MISSOURI URBAN FOREST—A TEN-YEAR COMPARISON

by Justine T. Gartner[1], Thomas Treiman[2], and Tim Frevert[3]

Abstract. A follow-up urban tree survey of 44 Missouri, U.S. towns was completed in 1999 by the Missouri Department of Conservation. These sample plots were first surveyed in 1989 in cooperation with the American Forestry Association and the USDA Forest Service as part of a nationwide survey of urban forests. Information recorded included tree location, a categorical variable for "right tree in the right place," a tree history (topped or not), and individual tree data such as species, size class, and condition. A comparison of data shows significant changes in Missouri's urban forests. Results show more trees but a decline in their condition. Missouri's urban forests are becoming more diverse. The top six tree species constitute 37% of those surveyed in 1999, as compared to 48% found in 1989. The average value of a Missouri street tree increased by US$642.

Key Words. Tree inventory; condition; topping; diversity; tree valuation; right tree, right place; urban forest.

In 1989, the American Forestry Association and the USDA Forest Service conducted a survey of the nation's urban forests in partnership with public agencies in several states. Trees in randomly selected communities were evaluated. The results of that initial survey provided a valuable snapshot of the United States's urban forests at that time, but without remeasurement there was no way to detect trends over time or to evaluate the effectiveness of urban forestry programs in impacting the resource.

In 1999, the Missouri Department of Conservation (MDC) conducted one of the first follow-up surveys. MDC manages significant amounts of publicly owned land, offers technical assistance to help private landowners manage their land, and also provides advice, materials, and funding to local governments and community groups interested in improving their urban forest resource. The objective of the follow-up survey was to depict whether and how Missouri's urban forests are changing over time.

SURVEY METHODS

The Missouri 1989 sample survey identified, measured, and assessed the health, history, and condition of trees on randomly located sample plots in 42 urban communities throughout the state (Rocca 1992). Communities were selected for inclusion in the 1989 survey based on a stratified random sample using community size and location in the state. In 1999, all the original communities were revisited (Figure 1 and Table 1). Two communities, Ballwin and Des Peres, were added based on population growth and perceived need for better information. Improved technology, such as handheld computers, allowed for some improvements in methodology between 1989 and 1999. The data from 1989 and 1999 are comparable, allowing for trend analysis.

The number of sample plots in each community was based on miles of road per community and varied from five in the smaller communities to 20 in the largest. Sample plots, stratified by location within the community (commercial, mixed commercial/residential, and residential) were randomly scattered across the community. Sample plots started at the intersection of two streets and included trees on both sides of the street for 1/4 mi (0.4 km) to the north and 1/4 mi to the west of the intersection. The same sample plots were used in 1989 and 1999, except for a few additions in the later survey. Additional plots were added in 1999 to intensify the survey in Hannibal, Webster Groves, Carthage, and Springfield.

The 1989 survey counted only those street trees that the foresters identified as city-owned. Information recorded in 1989 included tree location (commercial area, urban, and suburban), species, size class (in three broad size classes—small, medium, and large), and condition (excellent, good, fair, poor, and dead).

A survey protocol was initiated in 1999 to count all trees within 12 ft (3.65 m) of the curb or "curb equivalent" where a curb was not obvious. In 1999, categorical variables for "right tree in the right place" and tree history (topped or not) were added. The electronic data recorders used in 1999 allowed for quicker and more precise record keeping. In 1999, foresters measured each tree to a 1-in. (0.025-m) size class as opposed to the three more general size classes used in 1989.

Data were collected in both surveys by foresters from the Missouri Department of Conservation. All field workers received the same training and completed

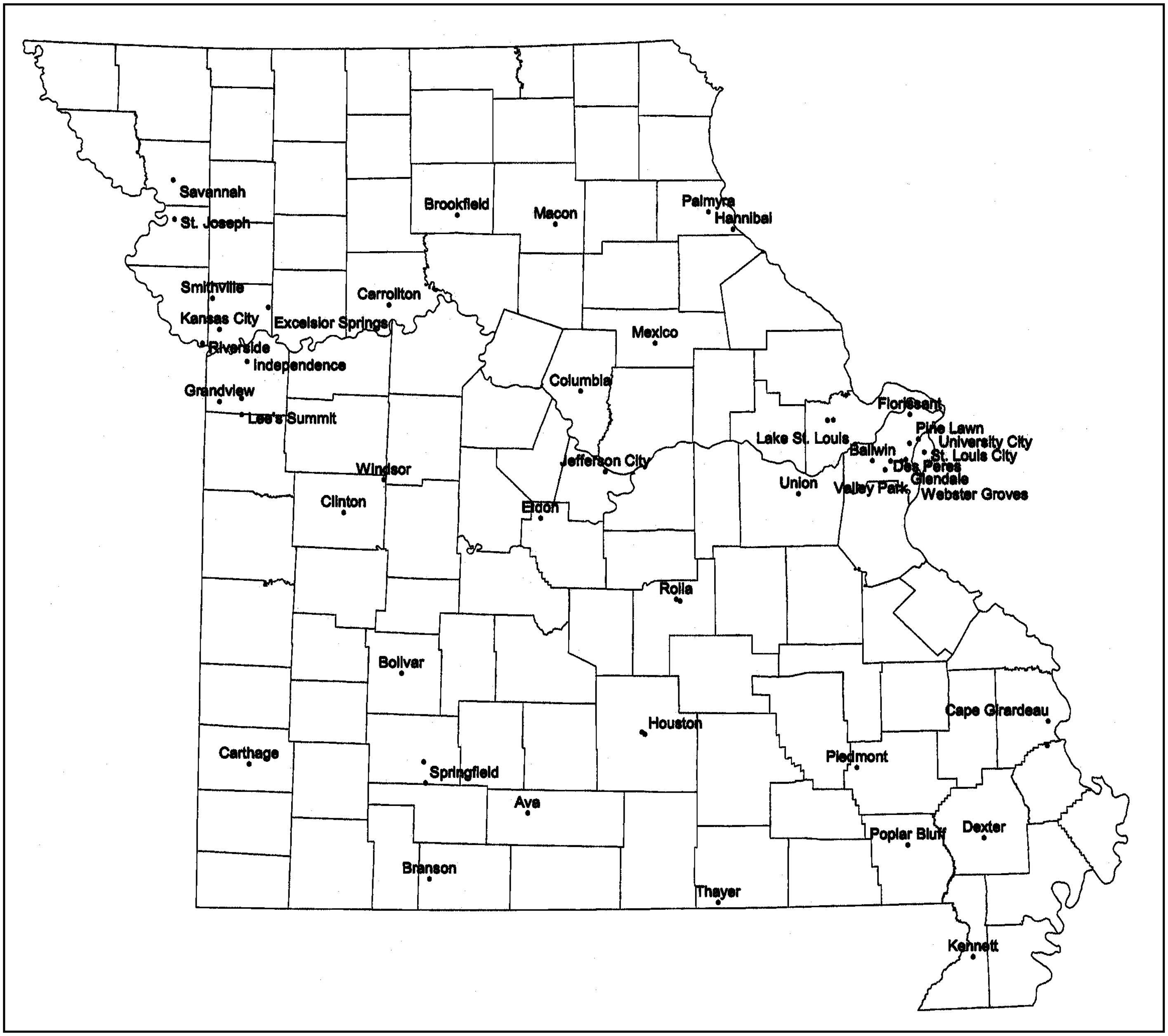

Figure 1. The spatial distribution of the 44 Missouri communities included in the 1999 survey of urban street trees. County borders are also shown.

the same set of "test plots" to help ensure consistency on subjective measures, such as tree condition and "right tree in the right place." Condition classes were based on the Council of Tree and Landscape Appraisers (CLTA) guidelines (1992). Both the 1989 and the 1999 surveys were conducted in late spring and early summer when trees were in leaf.

RESULTS AND DISCUSSION

More Street Trees Found in 1999

While the 1989 survey found approximately 46.2 (s^2 = 2112, n = 272 plots) trees per mile (1,609 m) of street, the 1999 survey found 62.9 (s^2 = 3266, n = 297 plots) trees per mile. Testing for a difference between means yields a t-statistic of –3.8, significant at greater than the 95% level. This increase can be partially attributed to changes in survey methodology as described above, but we estimate that the majority are the result of community planting efforts. Considering the size and species of the new trees, we estimate that over half were planted, and the remainder were due to natural ingrowth. Missouri's communities have been planting and growing trees very successfully for the past 10 years.

Table 1. Forty-four Missouri communities were surveyed in 1999, including two not surveyed in 1989. Four communities added extra plots in the 1999 survey. Otherwise, the number of plots was determined by the miles of road within a community.

Community	Population	Miles of road	Notes
Ava	3,171	32	
Ballwin	25,909	120	Added in 1999
Bolivar	8,248	64	
Branson	4,991	110	
Brookfield	4,679	50	
Cape Girardeau	35,596	208	
Carrollton	3,848	85	
Carthage	11,360	90	Extra plots in 1999
Clinton	9,248	67	
Columbia	78,915	387	
Des Peres	7,872	53	Added in 1999
Dexter	7,605	58	
Eldon	4,626	42	
Excelsior Spring	11,424	110	
Florissant	47,069	155	
Glendale	5,465	26	
Grandview	23,703	115	
Hannibal	17,728	154	Extra plots in 1999
Houston	2,023	26	
Independence	116,832	622	
Jefferson City	34,911	225	
Kansas City	441,574	2,200	
Kennett	10,621	87	
Lake St. Louis	9,319	50	
Lee's Summit	66,623	385	
Macon	5,428	65	
Mexico	11,250	73	
Palmyra	3,272	27	
Piedmont	2,385	17	
Pine Lawn	4,585	23	
Poplar Bluff	17,029	125	
Riverside	3,337	23	
Rolla	16,027	100	
Savannah	4,542	20	
Smithville	4,443	40	
Springfield	142,898	825	Extra plots in 1999
St. Louis	339,316	1,100	
St. Joseph	69,622	412	
Thayer	2,114	16	
Union	6,630	69	
University City	36,858	115	
Valley Park	5,799	31	
Webster Groves	21,332	100	Extra plots in 1999
Windsor	3,101	25	

The 1999 survey tallied more than 9,000 trees, an increase of 33% compared with the 6,000 counted in 1989. Based on the total miles of urban roads in Missouri, we estimate that there are 1,148,000 street trees statewide as of 1999. Surveyors also tallied about 6,000 planting spaces in 1999, leading to an estimate of 1.1 million empty planting spaces statewide, or one planting space for every existing tree. The 1989 survey estimated two planting spaces for every existing tree.

Tree Size Distribution Unchanged Since 1989

The distribution of trees in each size class has remained largely unchanged since 1989 (Table 2). The 1989 survey found only 7% of trees in the 24 in. (0.61 m) and greater size class. The 1999 survey found 9% in the 24 in. and greater size class. These small numbers are not surprising since large trees are more likely to become hazardous than are smaller or younger trees of the same species. Older trees are less able to adapt to changes in their growing environment and often develop decay and other problems (Harris et al. 1999). Dead or defective trees that are a threat to public safety should be removed. Others may have been removed during construction, such as street widening, upgrading of utilities, or the creation of new subdivisions. Because of the removal of older tress and the new plantings that filled empty planting spaces, Missouri's urban forest has not "aged" in the past 10 years (using size as a proxy for age). The stable size class percentages over the past 10 years indicate that communities continue to be interested in tree planting, and that they continue to replace problem trees in the large size classes with new plantings.

Table 2. Size-class distribution of trees found in 1989 and 1999. Very little change was found between the two surveys.

Dbh class (in.)	1999(%)	1989(%)
0 to 3	18.1	22.5
3 to 12	41.6	42.5
12 to 24	31.1	27.5
24 plus	9.2	5.5

Tree Condition Declined Since 1989

The average condition of Missouri's street trees has declined in the past 10 years. In 1989, 66% of the trees were judged either in excellent or good condition. In 1999, only 24% of trees were rated excellent or good

(Table 3). Because of some differences in methodology, statistical significance of this result cannot be verified.

Table 3. Change in tree condition between 1989 and 1999.

Condition	1999(%)	1989(%)
Dead	3.2	1.1
Very poor	4.2	*
Poor	18.6	8.9
Fair	38.6	21.0
Good	28.2	35.0
Excellent	7.2	34.0

*The condition "very poor" was not used in 1989.

Tree size can be used as a proxy for age. Since size distribution was unchanged between 1989 and 1999, this decline in condition cannot be attributed to an older tree population. The most likely cause is a community focus on tree planting. In 1999, 18% of trees were in the 0 to 3 in. (0 to 0.76 m) diameter at breast height (dbh) size class, and we estimate that over half of these trees were planted in the last 10 years. Communities with limited amounts of time and money appear to have been using their resources to plant trees. This focus on tree planting has been encouraged by a variety of tree planting programs directed at tree planting on public property, including the Missouri Department of Conservation's *Branch Out Missouri* cost share program (Missouri Department of Conservation 1999) and Forest ReLeaf of Missouri's *Project ReLeaf*, *Priority ReLeaf* and *Project Communitree* programs (Forest ReLeaf, undated).

Firmly defined condition classes based on the CLTA guidelines (1992) and standardized training may have also played roles in the apparent decline of overall tree health found in the 1999 survey. Using information and tables from this publication, urban foresters were able to evaluate each tree impartially. This standard was not uniformly used in 1989.

The smaller and younger trees were generally found to be in better condition than the larger trees in 1999 (Table 4). A chi-square test on the 1999 data (n = 9,531, DF = 15, chi = 145.4) shows that the relationship between trees size and tree condition is significant at greater than the 99% level. To help increase the overall long-term condition of their trees, communities will need to increase tree care as the trees age and grow into the higher size classes. To facilitate this, state-sponsored cost share programs should shift their focus to tree maintenance.

Table 4. Tree condition and tree size in 1999. Larger trees were generally found to be in poorer condition than smaller trees.

Dbh class (in.)	Dead (%)	Very poor (%)	Poor (%)	Fair (%)	Good (%)	Excellent (%)
0 to 3	1.9	4.1	15.7	36.5	30.3	11.2
3 to 12	2.5	3.0	18.4	39.2	28.2	8.4
12 to 24	2.1	4.8	19.4	39.5	27.8	6.1
24+	3.4	8.1	24.0	34.9	25.5	3.8

Tree Diversity Improved

The top six species of trees found along Missouri's streets have not changed since 1989, although their order has shifted (Table 5). The most interesting change is that in 1999 these six species accounted for a much smaller percentage of the total trees found. These top six accounted for 37% of the trees found in 1999 and 48% of the total in 1989, representing a major increase in overall diversity statewide. Evergreens continued to be a small part of the number of trees found on Missouri streets, based on these surveys. The 1999 survey found that evergreens make up only about 6% of the total.

Table 5. Most common species found in 1989 and 1999 surveys.

Species	1999 (%)	1989 (%)
Silver maple *(Acer saccharinum)*	10.5	13.4
Pin oak *(Quercus palustris)*	6.1	6.0
Green ash *(Fraxinus pennsylvanica)*	5.9	5.4
Sugar maple *(Acer saccharum)*	5.9	10.0
Siberian elm *(Ulmus pumila)*	4.6	8.5
Sweetgum *(Liquidambar styraciflua)*	4.2	4.7
% of trees in the top six species	**37.2**	**48.0**

The 1989 survey found a higher total number of species (132) than the 1999 survey (108). However, this decrease is not of great concern since most of the "extra" species documented in 1989 showed up only once or twice and several were undesirable. Undesirable tree species made up 11% of the total population in 1999. Undesirable tree species included 'Bradford' pear (*Pyrus calleryana* 'Bradford), tree of heaven *(Ailanthus altissima)*, Norway maple *(Acer platanoides)*, Japanese pagodatree *(Sophora japonica)*, Scotch and Austrian pine *(Pinus sylvestris, P. nigra)*, Lombardy poplar *(Populus nigra)*, zelkova *(Zelkova)*, and goldenraintree *(Koelreuteria paniculata)*. Criteria used to determine desirability included but were not limited to susceptibility to insect and disease problems, poor growth characteristics, propensity for storm damage, and fruiting habit. Trees that are continual maintenance problems were also identified as undesirable.

The number of different species of trees found per community ranged from a high of 61 in University City to a low of 17 in Clinton. The data from this urban forest survey can be used to assess species diversity at the community or even street level. Diversity indices provide one acceptable ranking. The indices are usually based on several variables, including total number of trees, total number of species found, and number of trees of each species found in a tree inventory. A mathematical index of species richness and heterogeneity, such as Simpson's index or the Shannon-Wiener function, assigns a single numerical value to species diversity (for formula, see Krebs 1989).

Both formulas are based on the assumption that a community with, for example, 10 tree species each making up 10% of the total is "more diverse" than a community with 10 species where one species makes up 91% of the total and the other nine only 1% each. In other words, it is not enough to find many different species. A diverse community needs significant numbers of each of its many species.

When considering species diversity, scale is an issue. Different answers will emerge when we ask whether the state's total urban forests are diverse, whether a specific community's street trees are diverse, or whether the trees along one particular street are diverse. For urban foresters, the proper scale is most likely the community or even street level. At the street or community level, diversity reduces the spread of insects and pathogens and provides differing spring flowers, variations in shade intensity, longer fall leaf coloration, and a variety of seed and fruit types that supply food for urban wildlife (Harris et al. 1999). The half-mile-long plots used in the urban forest survey make reasonably good proxies for diversity at the street level, while all the plots in a community can be combined to estimate diversity at the community level.

Using either the Simpson or Shannon-Wiener method at the street level, the communities of Branson, Glendale, Poplar Bluff, and Lake St. Louis have some of the most diverse streets in the state, with numbers ranging from 23.5 (Glendale's Shannon-Wiener number) to 9.7 (Lake St. Louis's Simpson index). Lee's Summit, Clinton, Springfield, Bolivar, and Kansas City had some of the least diverse streets, with numbers ranging from 4.7 (Springfield's Shannon-Wiener number) to 2.9 (Lee's Summit's Simpson index). Due to the natures of the two mathematical formulas, several communities, notably Mexico and Riverside, were ranked as diverse by one scale and not very diverse by the other.

At the community level, Poplar Bluff, Hannibal, Branson, and Webster Groves were among the most diverse, with numbers ranging from 29.6 (Webster Groves's Simpson number) to 22.9 (Branson's Shannon-Wiener index). The least diverse overall communities were Springfield, Des Peres, Ballwin, and Savannah, with numbers ranging from 6.4 (Springfield's Simpson number) to 9.1 (Ballwin's Shannon-Wiener index). Again, two communities, Glendale and Mexico, varied depending on the index. Obviously the indices are somewhat imprecise tools, particularly in the communities with fewer plots, but they are a measure that can help assess whether a community is achieving the goal of having a wide variety of species on every street.

Tree Density Varies with Location

Location designations were commercial, mixed commercial/residential, and residential. In both 1989 and 1999, the mixed commercial/residential zones had the most trees per mile of curb. In 1999, there with 67 trees per mile in the commercial/residential zone (n = 171), 21 more than in the commercial zone (n = 25). With a t-statistic of -2.1 (DF = 194), this result is significant at the 97% level. The commercial zones had more empty spaces per mile (69) than the other zones (about 61). These results are significant at about the 84% level. Summing trees found with planting spaces found yields the total possible tree spaces. This sum was lowest for the commercial zone (115 versus 127 in the commercial/residential zone), with a t-statistic of –2.4, significant at greater than the 95% level. Trees in all three locations average between fair and good condition.

Trees in commercial zones averaged only 9.4 in. (0.24 m) dbh, while mixed commercial/residential trees [11.4 in. (0.29 m) dbh] and residential trees [12.2 in. (0.31 m) dbh] were bigger. Both results are significant at greater than the 99% level (t-statistics –6.6 and –5.1, respectively). Some of this difference in size may be due to the growing conditions.

Two explanations seem possible for the smaller number and smaller size of trees in commercial zones. Commercial zones typically are not tree friendly. Trees may be forced to grow in small areas such as planting pits or parking lot islands. Soils found in these areas are usually compacted, with little access to water and air (Harris et al. 1999). Commercial zones usually have large expanses of impervious surfaces that hold summer heat, creating heat islands (Poracsky and Scott 1999). These poor growing conditions could result in small-diameter trees with a short lifespan. Or, using size as a proxy for age, it could also be that the commercial areas are where most trees have been planted recently. The two explanations are not contradictory. If trees in commercial zones have short lifespans, planting spaces will need to be refilled frequently.

Another consideration is the growing number of Missouri communities with landscaping and screening ordinances in commercial zones. These ordinances require incompatible zoning usages to be screened or buffered from each other. Recent plantings to meet these ordinances could also account for the number of small trees that were found in commercial zones.

Topped Trees Fairly Common

Topping is defined as "the drastic removal of large branches with little regard for location of the pruning cut" (Iles 1989). This practice stresses trees, creates hazards, increases suckering, and leaves large, open wounds subject to decay and disease (International Society of Arboriculture 1998). Nearly 12% of all trees surveyed were topped, with the highest percentages of topped trees showing up in the larger size class, 21% of trees over 24 in. (0.61 m) dbh, and 18% of trees 12 to 24 in. (0.30 to 0.61 m) dbh. A chi-square test shows that this relationship between topping and tree size is significant at the 95% level (n = 9,531, DF = 3, chi = 289.1).

Trees in the commercial zone were somewhat more likely to be topped (14%) than mixed commercial/residential trees (12%) or residential trees (9%). This relationship is also significant at greater than the 95% level (n = 9,531, DF = 2, chi = 30.5). One possible explanation is the desire of most commercial businesses to be visible from the curb. Businesses have a lower appreciation for trees than for the people they wish to invite into their establishment (Wolf 1999).

Trees in smaller communities (less than 100,000 in population) were somewhat more likely to be topped (12.5%) than trees in larger communities (6.9%). This finding may point to more effective urban forestry programs in larger communities.

Among the top ten most common species found, only silver maple *(Acer saccharinum)* and Siberian elm *(Ulmus pumila)* stand out as more likely to have been topped (Table 6).

Table 6. Most common species and percentage of trees topped, by species.

Species	% topped
Silver maple *(Acer saccharinum)*	34
Pin oak *(Quercus palustris)*	2
Green ash *(Fraxinus pennyslvanica)*	6
Sugar maple *(Acer saccharum)*	8
Siberian elm *(Ulmus pumila)*	29
Sweetgum *(Liquidambar styraciflua)*	5
Redbud *(Cercis canadensis)*	6
American elm *(Ulmus americana)*	13
Bradford pear (*Pyrus calleryana* 'Bradford')	12
Red maple *(Acer rubrum)*	5

Topping trees is not only unsightly and deleterious, but it also lowers the appraised value of the tree by reducing the tree's condition rating (Karlovich et al. 2000). In the 1999 survey, the average topped tree over 24 in. (0.61 m) dbh was worth US$2,900 less than 24 in. (0.61 m) or greater trees that were not topped, using CTLA's tree valuation formula (see below). This difference was significant at greater than the 95% level (n = 873, DF = 871, t-statistic = –5.8). The average topped tree rated in only poor to fair condition, while untopped trees were generally rated fair to good.

Value of Tree Resource Is Growing

The CLTA's *Guide to Plant Appraisal* (1992) formula for valuing street trees was used to calculate tree values. This formula relies on a tree's size, species, condition, and location. In general, trees that are bigger or healthier are appraised at a higher value. In 1989, the average value of each Missouri street tree was US$525. By 1999, that value had risen to US$1,167, an annual increase of about 7% (higher than the inflation rate during that period).

Since the size class distribution of trees did not change significantly between 1989 and 1999, and since the average condition actually decreased, this rise in value is due entirely to an improvement in the mix of species and the overall rise in the number of trees documented. The total estimated value of all Missouri's street trees is US$1.3 billion, based on an average tree value of US$1,167, 60 trees per mile (1,609 m), and the total of 18,534 street miles in Missouri urban communities.

Well-Located Trees More Valuable

Trees located in planting areas that will accommodate the mature size and shape of the tree, and that will provide the tree's moisture needs and light requirements, were rated as the "right tree for the right place." Planting the right tree in the right place ensures that the tree will not outgrow its site and interfere with surrounding utilities or structures (Gamstetter 1998). Meeting "right tree in the right place" definition adds to a tree's value.

The average value of "right" trees and "wrong" trees in each size class differed by US$100 and US$2,600 depending on size class, with "right" trees being valued higher. Results in all four size classes were significant at greater than the 99% level (t-statistics 10.9, 10.9, 16.5, and 55, respectively). Much of this is attributable to the better condition of "right" trees, which averaged fair to good. "Wrong" trees averaged only poor to fair in condition.

All three tree locations had about 68% of "right trees in the right place." Communities ranged from a high of 98% of their urban forest being the "right tree in the right place" in Ballwin to a low of 33% in Excelsior Springs.

Community Size Does Not Influence Condition, Size, or Density

No tree trends appeared from the 1999 data correlating community size with tree condition, size, or density. Methodologically, comparisons across towns or across population size classes may be difficult since the same individual surveyors usually surveyed whole towns and all the towns in a region. All surveyors received the same training and followed the same protocols, but any observer bias will most likely show up in comparisons between communities, especially for partially subjective variables such as tree condition and "right tree in the right place."

SUMMARY

The results of the 1999 survey, and comparisons with the 1989 survey, should be helpful for communities in assessing their urban forestry programs. Surveyed communities can determine whether their new trees are succeeding in creating the kind of urban forest desired and can also see where more maintenance is needed. The results of this survey might be extrapolated for other communities to evaluate their urban forestry programs.

During the 10 years between the two surveys, many trees were planted, resulting in the reduction of tree planting spaces. This fact, combined with a decline in the average condition, points to the need for communities to plan on devoting more of their resources and time to tree maintenance. Every attempt should be made to care for existing trees. New trees should not be planted if measures are not in place to properly care for them. The large increase in the number of new tree plantings and the increase in diversity may indicate an increased level of interest in urban forests at the community level and a growing knowledge base.

Planners should continue to choose species that are hardy and well adapted to the planting site. Each community should strive for diversity by utilizing significant numbers of species that are not well represented in their community. Careful consideration should be given to putting the "right tree in the right place," which also increases tree value.

With a present value of US$1.3 billion and a 7% per year average increase in value, trees are a huge benefit to Missouri communities. This benefit improves the quality of life and should be viewed as part of a community's infrastructure.

LITERATURE CITED

Council of Tree & Landscape Appraisers. 1992. Guide for Plant Appraisal (8th ed.). International Society of Arboriculture, Champaign, IL. 41 pp.

Forest ReLeaf of Missouri. Volunteers at Work. Forest ReLeaf of Missouri, St. Louis, MO, pp 8–9.

Gamstetter, D.N. 1998. Proceedings of the 8th National Urban Forestry Conference. American Forests, Washington, DC. 68 pp.

Harris, R.W., J.R. Clark, and N.P. Matheny. 1999. Arboriculture: Integrated Management of Landscape Trees, Shrubs, and Vines. Prentice-Hall, Englewood Cliffs, NJ.

International Society of Arboriculture. 1998. Why Topping Hurts Trees. International Society of Arboriculture, Champaign, IL.

Iles, J. 1989. The case against tree topping. Grounds Maint. 24(6):51, 74.

Karlovich, D.A., J.W. Groninger, and David D. Close. 2000. Tree condition associated with topping in southern Illinois communities. J. Arboric. 26:87–89.

Krebs, Charles J. 1989. Ecological Methodology. Harper Collins, New York, NY.

Missouri Department of Conservation. Annual Report 1998–1999. Missouri Department of Conservation, Jefferson City, MO, pp 45–47.

Poracsky, J., and M. Scott. 1999. Industrial-area street trees in Portland, Oregon. J. Arboric. 25:9–17.

Rocca, J.P. 1992. Survey Shows need for city trees. Missouri Municipal Review. 57(4):20–21.

Wolf, K.L. 1999. Grow for the Gold: Trees in Business Districts. TreeLink, Washington State Department of Natural Resources, Olympia, WA.

[1, 3]*Missouri Department of Conservation*
P.O. Box 180
Jefferson City, MO 65102, U.S.
(573) 751-4115

[2*]*Missouri Department of Conservation*
1110 S. College Avenue
Columbia, MO 65201, U.S.
(573) 882-9880

**Corresponding author*

Résumé. Un suivi de l'inventaire des arbres de 44 municipalités du Missouri a été complété en 1999 par le Département de conservation du Missouri. Ces places-échantillons ont été inventoriées une première fois en 1989 en coopération avec l'Association forestière américaine et le Service forestier américain, et ce dans le cadre d'un inventaire national des forêts urbaines. Ceci est le premier inventaire de suivi effectué par un état. L'information colligée a inclus la localisation de l'arbre, une variable de classement en fonction du critère « du bon arbre en bon endroit », un historique de l'arbre (écimé ou non), et des données spécifiques telles l'espèce, la classe de dimension et la condition. Une comparaison des données a révélé des changements significatifs dans les forêts urbaines du Missouri. Les résultats ont montré qu'il y avait plus d'arbres, mais aussi un déclin de leur condition. Les forêts urbaines du Missouri sont devenues plus diversifiées. Si les six plus importantes espèces constituaient 48% de la forêt urbaine en 1989, cette valeur a diminué à 37% en 1999. La valeur moyenne d'un arbre de rue au Missouri s'élève à 642$.

Zusammenfassung. Eine Nachfolgeuntersuchung von Bäumen in 44 Städten in Missouri wurde 1999 durch das Bundesamt für Erhaltung abgeschlossen. Die Untersuchungsstandorte wurden erstmals 1989 in Kooperation mit der American Forestry Association und dem USDA Forest Service als Teil einer national durchgeführten Studie über Stadtwälder untersucht. Diese Untersuchung war eine der ersten Nachfolgestudien, die durch einen Bundesstaat durchgeführt wurde. Die erhobenen Informationen umfassten Baumstandort, eine kategorische Variable für „Der richtige Baum am richtigen Platz", eine Baumbeschreibung, (gekappt oder nicht) und individuelle Baumdaten wie Art, Größenklasse und Kondition. Ein Vergleich der Daten zeigte signifikante Unterschiede in den Stadtwäldern von Missouri. Die Ergebnisse zeigten mehr Bäume, aber eine Verschlechterung ihrer Kondition. Die Stadtwälder von Missouri werden vielfältiger. Die sechs vorherrschenden Baumarten hatten 1999 einen Anteil von 37% und 1989 einen Anteil von 48% der untersuchten Bäume. Der Durchschnittswert eines Missouri-straßenbaums wuchs auf $ 642.

Resumen. El Departamento de conservación de Missouri realizó un levantamiento del arbolado en 44 pueblos en 1999. Las parcelas de muestreo habían sido levantadas en 1989 en cooperación con la Asociación Forestal Americana y el Servicio Forestal de la USDA como parte de un levantamiento de los bosques urbanos en toda la nación. La información registrada incluye localización del árbol, una variable categórica para "El Árbol Correcto en el Lugar Correcto", historia del árbol (desmochado o no), datos individuales como especies, clase de tamaño y condición. Una comparación de los datos muestra cambios significativos en los bosques urbanos de Missouri. Los resultados enseñan la declinación de muchos árboles. El bosque se está haciendo más diverso. Las seis especies más importantes constituyen el 37% de los árboles levantados en 1999, comparados con los encontrados en 1989. El valor promedio de un árbol urbano en Missouri aumentó a 642 dólares.