



TREE CITY USA® BULLETIN

No. 23

Dr. James R. Fazio, Editor • \$3.00

How to Conduct a Street Tree Inventory

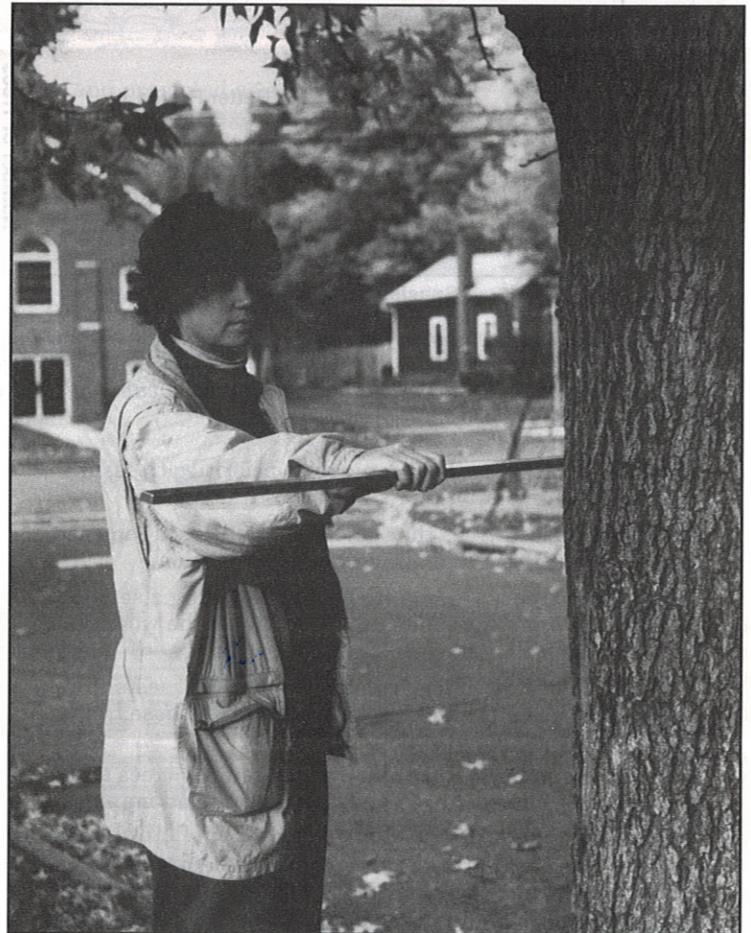
Whether a farmer or a diamond merchant, anyone who produces or manages items of value keeps an inventory. The figures are not only a monitor of current value, but a constant guide to decisions. In community forestry, a street tree inventory can be a valuable tool for upgrading management and assuring a healthy forest for the future.

There have been many people lost in the woods while carrying a compass, an instrument they thought would prevent such a happenstance. Once lost, they found there is nothing magic about carrying a compass — it must be working properly and the bearer must know how to use it.

Community tree inventories are much the same. It is often said that an inventory is the necessary first step toward good management of the tree resource. Yet, it is also well known that in smaller cities, especially, once an inventory has been completed, the results often end up on the proverbial shelf to gather dust. Rather than being a help to management, the inventory is held up by taxpayers or an elected official as an example of wasted time and money.

In larger cities, an inventory is more often part of the daily routine of tree management. Its initial preparation is a major project, but once completed it is used regularly to plan work for city crews or contractors and to keep tabs on what is accomplished. On this scale, both the inventory and its use are work for experts.

In smaller communities there is more opportunity — and need — to adopt inventory-based tree management. It is toward this goal that *Bulletin 23* is dedicated. In these pages are some of the basics needed to conduct a useful inventory. More instruction and professional guidance will be necessary before the work is actually conducted, but for the uninitiated or someone who has had a brief and bad experience with an inventory, the purpose here is to remove some of the mystery and point the way toward inventories that help.



James R. Fazio

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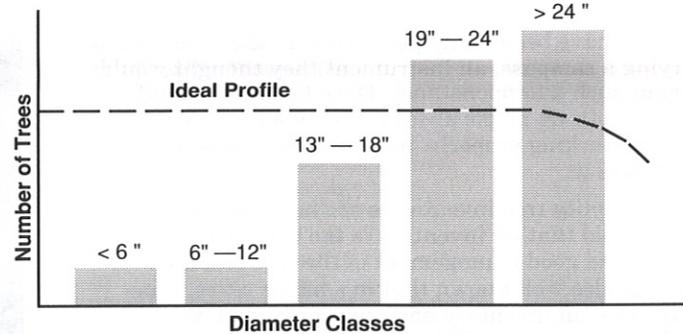
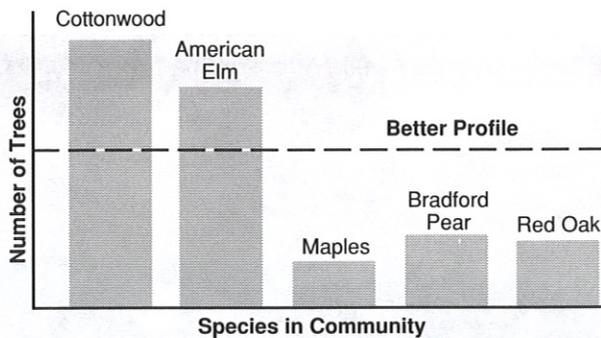
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Why Do An Inventory?

Knowing why an inventory is to be done is the single most important factor in determining success or failure of the project. Before trying to decide what kind of inventory to do or how to do it, make sure the tree board or forestry department has a crystal clear idea of how the inventory will be used in the on-going management program.

Here are some of the things an inventory can achieve, with appropriate modifications needed depending on the size of the community. Most of these items form the basis of a management plan, a useful annual guide to efficient and effective action.

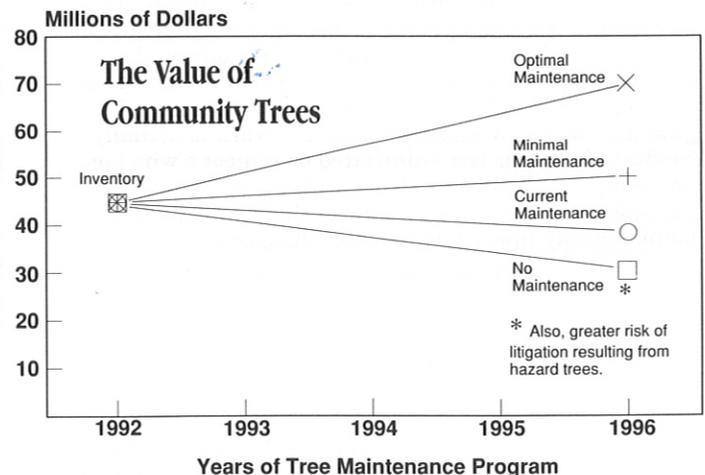
- Engenders public support, especially if citizens are involved as data collectors.
- Provides an accurate, insightful profile of the species and size (age) composition of the community forest.



Profiles can be used to foresee problems such as losing large numbers of trees at once as a result of insect or disease epidemics, ice or wind storms, or the limits of longevity being reached. Profiles can guide plans for replacements and new plantings that will mean healthier diversity through the use of suitable species that are currently under-represented.

- Reveals planting needs and suggests priorities to assure balance and diversity.
- Identifies hazard trees that should be treated or removed, thereby preventing damage and costly litigation.
- Determines tree maintenance needs, providing a sound basis for how many people are needed to do the work, and how much it will cost.
- Provides information for defensible budget requests that compare in accuracy and sophistication with those from other municipal departments.
- Establishes the monetary value of community trees and convincingly shows the effects of budgeting and management on the resource value.
- Locates trees that are special because of their large size, unusual form or connections with history. By pinpointing such specimens, special care can be provided and they can be included in educational materials.
- Allows keeping records of work performed to be used for:
 - (a.) reporting to the administration and elected officials,
 - (b.) better planning of time and crew size needed for tree maintenance,
 - (c.) assuring systematic care of all trees, and
 - (d.) continuity of information when personnel changes occur.
- Enables quick and intelligent responses to property owner questions and requests.

- Provides factual data for coordination with other departments such as planning and streets.
- Useful for monitoring planting success and growth of trees to enable evaluation of nursery sources.



Courtesy of ACRT, Inc.

Using a formula developed by the International Society of Arboriculture, an inventory can place a dollar value on community trees. This model, based on a study by ACRT, Inc., of one city's trees, illustrates the effects of adequate and inadequate tree care. Information such as this can help build a strong argument for budget requests.

Kinds of Inventories

There are many kinds of inventories and even more ways of conducting them. There is no single "right" inventory, although there are definitely correct procedures that must be followed in each one if the results are to be valid and useful.

Selecting the kind of inventory that is best for your community depends on the reasons for conducting it. That is, how are the results to be used? Matching the purpose with the kind of inventory is a necessary step if the inventory is to be useful.



Specific Problem Inventory

This is simply a search for information related only to a specific problem. For example, it may locate all elms in preparation for arrival of the Dutch Elm Disease, or identify trees that could be hazards if not treated or removed. Its use is limited to the one problem rather than to broader management.



Parks and Natural Areas

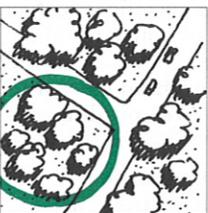
Trees in manicured parks and arboretums can be individually inventoried and keyed to a map with a location number. In more natural areas, where trees grow in dense groups, methods usually used gather information by sampling and generalizing rather than measuring all trees.

This will be covered in a forthcoming *Bulletin* on managing community natural areas.



Cover Type Survey

Using aerial photographs, the extent and distribution of tree crowns (the canopy) can be quantified. This is useful for monitoring trends, determining energy-saving potential, and establishing tree protection requirements for new developments.



Sampling Method

If interested only in statistical summaries such as species and size composition, available planting spaces and similar data, a sample (often ten percent) of the streets or blocks in the community may be all that is necessary. This kind of survey is relatively inexpensive and can be quite accurate

if the trees are generally homogeneous. If not homogeneous, accuracy is still possible by dividing the city into sections that are reasonably alike, such as old and new areas, and taking samples in each. In either case, the key to accuracy is in making sure the sample is purely random.

If these conditions are met, results of the sample can be generalized to the community as a whole and accurate profiles can be obtained.



Windshield Survey

In a windshield survey, data are collected by a team of observers and recorders (usually 3 or 4) riding in a car as it moves slowly along the street.

This popular technique is more of a data collection method than a specific kind of inventory, but it is often referred to and promoted as an inventory choice. Actually, it can be used in gathering data for either a sample or a complete inventory. Its advantages are that it is relatively fast and inexpensive, but its disadvantages are that less information can be collected and it is less precise than visiting each tree individually.



Complete Inventory — Periodic

In a complete survey, all street trees are inventoried and usually keyed to a specific location like a house address or a block. It is a detailed accounting of all trees. It is also the most time-consuming and expensive inventory, but the most accurate.



Complete Inventory — Continuous

This is the same as above except that a record is continuously maintained for each tree and planting site. Maintenance work is prescribed for each tree and planting is scheduled for the empty sites. As work is accomplished, the records are updated. For managing a community forest and reducing the liability for accidents, this is the most valuable method.

It is therefore the one covered in this *Bulletin*.

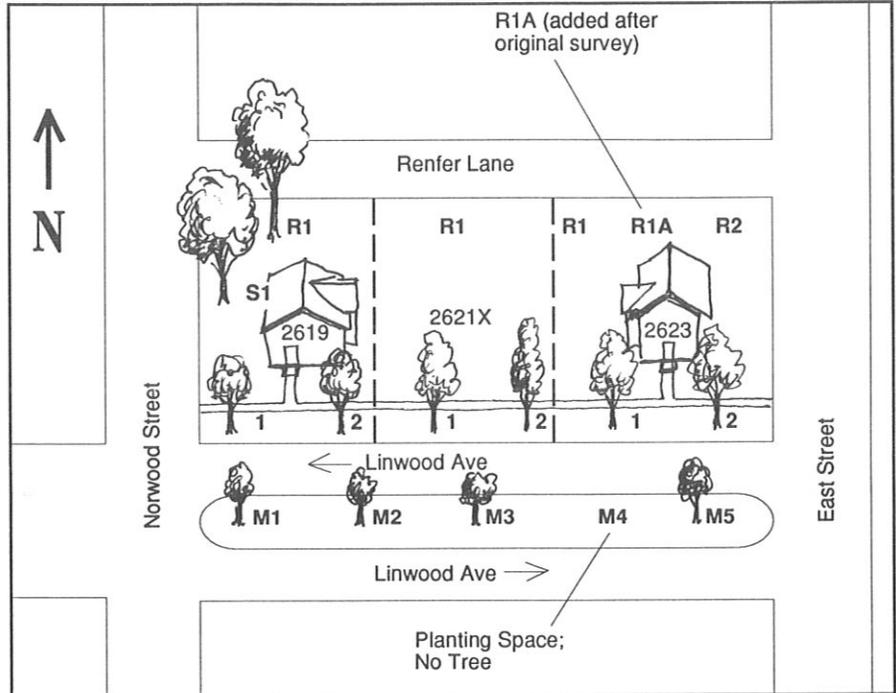
Note: In any inventory, even a so-called continuous one, a re-survey is usually necessary every 5 - 10 years. This is to account for growth, unreported tree work or removals and other changes in conditions. The exception is if all trees are visited and records updated, including diameter, within that period. In the long run, this could be the most economical, as well as effective, method.

What Data to Collect

Having decided the intended use of the inventory and the kind of inventory needed to collect the information, the next step is to determine exactly what information about each tree or site is needed. Considerable care should be taken with this task, as it is the foundation of your inventory system.

If your information will be fed into a computer for storage and reporting, "fields," or blanks, will be displayed on the monitor according to the particular program being used. The data collected are entered in these spaces. However, fields should be ignored if the data to be entered is information you do not need. On the other hand, you may need to add fields or enter items in the "remarks" space to include something unique to your management needs.

Most people will not be collecting data with the hand-held microcomputers used by professionals, so it is necessary to collect the information on forms and enter it later into the computer. Design the form to coincide exactly with the order in which data are asked for on the computer screen. Omit entries that will not be used. Here is the information most commonly collected:



A sequential numbering system must account for all trees and planting spaces in a way they can be relocated by work crews. In this system, all street trees and planting sites are tied to house addressees.

DATE: 10/15/88 TREEKEEPER: JR. INVENTORY FORM SITE: 2619 S. 1ST
 FROM: NORWOOD ST PAGE: 5
 TO: EAST ST NAME: Ed. D. Smith

ADDRESS	DATE	SITE	SPECIES	DBH	HT	TRUNK	BRNCH	FRUIT	FLWR	LEAF	TRUNK	BRNCH	FRUIT	FLWR	LEAF	TRUNK	BRNCH	FRUIT	FLWR	LEAF
2619 LINWOOD AVE		S	AMERICAN BIRCH	12	20	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
2621X		26	PLUM	12	15	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y

1 - Main 2 - Branch 3 - Fruit 4 - Flower 5 - Leaf 6 - Trunk 7 - Bark 8 - Wood 9 - Root 10 - Soil 11 - Air 12 - Water 13 - Sun 14 - Wind 15 - Noise 16 - Vibration 17 - Temperature 18 - Humidity 19 - Light 20 - Sound 21 - Smell 22 - Taste 23 - Touch 24 - Pain 25 - Itch 26 - Other

If computer storage of data will be used, inventory forms should be designed to record information in the same order it will be entered into the computer. This may mean simply having a form for each tree or site that duplicates the screen format, or it may be in columnar format. Fields that will not be used have been deleted from the data collection form.

1. Location

The location of each tree or empty space suitable for planting can be identified in a number of ways. Regardless of method, it is always a challenge trying to account for all the unique circumstances.

The objective is to identify the tree or plantable space in a way that it can be relocated by someone else at a later date. The method shown here ties each to a house or building number. For vacant lots, a fictitious number is given with a letter added, such as "X", to alert others that there is no building there.

Trees and spaces (referred to as "site") are numbered sequentially in the same direction as ascending house numbers. "S" for side and "R" for rear account for trees on corner lots or where the back of the house adjoins a second street. Trees on a median strip can be tied to a fictitious address corresponding to the hundred block. In the above example, these trees would be recorded at 2600X Linwood Ave. as M1, M2, etc. When a tree or space has been omitted and must be added after the survey, alphabetical letters can be added in sequence (1A, 2A, etc.). If using a computer program, you simply add the new tree or space, giving it the appropriate sequential number and the computer renumbers all the rest of the trees at that address.

It is important to include block information with each tree or planting site record so that all trees on a specific street can be retrieved from the data base regardless of house number. For example, Tree S1 at 2619 Linwood Ave. could be included with trees reported (for pruning, let's say) with all trees at that house, all trees at houses on Linwood Ave., or all trees on Norwood St.

Frequently, a community's management goals do not require knowing what trees are at a specific address. This is often the case when windshield surveys are used and trees are simply recorded by street or block. In this case, "address" information on the illustrated inventory form would be omitted (as would any other data columns not needed). However, this method can still take advantage of computer programs. If the program requires street addresses in order to work, a street or block can be given a fictitious address, such as 2600X Linwood Ave., with all trees on that street or block numbered sequentially.

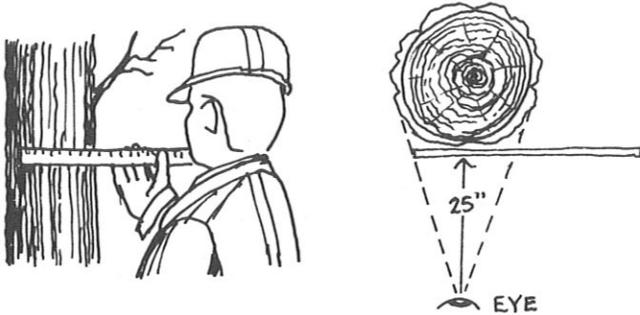
2. Tree Information

Species *Locust, Black* *Robinia pseudoacacia* *LOCB*
Maple, Sugar *Acer saccharum* *MPSU*

A checklist of trees known to be in the community should be developed before the inventory begins. Abbreviations can be made up or adopted from a standard list such as one developed by researchers in the USDA Forest Service. A good computer program will allow the user to switch back and forth between common and scientific names at will. Some require a numeric code for each species in order to manipulate or summarize data.

Size <3" 4-6" 7-12" 13-18" 19-24" 25-30" >30"

Taking exact measurements of diameter slows data collection and is usually not important for managing the trees. Therefore, size categories with reasonable, but usually arbitrary spreads should be used. Height and crown widths are usually unnecessary for management purposes. If needed, they can be obtained by measuring a sample of trees and correlating these measurements with diameter classes of species growing under the same general conditions.



With practice, tree diameters can be estimated by eye with a high degree of accuracy. For greater accuracy or to check estimates occasionally, a Biltmore stick is the quickest way. This device resembles a yard stick but is calibrated to be read in inches of diameter.

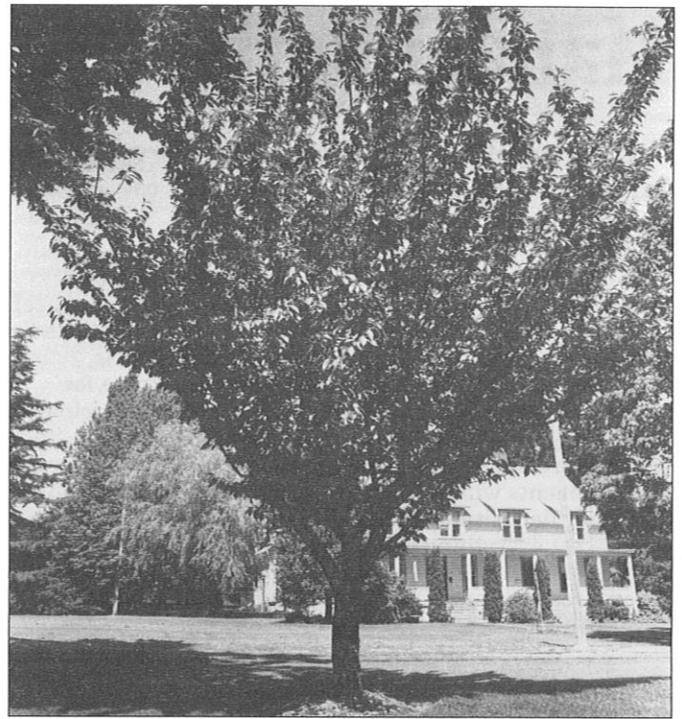
Condition *Excellent Good Fair Poor Dead*

Condition classes can be described in general terms for data collectors. For higher precision, a checklist can be obtained from the International Society of Arboriculture's *Guide for Establishing Values of Trees and Other Plants*. Summaries of these data are good indicators of the health of the urban forest. When combined (by a computer program) with species, size and location, they can also help estimate the monetary value of trees.

3. Maintenance Needs

Code	Work Needed
0	Plant
1	Remove
2	Priority Prune (safety)
3	Routine Prune
4	Training Prune
5	Remove Grate
6	Remove Stump
7	

This entry is the guide to planning work and determining budgets. The list of treatments or practices will depend on which ones are being used (or could be used) in the particular community. Each is coded to save space on data collection forms.



4. Site Information

Some inventory programs have entry fields for information that describe site features important to management. The entry may call for a simple "yes" or "no," or measurement. For example:

Overhead Lines	Y
Treelawn	8'
Sidewalk Damage	N
Land Use	164

Land use, coded in the above example using a list of USDA Forest Service code numbers, is used by the computer as the tree's location to calculate tree value. Using ISA's valuation formula that considers size, species, condition and location, a tree coded 164 (adjacent to privately owned, suburban residential property) would receive a higher dollar value than the same tree coded 324 (next to a freeway).

Again, use only that site information that helps meet an objective, or purpose, of your inventory. Otherwise, it is a waste of time. Also, these data are no substitute for actually inspecting a site before selecting planting stock or planning some other project.

5. Other Information

Insect or disease problems are sometimes inventoried, but usually this kind of information requires an expert and is obtained more effectively by other means.

A remarks category can also be used. This is helpful when the inventory is used for responding to phone calls from residents and maintaining work histories and plans. Remarks can include anything from the presence of a dangerous dog to noteworthy specimen trees. The drawback of a remarks field is that the information can usually not be summarized by computer or retrieved by topic unless it is coded and built into the program being used.

Managing the Project

Here are four steps essential for a successful inventory project.

1. Plan

Besides carefully determining the objectives for the inventory and deciding what data must be collected to meet them, a form must be designed to allow for all conditions that may be encountered. This being virtually impossible, flexibility should be built-in, such as allowing space for features or conditions to be added that were not anticipated. Part of planning is also developing comprehensive checklists or code sheets for data collectors, and making "rules" for how measurements will be taken, tree numbers will be assigned and other field situations will be handled to assure consistency. Test everything by working through the trees on several blocks in different parts of the community, refine the procedures, and put it in writing for each data collector.

2. Train

Whether using volunteers, summer youth crews or paid employees, begin with a workshop session. Explain the "why" behind the project as well as procedural rules and your expectations of quality work. Then conduct a practice session on the streets, working with all individuals or teams. (Teams of two are most efficient when using non-professionals.) Be sure to explain a procedure for handling unknown species or other problems that require delayed data recording or the supervisor's assistance.

To prevent problems from suspicious character reports, it helps to notify the city police and other city departments about when and where crews will be working. Identifying inventory workers with customized t-shirts, caps or wind-breakers also helps. Residents can be alerted through the news media. Crews should be briefed about how to handle inquiries from residents. A handout explaining the project is a good device and reduces the problem of crew members spending time in conversations.

3. Supervise

The history of street tree inventories teaches that spot checking for accuracy and honesty is essential. The nature and intensity of supervision will vary widely, but in all cases it should be done regularly by the person responsible for the project. Brief, daily meetings can be a useful way to discuss problems and work out solutions.

4. Use!

Make sure that inventory reports are used at every opportunity. Continuous inventories need regular updating. This requires a clear procedure for editing or adding data. In larger communities, this may be daily attention by a clerk or technician to update the data base as crew reports are turned in, permits for tree work are issued or citizen calls are received. In smaller communities, updates are best done periodically but regularly (perhaps once a month) by a tree board member or the forester. Tree work, blowdowns, new plantings and other changes need to be reflected promptly in the inventory.

Managing the Data

In very small communities, records for each tree, block or street can be kept on index cards. But even in these cases, today's technology makes it easy, useful and for many people — even fun — to use a computer to store, sort and report inventory data.

There are many computer programs available, each with different capabilities and limitations. The urban and community forestry specialist in your state forester's office will be able to provide suggestions and possibly a list of suppliers. You might also want to search the Internet. Type "street tree inventory" into a few search engines and you will be led to a number of sites offering inventory software, services or additional information.

When shopping for software, be sure to consider these criteria:

- ✓ Is it user friendly? No previous experience should be necessary if you are using volunteers or do not have sophisticated technical assistance at your disposal.
- ✓ Does the vendor offer online technical support?
- ✓ Does the vendor have a track record, i.e. is it a stable, established company or organization? There is nothing so frustrating as getting your inventory all set up, then needing some technical assistance only to discover that the supplier is no longer available to help.
- ✓ Does the program offer a full range of abilities? For example, can it do everything described in this bulletin?
- ✓ Is editing — that is, correcting or updating data — fast and *easy*?
- ✓ Can it be expanded as the community and its forestry program grow and more sophisticated features are wanted?
- ✓ Is the cost well within your budget?
- ✓ Is there a guarantee of satisfaction offered?



TREE CITY USA®

Reports

A major benefit of computerizing an inventory is the ability to instantly generate summaries of data any way desired. Of course, this can also be done by hand using index cards or other forms, but it is time-consuming, tedious and prone to errors.

There are many ways in which data can be reported. Once again, how it is done depends on the purpose of the inventory and how the data help meet management needs. Most frequently the summaries help guide decisions in developing a management plan, illustrate budget requests, justify programs or provide information to city officials for making public presentations or fielding inquiries.

Here are some examples of ways data can be reported:

- **All trees at a single address**

2621X LINWOOD AVE					
#1	Red oak	13-18" DBH	Cond.: Good	Value: \$1,921	
#2	Litlf linden	7-12" DBH	Cond.: Good	Value: \$1,225	
#R1		(Planting site)			

- **All trees on a block or street**

On LINWOOD AVE from NORWOOD ST to EAST ST					
Tree #	Species	Diameter	Condition	Maintenance	
2619 1	American elm	25-30"	Fair	Priority prune	
2619 2	Silver maple	13-18"	Poor	Remove	
2621X 1	Red oak	13-18"	Good		
2621X 2	Lit.lf.linden	7-12"	Good	Routine prune	
2623 1	Dead	7-12"	Dead	Remove	
2623 2	Fl crab apple	<6"	Excel.	Remove stake	

- **All trees needing specified maintenance**

ALL TREES IN NEED OF PRIORITY PRUNE			
On LINWOOD AVE			
2619	1	American elm	25-30"
2690	3	Green ash	13-18"
On MARCY LN			
32	1	Sugar maple	7-12"

- **Species frequency for entire city**

American elm	Ulmus americana	1,550	40.3%
Green ash	Frax penn laneolata	329	8.5%
Silver maple	Acer saccharinum	246	6.4%

- **Species cross-tabulated with any feature (Example: Condition)**

	Excellent	Fair	Good	Poor	Dead	Totals
Ash Species		234	678	29		941
Buckeye	23					23
American Elm	10	1		5		16
Malus Species	2		3			5
Norway Maple			3	2		5
Norway Maple Crimson King		2		2		4
Silver Maple				3		3
Dead					5	5
Report Totals:	35	237	684	41	5	1,002

In short, any information that is collected in an inventory and entered into the computer's data base can be retrieved and reported. From this rich storehouse of information, visual aids such as bar graphs and pie charts can be developed to enhance any presentation about the community forestry program.

Getting Assistance

It is improbable that a good inventory can be planned or implemented without some professional assistance. The best starting point is to contact the urban and community forestry coordinator in your state forester's office. He or she can provide some direction as well as the names of consultants. The names of qualified professionals in your area are also available from the American Society of Consulting Arborists (301/947-0483) and International Society of Arboriculture (217/355-9411).

Other Sources of Information

Publications

- *Urban Forestry — Planning and Managing Urban Greenspaces*
by Robert W. Miller
Prentice Hall, Englewood Cliffs, NJ 07632 (404 pp.)

This book should be on the shelf of anyone beginning or expanding a community forestry program. An entire chapter is devoted to street tree inventories, complete with a helpful bibliography.

If you are interested in purchasing this or other tree-related books, please visit www.arborday.org/books.

- *Tree Inventories: In the Palm of Your Hand*
by David Bloniarz, Shaun Phelan and H. Dennis Ryan

This is an important article published in *Tree Care Industry* (Nov., 2001) but the information is also available online at www.umass.edu/urbantree/palm. These sources explain a revolutionary way to collect inventory data on an ordinary Personal Digital Assistant (often called Palm Pilots). The USDA Forest Service and its partners developed the software and make it – and instructions – available free! The project is called the Mobile Community Tree Inventory System and includes downloadable paper forms as well as a program for your handheld computer for data collection and a companion program for desktop computers that enables storing and editing the inventory data and printing reports.

What About GPS and GIS?

Inventory data collection and display are becoming easier and faster for communities with the funds and equipment to use global positioning systems (GPS) and geographic information systems (GIS). Hand held or back pack instruments receive signals from satellites that pinpoint locations on earth. Unfortunately, inexpensive GPS units may only be accurate to about 50 feet, not close enough for properly locating individual trees along a street. More costly units, however, provide the accuracy of survey work.

GIS allows trees or other “data points” to be displayed electronically on maps. “Layers” of features such as utilities, fire hydrants, street lights, or individual trees can be added or deleted with a keystroke. This technology provides a wonderful visual display of the community’s forest. “Clicking” on an individual tree can even be used to bring up on the screen all information about that tree!

More information is available from consulting arborists. Information about GPS equipment is available at Web sites such as:

- www.geoline.com
- www.trimble.com/gps
- www.cn.de.iastate.edu/gps.html

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