree establishment planning and implementation
- R8 – Growing site suitability
- R9 – Tree protection policy development and enforcement
- R10 – Maintenance of publicly owned, "intensively" managed trees
- R11 – Management of publicly owned natural areas
- R12 – Tree risk management
- R13 – Urban wood and green waste utilization
- R14 – Native vegetation

← ECOLOGICAL CONNECTIONS →

TREES AND FOREST



Target T1: Relative tree canopy cover
Key objective: Achieve desired degree of tree cover, based on potential or according to goals set for entire municipality and for each neighborhood or land use.

Target T2: Age diversity (Size class distribution)
Key objective: Provide for ideal uneven age distribution of all "intensively" (or individually) managed trees – municipality-wide as well as at neighborhood level.

Target T3: Species diversity
Key objective: Establish a genetically diverse tree population across municipality as well as at the neighborhood level.

Target T4: Species suitability
Key objective: Establish a tree population suited to the urban environment and adapted to the overall region.

Target T5: Publicly owned trees (trees managed "intensively")
Key objective: Current and detailed understanding of the condition and risk potential of all publicly owned trees that are managed intensively (or individually).

← ECOLOGICAL CONNECTIONS →



TREES AND FOREST

Target T1: Relative tree canopy cover

Key objective: Achieve desired degree of tree cover, based on potential or according to goals set for entire municipality and for each neighborhood or land use.

Performance indicators:

- Low – The existing canopy cover for entire municipality is <50% of the desired canopy.
- Fair – The existing canopy is 50%-75% of desired.
- Good – The existing canopy is >75%-100% of desired.
- Optimal – The existing canopy is >75%-100% of desired – at individual neighborhood level as well as overall municipality.

← ECOLOGICAL CONNECTIONS →



COMMUNITY FRAMEWORK

Target C1: Municipal agency cooperation

Key objective: All municipal departments and agencies cooperate to advance goals related to urban forest issues and opportunities.

Performance Indicators:

- Low – Municipal departments/agencies take actions impacting urban forest with no cross-departmental coordination or consideration of the urban forest resource.
- Fair – Municipal departments/agencies recognize potential conflicts and reach out to urban forest managers on an *ad hoc* basis – and vice versa.
- Good – Informal teams among departments and agencies communicate regularly and collaborate on a project-specific basis.
- Optimal – Municipal policy implemented by formal interdepartmental/interagency working teams on all municipal projects.

← ECOLOGICAL CONNECTIONS →



COMMUNITY FRAMEWORK

Target C4: Involvement of large private and institutional landholders

Key objective: Large private landholders embrace and advance municipality-wide urban forest goals and objectives by implementing specific resource management plans.

Performance indicators:

- Low – Large private landholders are generally uninformed about urban forest issues and opportunities.
- Fair – Municipality conducts outreach directly to landholders with educational materials and technical assistance, providing clear goals and incentives for managing their tree resource.
- Good – Landholders develop comprehensive tree management plans (including funding strategies) that advance municipality-wide urban forest goals.
- Optimal – As described in "Good" rating, plus active community engagement and access to the property's forest resource.

← ECOLOGICAL CONNECTIONS →



RESOURCE MANAGEMENT APPROACH

Target R2: Canopy cover assessment and goals

Key objective: Urban forest policy and practice driven by accurate, high-resolution, and recent assessments of existing and potential canopy cover, with comprehensive goals municipality-wide and at neighborhood or smaller management level.

Performance indicators:

- Low – No assessment or goals.
- Fair – Low-resolution and/or point-based sampling of canopy cover using aerial photographs or satellite imagery – and limited or no goal-setting.
- Good – Complete, detailed, and spatially explicit, high-resolution Urban Tree Canopy (UTC) assessment based on enhanced data (such as LIDAR) – accompanied by comprehensive set of goals by land use and other parameters.
- Optimal – As described for "Good" rating – and all utilized effectively to drive urban forest policy and practice municipality-wide and at neighborhood or smaller management level.

← ECOLOGICAL CONNECTIONS →



RESOURCE MANAGEMENT APPROACH

Target R6: Municipal urban forestry program capacity

Key objective: Maintain sufficient well-trained personnel and equipment – whether in-house or through contracted or volunteer services – to implement municipality-wide urban forest management plan.

Performance indicators:

- Low – Team severely limited by lack of personnel and/or access to adequate equipment. Unable to perform adequate maintenance, let alone implement new goals.
- Fair – Team limited by lack of **trained** staff and/or access to adequate equipment.
- Good – Team able to implement **many** of the goals and objectives of the urban forest management plan.
- Optimal – Team able to implement **all** of the goals and objectives of the urban forest management plan.

← ECOLOGICAL CONNECTIONS →



RESOURCE MANAGEMENT APPROACH

Target R13: Urban wood and green waste utilization

Key objective: Create a closed system diverting all urban wood and green waste through reuse and recycling.

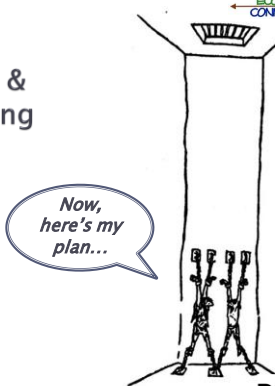


Performance indicators:

Low –	No utilization plan; wood and other green waste goes to landfill with little or no recycling and reuse.
Fair –	While most green waste does not go to landfill, uses are limited to chips or mulch.
Good –	The majority of green waste is reused or recycled – for energy, products, and other purposes beyond chips or mulch.
Optimal –	Comprehensive plan and processes in place to utilize all green waste one way or another, to the fullest extent possible.

← ECOLOGICAL CONNECTIONS →



Part VII – Developing & Implementing the Plan

← ECOLOGICAL CONNECTIONS →

Setting priorities & creating an action plan

- ▶ Some of the many decisions ...
 - What key components of a sustainable urban forest plan are lacking?
 - Which gaps are worth filling?
 - What do you want to achieve?
 - What are your specific goals for tree benefits, or ecosystem services?
 - And much more ...

← ECOLOGICAL CONNECTIONS →

Assessing risk & planning for change





The Sustainable Urban Forest

A Step-by-Step Approach

Michael Leff

← ECOLOGICAL CONNECTIONS →

MLeff@ecologicalconnections.com
(215) 870-0605