



**TREE CITY USA®
BULLETIN**

66

No.
Dr. James R. Fazio, Editor • \$3.00

Not Your Father's Arboriculture

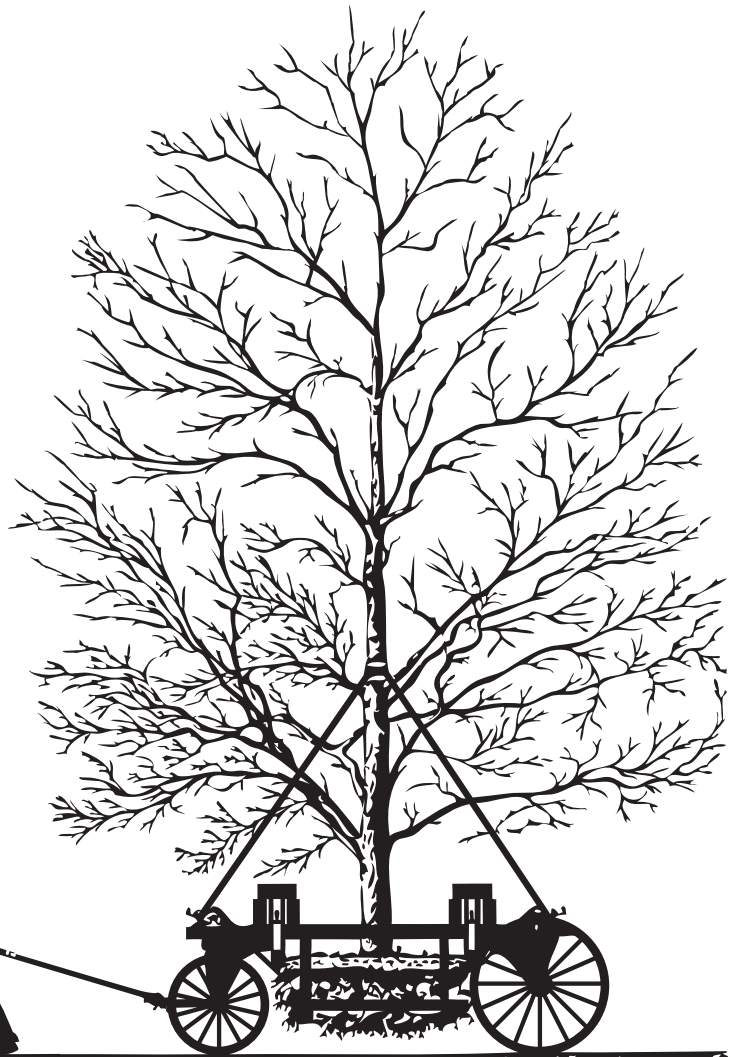
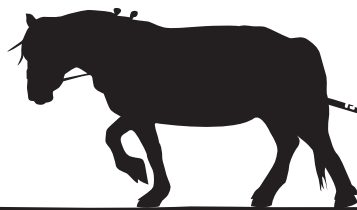
From pruning saws to lift machinery, today's arborists and urban foresters have tools available to them that would make their forefathers green with envy. Importantly, these tools help provide better tree care and safer working conditions than ever before. By knowing what is available, tree boards can help raise the standards of performance in their communities and improve urban forestry.

The first decade of the twentieth century was a remarkable time. It signaled an end to the steam century and introduced the Era of Electricity. Color photography was invented and the Wright Brothers made the first powered flight. Robert Peary reached the North Pole and Marconi transmitted messages across the Atlantic. And in the world of trees, two entrepreneurs advanced the science and art of arboriculture and founded companies that still bear their names today.

Francis A. Bartlett, a young graduate of the Massachusetts Agricultural College, applied his new knowledge and skills to shade tree care and convinced an estate owner in Bedford, New York, to hire him. It was 1907 and the first commercial tree care job performed by what became the F. A. Bartlett Tree Expert Company. Bartlett's competitor was John Davey, an immigrant from England who had been in practice for nearly 30 years before founding the Davey Tree Expert Company in 1909.

Both men also opened technical schools in what they termed 'tree surgery,' and Davey published a popular book, *The Tree Doctor*, in 1901. In the revised, hardback version in 1907, he wrote, "This work is sent forth with a fervent prayer for Heaven's blessing on it, and an appeal to all to help in planting and caring for trees in the country that was once preeminently 'The Land of Forests.'"

Bartlett and Davey were pioneers in arboriculture. They would be amazed and pleased at the state of individual tree care today and the collective practice we call urban forestry. In the pages that follow we highlight a few of the changes that are helping inspired communities do a better job of planting and caring for their trees.



Much has changed in the years since arboriculture was pioneered in the United States. New knowledge, tools and practices help assure healthier trees and urban forests. The results are social and environmental benefits provided by trees that are now more important than ever.

Inventories and Assessments

Good management begins with knowing what you have and what you want. Today's methods of establishing current bench marks have become more sophisticated and more accurate. Inventories have largely gone digital and the vision for what is wanted has evolved from shade and beautiful trees to safer and more fully-stocked urban forests that provide maximum eco-benefits. New technology is helping to connect the two.

Tree Inventories

There is a difference between an inventory and a tree canopy assessment. An inventory provides detailed data about individual trees along a street or in a park or other space. Typically this includes a specific location, species, size, condition, and management actions needed. What began with pen, paper and decks of cards (each card being a record of a tree), is now done mostly in computerized form. Small communities can still collect data on paper forms or use devices such as Android or Apple phones, pods or tablets. The data are then stored and manipulated using commercial or free software to produce reports and records for managing the urban forest. Inventory software programs seem to come and go, so contact your state community forestry coordinator for a current recommendation. More advanced methods include data collection with GPS coordinates and integration into a city's geographic information system (GIS) map. Another, called OpenTreeMap, allows the public to interact with the inventory and obtain (or contribute) information about the trees and planting sites.



Bartlett Tree Research Lab

Modern arborists rely on data loggers with GPS functionality for tree inventories. These devices allow for acquiring GPS coordinates for mapping trees and tree inventory attribute information.

Tree Canopy Assessments

Urban Tree Canopy assessments have become popular because they provide more of a community profile and a quantified look at ecosystem services. These assessments can be done with geographic information systems such as ESRI's ArcGIS products. They are designed to conduct complex statistical analyses of a community's existing tree cover and other ground features such as open fields, bodies of water and impervious surfaces. Additional information can then be derived and even scaled to any level from a city or region down to a street or neighborhood. Maps and reports can then be created to help communicate this information to policy-makers and the public. Several other assessment tools are available in the i-Tree suite of software programs developed by the USDA Forest Service and its partners. See page 8 for more information.



Wikipedia Commons - Claudium



NASA's Earth Observatory

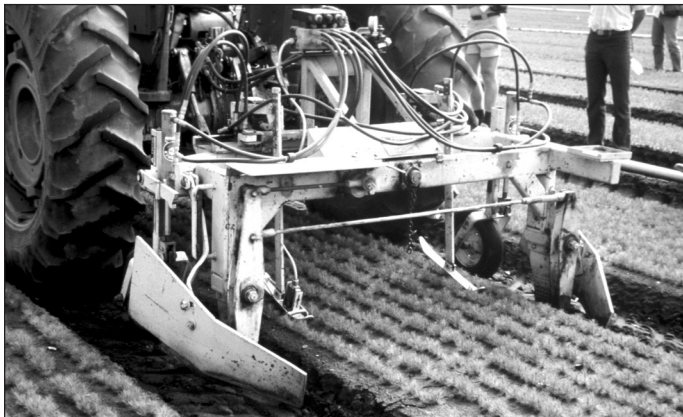
Instruments are making traditional data collection outdated. Included is a digital caliper for measuring tree diameters and then recording the data. The information can later be printed out or downloaded into a computer. A laser range-finder/hypsometer measures distances and tree heights.

A Good Start in the Nursery

Good urban forestry begins in the tree nursery. As we learn more and more about the valuable eco-services provided by urban trees, it becomes even clearer that planting should be viewed as an essential and continuing community goal. Good nursery stock is fundamental to achieving this goal and in recent years the focus has been on producing trees with vigorous, non-circling root systems.

Seedling Production

Seedlings for reforestation or transplanting to grow landscape trees are often field-grown. These are referred to as bare-root seedlings/trees. Modern methods have improved soil nutrition, disease control and documentation of seed sources that match the environment where the trees will ultimately be planted. Equipment has improved, too. Pictured is an innovative machine that can be used in the latter part of the first growing season to assure better roots. A horizontal blade is pulled along beneath the soil to sever the dominant tap roots and promote a more fibrous root system.



Tom Landis / U.S. Forest Service

A root pruner, or under-pruner at work in the field.

Another way seedlings are produced is in container nurseries. Seeds are planted in tubes containing an artificial soil mix comprised mostly of peat, vermiculite, and perlite. Precision sowing machines are used to place one or more seeds in each cavity. Overhead spray booms then move over the trays and water the seedlings or add fertilizers when needed. A modern greenhouse can also control temperature, ventilation, photoperiodic lighting, and even add carbon dioxide to promote growth. Plug seedlings have a much higher survivability rate when outplanted.



Louis Peón-Casanova

Large-Caliper Trees

Great strides have been made since the day of Luther Burbank, the plant wizard that popularized tree improvement through cultivars. Hybridized trees and new varieties allow the selection of traits best suited to a particular site or purpose.

A way that roots have been improved is through the use of root bags. At the nursery seedlings are placed in fabric bags filled with soil. When roots reach the fabric, instead of circling, they are pinched and nodules form that hold carbohydrates. Smaller roots emerge at the nodules creating a vigorous, fibrous root mass.

Planting techniques at the final destination have also improved. Great emphasis in recent years has been placed on planting at the root flare. This prevents the young tree from being too deep, something that has led to a host of tree health problems later in life.



Wicki58 / iStockphoto.com

Better Methods of Tree Care

“He who moves not forward goes backward,” wrote Johann Wolfgang almost 200 years ago. John Davey and Francis Bartlett moved us in the right direction but recent advancements have corrected some errors and made tree care easier and more effective.



John Davey

Compartmentalization of Decay

Thanks to research by the late Dr. Alex Shigo and other scientists, filling tree cavities with wire and cement is a thing of the past. An understanding of a tree’s ability to compartmentalize and seal wounds, especially when exposed to air instead of being covered by paint or cement, guides arborists today in pruning and scraping the rough edges of damaged trunks. Specialized pruning saws have replaced the kind of carpenter saws seen in the photo and improved risk assessment methods help make better decisions about when a tree should be removed in the interests of public safety.

Pioneer ‘tree surgeons’ at work as shown in John Davey’s book, *‘The Tree Doctor.’*

Better Ways to Reach the Canopy!

Climbing tree workers are still an important part of arboriculture and urban forestry, but cranes and aerial lift trucks have made the job safer and easier in many circumstances. The most recent advances have been in reducing size and maneuverability so that small equipment can be used in tight spaces and without damage to soil or the landscape.



John Davey

Intrepid climbers using ladders and ropes were literally out on a limb early in the 20th century!



Photo by Teupen USA, Inc., Courtesy of Tree Care Industry Magazine

Today, mini aerial lifts can maneuver in parks and yards while safely raising tree pruners as much as 150 feet or more.

Moving Big Trees

Unlike the pioneering tree mover on our cover, today's tree spades and other transplanting equipment can lift trees up to 10 inches in diameter along with soil and enough roots for survival. Special equipment and procedures have even successfully moved trees up to 3 feet in diameter. Moving large trees can resolve conflicts when trees are in the path of construction or when 'instant' landscaping is needed around new facilities. The counsel of skilled arborists is necessary to make such moves successful.

Tree spade capacities are indicated by the size of their openings. A '92' tree spade is 92 inches in diameter. A rule of thumb is it can transplant a tree as large as 9 inches in diameter. A '44' tree spade could move trees about 4 inches in diameter. However, moving trees a little smaller than the maximum is recommended.



Dutchman Industries, Inc.

Inspecting for Decay

Accurately determining the existence, location and extent of decay has always been a challenge for arborists. A mallet and good ear were once the best methods. Several better ways are available today, including the non-invasive (no drilling necessary) use of an acoustic tomography unit. This sophisticated system produces a map of internal conditions that can be read much like a radiologist interprets x-ray film.

Experts use acoustic tomography to map any decay within the tree.



U.S. Forest Service

Inspecting Roots

Pneumatic root excavators can now be used to do the tricky job of locating or inspecting the underground parts of trees. When operated with care, this tool uses air under high pressure to move soil without destroying the roots. It can be used to inspect for disease or damage, prepare trees for moving, avoid roots during trenching, tunneling or construction, and to remove the root systems of invasive or diseased trees. Bartlett Tree Experts use this device in a program called Root Invigoration to inspect, reduce compaction and invigorate roots.

Photo Courtesy of Matthew R. Foti Landscape and Trees, Inc.



Under the brand name Air-Spade® or, generically, 'pneumatic root excavator,' this tool offers a wide range of services in the hands of a skilled arborist.

Better Methods of Tree Care Cont'd.

Spray-less Chemical Treatments

Sprayers and blowers that were used to treat treetops often raised the ire of nearby homeowners and in some cases caused environmental damage. Now there are many methods for applying chemicals without spraying. These are used for delivering insecticides (with a classic example being for emerald ash borers) and growth regulators (for example to slow tree growth under power lines). The prescribed chemicals can be introduced into the tree's nutrient and water-conducting tissues beneath the bark using pressurized or non-pressurized injection devices or capsules. In some cases, they can be applied directly on tree trunks as bark-penetrating solutions, or poured over the roots in liquid form as a soil drench.



© Great Smoky Mountains National Park, Resource Management Archive, USDI National Park Service

A 'soil drench' is used to apply a chemical that will be taken up in the roots without boring into the tree, going airborne, or affecting surrounding vegetation.



Bartlett Tree Research Lab

A pressurized capsule is one of many ways now used to treat trees or prevent insect attacks. The chemical is slowly distributed throughout the tree primarily as water is conducted through the cells.

Other Advances...

Many more innovations and advances could be mentioned but space allowed the selection of only a few. Here are others considered to be of major importance. What would you add to the list?

- ✓ Powered tree ascenders and personal safety gear
- ✓ Chippers, stump grinders and lightweight chainsaws
- ✓ Laser pointers for communicating about tree parts
- ✓ Findings about soil volumes necessary for downtown trees
- ✓ Soil moisture meters and other environmental instruments
- ✓ Structural soil
- ✓ Porous pavement
- ✓ Professional organizations and arborist certification



Tree City USA Growth Awards were initiated in 1991 to recognize communities using arboricultural practices and engaging in a wide range of activities that go beyond the basic four standards of Tree City USA. Tree boards that remain abreast of the latest tools and best management practices are in a good position to lead their community toward Growth Award recognition. For more information and a list of suggested activities, please visit arborday.org/treecity.

Special Thanks

Contributors and sources of help for the compilation in this issue were:

- Mike Bowman, Retired City Forester
- Adam Howard, Nursery & Orchard Manager, Arbor Day Farm
- Dr. David Nowak, Project Leader, USDA Forest Service
- Dr. Tom Smiley, Arboricultural Researcher, Bartlett Tree Research Lab
- Dave Stephenson, Idaho Community Forestry Coordinator
- Steve Churchillo, Urban Forester, City of Reno, Nevada

Research for the Future

Research permeates the entire field of arboriculture today. Most of the advancements featured in this issue are the result of private and governmental research. The U.S. Forest Service, universities and major tree care companies are constantly searching for new knowledge that will improve tree care and urban forestry. Results are published in 'Arboriculture & Urban Forestry' and other scientific publications or online sources.

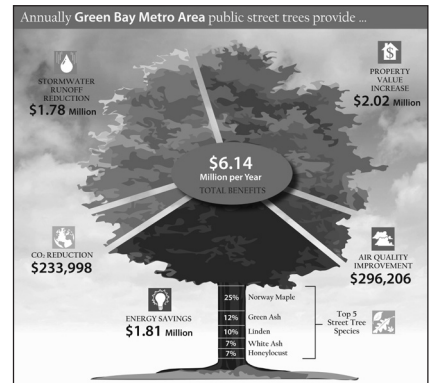
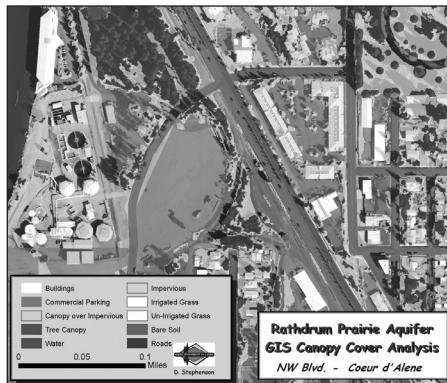
Today's Research Emphasis

Research today ranges from the social science of understanding relationships between trees and people to quantifying environmental benefits (ecoservices) or complex engineering studies of limb breakage and whole tree failures. Here are just a few examples.

TREES AND SOCIETY has taken on new meaning as social scientists move beyond aesthetics and study the relationship of trees to mental and physical health, crime prevention, domestic tranquility, worker satisfaction, motivation to volunteer or support urban forestry, shopping habits, and other human behavior.



ECOSERVICES are being quantified through painstaking studies of tree cover. Through satellite images, sample plots and computer modeling, tangible benefits such as carbon sequestration, air quality, energy savings, stormwater retention and similar benefits are being determined. In turn, the true value of urban trees is being expressed in dollars and cents and communicated to the public. One such tool is available at itreetools.org.



© USDA-www.itreetools.org

STRUCTURE AND MECHANICAL FORCES are the object of many studies today. Scientists use engineering techniques to measure mechanical forces and relate these to factors such as wind, ice or snow loads, or internal defects. The results help arborists select species properly, predict the effects of root damage or various methods of pruning, and assess trees for risk more accurately.

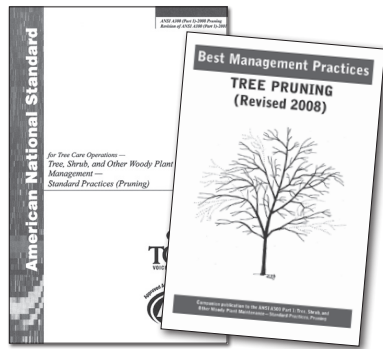


Standards Via ANSI

As arboriculture and urban forestry matured, it became clear that standardization of terminology and practices was needed. In nearly every industry, the American National Standards Institute (ANSI) oversees the creation, promulgation and use of standards. The standards themselves are developed by committees made up of stakeholders from throughout a particular industry. In the case of arboriculture and urban forestry, such a committee was formed in 1991 under leadership of the Tree Care Industry Association. The committee created the ANSI A300 Standard – *Tree, Shrub, and Other Woody Plant Maintenance* and meets regularly to keep it current. The standards in A300 are intended as “guides for federal, state, municipal and private authorities including property owners, property managers, and utilities in drafting their maintenance specifications.” In short, the standards assure that a technical term or practice means the same thing to all parties. The standards reflect the best collective thinking and consensus of the industry and are usually based on research as well as experience.

ANSI A300 is divided into parts and often accompanied by ‘Best Management Practices’ publications that go into greater detail about application of the standard on the ground. The parts of A300 are:

- Pruning
- Soil Management
- Supplemental Support Systems
- Lightning Protection Systems
- Management
- Planting and Transplanting
- Integrated Vegetation Management
- Tree Risk Management
- Integrated Pest Management
- Urban Forest Products



Standards and accompanying ‘Best Management Practices’ are available through the International Society of Arboriculture. Besides A300, other pertinent standards include various safety topics and Z60.1, ‘Nursery Stock.’

For More Information

For more information and direct links to ANSI and other material mentioned in this bulletin, please visit arborday.org/bulletins and click on Bulletin No. 66.

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