

## Research Note

## AN EVALUATION OF TREE DESCRIPTIONS IN A POPULAR GARDEN GUIDE

by Robert Sommer and Joshua Summit

Across the United States, tree planting programs are being implemented through new public-private partnerships. Many programs offer neighborhood residents choices among trees from a prepared species list. Confronted with the task, how is the homeowner who lacks training in arboriculture to make an informed choice? One of the most likely strategies is to consult a garden guide. In the western United States, the most probable information resource to be consulted is the *Sunset Western Garden Book*<sup>1</sup> published by the editors of *Sunset* magazine (6). First published in 1933, and now in its 5th edition with over 4 million copies in print, this is a generally well-respected garden guide. Because of its prominence, we wanted to learn the degree to which its descriptions of street trees were consistent with information collected from other sources.

As part of a larger study of public perceptions of street trees, we had available the ratings of 8 species by tree professionals, householders with the trees planted in front of their homes, and from individuals viewing slides (4). The 8 species were currently planted in Redwood City or Sunnyvale, California, and consisted of the southern magnolia (*Magnolia grandiflora*), American sweetgum (*Liquidambar styraciflua*), Chinese pistache (*Pistacia chinensis*), Australian willow (*Geijera parviflora*), fern pine (*Podocarpus gracillior*), Chinese hackberry (*Celtis chinensis*), American sycamore (*Platanus occidentalis*), and the Modesto ash (*Fraxinus velutina* 'Modesto'). These had been selected by the city arborists as species about which they desired additional information about public acceptance.

The following research questions were addressed in the present study:

1. To what degree are homeowners able to rate the characteristics of street trees on

the basis of the garden guide descriptions with identifying labels removed?

2. Are there consistent patterns of variation among the species in regard to the rated characteristics?
3. To what degree will the ratings made on the basis of the garden guide descriptions agree with ratings made by professionals, householders experienced with the trees, and individuals viewing slides of the same species?

### Method

Descriptions of the 8 species, including small illustrations of the full canopy and leaf area detail, were photocopied from the garden guide. All references to the genus or species were removed as was information about climate zones. Since all 8 species were classified as appropriate for Redwood City and Sunnyvale, there seemed little reason for asking respondents to make this determination. Figure 1 shows the description of one of the species, as it was presented to the respondents. Below each description was a scale along which respondents rated tree attributes from *very good* to *very poor*, with a separate column for attributes that could not be rated.

Questionnaires were distributed personally to 29 northern California homeowners, none of whom had any special training in horticulture or arboriculture. Most were either clerical workers or university faculty in fields not associated with horticulture. All were selected as people who might consult the garden guide when confronted with the task of selecting a street tree. Of the 29 questionnaires distributed, 26 were returned in time for the tabulation, and one arrived late.

When the descriptions from the garden guide were being photocopied, it was noted that the sec-

1. To avoid needless repetition of its full title, this book will be referred to as the "garden guide" in this paper.

Deciduous trees.

Valuable for form, foliage, and fall color, easy culture. Moderate growth rate; young and middle-aged trees generally upright, somewhat cone shaped, spreading in age. Lobed, maple-like leaves. Flowers inconspicuous; fruits are spiny balls which ornament trees in winter. need raking in spring.

Give neutral or slightly acid good garden soil; chlorosis in strongly alkaline soils is hard to correct. Plant from containers or from ball and burlap; be sure roots are not can-bound. Stake well. Prune only to shape. Trees branch from ground up and look most natural that way, but can be pruned high for easier foot traffic.

Good street trees. Form surface roots which can be nuisance in lawns or parking strips. Effective in tall screens or groves, planted 6-10 ft. apart. Brilliant fall foliage. Leaves color best when trees are in full sun and well-drained soil; fall color less effective in mild-est climates or in mild, late autumns.

For best appearance, should be watered deeply once a month in heavy soils, twice a month in sandy soils through dry season.



Grows

to 60 ft. (much taller in its native eastern U.S.). Narrow and erect in youth, with lower limbs eventually spreading to 20-25 ft. Tolerates damp soil; resistant to oak root fungus. Good all-year tree. In winter, branching pattern, furrowed bark, corky wings on twigs, and hanging fruit give interest; in spring and summer, leaves (5-7 lobed, 3-7 in. wide) are deep green; in fall, leaves turn purple, yellow, or red. Even seedling trees give good color (which may vary somewhat from year to year), but for uniformity, match trees while they are in fall color or buy budded trees of a named variety.

**Figure 1. Garden guide description of the American sweetgum rated by respondents. All references to genus or species were omitted.**

tion on the southern magnolia was much longer than that of the other species. To remove this as a source of bias, and also to avoid overtaxing the judges with such a lengthy section, several pages of material were omitted, including a section on "magnolia culture" that unfortunately included the only mention of disease problems in the 7 pages devoted to the species. As a consequence of this omission, 20 of the 26 respondents declined to rate this species as to disease resistance. It is likely that the remaining 6 individuals, including at least one who stated this directly to the researchers, identified the species from its description, and rated it according to prior knowledge. However, the fact that two-thirds of the respondents declined to rate the species because the relevant information was not included suggests that the raters took the task seriously, and that the ratings are based largely on the material presented. In this respect,

the researchers' mistake produced a serendipitous test of validity. When key information was omitted, most of the respondents declined to give a rating.

**Results**

The first question was whether lay judges without benefit of training in horticulture would be able to rate street trees on the basis of the information provided in the *Western Garden Guide*, with identifying labels removed. The answer is seen in the percentage of respondents willing to make ratings on each attribute. Table 1 shows that on 4 of the attributes on the rating scale, the answer is clearly affirmative. Disease resistance (except for the southern magnolia, for which the information had been inadvertently omitted by the researchers) was rated by 97% of the respondents, overall suitability and attractiveness by 95%, and shade by 93% of the respondents. However, the absence of root problems was rated by only 66% of the sample. In terms of individual species, the absence of root problems in the Modesto ash was rated by only 31% of the respondents, the American sycamore by 50%, the Chinese pistache by 54%, and the southern magnolia and the fern willow each by 58% of the respondents. The lack of information about root problems in the descriptions is noteworthy in the case of the Modesto ash, the American sycamore, and the southern magnolia, since our other sources of information indicated significant sidewalk damage associated with these species.

**Table 1. Ratings of street trees based on garden guide descriptions.**

Species	ATTRIBUTE RATED (5 = VERY GOOD; 1 = VERY POOR)									
	Visual attract.		Shade		Disease resist.		Abs. of root prob.		Overall suitability	
	Mean	N	Mean	N	Mean	N	Mean	N	Mean	N
Chin. pistache	4.1	25	4.0	24	3.4	25	4.3	14	3.9	24
So. magnolia	4.4	25	4.3	24	3.3	6	1.4	25	2.4	25
Chin. hackberry	4.0	25	4.0	24	4.2	26	4.7	24	4.0	25
Modesto ash	3.7	23	4.1	26	2.2	26	3.5	8	2.8	25
Austral. willow	4.1	24	2.9	25	4.7	23	4.7	22	4.0	23
Amer. sweetgum	4.4	26	3.7	23	3.8	25	2.0	26	3.4	26
Amer. sycamore	4.2	24	4.4	25	2.6	26	3.5	13	3.5	26
Fern pine	4.5	25	3.5	22	4.6	25	4.3	15	4.0	24

ANOVA tests for correlated measures were computed separately for the 5 scale attributes, followed by Scheffé F tests comparing pairs of species on the attribute. This statistical test employed the most appropriate error term for assessing the differences between pairs of species, but required the elimination of any instance in which an individual had not rated any one of the 8 species on a particular dimension. However, the means for the subsamples, with all missing values removed, were virtually identical to the means of the 8 species using all cases.

*Visual Attractiveness.* Twenty-three respondents rated all 8 species on this dimension. The ratings clustered at the favorable end of the scale. Scheffé tests did not show that any of the means differed significantly from the others.

*Shade.* There were 17 individuals who rated all 8 species on shade based on the garden guide descriptions. The differences between means were highly significant:  $F(7/135) = 6.11, p < 0.001$ . The southern magnolia and the American sycamore were rated highest on shade and the Australian willow the lowest. Scheffé tests revealed that the Australian willow was rated significantly worse on shade than 5 of the other species.

*Disease Resistance.* For the ANOVA tests, there seemed little value in including the 6 individuals who rated the southern magnolia on this dimension. Instead, the ANOVA was based on the 23 respondents who rated the remaining 7 species. Highly significant variation was noted among the 7 species rated for disease resistance, ranging from the Australian willow, which received very high ratings, to the Modesto ash and American sycamore, which were rated low.

*Absence of Root Problems.* Highest ratings on the absence of root problems were given to the Chinese hackberry and the Australian willow. Among the lowest ratings for any dimension were those given to the southern magnolia and the American sweetgum because of their root problems.

*Overall Suitability.* Twenty-two respondents rated all 8 species on overall suitability. The Chinese hackberry and the Australian willow were rated highest, and the southern magnolia and Modesto ash lowest in overall suitability based on

the garden guide descriptions. Scheffé tests showed that the southern magnolia was rated lower on overall suitability than 6 other species, and the Modesto ash significantly lower than 4 other species.

### **Relationship with Other Information Sources**

Mean ratings for each attribute based on the garden guide descriptions were correlated with comparable means obtained in earlier studies of householder attitudes toward the 8 species, professionals' assessment of the same species, and ratings of the 8 species based on slide presentations. Detailed information on the other studies has been published (2,3,5); therefore, only the highlights of the methods will be described here.

*Householder Survey.* A list of houses associated with each species was obtained, and visits made to the neighborhood to verify the presence of the trees. From this list, the residents of the approximately 80 houses associated with each species were sent questionnaires. Questions covered the benefits and annoyances of the particular street tree, satisfaction with city maintenance, and various demographic items.

*Professional Survey.* Questionnaires accompanied by a cover letter and stamped return envelope were mailed to 57 arborists, 48 landscape architects, and 107 garden supply firms in the same geographic area. The 4-page questionnaire requested ratings of the 8 species used in the householder survey along 5-point scales, from *very good* to *very poor*. Subsequent analysis established that the ratings from the 3 types of professionals were sufficiently similar to allow consolidation into a single category of expert judgment.

*Slide Presentation.* From the list of addresses associated with the 8 species, a random sample was selected of 5 primary plus 2 alternate addresses. A photographer was dispatched to these locations to photograph each tree, taking both full tree and base area views. This produced a series of 80 slides, consisting of 5 full tree and 5 base area views of the 8 species. The slide series was shown to a class of university students, who rated each species on selected attributes along 5-point scales, from *very good* to *very poor*, with an additional column for trees that could not be rated.

**Table 2. Relationship between garden guide descriptions and ratings by professionals, householders, and slide viewers.**

Attribute rated	Pearson correlations (r) between garden guide descriptions and ratings made by:		
	Professionals	Householders	Slide Viewers
Visual attractiveness	.12	-.23	-.25
Shade	.93**	.72*	.85**
Disease resistance	.89**	.86*	— <sup>1</sup>
Abs. of root problems	.91**	.77*	.66
Overall suitability	.61	.21	-.51

\*p < 0.05.

\*\*p < 0.01.

<sup>1</sup>Not included in procedure.

Table 2 shows the Pearson coefficients between the species means from the garden guide ratings and the comparable means obtained in the other procedures.

*Visual Attractiveness.* Ratings on attractiveness based on the garden guide descriptions did not correlate with the ratings in the other procedures. This is not surprising, since all of the species were rated high on visual attractiveness based on the garden guide descriptions, with no significant differences among species. This made it unlikely that these ratings could correlate significantly with those obtained in other procedures.

*Shade.* There were significant correlations between the ratings on shade based on the garden guide descriptions and the ratings given by professionals, householders, and individuals viewing slides of the 8 species. Apparently the garden guide captures those aspects of shade measured in the other procedures.

*Disease Resistance.* Ratings of disease resistance made on the basis of the garden guide descriptions correlated significantly with the ratings given by professionals and by householders. No ratings of disease resistance were obtained in the slide presentations, since this did not seem an attribute that could appropriately be rated by lay respondents viewing slides.

*Absence of Root Problems.* Ratings on this attribute made from the garden guide descriptions correlated significantly with ratings made by professionals and householders. The correlation with ratings given by slide viewers was positive but only marginally significant ( $r = 0.66, p = 0.10$ ).

*Overall Suitability.* There was a marginally significant trend for the garden guide ratings to agree with those made by professionals ( $r = 0.61, p = 0.10$ ). However, no relationship existed between the garden guide ratings and those given to the same species by householders, and there were *major differences* between the garden guide ratings and those given by people viewing slides of the same species ( $r = -0.51, p = NS$ ). Because of their attractive canopies, the southern magnolia and the Modesto ash were both rated favorably by respondents viewing slides, but people reading the garden guide descriptions (which descriptions included many problems associated with the 2 species) rated them near the bottom. Conversely, the Australian willow was rated favorably on the basis of its garden guide description, since no problems were described, but was rated low by individuals viewing slides taken after the 1990 freeze, which seriously damaged many Australian willows planted in the Redwood City and Sunnyvale areas.

Kendall's coefficient of concordance (W) is a nonparametric test of agreement between several different rankings of a number of items, whose magnitude ranges from 0 (no agreement) to 1 (perfect agreement). Table 3 shows the coefficients of concordance for each attribute.

Visual aesthetics was rated in all 4 procedures. The coefficient of concordance among the procedures was 0.42, which was not significant. The fern pine received high ratings based on the garden guide descriptions, but rated comparatively low by individuals viewing slides of it in their front yards, while the reverse was true of the Modesto ash.

**Table 3. Kendall's coefficients of concordance (W) for all attributes.**

Attribute rated	Correlation between garden guide, professional survey, householder survey, and slide ratings	
	W	P
Visual attractiveness	.42	NS
Shade	.83	.01
Disease resistance <sup>1</sup>	.87	.01
Abs. of root problems	.85	.01
Overall suitability	-.25	NS

\*p < 0.05; \*\*p < 0.01.

<sup>1</sup>Not included in procedure.

There was substantial agreement among the 4 procedures on shade,  $W = 0.83$ ,  $p < 0.01$ . The American sycamore and Modesto ash received high ratings on shade under all conditions, while the Australian willow and fern pine received low ratings on this dimension in all conditions.

Because of the inadvertent omission of information regarding disease problems for the southern magnolia, this species was omitted from the comparison. For the remaining 7 species, there was substantial agreement between the garden guide descriptions, professionals' ratings, and householder surveys,  $W = 0.87$ ,  $p < 0.01$ . The Australian willow and the fern pine received high ratings on disease resistance in these procedures, and the American sweetgum and the Modesto ash received low ratings.

Significant agreement existed among the 4 procedures on absence of root problems,  $W = 0.85$ ,  $p < 0.01$ . In every procedure the Australian willow, fern pine, and the Chinese pistache were considered to have few root problems and the southern magnolia to have serious root problems.

There was little agreement among the 4 procedures in judging the overall suitability of the 8 species,  $W = 0.25$ ,  $p = \text{NS}$ .

## Discussion

The garden guide provided sufficient information for homeowners without any special training in horticulture to rate most attributes of the 8 tree species. The one issue on which the garden guide provided insufficient information was problems caused by roots, on which one-third of the respondents were unable to give ratings. The garden guide descriptions made all of the species appear attractive, perhaps consistent with the philosophical view that nothing in nature can be ugly.

The lack of correspondence in overall suitability reflects a well-documented finding in sensory evaluation, for which there is typically better agreement in rating single attributes than overall preference. Ratings of overall preference are affected both by the internal variation in rating single attributes and differences in how these attributes are weighted. The garden guide editors appear to have finessed this issue by *not* providing indices of overall suitability, instead leaving synthesis to

the readers. The present study indicates that most readers can arrive at such judgments on their own, and that their judgments are likely to agree with those made by tree professionals.

The marginally negative relationship between the ratings of overall suitability made from the garden guide descriptions and from slide images has methodological implications, since slide images are frequently used in landscape assessment (1). The present study confirms the earlier finding (4), that slides can adequately convey visual characteristics, but judgments of tree suitability depend on additional factors that cannot be adequately assessed from slides.

**Acknowledgments.** This research was supported by a cooperative agreement with the North Central Forest Experiment Station.

## Literature Cited

1. Craik, K., and Feimer, N. 1987. Environmental assessment, pp. 891-918. In Stokols, D., and Altman, I. (eds). *Handbook of Environmental Psychology*. Wiley, New York.
2. Sommer, R., Cecchetti, C. L., and Guenther, H. 1992. *Agreement among arborists, gardeners, and landscape architects in rating street trees*. *J. Arboric.* 18: 252-256.
3. Sommer, R., Guenther, H., and Barker, P.A. 1990. *Surveying householder response to street trees*. *Landscape J.* 9: 79-85.
4. Sommer, R., Guenther, H. Barker, P.A., and Swenson, J.P. 1993. *Comparison of four methods of street tree assessment*. *J. Arboric.* 19: 27-34.
5. Sommer, R., Summit, J., and Clements, A. 1993. *Slide rating of street tree attributes*. *Landscape J.* 12: 17-22.
6. Sunset Magazine Editors. 1990. *Sunset Western Garden Book*, 5th ed. Sunset Publishing Corporation, Menlo Park, CA.

*Department of Psychology  
University of California, Davis,  
Davis, CA 95616-8686*