HOUSEHOLDER EVALUATIONS OF STREET TREES IN A CHICAGO SUBURB

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Abstract. Residents of Downers Grove, Illinois were surveyed about the street trees in front of their homes and in their neighborhoods. Householders' perceptions of benefits and annoyances of eight street tree species and of five types of neighborhood tree populations were compared. The survey assessed residents' satisfaction with the benefits and annoyances they receive from the trees; the trees' size, shape, and growth rate; and the diversity of tree species and sizes in their neighborhoods.

Research on the aesthetic quality of residential streets in the midwest has shown that street trees are the single strongest positive influence on the perceived quality of the view along the street (1,2,3,4). In these studies, researchers took photographs at systematically selected locations looking along streets. They then showed the photos to groups of people and instructed them to use a rating scale to evaluate the visual quality of each scene. Research using this method has been carried out independently in Ohio and Michigan communities and has yielded statistically comparable models for describing how the visual quality of street corridors varies depending on the numbers and sizes of street trees (6).

These studies provide useful information for managing vegetation in street corridors, but they also have several important limitations:

1. They examine the view looking along the street, more or less as it would be seen by a passing motorist. The visual quality of the view from this perspective is not necessarily the same as it would be from the perspective of a person walking along a sidewalk or viewing the street from a yard or house.
2. While the photographs used in these studies can accurately depict the overall visual character of the street, they do not show the finer visual details of individual trees, nor do they convey important nonvisual benefits and annoyances that homeowners may experience through day-to-day contact with a tree.
3. In almost all of these studies, the photographs depict street trees at a single season of the year, usually summer. They do not show important visual features that appear during other seasons — such as fall color, spring flowers, and winter twig patterns — nor do they capture the dynamic effect of seasons changing throughout the year.
4. The evaluations of visual quality of streets in these studies have usually been made by people who do not actually live in the neighborhoods or communities shown in the photographs. While there is no reason to expect that these evaluations would be different from those of residents of the photographed neighborhoods, in general it would be more desirable for local urban foresters to have street tree evaluations from actual residents of their own communities.

To obtain more detailed knowledge of householders' perceptions of and preferences for the trees in front of their own homes, a survey method has been developed and tested in California cities (7,8). In this method, people are asked to evaluate 1) their overall satisfaction with the street trees in front of their own residences; 2) the importance of various benefits and annoyances associated with these trees; and 3) their satisfaction with attributes of the trees such as size, shape, and growth rate. Significantly different levels of satisfaction, benefits, and annoyances were found for trees of ten different species located in eight California cities (9).

These results provide useful information for California communities to use in making decisions about species selection and maintenance practices

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for their urban street trees. The results of the California survey, however, are not directly applicable to communities in other parts of the country, due to differences in tree species, climate, demography, and other factors that may give rise to different preferences and evaluations. Therefore, this survey methodology is best viewed as a tool that may be applied by individual communities across the country to obtain information from their own residents. As a first step in applying this method to communities outside of California, we used Sommer's survey approach to assess residents' satisfaction with street trees in the Chicago suburb of Downers Grove, Illinois.

Methods

We modified the questionnaire developed by Sommer et al. (8) to add some factors relevant to the Chicago area, to remove factors that were relevant to California but not to the Chicago area, and to include items of specific interest to the Downers Grove Forestry Department. In 1988, the survey was mailed to homes with three different species of trees: hackberry (*Celtis occidentalis*), green ash (*Fraxinus pennsylvanica*), and Kentucky coffee-tree (*Gymnocladus dioicus*). A cover letter told the homeowner that the survey was being conducted by the Downers Grove Forestry Department in conjunction with the U.S. Forest Service and the Morton Arboretum. A postage-paid return envelope was included. In cases where there was more than one street tree in front of a home, a village employee marked the tree to be evaluated with a small spot of paint.

Preliminary results from the first survey were summarized by Schroeder and Ruffolo (5). Two years after the first survey, in 1990, a second survey was mailed out to a new sample of people. This second survey extended the original sample of tree species to include 5 additional types of trees: American linden (*Tilia americana*), honey locust (*Gleditsia triacanthos*), Norway maple (*Acer platanoides*), oak (*Quercus* spp.), and Callery pear (*Pyrus calleryana*). Thus, a total of 8 species of trees were studied.

Also in 1990, a modified version of the tree evaluation survey was mailed to a new sample of residents, to obtain data on people's evaluations

of the trees in their neighborhood as a whole, instead of just about the one tree in front of their home. This survey asked essentially the same questions as the individual tree survey, but in reference to "the trees growing along the street in your immediate neighborhood, that is, within a block or two of your home." Four new questions were also added to this survey, asking people about their perception of the diversity of tree species and sizes in their neighborhood, and about their preference for having uniform or diverse tree sizes and species in their neighborhood.

The neighborhood tree survey was mailed to residents in five neighborhoods, which were designated by the village forester as representing different types of tree populations: 1) even-aged mature trees of a single species (silver maple) with a closed canopy (i.e. tree crowns from opposite sides of the street meet overhead); 2) even-aged mature trees of a single species (green ash) with an open canopy (i.e. tree crowns do not meet over the street); 3) mixed ages and mixed species of trees with a closed canopy; 4) mixed ages and mixed species with an open canopy; and 5) small (immature) trees of mixed species.

Results

A combined total of 662 questionnaires about individual trees were mailed out in 1988 and 1990. Of these, 307 usable questionnaires were returned, for a response rate of 46 percent (Table 1). Questionnaires about neighborhood trees were mailed to 500 homes in 1990. Of these, 233 were returned, for a response rate of 47 percent (Table 2). Responses were tabulated and evaluation ratings were averaged so that comparisons could be made between species of individual trees and types of neighborhood tree populations.

Background Questions

Several background questions were included in the survey to enable us to characterize the people who responded to the surveys. Except in the cases noted below, the background characteristics did not differ significantly among residents who had different species of trees or who lived in different neighborhoods.

The respondents were fairly evenly divided

Table 1. Response rates for individual street tree survey.

Species	Questionnaires mailed	returned	Usable %
American linden	62	31	50
Green ash	93	36	39
Hackberry	90	36	40
Honey locust	100	51	51
Kentucky coffeetree	40	16	40
Norway maple	100	57	57
Oak	89	37	42
Pear	88	43	49

Table 2. Response rates for neighborhood street tree survey.

Neighborhood	Questionnaires mailed	returned	Usable %
Even-age, closed canopy, silver maple	100	53	53
Even-age, open canopy, green ash	100	44	44
Mixed ages, mixed species,closed canopy	100	41	41
Mixed ages, mixed species, open canopy	100	44	44
Mixed species, small trees	100	51	51

between male (53 percent) and female (47 percent). They ranged widely in age. Thirty-seven percent were in their 20's or 30's, 27 percent were in their 40's, and 36 percent were over 50 years of age. Overall, 97 percent of the respondents owned their own homes, and only 3 percent rented. About 72 percent of the respondents did their yard work for themselves, while most of the remainder indicated that yard work was done by other members of the family.

The average length of residence was about 12 years, but this varied somewhat between subgroups within each of the surveys. In the neighborhood survey, residents of the small-tree neighborhood had occupied their homes for a shorter length of time (6.6 years) than residents of the other neighborhoods. In the individual tree survey, people with green ash trees had the shortest length of occupancy (8.7 years), and people with Norway maple had the longest occupancy (16.2 years).

The respondents varied widely in their educational level. Overall, they were relatively well educated. Seventy-one percent had completed a college or technical school degree, and 33 percent of these had gone on to do at least some graduate work. Twenty-nine percent did not go past grade 12. A relatively high number of people chose not to reveal their income. Among those who did respond, 45 percent had incomes below $54,000, and 55 percent had incomes above $54,000.

Overall, the responses to background questions were quite similar across the subgroups of the sample. Thus, with the possible exception of length of residence, it is unlikely that the variations in preferences for street trees reported below are related to differences in these background variables.

Evaluations of Individual Trees

Overall opinion. Residents in the individual tree survey had a generally positive opinion of their trees (Figure 1). Six of the eight species had average ratings between "good" and "very good". Pear, Norway maple, and American linden received the highest ratings. The two lowest rated species, Kentucky Coffeetree and Hackberry, were rated slightly less than "good" in overall opinion.

Benefits. The most important benefits of street trees were visual - "pleasing to the eye" and "enhances look of my yard and house" (Figure 2). Other important benefits include bringing nature closer, increasing property values, and increasing sense of community. For all species combined, the highest rated benefits averaged between "minor" and "moderate" on the benefit scale, with only "pleasing to the eye" rating above moderate.

The least important benefit averaged over all species was "flowers on tree." This reflects the fact that only one of the species examined in this survey had showy flowers. Other benefits that were rated low included specific physical benefits such as "reduces noise," "slows wind speed," and "cools home in summer." The low ratings for these benefits may in part be due to the location of the trees (on the street and not right next to the
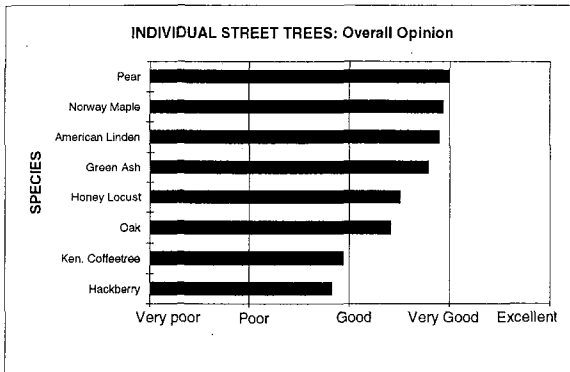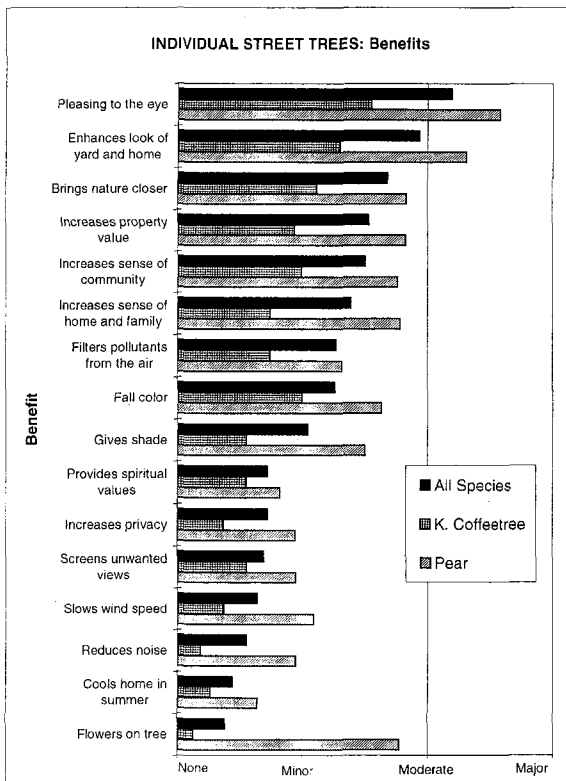
Figure 1

Figure 2

house), which would make them unlikely to have much physical effect on the house itself.

The eight tree species differed significantly in how residents rated their benefits. In general, the trees with the highest overall opinion ratings were also rated higher than other species on several of the specific benefits, and the species with the lowest overall opinion ratings were rated lower on several specific benefits. The profile of benefit

ratings for the most preferred species (pear) and one of the less preferred species (Kentucky Coffeetree) are included in Figure 2. The most striking difference in ratings was for the benefit of "flowers on trees," which for obvious reasons was rated much higher for pear than for any other species.

Annoyances. Overall, annoyances were rated as being much less significant than benefits of individual street trees (Figure 3). Even the strongest annoyance, averaged over all species, was rated as no more than "minor". Although noticeable problems may occur on particular trees, it appears that overall the annoyances of these trees are less prominent in people's minds than their benefits.

For all species combined, the most significant annoyances in the individual tree survey involved falling leaves in autumn, other falling debris, suckers, insect problems, and diseases. The least significant annoyances were those involving the tree blocking the view or making the surroundings too dark or unsafe.

Profiles of annoyance ratings for separate species can shed light on why certain species were rated higher or lower than others. Figure 3 includes profiles for pear and Kentucky coffeetree. Pear trees showed no specific annoyances that were particularly serious compared to the average. Falling flower parts did appear somewhat higher than average as an annoyance for this species, but were far from a serious problem. Kentucky coffeetree, on the other hand, had a relatively serious problem with falling debris. The large pods and compound leaves of this species were seen by many people as creating a litter problem in their yards.

Wildlife. The survey also included questions about the residents' perception of three kinds of animals associated with their trees — birds, bees, and squirrels. Residents were asked whether or not their tree attracted these animals, and if so whether or not this was a problem. Birds were seen as a positive aspect of trees, with 47 percent of the respondents saying that their tree attracted birds, and 69 percent of these saying that the birds were a benefit. Bees and squirrels were substantially less prominent in people's awareness than birds. Twenty-one percent of the respondents
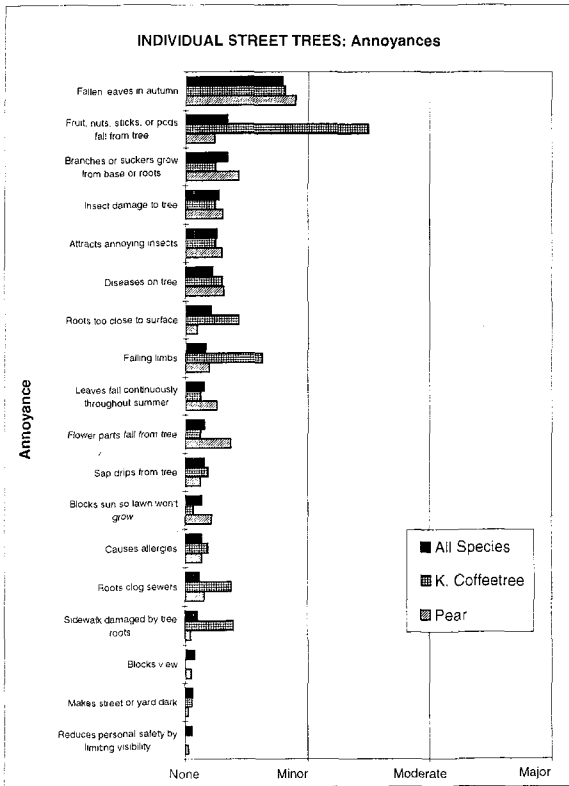
INDIVIDUAL STREET TREES: Annoyances

Figure 3

said that their tree attracted squirrels, while only 8 percent said that their tree attracted bees. Residents with pear trees, however, were much more likely (33 percent) to say that their trees attracted bees. For both squirrels and bees, about 30 percent of the people who said that their trees attracted these animals indicated that the animals were a benefit, while over half said that they were neither a benefit nor an annoyance.

Shape, size, and growth rate. Residents were asked about their satisfaction with the shape, size, and growth rate of their trees (Figure 4). On average, people were satisfied with the form or shape of their tree. Most of the species were rated as somewhat or very attractive in shape. Pear, American linden, and green ash were given the highest ratings for shape. The two lowest rated species, Kentucky coffeetree and hackberry, were rated as neither attractive nor unattractive in shape.

People were less satisfied with the size and growth rate of their trees than with their shape. On average, the respondents rated the size of their

trees as too small. Virtually no one rated their tree as too large. Pear was rated the best of any species on size, and Kentucky coffeetree was rated the worst. Trees were rated somewhat better on growth rate than on size; but again, virtually no one thought that their tree grew too fast. Norway maple had the most desirable growth rate, while oak was rated the worst in terms of its slow growth rate. Kentucky coffeetree and hackberry also were rated low on growth rate.

Evaluations of Neighborhood Trees

Overall opinion. In general, residents in the neighborhood tree survey rated their overall opinion of their neighborhood trees as between "good" and "very good". There were only small differences in overall opinion between the five neighborhoods that were surveyed. The small-tree neighborhood was rated slightly lower than the other neighborhoods, but still averaged about "good" on the
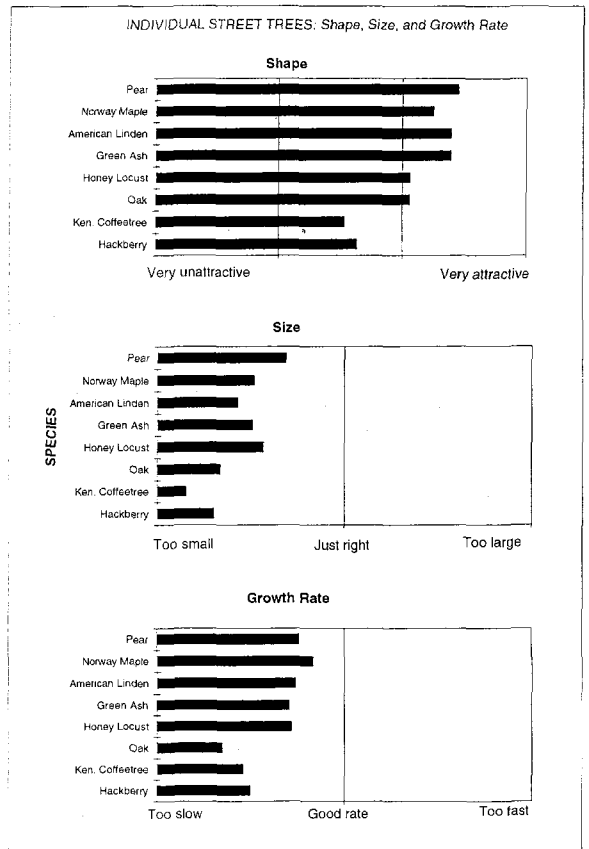

INDIVIDUAL STREET TREES: Shape, Size, and Growth Rate

Figure 4

scale of overall opinion. The other four neighbor-hoods did not differ significantly in overall opinion ratings.

Benefits. As in the individual tree survey, the most important benefits associated with neigh-borhood trees were visual: "pleasing to the eye", and "enhances look of yard and home" (Figure 5). Most benefits were rated significantly higher in the neighborhood tree survey than in the individual tree survey. This suggests that the presence of many trees in a neighborhood has a cumulative effect that is greater than the benefits of any one individual tree. This was especially the case for the benefits of shade and privacy, as well as for the physical benefits of reducing noise, slowing wind speed, and cooling the home.

The significance of benefits also appears to be related to the size of the trees. As would be expected, the small-tree neighborhood was rated lower than the other neighborhoods on most of the benefits. Additionally, the two closed-canopy neighborhoods were rated relatively high on re-ducing wind speed, reducing noise, and increas-ing privacy, while the two mixed-species neigh-borhoods were rated higher than the others on fall color.

Annoyances. Annoyances were all rated sig-nificantly higher in the neighborhood tree survey than in the individual tree survey but overall were still of minor significance compared to the benefits (Figure 6). The most serious annoyances for the neighborhood trees were autumn leaves falling, other falling debris (sticks, pods, etc.), insect damage, sap dripping, roots too close to the surface, and sidewalks damaged by roots.

The even-age, single-species, closed canopy neighborhood stood out as having many more annoyances than the other neighborhoods. This neighborhood consisted predominantly of mature silver maples, and it was rated significantly higher than the other neighborhoods on 12 out of the 18 annoyances on the list. In general, annoyances were rated as less severe in the small-tree neighborhood and in the even-age, single-species (green ash), open-canopy neighborhood than in the other neighborhoods.

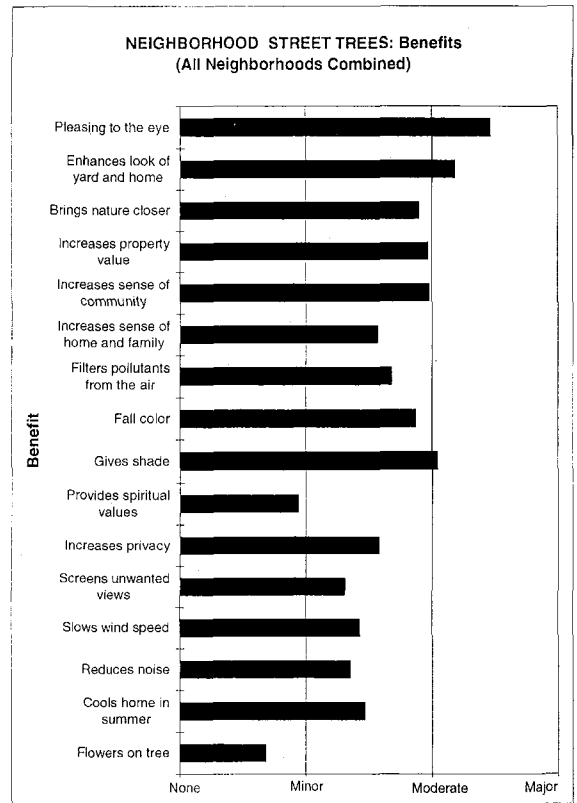**Wildlife.** Birds, bees, and squirrels were a more important factor in the neighborhood tree

Figure 5

survey than in the individual tree survey. Eighty-eight percent of the respondents said that their neighborhood trees attracted birds, 28 percent said the trees attracted bees, and 78 percent said they attracted squirrels. Of these, 84 percent saw birds as a benefit, 27 percent saw bees as a benefit, and 36 percent saw squirrels as a benefit. People in the small-tree neighborhood were less likely to say that their trees attracted birds or squirrels.

Size, growth rate, and shape. As was the case for individual street trees, neighborhood trees in general were seen as attractive in shape, but somewhat too small in size and too slow in growth rate. Not surprisingly, these tree attributes received the lowest ratings in the small-tree neighborhood. Only in the even-age, closed canopy, silver maple neighborhood were the size and growth rate evaluated as "just right". In general, the neighbor-hoods with closed canopies were rated as more satisfactory on tree size and growth rate than were
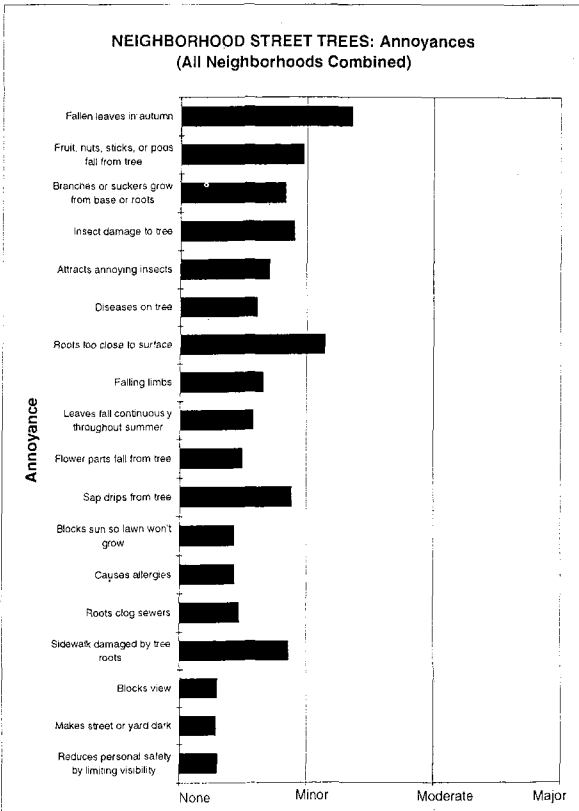
**NEIGHBORHOOD STREET TREES: Annoyances
(All Neighborhoods Combined)**

Figure 6

the neighborhoods with open canopies.

Species and size diversity. An important purpose for conducting the neighborhood survey was to learn about people's perceptions and preferences regarding diversity in their street trees. Questions on the survey addressed both the degree of diversity that people currently perceived in their neighborhood, and the degree of diversity that they would prefer to have. First, residents were asked whether the trees in their neighborhood were mostly the same size or a mixture of sizes. Then they were asked which they would most prefer, to have trees in their neighborhood that are all the same size or a mixture of different sizes. These same two questions were then repeated with respect to diversity of tree species.

Residents' perceptions of both size and species diversity in their neighborhoods (Figure 7, top half) were consistent with the designation of those neighborhoods by the village forester. The neighborhoods designated as having mixed ages

and species were rated much higher on both size diversity and species diversity than were the neighborhoods designated as having even-aged single species. The small-tree neighborhood was rated low on size diversity and high on species diversity. The even-age open-canopy neighborhood was rated somewhat higher than the even-age closed-canopy neighborhood on both size diversity and species diversity.

Residents' preferences for size and species diversity are shown in the bottom half of Figure 7. Residents in all of the neighborhoods showed at least a moderate preference for having diverse tree species in their neighborhoods. This preference was slightly stronger in the two neighborhoods with mixed ages and species than in the even-age single-species neighborhoods. In regard to size diversity, residents seemed to prefer the conditions already existing in the neighborhood where they lived. Those living in mixed age/species neighborhoods expressed a preference for diverse sizes while those living in even-age neighborhoods expressed a preference for uniformly sized trees. Residents of neighborhoods with small trees were
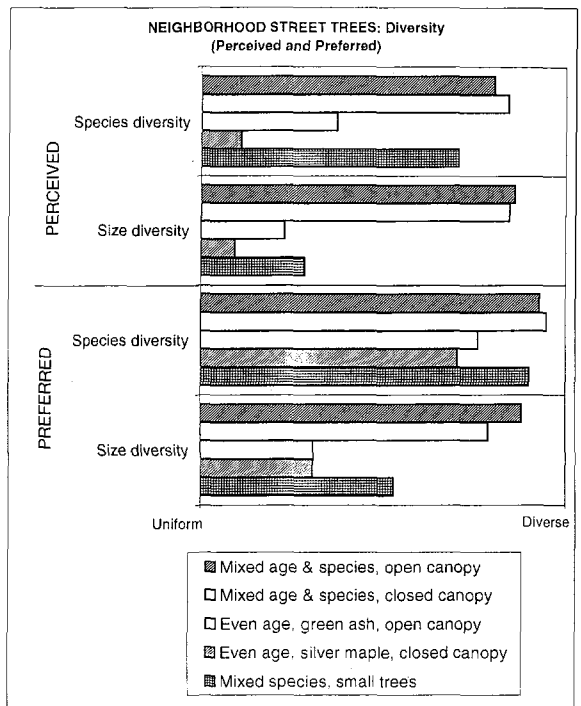

**NEIGHBORHOOD STREET TREES: Diversity
(Perceived and Preferred)**

Mixed age & species, open canopy
Mixed age & species, closed canopy
Even age, green ash, open canopy
Even age, silver maple, closed canopy
Mixed species, small trees

Figure 7

evenly divided on this question.

Discussion

The purpose of this survey was to provide information that would be helpful to the community of Downers Grove for selecting and maintaining trees so as to enhance the quality of neighborhoods for residents. The survey provides a detailed view of the overall level of satisfaction and of the importance of various benefits and annoyances from the point of view of residents who experience these trees in front of their houses and in their neighborhoods. Response rates were very good for a mail survey, suggesting that residents of Downers Grove have a high level of interest in their trees and how they are managed.

The most important benefits involved the visual quality of trees and their contribution to the appearance of the home and yard. Physical benefits such as cooling the air and removing pollutants were seen as relatively minor for individual street trees, but were somewhat more prominent when viewing trees in the neighborhood as a whole.

Overall, the benefits of trees were more prominent and significant than the annoyances. In some cases, however, specific annoyances associated with a particular species led to dissatisfaction with that species. The most notable example was Kentucky coffeetree, which had a problem with falling pods and sticks, and was one of the least preferred species.

While there was a generally high level of satisfaction with existing trees, there was also a strong indication that people would like to have larger, more mature-looking, and faster growing trees. Only in the neighborhood of mature silver maples did residents say that the size of their trees was "just right". The severity of many of the annoyances, however, was also greater in the mature silver maple neighborhood, suggesting that the desired tree size carried a price in the form of increased problems with surface roots, suckers, dripping sap, and falling leaves and debris.

The homeowners' desire for larger and faster growing trees is understandable, but public officials responsible for managing street trees must weigh this desire against the longer term costs of selecting fast growing trees. Many individual residents may

incline toward a short term point of view; some of them may only plan to live in a particular home for 3 or 4 years. Faster growing trees will provide more short-term enjoyment for these residents but will incur greater maintenance and replacement costs over time. The public tree official must take a longer term view of the community's welfare, since trees planted today must serve not only present residents but future residents as well. From this point of view, trees with a slow or moderate growth rate may be the best choice even if they cause some frustration for some current residents.

The survey demonstrated that people can accurately perceive the degree of species and size diversity of tree populations in the neighborhoods where they live. Overall, people said that they preferred a diversity of species. This suggests that efforts to avoid street tree monoculture and its attendant hazards would be well-accepted by these residents. Preference ratings for size diversity, on the other hand, suggest that people tend to prefer the degree of size diversity that they already have in their neighborhood. Thus it is possible that people in even-aged neighborhoods might initially be displeased with efforts to increase the size diversity of trees in their neighborhoods, but that they may come to prefer the increased diversity after they have become used to it.

Caution should be exercised in generalizing these results to other neighborhoods and communities, since the responses to this survey may have been influenced by factors specific to these particular neighborhoods at the time of the survey. In particular, the results for individual species must be interpreted relative to the age and size of the existing trees in these neighborhoods. Certain important benefits of trees, for example shade, are proportional to the size of the trees, and many of the individual trees represented in this survey probably had not yet reached their full, mature size. The results should therefore be interpreted as a "snap-shot" of the benefits provided by these trees at one moment in their life-span, and not as an assessment of the value of the trees over their entire life. In future applications of this survey method, it would be desirable to collect information on the actual sizes and ages of the trees

(instead of just the residents' perceptions of adequacy of size), to aid in interpreting the responses that people give.

Conclusion

We feel that this survey methodology provides a simple and effective way of assessing the performance of a community's street trees and of guiding future tree selection, planting, and maintenance. The data can be easily tabulated and displayed using spreadsheet software of the kind typically found on personal computers. Sophisticated statistical tests, while desirable for scientific purposes, are not essential for interpreting the basic results. Copies of the survey forms and details on the research procedures are available through consultation with the first author of this paper. We hope that other communities will benefit from applying this approach to understanding their residents' satisfaction with their street trees.

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Zusammenfassung. Die Anwohner von Downers Grove, Illinois wurden über die Bäume vor ihrem Haus und in der Nachbarschaft befragt. Die Ansichten der Hauseigentümer über die Vorteile und Nachteile von acht Straßenbaumarten und fünf Typen von benachbarten Pflanzengesellschaften wurden miteinander vorglichen. Die Umfrage überprüfte die Befriedigung der Anwohner über die Vorzüge und die Ärgernisse, die die Bäume verursachen; z.B. Die Baumgröße, Aussehen und Wachstumsrate, die Artenvielfalt und unterschiedliche Größe der Bäume in der Nachbarschaft.