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Dr. James R. Fazio, Editor • $3.00

Data to Advocacy – New Tools to Promote Trees

The best of information if not put to use does little good. Similarly, advocacy without solid information to back it up is often ineffective. Thanks to advances in urban forestry research and some unique partnerships to put the research results to work, Friends of Tree City USA now have some powerful tools to help win local support for tree planting and care.

"Woodman, spare that tree!" When George Pope Morris penned those lines of his famous poem in 1830, he reasoned with his listener, "My mother kissed me here; my father pressed my hand…" He invoked visions of his sisters playing in the shade of the threatened tree and birds singing in its branches. And thus went his argument for letting the old oak stand.

Today, sentiment and even aesthetics are not enough to protect the trees of our communities. Instead, it takes powerful arguments based on economics and tangible benefits. It takes statistics that show property value increases or the amount of money saved in reduced energy consumption. It takes evidence that trees fight trends in global warming or help protect the quality of water supplies.

James R. Fazio

Even though beautification is an important contribution of trees and other plants in urban settings, today it is essential to highlight the practical benefits that trees provide. New research-based tools can show how much trees clean the air, protect water quality and in other ways actually save money while at the same time make life more enjoyable.

To help shift the emphasis away from aesthetics and sentiments and toward the consideration of trees as an essential, contributing part of a city's infrastructure, a whole tool kit of research-based, computer-dependant programs have been developed. In this issue we highlight some that are available and explain what they can do to help you promote community forestry. When trees are viewed as a working community asset, there will be more trees planted and better care of those that already enrich our cities and towns. The new tools provide yet another means to develop the public support and the management necessary to help meet a goal of Tree City USA – continuous, systematic tree care throughout America.

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Data Makes an Impact

"Money talks," goes the old cliché. So does data – the facts and figures that represent the so-called 'bottom line.' A good example is the oldest form of data in community forestry, the results of a street tree inventory. Once a quantified profile of a city's trees is known, it is easier to obtain funds for management. The total appraised value of trees is usually enough to alert city officials to the responsibility they have for such a valuable resource. On a negative note, a tally of hazard trees provides solid evidence of liability potential in case of an accident. For example, in the small community of Moscow, Idaho, a street tree inventory conducted by tree board members and other volunteers documented 121 trees that were either dead or classified in poor or very poor condition. Seventy-eight of these were recommended for removal. According to city forester Roger Blanchard, letters were then sent to property owners adjacent to the hazardous street trees and the danger was soon eliminated.

Street tree inventories also reveal pruning needs and – importantly – available planting spaces. It is not uncommon to find that there are almost as many spaces as there are trees. By knowing the width of the empty planting strip or right-of-way and whether or not utilities or other obstructions are present, it is easy to calculate how many trees need to be planted and how many should be species that are small, medium or tall at maturity. From the data, planting plans and other management plans can be developed so that the work is accomplished over a given number of years.

All of the above can be accomplished with little more than pencils and paper and a computer program to store and sort the data. Illustrated reports can then be prepared to make it easy for a city council or others to quickly understand the extent and condition of their community forest.

At the higher end of technology are innovative approaches such as American Forests' CityGreen. In this case, satellite images are used to quantify the extent of canopy cover in a community as well as other surface features such as impervious pavement, buildings, grass, etc. CityGreen's computer magic can then analyze the environmental and economic benefits provided by the trees. Comparisons can be visually presented showing lost canopy cover over time and what this has cost the community in such things as increased air pollution or more water pollution. (The models can also project future savings depending on how many trees are planted.) In San Antonio, Texas, CityGreen was used to quantify a 22% decline in the city's tree canopy from 1985 – 2001. The accompanying loss of air pollution mitigation was calculated at $9 million per year along with $146 million in storm water management services and $17.7 million in lost energy savings to residents each summer. These shocking data became the catalyst for action to pass a revised tree preservation ordinance, protect watershed areas slated for heavy development, and stimulate tree planting. Similarly, in Atlanta, Georgia, CityGreen data were used to show how trees in a 4-acre parking lot provided major economic benefits. The results convinced top city officials to dust off and put to use a previously unenforced parking lot ordinance. Volunteers in the community are often enlisted to help with this phase of a project.

Brian W. Kratzer, Moscow-Pullman Daily News

Street tree inventory data are traditionally obtained in one of three ways: pencil and printed forms, computer-like hand-held data collection units or Personal Data Assistants as shown above, or GPS devices. The latter allow not only the electronic collection of site and tree data, but also pinpoint the tree on a "layer" of a computerized (GIS) street map.

The i-Tree Suite of Programs

More than ever before there is a need to convince community residents and decision-makers that trees are a community asset and their proper management adds value by increasing return on investment. It was this urgent need that led to the formation of a unique partnership and the creation of i-Tree. The i-Tree suite is a collection of computerized programs that can be used to quantify structure, function, value, and management needs of the urban forest resource. All are scientifically-based and are made available at no cost to the public. Technical support is also available for each program, as are training workshops.

A public-private partnership has produced the i-Tree suite of programs that are available at no cost to communities.

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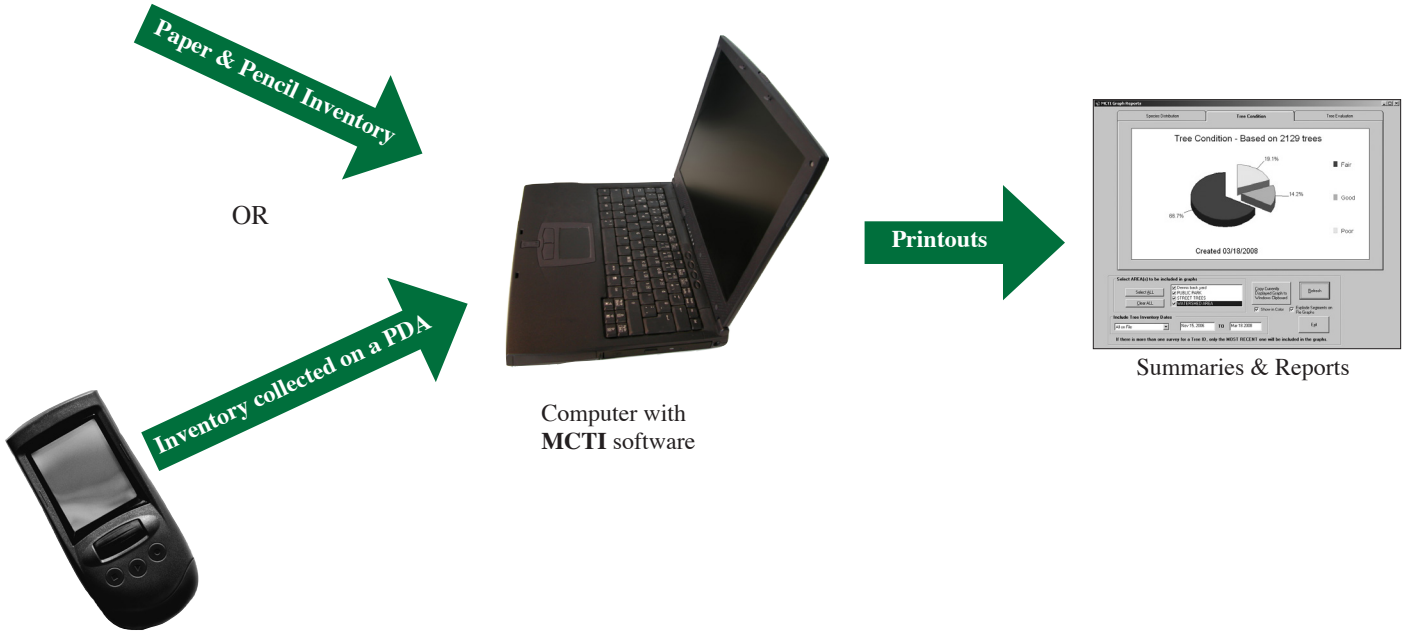
Mobile Community Tree Inventory

A first step to managing the urban forest is knowing what currently exists. Inventory data are collected in many ways, including the use of consultants and commercial data management products. **M**obile **C**ommunity **T**ree **I**nventory (MCTI) offers another alternative. It is a downloadable, public domain program that can provide two functions: (1) collecting data and (2) storing and managing data, and printing out statistics for reports and presentations. Using volunteers to collect the data, it is a way that any community can afford to conduct its own street tree inventory and have its own data management system.

An important feature on MCTI is that data can be collected in the traditional way using printed forms and pencil or pen, or you can run the program in a pocket PC (personal computer). When the electronic method is used in the field, time is saved and errors are reduced. This is because lists from drop-down menus are utilized instead of requiring data to be entered directly, and when back in the office the data are electronically transferred to your desktop computer (instead of being entered manually).



STRATUM

STRATUM is shorthand for "**S**treet **T**ree **R**esource **A**nalysis **T**ool for **U**rban Forest **M**anagers." The long form of the name is descriptive of what this program can do for your community. It uses the information gathered in a street tree inventory and converts it into information on the structure, function, value and urgent need of the stree tree resource. Inventory data collected in the past can be used in this computer program, or collected specifically for this purpose. Either a complete inventory can be used, or a sample. In addition, users are guided to input certain local information such as management costs, the city's population, and the price of electric energy. The results will tell you the annual contribution the street trees make for:

- ✔ Saving energy
- ✔ Improving air quality
- ✔ Reducing CO_2
- ✔ Controlling storm water runoff
- ✔ Increasing property values

Center for Urban Forest Research, USDA Forest Service

The use of STRATUM in Boise, Idaho, revealed that after subtracting the city's total expenditures on street and park trees, the trees provided $231,479 in net annual value, or $9.95 per tree. Looked at another way, the city's investment is currently returning $1.30 in value for every $1.00 spent on tree planting and care.

How STRATUM Can Help You

STRATUM is truly a tool to aid street tree management. The summary tables, graphs and charts that can be produced are helpful in many ways.

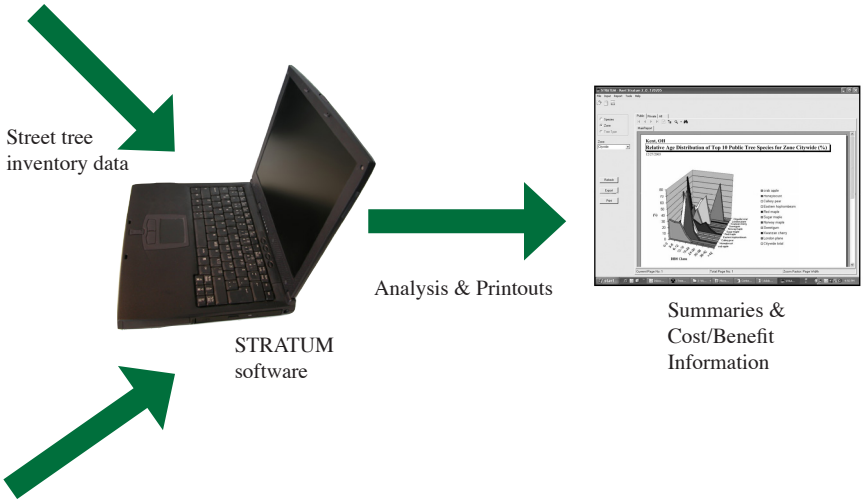
1. As with other inventory summaries, you will gain an accurate understanding of the structure of your community forestry – its species composition, numbers of trees and planting spaces, size distribution and other features.

2. Also, like other inventory summaries, the information can be used to develop plans for planting, pruning, and removing hazard trees.

3. Unlike ordinary inventory summaries, STRATUM enables you to show in dollars what your street trees are contributing compared with the cost of planting and caring for those trees. The results make a powerful argument for investing in street tree planting and care. For example, in Kent, Ohio, it was found that the street trees provide over $1 million in services each year and for every $1 invested, $4 of benefits are realized.

4. STRATUM can be used for the entire community or specific neighborhoods. It can even quantify the contributions of individual trees, by species and size, and rank them accordingly. It can make various other comparisons and identify conflicts with power lines and sidewalks.

5. Taken together, the results provide a guide for decisions about what trees to plant and what other management actions are needed in order to maximize your community's investment. STRATUM is a tool both for improved management and for advocating for public support of street trees.



A Science-Based Approach

The goal of i-Tree's developers has been to make the programs accessible, easy to use, and based on scientific data. A tremendous amount of behind-the-scenes work has made this possible. This included research to discover such things as how much rainwater is held in the canopy of trees of various species; how trees trap air pollutants of various kinds; and how such functions convert to dollar values and how these change as tree sizes change.

In STRATUM, another key to science-based results is what are called 'reference cities.' Since all of the computer models are based on local conditions and regional models, cities have been selected in each of 16 climate zones and were carefully studied by trained crews. The data from these cities are then applied to the calculations used for other communities in the same climate zone.

UFORE

The UFORE program within the i-Tree suite provides even more sophistication. It stands for **U**rban **FOR**est **E**ffects model. In this program, all trees in the community are taken into consideration, not just street or rights-of-way trees. For a small area such as a park or very small town, all trees might be inventoried and used. However, in most cases, UFORE uses a series of sample plots for data collection.

Similar to STRATUM, UFORE includes info on structure, function and value. Specifically, UFORE quantifies:

- ✔ The hourly amount of pollution (ozone, sulfur dioxide, nitrogen dioxide, carbon monoxide and particulate matter) removed by the urban forest.
- ✔ Net carbon sequestered (assimilated into new tissue every year) and total carbon stored (i.e. held in accumulated tissue).
- ✔ CO_2 reduction from power plant emissions.
- ✔ Volatile organic compound emissions and the relative impact of tree species on net ozone and carbon monoxide formation throughout the year.
- ✔ The potential impact of pests such as Asian longhorned beetles, Gypsy moths, and emerald ash borers.

How Data are Collected

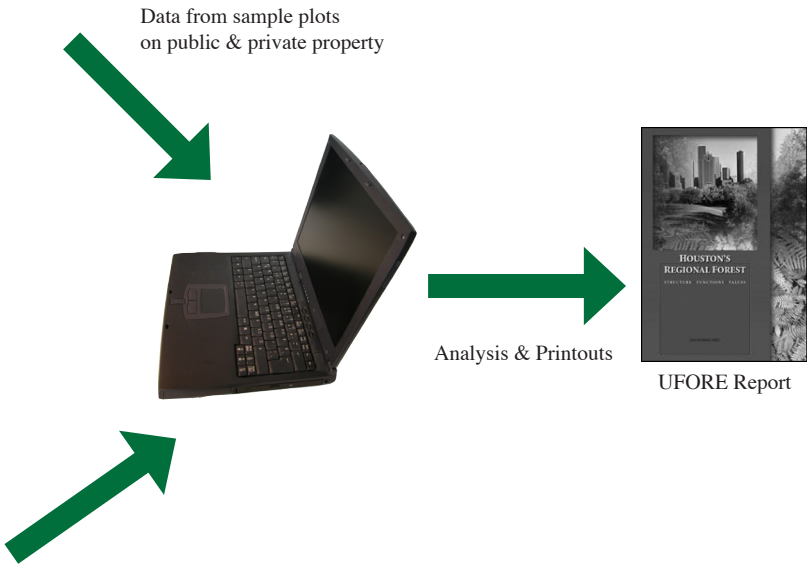
The UFORE program makes sample inventories easy. Typically 30-200, .1-acre plots are used. Once selected, the plots are located on the ground and permission is obtained for entry on private property where necessary. Trained crews (or sometimes volunteers) are usually used to then collect detailed information about the trees, shrubs and land features within the plots. This is done using either pencil and paper with later data entry into the computer, or into a companion PDA utility that can be downloaded when back in the office.

Weather and air pollution inputs have been acquired by the USDA Forest Service and are incorporated into the program for users.

How UFORE Can Help You

UFORE is a powerful tool for understanding and showing the value of the urban forest. Its results can:

1. Provide a profile of the entire community forest, both on public and private property.
2. Set the stage for improved ordinances and for fact-based planning and management.
3. Show how trees enhance human health and environmental quality.
4. Provide convincing evidence for how benefits accrue from investing in trees and urban forestry – including protection against pest epidemics.



Example Results from Several Cities

City	No. of Trees	%Tree Cover	C Sequestered (tons/year)	Pollution removed (t/yr)	Pollution value in $US	
Atlanta, GA	9,415,000	36.7	46,400	1,663	8,321,000	
Minneapolis, MN	979,000	26.4	8,900	306	1,527,000	
San Francisco, CA	668,000	11.9	5,100	141	693,000	
Morgantown, WV	658,000	35.5	2,890	72	333,000	
Freehold, NJ	48,000	34.4	545	22	110,000	

SOURCE: *Assessing Urban Forest Effects and Values – Washington D.C.'s Urban Forest*, USDA Forest Service Northern Research Station

Advocating for Trees

The impressive statistics produced by STRATUM and UFORE are of little use unless the results are translated into action. In 2004, when Minneapolis became the first city to test the i-Tree programs, the 'bottom line' was on the minds of the Minneapolis Tree Advisory Commission. Chair Peggy Booth said, "i-Tree exceeded my expectations on how useful the data would be… It had always been difficult for trees to have equity with streets, curbs and other parts of the infrastructure, but now I am more optimistic."

The results of i-Tree led to an increased budget for forestry operations in Minneapolis even while other city departments were experiencing funding cuts. Moreover, the city council directed the Public Works Department to work more closely with the tree commission in considering the effects of trees on rain water control and the other ways they affect the city's infrastructure. To foster continued communication and cooperation, a Public Works official was even appointed to be a member of the tree commission.

In the community of Casper, Wyoming, it took five employees and a supervisor about three weeks to complete a survey of 234 .1-acre plots for use in the UFORE program. Was it worth it? Project coordinator Jim Gerhart of the Casper Parks Division says an emphatic, "Yes." The results "were an eye-opener for everyone," he said. For one thing, it showed that poor planting in the past actually resulted in a negative figure for homeowners' energy costs and the carbon emitted by a fossil-fuel power plant to generate the additional energy. This was due to winter shading that results from poor tree selection and placement. Other values, however, came up positive and impressive! So much so that the city allocated a significant amount of additional funding for a 3-year period for pruning and generally getting the community forest in better condition. The UFORE data were also instrumental in convincing the city to hire a city forester.

The use of STRATUM in Cedar Rapids, Iowa, illustrates another benefit of the i-Tree suite. The street tree survey in this community resulted from partnerships under the leadership of the nonprofit organization, Trees Forever. The project was completed with financial support from the Holloway Family Environmental Trust and the work of over 41 adult volunteers, 150 7th grade science students with the help of their teacher and volunteers, and students from Coe College. In this community, a sample of 5 percent of the city streets was used instead of a complete survey. Student interns under the guidance of a botany professor earned a little summer income, and a professor of rhetoric even found a way to combine data collection with his academic goals. Learning about trees and their contributions, as well as learning to collaborate for the benefit of the community, provided educational value that went far beyond the classroom. In addition, the city gained data-based information to help decide on future management actions.

According to Sunny McDonald, Woodland Legacy Coordinator for Trees Forever, her organization plans to continue promoting the use of i-Tree throughout the state. "We try to promote tools so that communities are better informed when making their management decisions," she said.

Casper, Wyoming's Urban Forest Summary

Number of trees	123,000
Tree cover	8.9%
Most common species	Plains cottonwood, blue spruce, American elm
Percentage of trees under 6" diameter	57.5%
Pollution removal	50 tons/year ($249,000/year)
Carbon storage	37,000 tons ($689,000)
Carbon sequestration	1,200 tons/year ($22,000)
Energy savings (buildings)	- $26,700
Carbon emissions (power plants)	- $700/year
Structural value (cost of replacement)	$243 million

Annual Benefits	Average $/Tree	Average $/Resident	Citywide Total $
Storm water reduction savings	51	15	1.8 million
Property value increase	34	10	1.3 million
Energy savings (electricity & gas)	42	12.50	1.5 million
Air quality improvement	7	2	250,000
Carbon dioxide reduction	6	1.50	200,000
Totals	$140	$41	$5 million

Results produced by STRATUM in Cedar Rapids, Iowa, helped show residents the practical value of street trees.

Sunny McDonald/Trees Forever

Alicia Meyer

Above photos: Students from Coe College and even an elementary school were among the volunteers that rallied to collect data for use in STRATUM. Some were surprised to find that 55 percent of the street trees are from only two genera, ash and maple, a clear warning to provide greater diversity in future plantings.

Steps to Make it Happen...

1 Learn more about i-Tree online (see page 8). Then contact your city forester or the urban & community forestry coordinator in your state. You can locate the coordinator in your state by visiting **arborday.org** and clicking on "Tree Resources."

The results of i-Tree as the focus of a presentation can help with:

- Budgetary support for a tree program
- Grant requests for specific projects
- Creating a Management Plan
- Improving maintenance
- Decisions and public policy
- Gaining public support for a new or improved tree ordinance
- Building support for insect or disease control
- Protecting trees threatened by construction or other land use planning
- Receiving attention from the mass media
- Demonstrating what can be lost without public awareness

2 Conduct STRATUM or UFORE using resources available in your community.

3 Use the results in presentations to city councils, potential partner organizations, and others who can either help start an urban forestry program or strengthen one that already exists. One goal might be to obtain dependable, local budget support to assure a continuing, sustainable program of tree planting and care.

What One Tree Can Do

UFORE can produce results that even show what a single tree contributes to improving our environment. Here is an actual record from a UFORE analysis of a 16-inch diameter red oak tree in Washington, DC.

Carbon storage:	420 kg
Carbon sequestration:	15 kg/year
Carbon monoxide removed:	40 kg/year
Ozone removed:	360 g/year
Nitrogen oxide removed:	120 g/year
Particulate matter removed:	200 g/year
Sulfur dioxide removed:	120 g/year
Tree Value:	$4,700

James R. Fazio

The benefits of carbon storage and sequestration increase dramatically with size. Developers of an affordable housing complex in Portland, Oregon, recognized the contribution of large trees and retained as many as possible at this site while at the same time planting new trees.

More Sources of Help

More information about i-Tree is available at the Web site: **www.itreetools.org**. This site allows you to download the programs described in this Bulletin and offers additional sources of information such as a Users Forum and an i-Tree Newsletter. Users of the i-Tree suite also have in person or online support at 877-574-8733 or info@itreetools.org.

Another Web site with a wide variety of helpful information is **arborday.org.** This dynamic site changes regularly, so please bookmark it and visit often.

A Ready-Made PowerPoint Show

The Web site of the Center for Urban Forest Research is a rich trove of information that can help with advocacy for trees. There are even downloadable presentations based on data from various regions of the country. These can be further modified for showing to city councils or other organizations. The direct route to these helpful programs is: http://www.fs.fed.us/psw/programs/cufr/TreesInOurCity/.

Storm Damage Assessment

Another feature of the i-Tree suite of programs is its 'Storm Damage Assessment Protocol Utility.' In short, use of this feature allows a community to rapidly assess damage after any kind of storm and project the time needed and costs of cleanup. The process relies on randomly-established plots throughout the community. Measurements are then taken on these plots both before and after a storm. Trained damage assessors evaluate the amount of debris in each plot and project this to make community-wide cost estimates.

The advantage of this program is that it provides a dollar value for requesting emergency assistance. This will also be of interest to the mass media and provides one more opportunity for communicating with the general public about ways they should care for their trees after a storm.

Try This at Home

The USDA Forest Service Center for Urban Forest Research at the University of California – Davis was a partner in the development of the i-Tree suite. Now there is an interactive, online program for homeowners that can help evaluate the economic trade-offs between different landscape practices. It is called EcoSmart and it can estimate the impacts of strategic tree placement, rainfall management, and fire prevention practices. Using this program, you can simulate current or planned features on your property and find the best combinations to reduce your energy bills, conserve water, and make your home safer from wildfire. For more information, visit: www.ecosmart.gov.

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1. How to Prune Young Shade Trees	1.	$
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8. Don't Top Trees!	8.	
9. Writing a Municipal Tree Ordinance	9.	
10. Plant Trees for America!	10.	
11. How to Prevent Tree/Sign Conflicts	11.	
12. What City Foresters Do	12.	
13. Trees for Wildlife	13.	
14. How to Kill a Tree	14.	
15. How to Recognize/Prevent Hazard Trees	15.	
16. How to Recycle Shade Tree Materials	16.	
17. How to Landscape to Save Water	17.	
18. Tree City USA Growth Award	18.	
19. How to Select and Plant a Tree	19.	
20. A Systematic Approach to Building with Trees	20.	
21. How Trees Can Save Energy	21.	
22. Tree City USA: Foundation for Better Mgt.	22.	
23. How to Conduct a Street Tree Inventory	23.	
24. Trees and Parking Lots	24.	
25. Tree Line USA	25.	
26. Understanding Landscape Cultivars	26.	
27. How to Manage Community Natural Areas	27.	
28. Placing a Value on Trees	28.	
29. How to Plan for Management	29.	
30. Ten Tree Myths to Think About	30.	
31. Tree Protection Ordinances	31.	
32. Let's Stop Salt Damage	32.	
33. How to Interpret Trees	33.	
34. How to Fund Community Forestry	34.	
35. Protect Trees During Underground Work	35.	
36. How to Work with Volunteers Effectively	36.	
37. Plant Health Care	37.	
38. The Way Trees Work	38.	
39. Putting Trees to Work	39.	
40. Trees in the Riparian Zone	40.	
41. Reduce Wildfire Risk	41.	
42. Working With Children	42.	
43. Selling Tree Programs	43.	
44. What Ails Your Tree?	44.	
45. Trees For Better Streets	45.	
46. Data to Advocacy	46.	
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