Literature Review and Summary Report

Urban Forest Management and Public Works: Improving Communication and Building Capacity

February, 2007

DAVEY
RESOURCE GROUP
A Division of The Davey Tree Expert Company

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A. Literature Review Summary

Background

A comprehensive literature review was performed in support of the American Public Works Association's project, *Urban Forest Management and Public Works: Improving Communication and Building Capacity*. The purpose of the literature review was to determine the type, extent, and content of research and information that is readily available regarding urban forest management in the municipal public works context.

The findings of the literature review are a resource for the project steering committee to use to determine the key components of a successful urban forestry program. The findings of the literature review also identify where there is a lack of accessible and relevant information on the subject.

Sources Reviewed

A variety of literature sources were researched and reviewed; those included professional journals, professional trade magazines, popular publications, on-line publications, and organizational websites. Over 20 sources were reviewed. The specific sources of literature and information and the number of documents found related to the project's topic of urban management within a public works context are presented in Table 1.

Source	Number of Related Documents Found
Journal of Arboriculture	24
Municipal Index	6
American City and County	5
Journal of Forestry	4
City Trees	4
Public Works Management and Policy	4
American Public Works Reporter	3
Journal of the American Planning Association	3
American Forests	2
Results of a Survey of Society of Municipal Arborists Members/Prospective Members	2
Public Works Magazine	1
American Review of Public Administration	1
Municipal Tree Management in the United States	1
Urban Forests Landscapes: Integrating Multidisciplinary Perspectives	1
Urban Forestry: Planning and Managing Urban Greenspaces	1
Urban Forest: Comprehensive Management	1
Grounds Maintenance	0
International City/County Management Association	0
Urban Forestry South Expo	0
Northeast Center for Urban and Community Forestry	0
New York State Urban and Community Forestry Council	0

The above list of sources is not presented to be a conclusive and exhaustive list of all topical urban forestry or public works related literature and information. The literature sources reviewed were identified through suggestions made by Steering Committee members, from known bibliographies, from internet-based research, and from professional knowledge. The objective of this task was to research a broad-based range of existing and easily accessible sources of information to gauge the level of availability of urban forestry information to public works staff.

A complete listing of authors, titles, and abstracts accompany this report and is organized by primary source in Appendix A.

Findings

The literature review revealed that no single source of information or document precisely contained information on successful urban forest management in a public works context. However, the literature and sources of information reviewed did cover a broad range of urban forest management and related topics. The most prevalent themes are summarized below in order of frequency:

- Case studies of urban forestry programs in various American cities and states
- Federal urban forestry programs, initiatives, and guidelines
- Technological advances and tools for urban forest management and analysis
- Urban forest benefits and measurements
- Urban planning
- Urban forestry management statistics

An analysis of the literature and information sources reveals that there are a variety of urban forest management program components and issues commonly cited as important to building, sustaining, and growing a program regardless of the organizational structure and location of the forestry program. These components and/or issues are presented below in topical groups:

- Staffing
- Regulations and Policies
- Urban Forest Benefits
- Public Outreach/Education
- Technology

Discussion

The literature reviewed discussed or presented facts and opinions on five major topical components of a comprehensive urban forestry program. The following discussion provides a brief synopsis of the major points or elements presented for each topic.

Staffing

A truly proactive and comprehensive urban forest management program requires trained and dedicated staff to oversee management and operational activities. The important duties of tree planting, tree maintenance, emergency response, plan review, development site inspection, project management, contract administration, interagency assistance and coordination, and citizen education, among others, require a sufficient level of staffing with appropriate training. Staff responsible for urban forest management should also be professionally certified or have access to certified employees to assist in making operational and management decisions.

The level of staffing and types of positions will vary with the size of the city, the public tree population, and the degree of responsibility as defined by local regulations. No guidelines were given as to the appropriate personnel complement for an urban forestry program; however, it was agreed that at least one management level position should exist that is dedicated solely to urban forestry operations and management. This person should also have access to sufficient in-house or contractual resources to manage a proactive program.

Regulations and Policies

Research and professional opinions in the literature strongly suggest that tree ordinances and clear urban forest management policies are the foundation of a sustainable program. Such regulations and guiding principles establish the authority and accountability for tree management, set minimum standards for maintenance and planting, and can help protect and preserve the existing urban forest canopy.

Examples of these types of regulations and policies are: tree ordinances, tree preservation ordinances, site development regulations, landscape guidelines; urban forest management plans, emergency response plans, and planting plans.

Urban Forest Benefits

Compelling statistics and findings from a great number of peer-reviewed, scientifically valid, and legally defensible studies are currently available to describe the enormous impact vigorous, well-maintained public trees and forests have on our cities.

These benefits can now be quantified in terms of a variety of green infrastructure services—stormwater management, air pollution control, water quality improvement, carbon sequestration, energy consumption reductions, among others. Trees also contribute greatly to economic development and stability of cities through increased real estate values, attraction and retention of businesses and their employees, and the enhancement of consumer activities in business districts. Trees also increase the quality of life through aesthetics and providing wildlife habitat.

These many and important benefits should be recognized and promoted by urban forest managers and those responsible for the care of public trees. The tangible assets and benefits that trees provide should be accounted for when making budget and funding decisions for this unique public resource that can be considered as a biogenic utility and green infrastructure component in the public works sector.

Public Outreach/Education

Community partnerships and support of the urban forestry program are critical for the success of sustainable urban forests. It is believed that most municipalities are not taking full advantage of valuable resources in the community, such as individual citizens, community and neighborhood groups, volunteer tree boards, allied non-profit organizations, utility companies, and local businesses.

If municipalities and the city staff who are responsible for urban forestry programs make greater efforts to build partnerships, they can increase the citizens' understanding and appreciation of the urban forest as well as make tangible strides in improving the health and safety of the forest resources. An informed citizenry will support funding initiatives for forestry programs, become a source of political support for forestry issues, causes, and projects, and will actively participate in the care and planting of the public forest as well as the private forest, which collectively contributes to the quality of life in a community.

Technology

The rapid development of computer and diagnostic technologies has changed the way urban forest managers carry out their responsibilities. With increased availability of networked, desktop, and handheld field computers and GPS and GIS technologies, managers can use a variety of software applications to improve management effectiveness and efficiency. Management tasks now automated by computer software include: mapping tree locations, inventorying tree attributes, analyzing urban forest structure, creating and issuing work orders, recording work histories and costs, creating annual and multi-year budgets; preparing and responding to severe weather events; tracking fleet and equipment inventory and data; recording citizen requests and calls for service and information; making a variety of reports; and communicating with other city staff, elected officials, and the citizens.

Specific software applications have been recently developed to measure, display, and report on total forest canopy cover, individual and collective tree benefits, and to perform cost/benefit analyses. Examples of these are the American Forests' CityGreen program and the USDA Forest Service's i-Tree Suite.

Tree care and planting tasks have also been improved through the use of new technologies: assessing tree condition and risk through the use of diagnostic tools such as the resistograph and tree radar; improving tree survivability at planting with the use of new engineering and construction techniques; and even applying new soil amendments and formulations.

To be most effective and efficient, urban forest management staff needs to have an awareness of, access to, and training for using these new technologies in their daily operations.

Conclusion

Arboriculture is an emerging science, and urban forestry is a growing management discipline in the municipal setting. For the scientist, technician, and practitioner, there is a wealth of published literature on the science of trees, urban forests, and tree planting and maintenance. For the professional urban forester or municipal arborist, there is a wealth of published literature and publications that inform and instruct on a wide variety of program development and sustainability topics.

However, based on the literature review, what appears to be lacking is both technical and managerial information geared to public works managers who have responsibility for public trees, as well as other public infrastructure, facilities, and safety responsibilities.

One literature source reported that in 1994, 86% of municipal departments responsible for public tree care also had non-tree-related responsibilities. Clearly, the vast majority of urban forest management in the United States is being performed by public works and other non-arboricultural staff. Unless these managers have been informed or enlightened as to the existing sources of urban forest management information, such as the Society of Municipal Arborists and their publication *City Trees*, or the International Society of Arboriculture and their *Journal of Arboriculture and Urban Forestry* or the *Urban Forestry South Expo* website, for example, then they will continue to manage without the benefit of this information.

The traditional sources of information and education available to public works staff, such as the American Public Works Association's *Reporter, American City and County,* and the Public Works website, have not previously nor currently offer many resources and educational opportunities for better urban forestry management presented from a public works perspective or context.

Appendix A
Literature Review Summary

JOURNALS

<u>American City and County</u>

American City and County Staff. "Grounds Maintenance/City Surveys Region's Forestry Practices." *American City and County.* 01 Apr. 2001.   06 Sept. 2006. <http://americancityandcounty.com/mag/government_grounds_maintenancecity_surveys/ index.html>.

Kenosha, Wis., has surveyed area communities to examine urban forestry practices in the Kenosha region. Administered by the city's Park Division, the survey assisted Park Superintendent Terrence Flatley in proposing his 2001 budget for labor and equipment.

Miller, Laura. "GIS Branches Into Urban Forest Management." *American City and County.* 01 Feb. 1995. 07 Sept. 2006 <http://americancityandcounty.com/mag/ government_gis_branches_urban/index.html>.

GIS gives urban foresters a planning advantage by allowing them to anticipate uses of trees areas. Having all city departments linked to the GIS will allow for better planning and coordination.

"Grounds Maintenance/City Surveys Region's Forestry Practices." *American City and County Staff.* 01 April, 2001.

Kenosha, Wis. has surveyed area communities to examine urban forestry practices in the Kenosha region. Administered by the city's Park Division, the survey assisted Park Superintendent Terrence Flatley in proposing his 2001 budget for labor and equipment.

Raflo, Brook. "Urban Forestry/City Develops Software, Available To All." *American City and County.* 01 Dec. 2002. 06 Sept. 2006. <http://americancityandcounty.com/mag/ government_city_develops_software/index.html>.

Local governments looking for an inexpensive way to monitor their tree inventories can tip their hats to Springfield, Mass. The City's Parks Department has developed an automated tracking system that is available to any community for free.

Ursery, Stephen. "GIS/GPS/Chattanooga, Tenn., Builds Tree Inventory." *American City and County.* 01 Jul. 2003. 06 Sept. 2006. <http://americancityandcounty.com/mag/ government_chattanooga_tenn_builds/index.html

Using GPS technology, Chattanooga, Tenn. has created a tree inventory of its business district. The inventory will help the City plan tree maintenance in the area and is a component of the GIS that the City shares with Hamilton County, Tenn.

<u>American Forests</u>

Harte, Alexis. "San Antonio: Restoring the Urban Oasis." *American Forest Magazine*. Fall 2003. American Forests. 06 Sept. 2006. http://www.americanforests.org/ productsandpubs/magazine/archives/2003fall/feature1_1.php>.

Development and tree loss usually go hand in hand. Here's how a southwestern jewel is gathering the tools to change that scenario.

Leatherman, Courtney. "Digging Out of a Tree Deficit." *American Forest Magazine*. Autumn 2001. American Forests. 06 Sept. 2006. <http://www.americanforests.org/ productsandpubs/magazine/archives/2001autumn/digging_out.php>.

Changing a city from gray back to green requires computer savvy, high-tech pictures, and local action.

American Review of Public Administration

Nalbandian, John. "Professionals and the Conflicting Forces of Administrative Modernization and Civic Engagement." *The American Review of Public Administration*. 35(4). 2005. 311-326.

Local government professionals find themselves in the middle of two dynamic forces: administrative modernization and citizen engagement. Attention to one without recognition of the other renders governance ineffective. The key to effective professionalism in local governance is bridging the gaps in governance that these two trends create.

APWA Reporter Articles

"APWA Joins the Sustainable Urban Forest Coalition" APWA Archives. 07 June, 2006.

APWA recently joined the Sustainable Urban Forests Coalition (SUFC) in an effort to aid in advancing a national agenda for well-managed urban and community forests. The SUFC is a national coalition, including such members as the Alliance for Community Trees, American Planning Association, and Society of Municipal Arborists, united to advance a unified urban forest agenda for our nation's communities. Urban forests include the aggregate of all community vegetation and green spaces in neighborhoods of large and small cities across the county and that provide benefits essential to enriching community quality of life.

Gonzalez, George. "Sidewalk Management and Tree Preservation in Los Angeles."

Sidewalks and urban trees are capable of living in the same areas. With proper planning, species selection, and maintenance, many headaches can be avoided. Sometimes it requires re-designing sidewalks to work along with trees and tree roots to avoid damage in the future.

McPherson, Gregory E. "Urban Forestry: Benefits and Drawbacks of City Trees." Presented to APWA Congress, 2003.

Trees have their drawbacks. Implementing strategies to reduce these drawbacks and control costs is one aspect of effective management. Less commonly practiced but equally important is managing trees to maximize their benefits. Examples of this include enlarging planting spaces in sidewalks to contain larger-stature trees, retaining more leaf area during pruning, selecting species that match the site's functional needs, and aggressively enforcing parking lot tree shade ordinances. By adding benefits into the municipal forestry equation, managers can deliver a higher level of service at less cost.

City Trees

Buscaino, Mark. "An Opportunity for Growth and Development; USDA Forest Service's Urban and Community Forestry Program." *City Trees*. January/February 2005 26-28.

The Urban and Community Forestry program identified key focus areas/activities that are encouraged for cities to achieve. Included are: increasing local per capita investment in urban and community forestry activities; providing education and training

to both professionals and non-professionals alike; promoting active community tree inventories and management plans; hiring professional community foresters/arborists; adopting and enforcing tree protection and preservation ordinances; and forming local community forestry advocacy organizations to ensure a strong foundation of grassroots support.

Croy, Owen; Paterson, Robert. "Creating Policies for Trees." *City Trees.* July/August 2004 25.

Well-crafted policies will provide decision makers and the public with the organization's intentions for any particular matter that may arise in the future. This assists in the rationalization of decision-making and can help avoid the pitfalls associated with making hasty decisions that respond only to short-term issues. The policy may also provide explicit guidance in the implementation of the policy by staff or contractors.

Rodbell, Phillip. "Planning for Active Management." *City Trees.* January/February 2005 38.

To establish a firm administrative framework for management, complete the following tasks: 1) organize an officially recognized advisory board and meeting schedule, 2) draft and report on annual and long-term performance goals, objectives, and work plans, 3) develop and maintain relationships with relevant city agencies and commissions, and commercial utilities, 4) compile relevant city codes, regulations, and state laws related to trees, 5) take steps to modify local codes and regulations as necessary to protect trees and the entire urban forest, 6) institute process for technical review of capital improvement projects and private development plans for potential effects on trees, and 7) budget for professional improvement opportunities for staff and volunteers. When completed and compiled, these many activities yield a single comprehensive plan and policy manual critical to establishing a well-managed and supported program of care for community trees and the urban forest as a whole.

Rodbell, Phillip. "Stewards of a Declining Forest." *City Trees.* May/June 2005 36.

The urban forester's job is to maintain and enhance a community's tree cover, not to preside over a declining public asset. To do this successfully, we need technical skills, planning, enforceable policies, and public support. If we do it right, the communities we serve will have healthy tree cover and be thriving places for undertakers and public health advocates alike.

Journal of the American Planning Association

Campbell, Scott. "Green Cities, growing cities, just cities?: Urban planning and the contradictions of sustainable development." *Journal of the American Planning Association.* Summer 1996: 296.

Nothing inherent in the discipline steers planners either toward environmental protection or toward economic development - or toward a third goal of planning: social equity. Instead, planners work within the tension generated among these 3 fundamental aims, which is called the planner's triangle, with sustainable development at the center. This center cannot be reached directly, but only approximately and indirectly, through a sustained period of confronting and resolving the triangle's conflicts. To do so, planners have to redefine sustainability, since its current formulation romanticizes the sustainable past and is too vaguely holistic. Planners would benefit from integrating social theory with environmental thinking and from combining their substantive skills with techniques for community conflict resolution, to confront economic and environmental justice.

"Planning for Urban and Community Forestry." *Overview.* American Planning Association. 5 Sept. 2006 <http://www.planning.org/forestry/>.

> *The American Planning Association, in close collaboration with the International Society of Arboriculture (ISA) and American Forests (AF), will prepare a state-of-the-art best practices manual about how urban and community forestry can best be integrated into long-range and current municipal planning activities in the U. S.*

"Planning for Urban and Community Forestry: A Literature Review." American Planning Association. 5 September 2006 <http://www.planning.org/forestry/litreview.htm>.

> *The Planning for Urban and Community Forestry review contains book, article, and government document citations. The list is part of a continuous process and may be considered both a literature review and a resource list for the project.*

Journal of Arboriculture

Dwyer, John F., Nowak, David J., Noble, Mary Heather. "Sustaining Urban Forests." *Journal of Arboriculture.* 29(1) (January 2003): 49-55.

> *Urban forests are diverse and interconnected ecosystems. They are complex environments and are linked with many other components of the urban system. Management of urban forest systems requires the involvement of a widening range of disciplines, users, and managers to sustain forest health. Current urban forest management often focuses on sustaining a healthy population of publicly owned trees. Expanding the management focus of urban forests to all trees and associated resources is required. The management of trees in the urban ecosystem will be challenging and will require nontraditional techniques. However, the overall societal benefits of doing so will be substantial.*

Elmendorf, William F., Cotrone, Vincent J., Mullen, Joseph T. "Trends in Urban Forestry Practices, Programs, and Sustainability: Contrasting a Pennsylvania, U. S., Study." *Journal of Arboriculture.* 29(4) (July 2003): 237-248.

> *Previous studies provided criteria and guidelines both for measuring and increasing the sustainability of urban forests. These studies have also provided evidence that difficulties existed in completing important practices (e.g., inventories, street tree ordinances, management plans), which contribute to both better urban forest programs and sustainability. In a recent study of both small town tree commissions and programs in northeastern Pennsylvania U. S., there was a marked difference between tree commission members' attitudes toward urban forestry practices and the successful completion of them. Focus groups composed of tree commission members were used to gather information on why these differences existed. Our northeastern Pennsylvania study provided evidence that local tree commissions had difficulties completing urban forestry practices for a number of reasons, including a lack of volunteer time and a need for additional support and assistance. The study also showed that small town tree commissioners viewed and defined urban forest sustainability much more practically than has been expressed in the extant literature. Questions continue about how well local urban forestry practices support sustainable urban forest programs and resources.*

Grey, Gene. "What Should be the Role of State Government in Municipal Arboriculture – Urban Forestry." *Journal of Arboriculture.* 4(3) (March 1978): 71-72

> *This article reports on when and where the state government should step in to help out municipalities with their urban forestry program.*

Grado, Stephen C., Grebner, Donald L., Measells, Marcus K., Husak, Amanda L. Status, Needs, and Knowledge Levels of Mississippi's Communities Relative to Urban Forestry." *Journal of Arboriculture and Urban Forestry.* 32(1) (January 2006): 24-32.

This article looks at the knowledge levels and information needs of Mississippi's various sized municipalities. Among the different municipalities, there was a general interest in urban and community forestry no matter what size the city. One major hurdle commonly encountered was lack of adequate funding. The funding which is available from the state tends to favor those communities of larger size. Despite the obstacles, most communities still are interested in furthering their technical knowledge and taking the necessary steps to improve their urban forest environment.

Grado, Stephen C., Grebner, Donald L., Measells, Marcus K., and Husak, Amanda L. "Status, Needs, and Knowledge Levels of Mississippi's Communities Relative to Urban Forestry." *Journal of Arboriculture and Urban Forestry.* 32 (1):24-32.

There is a need to determine levels of knowledge about and participation in urban and community forestry programs by local elected officials and other community planners. This project's goals were to identify the past and current involvement and future interest levels among Mississippi's small to large communities for urban forestry programs and assistance.

Harrell, James. "Florida's Urban Forestry Program." *Journal of Arboriculture.* 4(9) (September 1978): 202-207.

The Florida Department of Forestry has, since 1971, been a leader of the development of Urban Forestry South. Florida counties and municipalities, in cooperation with the Division, sponsor an urban forestry program that currently employs sixteen urban foresters. Enlightened environmental legislation, rapid urban growth, and sub-tropical climate have combined to create innovative urban forest management.

Jorgenson, Carl. "Challenges of Municipal Arboriculture." *Journal of Arboriculture.* (November 1976): 217-220.

Municipal arboriculture encompasses four principal objectives: 1) quality tree planting programs as growth of a city occurs, 2) preservation of existing trees, 3) maintenance of trees on the public right-of-way and city properties, and 4) education of the general public as to the value of trees. Varying approaches to these four objectives and the means of carrying them out are presented. Effective implementation of the objectives depends on a workable tree ordinance.

Kuhns, Michael R., Lee, Brook, Reiter, Douglas K., "Characteristics of Urban Forestry Programs in Utah, U. S." *Journal of Arboriculture.* 31(6) (November 2005): 285-295.

Urban/community forestry programs in Utah, U. S., were studied; a questionnaire was sent to community forestry contacts in every incorporated community in the state in summer 2002. Respondents reported on program support, budget, management authority and practices, strengths and weaknesses, and training and information needs. Program support for residents, town officials, and employees was fairly strong, with 80% indicating some support. One-quarter of towns have a tree board and celebrate Arbor Day. Towns obtain assistance from nurseries or tree care businesses, Extension, and state forestry, in that order. Two-thirds of communities have a tree-related budget, with a mean budget of US$44,000 and a median budget of $3,000, averaging $258 per resident and $25.16 per tree. Total budget generally increased with population, but the smallest towns had the largest per capita and per tree budgets. Most towns spend

enough to qualify for Tree City USA's requirement of $2 per capita. The ratio of spending for maintenance versus planting increased from 0.6 for small towns to 4.1 for larger cities. Just under two-thirds of communities have forestry programs. The average number of trees increasing as population increased, but with trees per capita generally deceasing as population increased, ranging from 0.21 to 0.43 trees per person.

Magill, Arthur. "URBANBASE: Key to Urban Forestry Information." *Journal of Arboriculture.* 6(4) (April 1980): 101-104.

To accomplish effective communication and technology transfer in urban forestry planning and management, an urban forestry database needs to be developed. URBANBASE is a proposed information retrieval and exchange system, computerized and interdisciplinary. If operational, URBANBASE would provide relevant references and digests of documents, in simple language to urban forestry practitioners, consultants, city and other local governments.

Mayne, Leslie. "Review of U.S.D.A. Forest Service National Guidelines Cooperative Forestry – Urban and Community Forestry." *Journal of Arboriculture.* 2(8) (August 1976): 151-152.

The USDA Forest Service National Guidelines for the Cooperative Forestry–Urban and Community Forestry program are reviewed.

McGuire, John. "Plant a Tree and Save a City." *Journal of Arboriculture.* 1(11) (November 1975): 208-211.

The role of leading, coordinating, and stimulating an urban forestry program has been given by Congress to the Forest Service, U. S. Department of Agriculture. The action role, however, for urban forestry must remain with those who can do the best job – the States, cities, and private industry. To be successful, an urban forestry program must be closely tied to related fields. Finally, an urban forestry program can be successful only through very close cooperation of all sectors – the Federal agencies, State and local governments, universities, professional organizations, and private industry.

McConnell, Robert. "Tree Maintenance in Philadelphia." *Journal of Arboriculture.* 2(4) (April 1976): 77-78.

A general article about the history of the urban forestry program in Philadelphia. It also reports information on the development and management of Faimount Park, tree planting programs, and budgets in Philadelphia.

McDermott, Thomas P. "The Charlotte Tree Program." *Journal of Arboriculture.* 5(8) (August 1979): 179-182.

Municipal contracts must be publicly advertised. Bids may be of two kinds— whole job or item-basis. Under the whole job price arrangement, the price to complete the entire contract is given. Because there are no itemized costs, if a problem arises and something has to be added or removed, there is no assurance that a fair cost will be paid or deducted. With an item-basis bid, each item has a separate number, a separate specification and a quantity, and a separate per-item price for each bid. Problems arise if one item must be exchanged for another. Be careful of any contracts that use state and federal guidelines or funding. There will be labor requirements. Payments are the major problem with municipal tree contracts. They are slow and a credit squeeze often results. There should be a provision for partial payments in the specifications. Payments and billing should correspond with progress. The smaller the final bill, the better.

McDermott, Thomas P., and Neumann, Philip F. "Municipal Arboriculture in Charlotte, North Carolina." *Journal of Arboriculture.* (April 1977): 78-80.

> *Machines available for converting wood and brush into chips range all the way from huge, truck-mounted units powered by 300-horsepower engines, and capable of gobbling logs up to 5 ft. in diameter, to small 5-horsepower units that can be pushed on their wheels to the job site. In selecting from all the available machines for the one which will best meet your needs, there are many factors to keep in mind. As with any mechanical device, your chipper unit is ultimately going to need repair parts and service.*

Moll, Gary. "Urban Forest Planning." *Journal of Arboriculture.* 4(9) (September 1978): 213-215.

> *In Southern Maryland, they have developed a unique opportunity for urban forestry planning. With the rapid urban growth, they use urban forestry planning to help preserve trees in new housing developments. They use the help of county planners to enforce the urban forestry planning.*

Nobles, Bob. "Urban Forestry." *Journal of Arboriculture.* 3(5) (May 1977): 98-100.

> *This article reports on the need for cooperation between cities, states, and regional government in urban forestry.*

Oates, James T. "The Essentials of Municipal Arboriculture." *Journal of Arboriculture.* (August 1975): 148-150.

> *The beech bark disease, as it exists in the northeastern United States, is caused by fungi infecting minute feeding wounds made by scale insects in the bark of the beech. The principal fungus is* Nectria coccinea *var.* faginata*. The beech bark disease was known in Europe before 1849, and except for a few outbreaks, little damage was caused by it. The beech scale was introduced into Halifax, Nova Scotia about 1890. But the first recorded outbreak of the disease was not until 1920. Many beech trees are killed and weakened in infected stands, although some trees seem to have a natural resistance to the disease. There was little real concern about the disease in the U. S. until the last few years, when the industries learned to use beech profitably. Now there is a need for a better understanding of the disease.*

Rubens, James. "Current Urban Forestry Policy of U. S. Governments." *Journal of Arboriculture.* 4(10) (October 1978): 234-239.

> *Urban forestry policy should be directed to the needs as expressed by urban forestry managers, rather than the somewhat inaccurate preconceptions of policy makers from traditional woodland forestry backgrounds. In-depth communication among all levels of government and private practitioners will be the first step toward significant improvement of the condition of urban forests.*

Schroeder, Herbert W., Green, Thomas L., Howe, Timothy J. "Community Tree Programs in Illinois, U. S.: A Statewide Survey and Assessment." *Journal of Arboriculture.* 29(4) (July 2003): 218-225.

> *This article reports the combined results of two surveys of Illinois, U. S., communities about the status and needs of their community tree programs. The surveys were intended primarily to help state and federal agencies and private organizations to more effectively target the support they give to Illinois community tree programs. In 1995, we surveyed individuals responsible for tree care activities in small Illinois communities (populations less than 25,000), and in 1999, we extended the survey to communities with populations*

of 25,000 or greater. Local municipal officials, regardless of community size, have strong positive attitudes toward the value of trees to their communities. Communities vary, however, in their resources, problems, and needs relating to their public trees. In particular, small communities often lack key components of an effective tree program and trained personnel for carrying out these programs. In providing assistance for community tree programs, state, federal, and private organizations should keep in mind the distinct needs and opportunities of communities of different sizes.

Sievert, Ralph. "Urban Forestry in Ohio." *Journal of Arboriculture.* 6(4) (April 1980): 111-112.

Using a portion of the three million Federal dollars in 50% matching funds to cooperating states, the Ohio Department of Natural Resources, Division of Forestry has established a comprehensive urban forestry program. The objective of the Ohio's program is to improve urban environments through the proper use of trees and shrubs. This will be accomplished by directing technical assistance towards units of local government, planning organizations, developers, and private individuals.

Skiera, Robert W. "What Should be the Role of Government in Municipal Arboriculture?" *Journal of Arboriculture.* 4(6) (June 1978): 140-141.

This article highlights the importance of government support for municipal arboriculture. It is critical for governments to provide funding and other resources for urban forestry programs. Monies should be provided for planting programs, maintenance, inventories, and removal programs. Money should also be provided for smaller communities to hire a consultant if they so desire.

Straka, Thomas J., Marsinko, Allan P., Childers, Christopher J. "Individual Characteristics Affecting Participation in Urban and Community Forestry Programs in South Carolina, U. S." *Journal of Arboriculture*. 31(3) (May 2005): 131-137.

This article reports the results of a 2003 statewide survey of South Carolina, U. S., residents concerning characteristics affecting participation in urban and community forestry programs. Results are intended to increase effectiveness of program planning and organization within state forestry commissions. Participants in urban and community forestry programs have strong feelings for the importance of these programs, and the majority (91%) expected continued participation. The majority of nonparticipants (71%) were unaware of the existence of these programs, and most (59%) did not know whether they would ever participate in future programs. Future considerations for the success of urban and community forestry programs in South Carolina need to focus on increased public awareness. Prior awareness of the program and participant's age significantly ($P \leq 0.10$) affected stated intentions to participate in the program.

Tate, Robert. "Public Relations in Urban Forestry." *Journal of Arboriculture.* 2(9) (September 1976): 170-172*

Good public relations are for a successful urban forestry program. Important goals can be met by implementing a comprehensive public relations program tailored to the urban forestry program's and community's needs.

Treiman, Thomas, Gartner, Justine. "Community Forestry in Missouri, U. S.: Attitudes and Knowledge of Local Officials." *Journal of Arboriculture.* 30(4) (July 2004): 205-213.

A survey was employed to help understand the knowledge, motivation, and behavior of those responsible for tree care in 602 Missouri, U. S., communities. Our goal was to characterize the local agencies charged with managing urban trees, their budgets and personnel, and to determine which issues local officials responsible for managing publicly owned trees found to be most pressing. This information is used to evaluate the state's community forestry program, which is designed to coordinate and facilitate the efforts made by many jurisdictions and entities that own and affect community forests. Survey findings indicate that most communities lack basic information on tree care and do not employ anyone specifically to care for the community's trees. Responsibility for tree care can be in any number of departments (or none). Agencies working with communities will need to target basic training and information. Information on how to diversify funding and secure more stable sources of income will prove valuable because many communities budget zero dollars for tree care. Cost-share dollars should also be targeted with an emphasis on increasing participation among smaller communities. Interest in tree preservation during development is high in most communities, underlining the need to provide information on development principles that preserve or maximize greenspace.

Journal of Forestry

McPherson, Greg; Simpson, James R. Peper, Paula J. Maco, Scott E.; Xiao, Qingfu. *Journal of Forestry*, Volume 103, Number 8, December 2005, pp. 411-416(6)

Increasingly, city trees are viewed as a best management practice to control stormwater, an urban-heat–island mitigation measure for cleaner air, a CO_2-reduction option to offset emissions, and an alternative to costly new electric power plants. Measuring benefits that accrue from the community forest is the first step to altering forest structure in ways that will enhance future benefits. This article describes the structure, function, and value of street and park tree populations in Fort Collins, Colorado; Cheyenne, Wyoming; Bismarck, North Dakota; Berkeley, California; and Glendale, Arizona. Although these cities spent $13–65 annually per tree, benefits ranged from $31 to $89 per tree. For every dollar invested in management, benefits returned annually ranged from $1.37 to $3.09. Strategies each city can take to increase net benefits are presented.

Ricard, Robert M. *Northern Journal of Applied Forestry*; Volume 22, Number 4, December 2005, pp. 248-253(6)

Since 1918, Connecticut state law has required the appointment of a tree warden who assumes responsibility for public trees in that municipality. A major, if not the primary, responsibility of municipal government is public safety and yet local government is also charged with protecting and enhancing the economic, social, and environmental well-being of the community. As a result, the tree warden has to balance public safety and conservation. This is only possible when tree wardens are well trained. However, state statutes do not require a tree warden to possess any relevant qualifications or to participate in continuing education. Following a 1991 needs assessment, several educational initiatives were started to increase tree warden knowledge. Results from a statewide needs assessment found that tree wardens participated in more continuing education opportunities in 2001 than they did in 1991, with a large percentage becoming Connecticut Certified Tree Wardens.

Groninger J.W.; Close D.D.; Basman C.M. *Journal of Forestry*, Volume 100, Number 1, 1 January 2002, pp. 23-28(6)

> *The practice of urban forestry traditionally has been confined to large cities and their suburbs. However, trees and forests within municipalities–regardless of community size or location within a rural, urban, or suburban setting–all have the potential to provide residents with the environmental benefits and other amenities associated with urban forestry. In most cases, the management afforded metropolitan trees is far superior to that in nonmetropolitan communities. As a result, small towns are often populated by unsightly, unhealthy, and potentially dangerous trees. The biological, economic, and social forces underlying the poor condition of these forests are presented and potential remedies discussed.*

Schoeneman, Rita S.; Ries, Paul D. Journal of Forestry, Volume 92, Number 10, 1 October 1994, pp. 6-10(5)

> *The successful management of urban forests should reflect and make use of the culture of local communities Although formed in some way by regional and national concerns, urban forest programs must be developed and managed at the local level. Federal, state, and local programs lend support to local urban forestry efforts, but caring for community trees in the United States began as a grassroot effort and will remain so. Community members continue to be a reliable motivating force for implementing successful urban forestry programs; their involvement ensures the continuation of this important city resource.*

Municipal Index

Black, Tom. "Building to Mother Nature's specs." *Municipal Index*. 01 February, 1997.

> *From wetlands to warblers, environmental concerns weigh heavily on the minds of today's contractors, who must proceed with caution lest they spoil an increasingly fragile environment. Familiarity with environmental regulations and a methodical approach are needed for major road and bridge projects.*

Ghezzi, Patti. "Tree Inventories Show Value, Promote Safety." *Municipal Index*. 01 March, 2005.

> *When an ice storm shut down historic Madison, GA last winter, City Manager Monica Callahan knew the City's $30,000 tree inventory conducted a few months earlier was a worthwhile investment. Following the inventory, the City was able to identify and remove sick trees that could have come crashing down under the weight of the ice that coated their branches during the storm. "The tree inventory allowed us to be more proactive with our planning," Callahan says. "It helped us make better choices."*

Miller, Laura. "GIS Branches Into Urban Forest Management." *Municipal Index*. 01 February, 1995.

> *A GIS integrates data and presents it in a graphic format, allowing urban foresters to plot tree location and related information on computerized maps. Graphic symbols representing trees are displayed on the maps and are linked to a database containing tree characteristic information for each tree in the inventory.*

"Cities Should Reconsider Tree Inventory Staff." *Municipal Index*. 01 November, 1998.

> *Many cities rely on volunteer labor or general contractors to complete street tree inventory surveys throughout their cities. It is generally best to spend the money for professional, certified arborists who have been trained in hazard tree assessment as well as many other fields.*

"Grounds Maintenance: Municipal Tree Budgets Falling Like Leaves." *Municipal Index*. 01 August 1995.

> *Trees benefit communities and urban environments economically, socially, and environmentally, and in order for them to remain assets to communities they must receive regular maintenance and care. Municipal tree management programs carry much of the responsibility for ensuring the health of urban forests in the United States.*

"Public Works Department Leads City's Environmental Efforts." Municipal Index. 01 March, 1998.

> *Because of its location in environmentally sensitive South Florida, Hollywood has long promoted the 3 Rs of environmentalism— reduce, reuse, and recycle. The public works department has taken the lead in the City's efforts.*

Public Works Magazine

Golden, Jay S., Kaloush, Kamil E. "A Hot Night in the Big City." *Public Works Magazine*. 01 Dec. 2005.

> *It is estimated that by the year 2030, 60% of the population will live within City limits. Rapid urbanization leads to the drastic reduction of greenspace and the paving of many locations which used to be occupied by trees. This causes the heat to be retained during the night leading to an overall elevated average temperature for urban environments.*

Public Works Management and Policy

Gore, Al. "Building Livable Communities." *Public Works Management and Policy*. January 1999. 179-186.

> *Historically, America's cities have been vibrant centers of culture and business with residents lving in or near the central city. The last fifty years have witnessed the outward movement to suburban and exurban areas, creating new and extensive infrastructure demands to sustain the sprawl. In many cases, central cities were left without a strong business community and with a crumbling and decaying housing stock and infrastructure. Individuals, businesses, local community groups, and government have come together in a number of areas on the country and successfully addressed the issues of business (dis)investment, decaying infrastructure and housing stock, historic preservation, and open space. The challenge now is for everyone to play the "smart growth" game- creating more livable communities, preserving historic areas, revitalizing central cities, and protecting farmlands across America. With the renewed federal commitment to livable growth, local communities will find additional resources available (financial, information, and otherwise) to assist in developing "smart growth" strategies.*

Greenough, Geoff, Eggum, Thomas, Ford, Ulysses G. III, Grigg, Neil S., Sizer, Ed. "Public Works Delivery Systems in North America." *Public Works Management and Policy.* 4(1) July 1999. 41-49.

One of the 1998 International Public Works Congress and Exposition's workshops focused on the methods of delivery currently used to provide public works services in North America. This article examines three public works delivery systems: traditional model, privatization in general, and managed competition. The three perspectives are intended to provide insight into actual methods, advantages and disadvantages, and trends of each approach based on experience rather than theory.

Heynen, Nikolas C., Lindsey, Greg. "Correlates of Urban Forest Canopy Cover." *Public Works Management and Policy.* 8(1) July 2003. 33-47.

Scientists and managers often use urban forest canopy cover as an indicator of forest health. Furthermore, canopy cover is often the measure communities use to set tree planting goals. Little is known, however, about factors that contribute to variation in canopy cover. We describe canopy cover in 60 urban areas in Central Indiana. We then propose and test a model that treats canopy cover as a function of ecological and geographic factors, urban form, socioeconomic factors, and a policy index. Urban areas are more likely to have more canopy cover if they are in counties with more canopy cover, have higher proportions of their populations with college degrees, have older housing stock, have both more land and land with slopes greater than 15%, and have denser stream networks. Population density, median household income, and planning and zoning or status as a Tree City are not correlated with urban canopy cover.

Kirlin, John J. "Regional Investment as a Theme in Public Works Policy Making and Management." *Public Works Management and Policy.* 8(1) July 2003. 28-32.

Policy decisions regarding investment in public works, such as water systems, highways, or public buildings, are important decisions for local public officials. The management of these investments over time is equally important. However, information about public works investments across a region is often inadequate. Individual jurisdictions and authorities often have good information about the public works for which they are directly responsible but far less complete information about public works that are the responsibility of overlapping or nearby entities that are relevant to the effective functioning of a region. Systematic analyses of the consequences of particular investment or management decisions on the region and its sub-areas can improve understanding of those choices.

Books and Other Publications/Surveys

Bradley, Gordon, A., Ed. 1995. *Urban Forest Landscapes: Integrating Multidisciplinary Perspectives*. Seattle: University of Washington Press.

> *Divided into four parts. Part 1, "Introduction and Historical Perspective", provides an excellent overview for those new to the topic. Part 2, "The Environmental Setting", includes a chapter on land use controls. Part 4, "Integration: Tradeoffs and Benefits", will probably provide the most insight to planners and foresters.*

Grey, Gene W. 1996. *The Urban Forest: Comprehensive Management*. New York: Wiley.

> *Grey defines urban forestry as, "that which must be done to make trees compatible and functional in the urban environment." This volume is an elaboration on that theme.*

Idleman & Associates. 2006. Results of a Survey of Prospective Members. Society of Municipal Arborists.

Idleman & Associates. 2005. Results of a Survey of Members. Society of Municipal Arborists.

Kielbaso, J. James, 1988. Trends in Urban Forest Management. Baseline Data Report. Vol. 20 No. 1. International City Management Association, Washington, D. C.

Miller, Robert W. 1997. *Urban Forestry: Planning and Managing Urban Greenspaces*. 2nd Ed. Upper Saddle River, N. J.: Prentice Hall.

> *A textbook introduction to urban forestry. Appendices include a sample tree ordinance, sample tree protection ordinance, and a sample screening ordinance.*

Sacamano, Paul L.; Tschantz, Barbara L. 1994. Municipal Tree Management in the United States. International Society of Arboriculture/ United States Department of Agriculture Forest Service.