Best Management Practices for Effective Urban Forestry Management

Public Works Role and Impact in Urban Forest Management

Trees are Infrastructure
• Roads
• Sidewalks
• Water
• Power
• Sewer
• Communication
• TREES

Public Works Role and Impact in Urban Forest Management

Responsibility: Maintenance

Public Works Role and Impact in Urban Forest Management

Responsibility: Planting

Public Works Role and Impact in Urban Forest Management

Responsibility: Public Safety & Risk Management

Public Works Role and Impact in Urban Forest Management

Responsibility: Resource Inventory & Management
Public Works Role and Impact in Urban Forest Management
Responsibility: Public Relations and Education

“I don’t know how to do all of that!?!?”

Project Background
- Partners:

Urban Forestry BMPs

Urban Forest Management Plans
- All communities manage urban trees
  - Levels
    - Young
    - Growing
    - Mature
Tree Inventories

- “Windshield”
- Partial
- Complete

Software programs to manage inventory data

- Variety of programs available
- Used to:
  - Create work orders
  - Track citizen calls
  - Generate reports
  - Make maps

Tree Maintenance Plan

- Tree Maintenance
  - Removal and pruning prioritized
  - Stump grinding
  - Fertilization
  - Insect and disease treatment
  - Grate and guard repair
  - Mulching
  - Watering

Tree Planting Plan

- Planting locations identified from inventory data
- Species options
- Maintenance plans for newly establishing trees
- Technical information on proper tree planting techniques

Tree Board or Advisory Council

- Assisting and advisory
- Education
- Interact with elected officials
- Generate funds

Public Relations and Education

- Increase support for program
- Increase understanding
- Confidence
  - Arbor Day events
  - Seminars
  - Youth activities/outreach programs
Urban Forest Cost/Benefit Analysis

• Valuable municipal resources
• Justify funding
• Build Public Support
• Quantify the benefits of the urban forest
  – Energy reduction
  – Stormwater management
  – Property values
  – Air Quality
• I-tree suite

Urban Forestry BMPs

Budgeting & Funding

• Level of Service Concept
  - Reactive Management – Minimum service level
    Responding only to emergencies and high priority complaints
    Financial demands are lowest; but safety risks are not
    addressed and “customer” satisfaction is low
  - Routine Management – Adequate service level
    Address both emergency and request driven work –
    Have resources to begin routine tree maintenance and
    scheduled planting programs
  - Proactive Management – High service level
    Provides for frequent preventative tree maintenance cycles
    High level of tree planting
    Comprehensive emergency response and clean-up services
    Pest and disease treatment programs
    Public outreach and education

Identify Funding Sources

• Tree planting grants
• Public awareness and volunteer training grants
• Local measures
  – Assessment districts
  – Parcel tax
• Other revenue sources
  – Carbon dioxide emission reduction credits
  – Shade tree programs for energy conservation
  – Stormwater management
  – Air pollution mitigation

General Staffing Compliment

• Crew
  – Foreman/Forestry Supervisor
  – Trimmer
  – Groundperson
General Staffing Compliment
• Management
  – Forestry Supervisor/Assistant Urban Forester
  – Urban Forester

Consultant vs. In-House Forester
In-House Forester/Arborist
• Deep ties within the community.
• Has or will build “institutional knowledge”.
• Is available at a moment’s notice.

Consultant
• Usually is very experienced and knowledgeable on a wide array of topics.
• Can be less expensive over the long haul.
  • Not necessary to purchase equipment. A bucket and chipper will cost $140,000.
  • Is better for production work such as over the road pruning.
  • More control over personnel.

Urban Forestry BMPs
Ordinances, Regulations, & Public Policies

Legislation and Regulations
• Federal Policies
• State Regulations
• Local Regulations and Public Policy Tools

State Policies and Regulations
• State Enabling Legislation
  – Home Rule vs. Dillon Rule
  – Comprehensive planning
  – Utilities oversight
  – Forestry and landscape practices

• Environmental Regulations
  – Erosion and sediment control
  – Air and water quality
  – Transportation

Local Policies and Regulations
• Tree Ordinances
• Land Development Regulations
• Subdivision Regulations
• Performance Standards
• Comprehensive Planning
Urban Forest Management BMPs

- Management Plans
- Legislation/Policies
- Budget/Funding
- Staffing
- Comprehensive Urban Forestry Program

Why Is Urban Forest Management Important to Public Works?

- Investment in community’s future
- Public safety and municipal liability
- Efficient operations
- Improve the environment

Why Is Urban Forest Management Important to All of Us?

Each year Indianapolis street trees provide:

- $600,000 in energy savings
- $2 million in reduced storm water runoff
- $2.8 million increased property value
- $225,000 in improvements to air quality

$5.6 million TOTAL value each year!

Common Goals

- Sustainable Communities
- Safe Communities
- High Quality of Life

The Benefits of the Urban Forest

Trees are THE growing capital asset that benefits everyone in the City.

For More Information

- Society of Municipal Arborists – www.urban-forestry.com
- Davey Resource Group – www.davey.com/drg
Urban Forestry Best Management Practices for Public Works Managers

Budgeting & Funding

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Urban Forestry Best Management Practices for Public Works Managers

Budgeting & Funding

Most communities “want it all”—thriving and safe residential neighborhoods; stable and diverse business districts; and healthy and attractive urban forests. It often falls to public works agencies to build and maintain the infrastructure that can make these goals possible. The proactive and professional management of any public infrastructure component requires a sufficient level of funding to maintain the component to industry and community standards, and the urban forest is no different.

However, the urban forest is often viewed as a luxury and not a vital component of the urban infrastructure. But this view only acknowledges the aesthetic value of trees and ignores the tremendous public health and safety benefits they provide. It discounts public liability and the considerable effort required to keep trees healthy and safe against storms, insects and diseases.

Public tree management often competes with larger community services such as law enforcement and fire protection, and competes within public works with road, sewer, and bridge building and repair. Decreased funding is thought to be one of the greatest challenges facing urban forests today. There is no doubt that the level of funding and the budget allocation of those resources can determine an urban forestry program’s viability and sustainability within the broader context of all responsibilities of a public works agency. With sufficient financial resources to secure professional services, equipment, and management, an urban forestry program can fulfill its mission, respond to change and challenges, and best serve the public.

To help you understand the financial aspect of managing an urban forestry program, the following sections will describe and recommend budget allocation strategies for various activities, levels of funding, and sources of funding.

Given any level of funding, the public works manager must decide annually on the best allocation of funds among all the tasks necessary to plant and maintain the public trees under their management.

Generally across the county, urban forestry budgets are allocated primarily for maintenance (58 percent), followed by planting (14 percent), and then management (8 percent). Figure 1 displays the allocation of municipal budget by urban forest management activity (Source: J. Kielbasa and V. Cotrone, Michigan State University):

- Pruning 30%
- Removal 28%
- Planting 14%
- Management 8%
- Other 12%

Figure 1. Average National Urban Forest Budget Allocation

Typically, activities that reduce public liability and increase public safety, such as pruning and removal, are performed first and have the highest priority. Immediate safety risks should always be addressed first, but routine and preventive urban forest maintenance should also be part of the maintenance program and budget. Planting should be a significant portion of the total budget, second only to maintenance, and generally does not exceed 50 percent of the operating budget.
There is no national standard for the best or most effective urban forest budget allocation. The allocation between activities may always be in flux depending on the condition of the trees, the planting needs, the incidences of severe weather, the presence and types of insect and disease threats, and the desires of the citizens and community leaders at the time the budget is developed.

Again, there is no “magic” formula for determining how much funding is needed for a proactive, sustainable forestry program. Every urban forest is different, and urban forestry programs may be at differing stages of development. The simple answer is that there should be sufficient funding to carry out preventive tree maintenance, perform emergency response, and conduct adequate planting, as well as support management, staff, equipment, and contractual services.

The most obvious basis for developing or determining a sufficient budget is from a public tree inventory. The inventory can reveal exactly how many vacant planting sites exist and how many trees of each size and species require specific maintenance. By applying local in-house or contractual costs for tree planting and maintenance to the inventory data, a public works agency can determine the total budget needed to accomplish all tasks and can then develop an annual budget based on a multi-year work plan. Additional expenses for administration, personnel, public education, and other related urban forestry program components should also be added to the operational budget for the true, desired annual budget.

However, if an inventory does not exist or is out-of-date, there are some national guidelines and statistics that can be used as a general indicator of whether an urban forestry program is adequately funded. The following information can be used to gauge a local urban forestry program’s level of funding as compared to national averages, statistical research, and general funding guidelines. This information is only provided for qualitative comparisons, and should not be considered in any way as a rule for adequate levels of funding at the local level.

- The National Arbor Day Foundation requires that a community forestry program be supported by an annual budget of at least $2 per capita as one qualification for its Tree City, USA program. The NADF believes this is a minimum amount necessary to provide tree maintenance, planting and management services to the public.

- A common generalization is that a more realistic average is $5 per capita.

- Based on reports submitted to the NADF for Tree City, USA certification, Table 1 shows the average municipal urban forestry budgets and average per capita expenditure by population level as reported by 3,130 communities in 2006.

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<th>Per Capita</th>
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<tr>
<td>100,000+</td>
<td>$1,869,440</td>
<td>$5.83</td>
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</tbody>
</table>

Table 1. The average municipal urban forestry budgets and average per capita expenditure by population level as reported by 3,130 communities in 2006
“Level of Service” Concept

Many public works agencies are familiar with using the “level of service” concept when determining annual budgets. Based on the characteristics of the infrastructure components, mandated and desired services, and other public works responsibilities, budget decisions are often made on levels of service delivery. The focus of these budget determinations is on getting results rather than determining a single, fixed budget level.

Multiple budget scenarios can be expressed as the funding amount necessary to provide minimum to adequate to high levels of urban forestry services. This can also be expressed as reactive, routine, and proactive management.

- The minimum service level, or reactive management, is characterized by responding only to emergencies and high priority complaints. At this level, safety risks do get addressed and the financial demands are the lowest, but it is the least efficient means of service delivery in the long run, generates low customer satisfaction, and usually is a result of the lack of a coherently developed urban forestry program.

- An adequate service level, or routine management approach, addresses most emergency and request-driven work, but also has the resources to begin routine tree maintenance and scheduled planting programs.

- A high service level, or proactive management, provides for frequent preventive tree maintenance cycles, a high level of tree planting, comprehensive emergency response and clean-up services, pest and disease treatment programs, and public outreach and education. This level has the highest annual costs but generally results in safer, more sustainable urban forests with less storm damage potential and insect and disease threats, maximum tree benefits, and the greatest level of customer satisfaction.

Sources of Funding

Once the appropriate level of funding is determined based on the needs of the urban forest and the level of service the community desires, the source or combination of sources for that funding can vary. Some of the traditional sources as well as innovative approaches to funding urban forestry services will be briefly described.

It should be noted that many of the funding sources and mechanisms that will be described in this guide may require specific local and state enabling legislation and/or special authorization from city or county managers and councils to implement and access. It is important for the public works manager to be familiar with all of the regulations and restrictions for using the traditional and alternative funding mechanisms described in this guide.

The following funding sources are presented in the order of the most common methods of financing urban forestry programs across the country.

1. General Fund/Departmental Funds
Across the country, the most common and largest single source of urban forest management funds is from the general fund. Whether there is a specific account or line item for urban forest management, the general fund usually supports the bulk of tree maintenance and planting projects.

2. Federal, State, Local Governmental Grants; Private Foundation Grants
With today’s high demand for more services with limited public funds, sustaining an urban forestry program may require supplemental funding from non-local sources. In fact, grants are the second most relied upon source of funds for many urban forestry programs.

“Whether public works managers know it or not, they do have an urban forestry program and budget. If you pick up a limb after a storm or prune a tree for sidewalk clearance—you have an urban forestry program and are spending public funds on tree care!”

- Rachel Barker, Public Services Director, Columbus, Georgia
Luckily, as a public agency with a nonprofit status and with existing support structures and staff, public works departments are in a good position to apply for and receive grants to support urban forestry activities. These opportunities can be found with the federal, state and local government, nonprofit organizations, large corporate and private business foundations, and private charitable foundations.

Popular sources for grants and information on grants are:
- US Department of Agriculture’s Urban & Community Forestry Challenge Cost Share Grants administered by a state’s Division of Forestry
- US Department of Transportation’s grant program
- US Department of Housing and Urban Development’s Community Development Block Grant
- The Foundation Center
- The Alliance for Community Trees (ACT)

3. Taxes, Special Assessments and Special Tax Districts
Many cities throughout the U.S. attain funding for urban forestry through taxes and special assessments. Some states authorize local communities to assess property owners for specific public benefits and services such as stormwater and sewer systems, and public trees. The assessment can be levied as a fee per foot of right-of-way frontage or as a percentage of the property value. The City of Cincinnati, Ohio, has a frontage street tree assessment authorized by state and city codes that has been in effect for 20 years. State law restricts the use of this tax revenue for anything other than maintenance and planting of trees. St. Louis, Missouri implements a property transfer tax and a sales tax (1/2 cent) to pay for the city’s urban forestry program. In Burlingame, California, a portion of a gas tax has provided $100,000 to the urban forestry’s departmental budget in previous years.

Taxes, Special Assessments and Special Tax Districts

4. Capital Improvement Project Budgets
Capital projects have large, comprehensive budgets that have been carefully determined. All aspects and impacts of the project can be accounted for with these kinds of funds. Although restricted to the specific project, often tree maintenance and planting can be included as a valid expenditure.

If trees are viewed and defined as capital assets, then during road and bridge construction and utility projects, funds can be allocated for protection of existing trees, remediation treatment for any trees impacted by construction activities, and planting new trees after the project is complete.

The City of Milwaukee has had success making trees part of its street and road improvement projects. A sample project budget may look something like this, with trees being an essential, but relatively inexpensive, part of the project.

5. Tree Work Permit, Development, and Inspection Fees
Permit, development, and inspection fees are not uncommon funding mechanisms used by public works agencies. These same mechanisms can be used for urban forest management. Examples of using these types of fees, to the extent permitted under state and local codes, include:

Permit and Plan Review and Inspection Fees
It is not uncommon for public works departments to require private developers and businesses to support the administrative time needed for proper and professional plan review and site inspection tasks. In light of the urban forestry goals of the agency to protect and enhance the urban forest, charging specifically for the time and arboricultural expertise needed to approve permit applications, review plans, and make site inspections might be a viable option to support the salary and benefits of additional full- or part-time urban forestry positions.

Developers Fees. Counties and cities may impose development fees on landowners in a “benefit area” to pay for a proportionate share of the public facilities required to serve a development. Trees can be considered public facilities and the planting and maintenance costs can be supported by these fees. Also, developers could be required to pay a set dollar amount to support a community’s overall urban forestry program. In effect, it would be a cost of doing business within the community limits. The fee could be a percentage of the total project cost, based
on the number of housing units built, or based on the area of land being developed.

**Utility Company Fees.** Non-municipal utility companies perform new construction, maintenance, and repair work on an annual basis in many communities. This work may affect the aboveground and belowground portions of public trees. It is prudent and reasonable to assess a fee to such utility companies when their work affects municipal trees. Utility companies with aerial facilities might be required to provide an anticipated annual work plan and maps with an appropriate fee attached to provide for inspection and monitoring. Any compensation for documented damage to public trees during utility work would be collected separately on a case-by-case basis, and the utility company should be responsible for the costs for any remediation necessary (e.g., pruning, fertilization, or temporary irrigation) above and beyond the fees and compensatory payment. The same conditions would apply for companies installing or maintaining underground utilities.

**6. Compensatory Payments and Environmental Fines**

Trees on streets, rights-of-way, and other public properties, like municipal buildings, parks, and cemeteries, are often public property, or under the direct control of a public agency. Whether due to an act of vandalism, accident, or negligence, the county or municipality should be compensated for the loss or damage to its property. Trees have value and repair to trees costs money, just like replacing or repairing street lights or signs. If tree damage or loss occurs due to a development project, vehicular accident, private utility work, etc., then the responsible party should be required to pay for the replacement value or repair costs.

**Damage Compensation.** This source may not generate a great deal of money, but it is a legitimate and often under-pursued source of funds. When an automobile damages a public tree or when construction equipment destroys a group of public trees, the public works agency should seek compensation for the landscape value of that tree(s). The department can rightly seek compensation for the total damages, including 1) the value of the tree(s); 2) the cost of repair or clean-up; and 3) the cost of the administrative time used to resolve the situation. The receipt of $500 from a minor car accident to $5,000 for a major damage claim can add up over time. Generally, the compensation is collected from the insurance company of the person responsible for the damage or directly from the business that caused the damage to public trees. The compensation funds can be used to remediate the specific damage, or be used for other legitimate urban forestry functions throughout the community.

**Environmental Fines.** Since the enactment of federal and state clean water and air legislation, companies in violation of those laws are often required to pay tremendous sums through environmental court fines. By coordinating with the enforcement agency, all or a portion of those fines can be directed to the local community’s tree planting and public education programs.

**7. Innovative and Underutilized Funding Mechanisms**

There are a number of innovative and underutilized funding mechanisms that may not be appropriate for every community and every public works urban forestry program, but they are valid and potential sources of funds that should be considered.

**Utility Bill Donations.** If a community bills property owners directly for water and sewer services, these municipal invoices could be a source for needed funds for the urban forestry program. A small fixed amount from $0.25 to $1.00 could be automatically added to each bill; the property owner would then have the option to voluntarily include it with their utility payment. Another option is to ask the bill payers to round the invoice amount up to a higher figure of their choice. Using this voluntary funding mechanism can potentially raise thousands of dollars.

**Carbon Trading.** Carbon dioxide (CO2) is used during a tree’s photosynthesis process to produce the natural building blocks necessary for growth. This process takes carbon dioxide from the atmosphere and holds it as woody and foliar material. One large tree can store hundreds of pounds of carbon. This function is referred to as...
carbon sequestration, and now there is the potential to make real money from this natural process. Spurred internationally by the Kyoto Protocol, nationally by the Clean Air Act and the U.S. Conference of Mayors’ Climate Protection Agreement, and locally by citizens and businesses alike, a legitimate market is developing for owners of trees and forests to sell the carbon sequestration functions of their urban forest and receive fair market value based on quantity. Computer models, like i-Tree’s UFORE and STRATUM can generate and document the quantity of carbon sequestered by a public urban forest, and working with a certified valuator, a local government can sell the carbon to offset the emissions for others.

Sale of Municipal Wood Products. If local policies allow public property to be sold, the wood waste from tree maintenance and storm damage repairs can be a source of funds for the urban forestry program. Other cities have been successful in selling split and unsplit firewood, hardwood timber, rough wood chip mulch, and compost to the general public and commercial businesses. Rather than pay for removal and disposal, cities sell these excess wood products. A new trend is to use the removal of a significant or historic public tree as a source of creative fund raising. The logs and useable wood are given to local craftsmen who then create furniture, sculpture, and other collectibles from the wood. These are sold and all or portions of the proceeds are returned to the urban forestry program.

Fund-Raising Activities. With the support of volunteers, the community can hold various fund-raising events throughout the year to support the public works urban forestry program. Competitive and social runs and walks are popular large events. But, volunteers can also staff food and drink booths at local fairs and festivals. Tree merchandise or other local merchandise can be commissioned and sold. Restaurants can have special “Tree Nights” where a small percentage of the patrons’ bills are donated back to the community for tree planting. Even small efforts, such as school and church bake sales and yard sales, can be encouraged to raise funds for trees in the community.

Private Donations/Corporate Sponsorships. Many communities are fortunate to have generous citizens and organizations that care about the quality of life of the community. The public works agency and the local tree commission could solicit citizens and foundations for private donations to support tree planting, tree care, and public education activities. A major source of donations could be from foundations, businesses and corporations that wish to sponsor nonprofit, environmental activities. All potential contributors should be reminded that, if their financial situation allows, any donations might be tax-deductible when they file their federal income tax returns.

Conclusion

Greater funding levels can allow a public works agency’s urban forestry program to move from a reactive to a proactive management approach, provide greater services, and increase tree canopy coverage if funds to sustain all activities, programs, and initiatives can be secured.

There are various funding mechanisms and sources to be considered to support increasing staff levels, public education efforts, tree protection, maintenance, planting activities, and other components of a truly progressive, comprehensive urban forest management program.
For More Information

Urban & Community Challenge
Cost Share Grants
(contact your local state coordinator)
www.fs.fed.us/ucf/Related_Links/UCF_State_coordinators.htm

Community Development Block Grants
www.hud.gov/offices/cpd/communitydevelopment/programs/index.cfm

Environmental Protection Agency
www.epa.gov/ogd/grants/information.htm

Department of Transportation
www.dot.gov/ost/m60/grant/grelate.htm

The Foundation Center
www.foundationcenter.org/

Alliance for Community Trees
www.actrees.org/site/index.php

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Staffing

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Introduction

Within our communities, trees are one of the most valuable public assets. They are unique from other assets that public works departments manage in that they are living, growing organisms and can have potentially very long service lives. The care and management of this valuable resource requires specialized, professional expertise and a unique set of work skills.

In this best management practices guide, information will be provided to describe the staffing recommended for operating an efficient and effective urban forestry planting and maintenance program within a public works department.

What is an Arborist?

Before describing aspects of staffing, such as the types and numbers of positions, qualifications, and pros and cons of in-house and contractual services, it is important to know how urban forestry staffing is different from other positions in a public works department.

The management of individual, landscape trees is called “arboriculture,” and staff who participate in the management of these trees are called “arborists.” Arborists are men and women who make a career of caring for the urban forest. Their work is physically demanding, often dangerous, and intellectually challenging. As science and experience reveal new information about tree biology, physiology, maintenance and planting, arborists’ need for education never stops.

Just because someone is experienced with the use of a chainsaw or a shovel does not make him or her automatically qualified to prune or plant trees. Specific education and training, and a comprehensive understanding of trees, site conditions, and long-term management issues is required to properly take care of and plant public trees.

Like the arborist, the “urban forest manager” is a professional experienced in all aspects of arboriculture in the public arena. The urban forest manager is dedicated to the administration of the tree management program to achieve the goals of a safe public forest that maximizes tree benefits for the community in the long term. This broad managerial view and responsibilities enable the professional urban forester to help public works staff, elected officials, and citizens make wise decisions and get the most for their investment in trees.
Generally, an urban forestry program has both supervision and operational employees who are supported by administrative and other management employees within the public works department.

As reported in a 1994 report titled “Municipal Tree Management in the United States,” on average, municipalities have six (6) daily employees in their municipal tree management programs. This is an average from cities of all sizes. Table 1 shows the average number of urban forestry program employees by city population.

Table 1.
Average Daily Number of Employees by Population

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<th>Population Range</th>
<th>Number of Employees</th>
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<td>Entire survey</td>
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Source: ISA Research Trust and USDA Forest Service

The supervisory position can be termed as the city forester, urban forester, tree warden, community forester, or city arborist; these titles are often used interchangeably to describe positions with similar management responsibilities. They plan and direct the maintenance and planting field work, and are charged with all duties related to the functions, growth, and sustainability of the urban forest management program. In a more developed and established program, the city forester may have an assistant supervisor.

The operational positions are typically a forestry supervisor and/or crew leader, trimmer, and groundworker. Public works agencies may not use these exact titles depending on the existing personnel job titles and descriptions accepted and already in use by the agency.

The following briefly describes the qualifications, duties, and typical pay scale of each supervisory and operational position.

**Groundworker:**
**Qualifications**
- High school diploma or GED.
- Ability to perform manual labor.
- Possess a valid driver’s license.

**Duties**
- Assists with job site setup.
- Feeds brush into the chipper or stacks brush for pick-up.
- Flags traffic.
- Other tasks as assigned.

**Pay scale - $21,000 – 32,000/year**

**Trimmer:**
**Qualifications**
- High school diploma or GED.
- Minimum one to two years experience as a trimmer or a tree crew leader.
- Good working knowledge of proper tree care practices.
- Possess a valid CDL.
- ISA Certified Arborist status is a plus.

**Duties**
- Coordinates daily work activities of the crew.
- Ensures work is carried out safely, efficiently.
- Applies various safety standards, organizational policies, and applicable laws.
- Completes paperwork.
- Communicates with higher levels of management.
- Performs public relations with the general public.

**Pay scale - $28,500 – 43,700/year**

**Tree Crew Leader**
**Qualifications**
- High school diploma or GED.
- Minimum one - two years experience as a trimmer or a tree crew leader.
- Good working knowledge of proper tree care practices.
- Possess a valid CDL.
- ISA Certified Arborist status is a plus.

**Duties**
- Performs duties of the crew leader in his/ her absence.
- Drives and operates bucket truck, chipper.
- Performs pruning and removal work.
- Helps set up safe work zones.
- Maintains equipment.
- Completes reports, paperwork.
- Communicates with supervisors.

**Pay scale - $23,500 – 36,100/year**
Forestry Supervisor
Qualifications
- High school diploma or GED, or some higher education.
- Five years minimum experience in arboriculture including supervisory experience.
- Possess a valid CDL.
- ISA Certified Arborist.
Duties
- Directs and counsels assigned staff and contract crews.
- Investigates and prioritizes service requests.
- Enters and retrieves data on computer.
- Responds to after-hours emergency calls as needed, and mobilizes crews and equipment.
- Trains individuals/crews as necessary.
- Coordinates with other organizations.
- Communicates with chain of command.
Pay scale - $30,000 - $46,000/year

Urban Forester
Qualifications
- Bachelor’s degree in forestry, horticulture, landscape horticulture or a related field.
- 3-5 years of direct experience in the field.
- Possess a valid driver’s license.
- State certified pesticide applicator.
- ISA Certified Arborist with Municipal Specialist designation.
Duties
- Prepares and maintains the street tree maintenance plan.
- Prepares an annual tree planting plan.
- Enforces the tree ordinance.
- Plans and conducts public education programs.
- Prepares contracts for tree services.
- Coordinates with other agencies.
- Purchases equipment and supplies.
- Directs work of assigned staff.
- Establishes, maintains records and files.
- Responds to citizen requests about private trees.
Pay scale - $40,000 - $65,000/year

"In-house" or Contractual Pros and Cons

Most public works agencies have the option of performing urban forestry tasks using in-house staffing and equipment, or using contractors who specialize in various arboricultural and horticultural disciplines and services. Often, a combination of using both in-house personnel and contractors is chosen to ensure that the urban forest management services provided are performed at the lowest possible cost, as efficiently as possible, and with the greatest level of expertise. Additionally, for special projects, or tasks that are not daily responsibilities, public works agencies will often use consultants on an as-needed basis.

In-House Management - Forester/Arborist
Advantages
- Deep ties within the community.
- Has or will build “institutional knowledge.”
- Is available at a moment’s notice to perform a wider variety of tasks.
- Is directly accountable to the citizens and the public works director.

Disadvantages
- May only be experienced in limited aspects of arboriculture and urban forest management.
- Investment must be made in equipment for this position, such as a vehicle, computer, and diagnostic tools.
- May need to invest time and funding for obtaining and maintaining certifications, licenses, and other training.
- Not easily removed from the position if performance is substandard.

In-House Management - Forester/Arborist
Disadvantages
- May only be experienced in limited aspects of arboriculture and urban forest management.
- Investment must be made in equipment for this position, such as a vehicle, computer, and diagnostic tools.
- May need to invest time and funding for obtaining and maintaining certifications, licenses, and other training.
- Not easily removed from the position if performance is substandard.

There are potential advantages and disadvantages to using in-house staff and contractors for urban forest management. Both the leadership of the program (the urban forest manager, city forester, city arborist) and the workers in the program (tree planting, maintenance, stump removal, insect and disease control), can be in-house or contracted. The advantages and disadvantages for both levels are generally summarized as these:
Contracted Management -
Urban Forestry Consultant

**Advantages**
- Usually is very experienced and knowledgeable on a wide array of topics.
- Can provide a high level of knowledge in a specific area, such as hazard tree identification, tree valuation, ordinances and technical specifications, tree preservation.
- Can be released from service more easily.
- Usually is fully and pre-equipped with a vehicle and computer.
- All certifications, licensing, and continuing education are already in place and separately provided.

**Disadvantages**
- Contract agreement may limit flexibility in job assignments.
- If used regularly, and for an extended period of time, can be more expensive in the long term.
- Administrative time must be provided for contract writing, monitoring, and invoice processing.

---

In-house Crews and Work Production

**Advantages**
- More flexible for other work assignments.
- Quality can be perfected to meet community standards through training and over time.
- Can respond more quickly to emergencies.
- Workforce is more stable.
- Staff can be more knowledgeable about the community, and can be motivated by pride and residency.
- More control over training and specializations.
- No administrative time is needed to write and oversee contracts.

**Disadvantages**
- Large investment in equipment and maintenance, for example, a lift truck and chipper can cost $140,000 per crew.
- Workers are paid regardless of work production quantity, efficiency, and quality.
- Difficult to release from employment.
- Public works department is responsible for damage caused by crew actions.
- Public works department is responsible for on-the-job injuries and workman’s compensation.

---

Contractual Crews and Work Production

**Advantages**
- Funds are paid only for work performed and when completed to specifications and the satisfaction of the public works department.
- Labor is available for peak demands and special projects; there is cancellation and no cost when work is not needed or when the weather is poor.
- Contractor provides all required equipment, tools, and supplies; repair, maintenance, and downtime of equipment are not the responsibility of the public works department.
- All insurance and workman’s compensation is the responsibility of the contractor.
- Contractor provides employee supervision, training, and certifications.
- Liability for damage to public and private property is the responsibility of the contractor.

**Disadvantages**
- Contractors are bound by the specifications of the contract; their work assignments are not as flexible.
- May not be as quick to respond to emergencies as in-house crews.
- Administrative time is required for contract writing, monitoring, and invoice processing.

By knowing your in-house and contractual crew costs, production rates, and work load, you can compare costs required to complete a set of work orders, and to determine the best method of accomplishing the work.

Using data from job analysis and local costs, Chattanooga, Tennessee, Public Works Department gives the following example of a pruning program cost analysis.

---

**Example - Pruning Maintenance Project**

<table>
<thead>
<tr>
<th>Tree Size Class</th>
<th>0-6&quot;</th>
<th>7-12&quot;</th>
<th>13-24&quot;</th>
<th>25-36&quot;</th>
<th>36&quot;+</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total Trees</td>
<td>927</td>
<td>381</td>
<td>247</td>
<td>23</td>
<td>8</td>
</tr>
<tr>
<td>Man Hours to Prune</td>
<td>1.0</td>
<td>1.4</td>
<td>3.5</td>
<td>6.3</td>
<td>7</td>
</tr>
<tr>
<td>Total Time</td>
<td>927</td>
<td>533</td>
<td>865</td>
<td>145</td>
<td>56</td>
</tr>
<tr>
<td>In-House Costs (1)</td>
<td>$53,395</td>
<td>$30,700</td>
<td>$49,825</td>
<td>$8,350</td>
<td>$3,225</td>
</tr>
<tr>
<td>Contractual Costs (2)</td>
<td>$76,400</td>
<td>$43,930</td>
<td>$71,290</td>
<td>$11,950</td>
<td>$4,615</td>
</tr>
</tbody>
</table>

(1) Based on local cost estimates of 75’ Bucket Truck (10 years, fuel, maintenance, etc.) @ $11.00/hr; Chipper $6.62/hour Crew* (does not include fringes) $40.00/hour = Total cost per hour $57.60

(2) Based on local cost estimates of - $82.42/hour for a three man crew equipped with 75’ bucket truck, and chipper.

These cost figures and production rates are not to be applied nationally, and are only presented here as an example for educational purposes.
Staff Training and Development

Staff training and development are major and constant responsibilities of public works departments for all programs. Whether it is stormwater, roadway, sewer, or urban forest management, all employees should be trained on current industry standards and safe work practices.

Reasons for training range from new-hire training about your urban forestry program operations, to introducing new technical concepts and practical techniques to the field staff, to bringing in a new computer software system for the urban forest manager.

Whatever the reason or need for conducting a training session, the public works manager should develop a comprehensive, ongoing, and consistent training program. This quality training program is essential in keeping staff safe, efficient in their work, and motivated about learning new concepts.

For urban forestry program staff, training is diverse given the nature of the resource and the working conditions. Typically, all forestry employees should be aware of and receive some training in:

- Tree identification and basic tree physiology
- ANSI A300 pruning, maintenance, and protection standards
- ANSI Z133.1 safety requirements
- ANSI Z60.1 standards for nursery stock
- Job site setup, flagging, and safety
- First Aid, CPR
- OSHA compliance
- Electrical Hazards Awareness Program
- ISA Certified Tree Worker and Certified Arborist Training

Advanced Training is available for:

- Tree hazard identification
- Tree valuation
- Aerial rescue
- Insect and disease diagnosis and management
- ISA Municipal Specialist designation

These topics and other urban forestry related training programs, coursework, workshops, and conferences are available from a variety of sources:

- International Society of Arboriculture
- Tree Care Industry of America
- Society of Municipal Arborists
- American Public Works Association Red Cross/public health departments
- City or county personnel and human resource departments
- Consulting firms
- Local county cooperative extension offices
- Universities and technical colleges

Training does more than just educate workers. Training supports professional development and job advancement, and positively influences attitudes and morale. If you want to keep your staff motivated about learning new concepts and performing their work responsibilities in the best and safest ways possible, then the quality and variety of the training provided is key.
For More Information

Your State Urban Forestry Coordinator
www.arborday.org/programs/urbanforesters.cfm

International Society of Arboriculture
www.isa-arbor.com/home.aspx

Society of Municipal Arborists
www.urban-forestry.com/

Tree Care Industry of America
www.treecareindustry.org/public/main_safetyed.htm

American Public Works Association
www.apwa.net/Education/

ANSI Standards
www.ansi.org/education_trainings/overview.aspx?menuid=9

Davey Resource Group
www.davey.com

ACRT, Inc.
www.acrtinc.com/ACRT_training.html

National Arbor Day Foundation
Tree City USA Bulletins
www.arborday.org/programs/treecitybulletinsbrowse.cfm

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Thank You
Urban Forestry Best Management Practices for Public Works Managers

Staffing
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Introduction

Enacting laws and policies that make public prohibitions and direct action in a certain way is not a popular way of influencing behavior. However, sometimes an issue is so important and complex that legislation and official policies are appropriate tools for local governments to use to protect its citizens and property. Managing urban forests and natural resources is an important and complex issue.

Various types of legislation, regulations, policies, and other tools can be particularly effective in protecting natural resources since the very nature and location of these resources often cross public and private lines, and the presence or absence of them in a community can greatly affect the community and surrounding areas.

This guide is intended to introduce communities to the myriad of regulatory tools available to assist in the proactive management of the urban forest.

Ordinances

Communities can regulate the urban forest through a variety of legislation. Most legislation has been created and amended over time on the local level, but federal and state regulations and laws sometimes supersede and dictate the local community’s ability to control and manage trees on public and private properties. The following is a discussion of the primary legislation and regulations that can affect the urban forest.

Tree Ordinances

Tree ordinances reflect the values of a community and the worth of a community’s trees or urban forest. A tree ordinance encourages tree planting and tree maintenance to secure the beautification, air-cooling and purification, noise abatement, property value enhancement, wildlife habitat, and the public health and safety benefits trees provide.

An ordinance contains the legal provisions adopted by the local or community government to provide authority, define responsibility, offer guidance to residents, and establish minimum standards for a community’s tree program. An individualized tree ordinance should be developed for each community; one ordinance does not fit all local situations.

Key Benefits to Adopting a Tree Ordinance

- Provides permanent procedures and legal authority
- Establishes an official policy for the community
- Helps establish new tree management programs
- Identifies standards and regulations for arboricultural practices, such as planting, removal, maintenance, and selection of appropriate tree species for the public trees.
- Makes the community’s tree management program more visible
- Establishes a program independent of changing public opinion and finances
- Provides a channel through which governmental departments may interact
- Establishes the nature and degree of public responsibilities to the community’s trees according to specific standards
- Provides the means to educate the public about the benefits of the urban forest

(Ricard, 2002)
For a government to legitimately claim to have a comprehensive urban forestry program, a street tree ordinance should be in place. Generally, simple tree ordinances guide the management of public trees. They address issues such as proper planting, maintenance, liability, and responsibility. A street tree ordinance can establish standards and set guidelines. It is the legal framework within which local tree management activities are conducted for the general welfare.

They also act as a solid example of how the entire community and citizens should manage the trees under their control. Tree ordinances can protect the valuable natural resource of the urban forest and ensure that it is protected to provide public health and safety, as well as many other important benefits.

Although ordinances may vary widely in form, content, and complexity, an effective tree ordinance should meet the following criteria:

1. **Goals** should be clearly stated and ordinance provisions should address the stated goals.

2. **Responsibility** should be designated, and authority granted commensurate with responsibility.

3. **Basic performance standards** should be set.

4. **Flexibility** should be designed into the ordinance.

5. **Enforcement** methods should be specified.

6. The ordinance should be developed as part of a comprehensive management strategy.

7. The ordinance should be developed with community support.

The first five criteria are key features of the ordinance itself. The last two criteria reflect the background in which the ordinance is developed. Although an ordinance meeting these criteria is not guaranteed success, ordinances lacking one or more of these elements will definitely be handicapped.

Tree ordinances are among the tools used by communities striving to attain a healthy, vigorous, and well-managed community forest. By themselves, however, tree ordinances cannot assure that the trees in and around our communities will be improved or even maintained. Tree ordinances simply provide the authorization and standards for management activities. If these activities are not integrated into an overall management strategy, problems are likely to arise. Without an overall strategy, management can be haphazard, inefficient, and ineffective, and the community forest will suffer.

The effectiveness of a tree ordinance can be influenced by many factors:

- Do the residents support or oppose various ordinance provisions and other regulations, or are they even aware of them?
- Can the ordinance be enforced adequately?
- Will the ordinance account for existing environmental and structural limitations that affect tree health, growth, and survival?
- Will the government have the personnel and financial resources to fulfill ordinance requirements?

These questions should be asked at the beginning of creating a new ordinance or when revising and updating an existing ordinance. The honest answers to these questions will help public works agencies and other urban forestry program stakeholders determine if the ordinance and its provisions will succeed.

**Tree Preservation Ordinances**

Tree preservation ordinances expand on the general principles and goals of the simple tree ordinances by addressing larger issues such as protection of trees on private property, protection of trees in critical areas, such as streambanks, floodplains, and steep slopes, and protection of unique forest ecosystem areas.

The goals of tree preservation ordinances can include:

- Reducing tree loss during development
- Reducing damage to standing trees during construction
- Providing for replacement of trees lost during construction
- Providing for planting trees where none occurred previously
- Providing for the maintenance of preserved trees after construction is completed

Determining the goals and scope is an important part of developing the ordinance. The scope of the ordinance may cover only projects undertaken by a government on public land, or it could also include work by utility companies, private residential, commercial, or industrial projects. There may be a minimum size for a project to be regulated, measured in land area or in project cost. The ordinance may regulate only tree preservation or may also include replacement and new planting. It may or may not include provisions for education or enforcement. The heart of the ordinance should be the preservation of trees within a development proposed for a forested area. There are many variations to the intent of tree preservation, but the bottom line becomes what should be preserved—the forest or the trees.

This often becomes an issue of just how many trees make up a forest. Some ordinances will list a percentage of trees lost versus the total trees remaining in the form of a tolerance barometer, i.e., a loss of more than 35 percent...
of trees due to a proposed development would be unacceptable, and a new plan would have to be submitted for approval. Some ordinances use a minimum basal area to ensure a minimum canopy cover for all land within the municipality.

Another approach is to specify that the forest left following development will be similar to the one existing before the project was completed, i.e., if 15 percent of the trees on the site were larger than 24 inches, then trees this size should make up 15 percent of the trees remaining after construction. The intent of this provision is to have forests of similar size distribution after development, thereby preserving the character of the forests. For example, if there were 1,000 trees on a site and 150 trees were large diameter trees, then when the site is developed and there are 100 trees left, 15 trees would be in the larger diameter classes.

Tree replacement is a simple concept, but to be equitable it can become a very complex procedure. For example, an ordinance may require that the loss of a 30-inch diameter tree must be replaced with the planting of fifteen 2-inch diameter trees. However, it may be difficult, and potentially impossible, to find enough suitable planting locations for the replacement trees. This approach also fails to mitigate the environmental effect of mature tree loss.

A variety of replacement strategies are possible within tree preservation ordinances including:

- Requiring developers to set aside wooded areas as preserves
- Sliding scales
- Percentage replacement
- Off-site reforestation
- Flexible, no-net loss formulas

Each approach has its advantages and disadvantages; no approach is perfect. The intent of a tree preservation ordinance should be to provide incentives for unique and creative project designs that complement the existing forests and replace excessive tree loss.

Developing an ordinance that creates incentives is a positive way to achieve compliance. For example, preserved trees may be credited to the landscaping typically required on a project. In addition, a protected forest may be dedicated to the community in lieu of park dedication requirements.

Trees and forests are valuable elements in any community’s infrastructure. Development in a community from the construction of a single building to the improvements found in a new residential subdivision can have adverse and permanent impacts upon this important natural resource.

Each community must decide upon its own appropriate balance of trees and development. Both are important. The creation of a tree preservation ordinance can assist in determining what an appropriate balance is for the community. When all of the affected parties—from property owners to developers and builders to government officials—are involved in making these decisions and, ultimately, creating the tree preservation ordinance, the community inevitably improves the quality of life for its residents without sacrificing economic progress.
As the population and economy grows, communities across the country are growing too, and at a rapid rate. However, sometimes the success of a place can threaten the very reasons and resources that made it so attractive in the first place. Rapid development can lead to staggering losses of greenspace and urban and rural forest resources. Clear-cutting building sites for construction, accidental damage, utility excavation, road construction, land grade changes, and pollution from developing areas can destroy millions of trees each year. In response to this situation, communities turn their attention to a variety of planning and zoning tools to help guide and direct growth in a reasonable and fair way to achieve the greatest benefits for all. Commonly, tree protection and planting are made part of these tools. Typically, planning and zoning regulations, plans, and guidelines are determined by and are the primary responsibility of the local or regional planning agency. However, public works departments often help enforce and inspect projects governed by these planning regulations. These regulations and tools can significantly affect the urban forest and are briefly described below.

**Comprehensive Plans**
Comprehensive plans are typically developed at the local level by a county, township, or community. Comprehensive land use plans are an all-inclusive document that identifies a community’s resources, both the natural and built environment, and plans for future growth and development. Generally, a community must establish a comprehensive plan prior to enacting zoning, subdivision, and land development regulations. A comprehensive plan is typically a static document that establishes goals and policies for a community to implement over a ten- to twenty-year period, at which time a new plan is developed. Throughout the life of a comprehensive plan, it is usually reevaluated and updated to identify the progress a community has made in implementing the various goals and policies, to account for significant land development and changes, and to accommodate new goals of the community.

This plan can and does impact the management of the urban forest resources. A common component of a comprehensive plan is information on the location and quality of natural resources of the community. Based on that and other information, the plan can be developed to allow for some level of preservation and protection of the community’s key natural resources.

Even though the responsibility of the comprehensive plan is primarily with the local planning agency, the public works agency responsible for the urban forest can and should participate in the development or updating process. A comprehensive plan usually documents a community’s urban forest resources and identifies goals for preservation, enhancement, and even restoration. Public works managers can help establish goals for individual public street trees, privately owned trees, and large tracts of woodlands located in the community.

They can attempt to preserve tree canopy by requiring developers to submit detailed plats, construction, and development plans and documents indicating the presence of large diameter trees and groups of forest trees, identification of tree protection and tree preservation areas, and landscaping calculations.

Zoning, subdivision, and land development regulations are frequently amended and are considered living documents that are revised as the development climate changes, new building technologies are developed, and land and natural resource information is learned. Since they are often revised, it is important for public works managers charged with managing the urban forest to become informed and involved in the process.

Land Development Regulations often address many issues that are related to urban forest management:
- Site plan review
- Landscaping and tree cover requirements
- Tree protection
- Erosion and sediment control
- Storm water management
Dictionary definitions of “policy” include “prudence or wisdom in the management of affairs;” “a definite course of action selected from alternatives;” and “a high level overall plan.” Especially for operational duties, like tree maintenance and planting, appropriate internal policies regarding urban forest management can aid in the development and sustainability of a program.

Without formal public policies authorized by the public works department head and/or council, or without administrative regulations and policies from the city or county manager, there may not be the framework and support for a coordinated, efficient, technically competent, and comprehensive urban forest management program. Clear and reasonable policies encourage independent departments, other governmental agencies, utility companies, businesses, and even the citizens to interact and function cooperatively with each other.

Without general guidance and cooperation, poor management can result in the form of inefficient duplication or overlapping of efforts, and/or the opposite, underlapping, where areas of responsibility and needs go unmet. The lack of public urban forestry management policies can allow agencies to operate with conflicting or inadequate urban forest management standards. The lack of a policy also means there is no measure by which to judge the community’s actions as successes or failures.

Examples of urban forestry issues and responsibilities that might be the subject of official policies are:

- Criteria for public tree removal.
- Lists of approved and prohibited tree species that can be planted on public property.
- Planting site location standards to avoid conflict with utilities, sight distances, signs, and other potential obstacles.
- Use of current industry planting and maintenance standards for public works projects, private contractors, and citizens alike.
- Utility company activities
- Safe work practices and work sites.
- Interdepartmental plan review and approval and communication.

Without the need for complicated or unpopular legislation, the adoption and enforcement of various urban forest management policies and guidelines can support a change away from a problem-specific, crisis management, and reactive approach to a more proactive, professional management response. The lack of such useful policy statements and guidelines can allow agencies to act independently without regard to efficiency or effectiveness, hinder attempts to coordinate the action of public agencies regarding the proper management of public trees, and can confuse interaction of the public works agency with citizens, businesses, utilities, and other outside entities when dealing with public trees.

Gaining Support and Acceptance for Urban Forest Regulations and Policies

An important element in the support and acceptance of urban forestry regulations and policies is education. Public works managers can work with other public agencies and citizens to educate and inform property owners, businesses, developers, and contractors how to best maintain their trees and forests, properly plant trees, and engage in development projects using methods that protect existing trees and forest tracts. There are many educational tools that are proven approaches to achieve buy-in by stakeholders regarding regulations, guidelines, and policies, and to ultimately protect urban and community forests.

Creating new policies means educating public staff about why the policies are needed and how the department and urban forestry program will benefit. Implementing tree ordinances, public tree maintenance and planting policies, tree protection and preservation guidelines, or other regulatory measures will require educating the citizens, public officials and developers about how to comply with the existing or new requirements in a way that appropriately protects the resources while allowing use of the land and sustaining a healthy urban forest.

The topics of any educational efforts should range from the use of statistical and scientific data about trees and urban forests to more basic, consumer-oriented tree care, planting and benefits information. The educational efforts can be targeted to the following persons and groups in addition to public works staff:

- City Planners
- Building Inspectors
- City Advisory Commissions
- Contractors/Subcontractors
- Home/Property Owners
- Neighborhood Associations Developers
- Citizen Groups
- City Councils
- Utility Companies
- Realtors
- Architects/Landscape Architects

If you do implement new regulations and policies for the benefit of the urban forest, these educational tools may help in gaining acceptance and compliance in the community at-large:

- Workshops and training seminars with community leaders, advisory groups, contractors, homebuilders, and county and municipal staff.
- Publications, including direct mailings, newsletters, forestry and arboricultural handouts and brochures, and articles for the local print media. These publications
should be available in electronic format for use in direct e-mail responses and posting on websites.

- Awards and special events to recognize citizens, contractors, and other government departments who excel at tree preservation and reforestation or provide significant support to the public works agency; and local “Big Tree Contests” and Arbor Day events and programs to raise awareness of the urban forest in general.

Recommendations for Implementing Urban Forest Regulations and Policies

Creating and sustaining a comprehensive urban forestry program requires that many factors and resources be in place. Key components are regulatory tools and policy statements.

Typically, a community starts with “the basics” and then builds on those as the urban forestry program matures, more staff and resources are available, and the desires of the citizens and elected officials change.

The following recommendations are made to suggest a reasonable approach or order of implementing urban forest regulations and policies depending on whether you manage a new, developing, or established program.

**New Program**

1. Create and adopt a basic Public Tree Ordinance. Typical provisions included in a basic tree ordinance are: purpose; authority and power; limits of applicability; tree planting and maintenance and removal standards; enforcement; and penalties, claims, and appeals.
2. Create an advisory Tree Board/Commission to recommend polices and practices, and to be a liaison with the public and elected officials.
3. Include a section specifically for compensatory payment for damages to public trees. If an automobile accident occurs or a public tree is illegally and improperly pruned, the Town should collect damages from the responsible party to compensate for the corrective action needed and/or loss of the public tree. The Urban Forester should be designated as the authority to determine the appropriate amount using local standards or national standards, such as the formulas developed by the Council of Tree and Landscape Appraisers.

**Developing Program**

1. Review current public tree ordinance and make necessary amendments to be in compliance with current arboricultural standards; assure compatibility with other local ordinances; secure power to control safety risk and insect and disease problems on private property; define and expand duties and authority of the urban forest manager.
2. Formalize a ‘Public Tree Work Permit’ process in the public tree ordinance and/or within the current public works system. The permit process would require all parties, including other government units, utility companies, developers, and citizens, to submit a permit application and receive an approved permit before any public tree is pruned, removed, or planted.
3. Create a basic Tree Preservation and Protection Ordinance for public trees.
4. Become familiar with the existing local zoning, subdivision regulations, and landscape guidelines. Begin to interact with the controlling agency to coordinate and incorporate urban forestry program goals. Review any planting or maintenance specifications to ensure they meet current industry standards.
Established Program
1. Create a Tree Preservation Ordinance for private trees with clear procedures for protecting trees and forested areas during land disturbance or development, and with penalties for non-compliance.
2. Have direct authority and powers described within zoning and subdivision regulations for inspection and enforcement of tree and landscape requirements and issues; recommend the establishment of minimum canopy cover requirements for various land uses.

Be an active participant in each comprehensive plan review; request that the most current urban forest management plan be made a part of or referenced in the comprehensive plan.
Thank You

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Urban Forestry Best Management Practices for Public Works Managers
Ordinances, Regulations, & Public Policies
Urban Forestry Best Management Practices for Public Works Managers

Urban Forest Management Plan
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Urban Forestry Best Management Practices for Public Works Managers

Introduction

The purpose of having an urban forest management plan is to ensure that a community will enjoy the benefits of trees through proper arboricultural techniques and management practices. The goal of the plan is to state what is needed to manage the urban forest and to describe activities and services required to execute these responsibilities.

If a management plan is based on analysis from an accurate tree inventory and developed with input from public works staff, arboricultural experts, and the citizens, then the public works agency responsible for the urban forest will realize many benefits:

Increased Public Safety

All public works agencies know that a large part of their primary mission is to assure safety and manage risk related to public infrastructure. A tree inventory and management plan will provide lists of trees requiring priority removal and pruning that a manager can carry out within the limits of budget and time. The inventory can be used subsequently to monitor trees for safety risks on a continual basis. By implementing recommendations made in the management plan, storm damage risks will also decline.

Increased Efficiency

Once an inventory has identified the work to be done and a management plan has prescribed a maintenance program, a manager can execute that work in a much more efficient manner than before. By scheduling all work in a given area to be done at the same time (rather than by reacting to single requests) the savings in travel and setup time are substantial, with historical examples showing about a 50 percent reduction in cost—especially when a system of rotational work and/or preventative maintenance is adopted. There is also increased efficiency in the office created by using an electronic inventory to locate and manipulate records and select and schedule work. The efficient response to citizen requests and questions also improves customer service.

Facilitate Short- And Long-Term Planning

Planning can be made much easier by using the results of the tree inventory and the analysis of an urban forest management plan. Since maintenance and planting needs have been assessed, and other issues such as hardscape conflicts and right-of-way clearances, personnel levels and training, and even public relations are addressed in the plan, short and long-term planning for the forest is made easier.

Justify Budgets

An urban forest management plan provides the data and analysis needed to determine specific levels of funding for tree maintenance and tree planting projected over a multi-year period. With accurate data, a manager can establish, prioritize, and justify annual budget requests. The tasks and associated costs are clearly spelled out in the plan, and can be supported by detailed lists. Many public works managers have found that they have much greater success with budget requests that are based on the analysis of high-quality data. Also, a good inventory provides a solid basis for grant applications.

Documentation

For many reasons, public works managers are frequently asked to provide documentation of their actions. This documentation can range from annual work accomplishments to a contractor’s costs per tree, from a removal list to a specific service request. Some requests may be routine, while others may have strong budgetary or even legal implications. The urban forest management plan and most tree inventory software programs make such documentation very easy through reports that are included in the plan or that can be generated from the inventory database. Software packages come with standard reports, and there is usually a mechanism for creating special reports.

Trees on streets and on other publicly owned properties managed by public works agencies provide a multitude of aesthetic and environmental benefits to citizens, businesses and visitors alike. Beyond shade and beauty, trees also have practical benefits and a real monetary value that cities sometimes are unaware of—you urban forest provides valuable public services and could be worth over a million dollars. Unlike other public infrastructure components, properly planted and maintained trees increase in value over time.

An urban forest management plan, based on recent tree inventory data and analysis of available staff, equipment, and budget resources, is an essential tool for protecting this valuable resource. An urban forest management plan is an action plan; it gives public works agencies detailed information, recommendations, and resources needed to effectively and proactively manage public trees.
Management Plan Components

The components and variations of urban forest management plans are many, depending on the developmental stage of the urban forestry program within a public works agency. Generally, these elements are included or addressed in the plan:

1. Tree inventory data and analysis
2. Tree inventory and mapping data management software
3. Tree risk reduction/emergency storm response plan
4. Tree board or advisory council development
5. Public relations and education
6. Urban forest cost/benefit analysis

In the following sections, these six basic components of a plan will be discussed in more detail. They will be prioritized for the benefit of managers who are just beginning a program and for managers who have an established program and are looking to improve it.

Tree Inventories

What Is a Tree Inventory?
Public tree inventories are a statistically reliable survey of publicly owned and managed trees, used to determine the location and the exact or estimated measurements of quantity, quality, health, and trends of the urban forest, as well as a description of other urban forest attributes, such as potential planting sites, utilities present, and hardscape features.

Data commonly collected during an inventory includes:
- Location
- Species
- Diameter
- Condition
- Maintenance need and priority
- Proximity to utility lines, traffic signs and signals
- Sidewalk and other hardscape damage
- Insect and disease problems
- Potential planting sites

Inventories are generally completed by trained Certified Arborists or experienced inventory arborists. The tree attribute and location data are generally collected using handheld computers, geographic information systems (GIS) data, and/or geographic positioning systems (GPS) equipment.

Types of Inventories - Depending on the size of your community and your resources, there are different types of inventories that can be accomplished to provide you with an accurate accounting of public trees.

- “Windshield” Surveys – A windshield survey is a simple method of evaluating public trees, and may be a good first step for a new or developing urban forestry program. To perform a windshield survey, an arborist or someone knowledgeable about trees, drives along a community’s roads recording certain tree characteristics. Windshield surveys are most efficient when the arborist is looking for only a few particular tree characteristics, such as species, size, maintenance needs, or safety risk level. Windshield surveys have been and continue to be used in many cities and towns throughout the United States. The data collected during such a survey can be kept in written format on simple data forms, or entered into simple spreadsheet programs.
• **Statistical Sample Inventories** – A statistically sound, random sample of an urban forest is a cost-effective way of obtaining an overall picture of the state of the trees. Usually, obtaining data from between 3 to 6 percent of street miles and/or public property acreage will produce results that are accurate to within 10 percent of what a complete inventory would produce.

Using commercially available management GIS-based asset management software programs, simple computer spreadsheet programs, or other database programs, public works agencies can use the inventory data to create work reports, schedule tree maintenance and planting tasks, track costs, and efficiently respond to citizen requests.

Managing and updating inventory data and work orders can entail a significant investment of time and money, so public works managers need to carefully consider who will be performing this task, and what outputs are desired, and then select a system that is compatible with current agency capabilities and procedures. When the right tree inventory data management system is selected, public works managers are able to use the data for long-range, proactive planning to ensure the continued beauty, vitality, safety, and survival of all public trees.

**Inventory Data Analysis**

A significant component of an urban forest management plan is a professional analysis of the tree inventory data. Generally, statistical analysis is performed resulting in a number of tables and graphs depicting the tree population’s characteristics. Then, based on that analysis and the results, maintenance and planting priorities are developed and overall management recommendations are made for a multi-year period. Following is a description of the inventory data analysis part of a management plan.

• **Population Characteristics**

The public urban forest is a complex, inter-related system of trees, site conditions, and other infrastructure components. Understanding this dynamic system is important for proper decision making regarding appropriate tree care practices, planting decisions, and urban forest management. The public tree population characteristics section of a management plan provides insight into the current composition and condition of an inventoried tree population.

The characteristics of the urban forest include species, size, condition, and other related tree and site factors. By identifying the species, size, and condition of trees in the urban forest, much is revealed about the forest’s composition, relative age, and health. It is important for public works managers to know the kinds of trees as well as the number of trees present. Species composition data are essential because tree species vary considerably in life expectancy and maintenance needs. The types of trees present in a community greatly affect tree maintenance activities and budgets. Similarly, tree diameter and size class data help to define the general age and size distribution of the total tree population.

By analyzing and using this information, public works and urban forest managers can forecast trends, anticipate maintenance needs, budget for tree-related expenditures, and develop a basis for long-range planning. Knowing urban forest population characteristics facilitates decision making, which then allows proper and timely action to be taken for safety risk-reduction on the public rights-of-way, preventive maintenance to reduce storm damage and planning for needed tree planting operations. This ensures a stable and diverse tree population for the future.

• **Maintenance and Planting Programs**

One objective of an urban forest management plan is to determine the current appropriate maintenance recommendations for the tree population and to prioritize these tasks. Typical maintenance recommendations are: removal, pruning, stump grinding, green waste disposal, fertilization, insect and disease treatment, grate and guard repair, mulching, and watering.

The highest priority maintenance recommendations of removal and pruning pertain primarily to protecting public safety and are based on the existence of potential risks to the right-of-way, public property, and the citizens and their property at the time of the inventory. Rather than being priority safety pruning and removal activities, other maintenance activities...
recommendations are practices directed at improving the overall health, longevity, and aesthetics of the urban forest.

Often, the plan will provide additional resources and information regarding current industry standards and specifications for performing tree maintenance tasks. The plan can make recommendations for in-house staffing levels and equipment and/or determine if contractors can more efficiently perform a task or function. Operational reviews are commonly incorporated into the urban forest management plan.

The urban forest management plan looks at all inventory data and recommends an implementation schedule and prioritization scheme that allows public works agencies to develop cost-effective strategies for urban forest maintenance programs based on an accurate evaluation of current tree population characteristics and on future tree-related expenditures.

**Planting Programs**

Urban forest management plans address planting needs and can use inventory data to develop and guide public tree planting programs. Tree species selection and planting location designations are significant components of an urban forestry program. Decisions of what kind of tree to plant and where to plant it are critical due to the long-term impact of these decisions.

The tree inventory reveals the number of vacant planting sites, the size and types of these locations, the current species distribution, and other pertinent data. The urban forest management plan looks at this data to develop an overall planting strategy and address many issues related to new tree planting and care. The plan identifies the areas with the greatest need for improvement, recommends species appropriate for the available planting spaces, discusses specific maintenance plans for newly establishing trees, and provides technical information about proper tree planting techniques.

Using the urban forest management plan with its accurate data and professional interpretation and planning, a public works agency can plant trees that will ultimately be healthier, safer, have greater life expectancies, have fewer conflicts with utilities and other infrastructure, be less expensive to maintain, and maximize the benefits to the community provided by public trees.

Through careful analysis of local conditions and species composition, provisions in the management plan can be included to attempt to mitigate the disruption to its urban forest caused by the existing or potential insect and disease infestations. Taking a proactive approach to these kinds of threats enable the public works agency to address public and private needs in an efficient and effective manner.

With the urban forest management plan as a guide, public works managers can endeavor to distribute the costs associated with significant tree loss and damage from insects, disease and natural disasters over a manageable time period, as well as lessen the social and economic impact that such an extensive loss will have on the quality of life in our community.

**Insect and Disease Threats and Control**

American cities and counties have dealt with insect and disease threats to public forests for more than a hundred years. Historically, many communities have suffered significant tree loss and damage from such threats as the chestnut blight, Dutch elm disease, and the gypsy moth. The twenty-first century and the new global economy bring new threats to our urban forests, such as the Emerald Ash Borer, Asian Longhorned Beetle, and Sudden Oak Death.

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**Budgets**

Urban forest management plans generally include a multi-year, prioritized program for all basic urban forestry activities and provide relative costs that could be incurred by the recommended activities. These budget figures are usually based on local contractual charges for maintenance and planting tasks and on in-house costs for performing the needed services.

Urban forestry program budgets in management plans typically are presented on an annual basis for a period of five to ten years. The budget is recommended to address the highest priority removal and maintenance recommendations first. This is intended to reduce potential high-risk situations for the public and all associated liabilities. Then the public works agency can phase in the recommended routine pruning and planting cycles to distribute the annual budget funds more evenly. It is not uncommon for the budgets presented in the management plan to exceed the current resources of the public works agency. However, with the information about how much funding is required to properly maintain and sustain the public urban forest and improve public safety, public works agencies and managers should know what financial commitment is necessary and then take steps in subsequent years to attain the level of funding required.
Tree Inventory and Mapping Data Management Software

Computerized facility and asset inventories, location information, and work order systems are common tools used by public works managers every day. Managing tree inventory information is not that different than managing any other public infrastructure component and there are a variety of computerized systems and software programs to help in this task.

On the most basic level, tree inventory data can be entered and maintained in any simple spreadsheet or database software program. These programs are inexpensive, easy to use, and usually already exist on most office computers. Simple data sorting and querying can quickly provide information on urban forest conditions and tasks.

More commonly, tree inventory data and mapped location information are best maintained and managed using commercially available software programs specifically designed for urban forest management. These programs are customized for the public works agency to facilitate updating and editing, and are capable of instantly providing useful information and producing reports such as:

- Work histories and costs for each tree
- Citizen service and information requests
- Work orders
- Available planting sites
- Tree valuation
- Maps

As a management tool, a computerized tree inventory and data management software program promotes efficient allocation of work crews and equipment; expedites responses to service requests; identifies safety risks; facilitates accurate cost analysis; provides data for communicating with the public, elected officials, and other departments; can provide information needed for grant applications; tracks permits; and projects future work programs and required budgets.

The management plan will generally assess the needs, capabilities, and responsibilities of the public works agency and make an appropriate recommendation of what individual or combination of software programs and data management systems is right for the agency.

There are a number of commercially available tree management software programs from arboricultural consulting companies. There is also free, public-domain software, such as the U.S. Forest Service’s Mobile Community Tree Inventory (MCTI) program that can be run on personal digital assistants or desktop computers.
The urban forest management plan can and should have sections devoted to urban forest risk reduction and an emergency response and recovery plan that provides information about general tree risk reduction and gives directions to the public works agency during an extreme storm emergency.

When developing an emergency management plan, dealing with serious public safety and health issues is an obvious component, but including trees and woody debris in mitigation efforts must not be overlooked. When catastrophic disasters, such as tornadoes, ice storms, hurricanes, and severe straight-line winds strike a metropolitan center, thousands of cubic yards of debris are produced. Trees and vegetation can account for approximately 30 percent of this debris volume.

Beyond the task of collecting and disposing of this debris, additional management considerations include increased threat to life from hanging limbs and uprooted trees, hindrance to life-saving efforts by blocked streets and driveways, power outages and power restoration efforts, and personal and public property damage. The impact of these additional tree-related considerations is not always quantifiable but can overwhelm public services and slow down the short and long-term recovery process.

A comprehensive urban forest management program greatly reduces storm hazards through proper planting, preventive maintenance, and systematic risk reduction. However, when disasters occur, an emergency plan as an addendum to this plan can provide solid data, facts, and protocols to assure service continuity and timely recovery and restoration. The overall objective is to create an emergency preparedness program that details improved policies and procedures, increasing the efficiency and productivity of emergency storm response operations.

Both the emergency response plan and risk reduction plans should be created as a collaborative effort between all key agencies and stakeholder in the community. With the public works department as the lead, information and input from police and fire, parks, purchasing, city or county administration, controlling utility companies, local and state emergency management agencies, and contractors should be obtained and considered when developing these plans.

Risk reduction plans can also address threats to public safety, health and public works operational responsibilities and issues that are non-storm emergencies, such as:

- Clearing leaves and woody debris from gutters and storm drains
- Sidewalk, street, and building clearance standards
- Line-of-sight conflicts for street and safety signage
- Blockage of street lamps and traffic lights
- Conflicts with overhead and underground utilities

Tree Risk Reduction Plan/ Emergency Storm Response Plan
Greening and maintaining a community’s urban forest is a long-term commitment dependent on not only the professional management and expertise of public works staff but also on the support and involvement of the citizens. Unlike fire hydrants and sidewalks, an urban forest is a public asset that can generate both positive and negative emotional responses. An important step in dealing with this unique characteristic of an infrastructure component is forming and supporting a group of local citizens who are dedicated to the care and maintenance of the community trees while assisting the public works agency in its mission.

This group is often called a tree board or an urban forestry advisory council and can provide a number of services to public works agencies. They can educate the citizens at large on the importance of trees, interact directly with elected officials in support of the program, assist in maintenance tasks like small tree maintenance, mulching, planting, and watering, and apply for grants and generate private financial donations.

Their singular mission, however, is to recommend unbiased, citizen-based direction and alternatives regarding community tree management to public works managers. They serve in an advisory capacity only, and depend on public works personnel to actually implement most of their recommendations. Still, the ultimate responsibility for the community’s urban forestry program rests with the public works agency.

The urban forest management plan should include information on creating a local community forestry program in areas that do not already have one, and for sustaining one that already exists.

Public Relations and Education

On a basic and general level, having a computerized tree inventory and urban forest management plan facilitates and improves public relations and education. For instance, most citizen callers are pleased when they have reached someone who knows their tree and can answer general questions or respond directly to their request because of quick access to information such as tree attributes and scheduled work. Computerized tree inventories are also useful tools for public education. The inventory data, maps or summary reports can be distributed in print or on a website so the public can access them. In this way, the public can gain a better understanding of the work of urban forestry and become more willing to support its program.

Through years of experience, urban forest managers across the country have found that public education is the true key to reaching the goals of an urban forestry program in a community. A public works agency will be able to effectively achieve urban forest management goals only by educating citizens, elected officials, and other public agencies working within the community. Ordinances, management plans, guidelines, policies and procedures alone will not guarantee success. An urban forest management plan will recommend specific actions to increase and support public relations and education about trees and the urban forestry program. Such recommendations may include:

- Holding a seminar or public meeting to discuss the tree inventory project, its results, and its importance for the community.
- Developing monthly evening or weekend seminars directed at residents related to tree care and landscaping. Bring in local guest experts from various disciplines in the green industry.
- Writing a monthly tree-related article for local newspapers and community websites, or preparing a press release for each new project.
- Sending letters to residents in areas where tree maintenance or planting projects will be conducted each year.
- Developing a tree care door hanger or brochure to go to each residence where new trees are planted to encourage them to help maintain the tree and not damage it during mowing.
Urban Forest Cost/Benefit Analysis

The public trees growing in any community are valuable municipal resources. They provide tangible and intangible benefits for diverse services such as pollution control, energy reduction, storm water management, property values, wildlife habitat, education, and aesthetics. Previously, the services and benefits trees provided in the urban and suburban setting were considered to be unquantifiable. However, by using extensive scientific studies and practical research, these benefits can now be confidently calculated using models contained in i-Tree software and current tree inventory information.

The i-Tree suite of free software tools was recently released by the U. S. Forest Service and can be used to assess and manage community forests. With these tools, public works and urban forest managers can accurately quantify the benefits of urban forests and understand and balance the costs of managing an urban forest.

Using the tree inventory data and applying i-Tree’s STRATUM (street tree resource analysis tool for urban forest managers) an urban forest management plan can assess and quantify the functions of the public tree resource and place a dollar value on the annual environmental benefits they provide. However, enhancing, protecting, and maintaining this municipal resource has costs; public works agencies annually allocate public funds for planting, removal, pruning, emergency cleanup, inspection, and administration of the urban forestry program. The STRATUM model accounts for costs of managing an urban forest and provides results in terms of net benefits.

An urban forest management plan that includes such a cost-benefit analysis will help the public works manager:
- Obtain economic evaluations of street trees using annual budget and expenditure data to assess the management program.
- Justify funding and perform strategic planning for the urban forest.
- Gain more public support for the value of trees to economic development, environmental health, and quality of life issues in the community.
- Determine the annual amount of pollution removed by the urban forest, the percent of air quality improvement, the amount of carbon sequestered, the amount of energy consumption reductions, and estimated increases in property values and aesthetics.

This kind of cost/benefit analysis may provide public works managers with the justification for more attention and funding for urban forestry planning, design, management, and maintenance. The science behind these models and type of analysis is sound and has been published in peer-reviewed journals. The challenge now is to apply the science to enhance the quality of life in our communities by improving the condition and extent of the urban forest.
Urban Forest Management Plan Summary

The urban forest management plan should be considered a "living," working document. The work programs recommended in it should be reviewed annually and adjustments made appropriately for the following year. The entire document itself should be reviewed on a five or ten year basis to determine if management and urban forest conditions have changed significantly.

The management of public trees is challenging, to say the least. Public works managers have the daunting task of balancing the recommendations of experts, the wishes of council members and other elected officials, the needs of citizens, the pressures of local economics, the concerns for liability issues, the physical aspects of trees, the forces of nature and severe weather events, and the desire for all of these factors to be met simultaneously.

Without a management plan, the governments and individuals responsible for taking care of an urban forest will not be effective in meeting the true needs of the trees and the community. A management plan establishes a clear set of priorities and objectives related to the goal of maintaining a productive and beneficial community forest.

You’ve heard the riddle, “How do you eat an elephant?” The answer is, “One bite at a time.” This is also good advice for creating or improving an urban forest management plan. If you are just beginning an urban forest management plan project, try to accomplish these tasks first:
- Conduct a windshield survey or sample tree inventory that is managed and updated on paper or in a computerized spreadsheet program.
- Based on the data you collect, create a management plan with sections that address the highest priority maintenance and planting tasks with estimated budgets for this work.

If you already have an existing, basic tree management plan, consider improving it by accomplishing these tasks:
- Complete a 100 percent public tree inventory with GIS or GPS tree location mapping, if it doesn’t already exist.
- Obtain a customized tree inventory data management software program to help you carry out the plan’s recommendations and record your work accomplishments.
- Create or update your management plan to include analysis and recommendations for preventive maintenance cycles; a community-wide planting program; expanded public relations and education; and risk reduction programs.

If you have an existing comprehensive urban forest management plan, the next time it is reviewed, consider addressing and including these components:
- Comprehensive risk reduction and emergency storm response plans.
- Operational review with recommendations for improved work procedures, equipment inventory, budget level, and administrative efficiencies.
- Ordinance, policies, and procedures review and recommended revisions
- Tree cost-benefit analysis.

Whatever level your urban forestry program is at currently, and depending on where you want to go with it in the future, an urban forest management plan can help guide you to achieving your goals. There are many sources of information and assistance at your disposal just for the asking.

The existence of an urban forest management plan in a community indicates a high level of commitment to protecting trees, and it indicates a higher level of education and knowledge about natural resource issues in general. The benefits of trees can be maximized when both professional management resources and an educated public coexist.

With a tree inventory and urban forest management plan, a public works agency can objectively consider each specific issue and balance these pressures with a knowledgeable understanding of trees and their needs. If balance is achieved, the community’s beauty will flourish and the health and safety of its trees and citizens will be maintained.

For More Information

Your State Urban Forestry Coordinator
www.arborday.org/programs/urbanforesters.cfm

USDA Northeastern Area Urban and Community Forest Resources
“A GUIDE: DEVELOPING A STREET AND PARK TREE MANAGEMENT PLAN”

Wisconsin Department of Natural Resources Bureau of Forestry
“A Technical Guide to Developing Urban Forestry Strategic and Management Plans”
http://www.dnr.state.wi.us/org/land/Forestry/uf/resources/uf%20planning%20guide.pdf

Urban Forestry South
“Urban and Community Forestry Strategic Plans”
http://www.urbanforestrysouth.org/Resources/Collections/u-cf-strategic-plans-1/view

National Arbor Day Foundation
Tree City USA Bulletins
www.arborday.org/programs/treecitybulletinsbrowse.cfm

USDA Northeast Center for Urban and Community Forest Resources
“Community Tree Inventory: Data Collection”
www.umass.edu/urbantree/inventorywhitepaper.pdf

National Arbor Day Foundation
Tree City USA Bulletins
www.arborday.org/programs/treecitybulletinsbrowse.cfm

USDA Northeastern Area Urban and Community Forest Resources
“Tree Inventory and Management Software List with Descriptions”
www.na.fs.fed.us/urban/inforesources/inventory/InventorySoftwareListDetails.pdf

USDA Northeastern Area Urban and Community Forest Resources
“A Guide to Street Tree Inventory Software”
www.na.fs.fed.us/spfo/pubs/uf/streettree/toc.htm

USFS i-Tree Tools
http://www.itreetools.org

Cost/Benefit Analysis
USFS i-Tree Tools
/www.itreetools.org
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Thank You