AGREEMENT AMONG ARBORISTS, GARDENERS, AND LANDSCAPE ARCHITECTS IN RATING STREET TREES

by Robert Sommer, Christina L. Cecchettini, and Hartmut Guenther

Professional judgment plays a major role in selecting street trees, most often in the compilation of regional lists. Little information is available as to the degree of agreement among members of different professions involved with street tree selection. Based on their training, it is possible that landscape architects are most sensitive to visual aesthetics in choosing trees, city arborists will be most concerned with cost, growth, and liability issues, while professional gardeners would be concerned primarily with tree maintenance. If professions differ markedly from one another in suitability ratings, it will be necessary to secure representation from the other professions in order to ensure attention to all relevant factors in tree selection.

The present study examines the degree of agreement among arborists, professional gardeners, and landscape architects regarding the suitability of eight species of street trees currently planted in their area. A subsidiary question involves the value of mail surveys as a tool for assessing practitioner opinions of tree species planted locally. The questionnaire is an extraordinarily efficient tool for collecting evaluations from a large number of practitioners, and if this approach can be used successfully in collecting street tree evaluations, this may have important ramifications for compiling regional and statewide lists using a broad pool of qualified individuals representing different professions.

Method

The present study took place in the south San Francisco Bay area, in and around the cities of Sunnyvale and Redwood City, CA. Three relevant professions were identified, each containing a sufficient number of local practitioners for a mail survey: 1) certified arborists belonging to the Western Chapter of the International Society of Arboriculture, 2) registered landscape architects practicing in the area, and 3) professional gardeners and tree maintenance firms listed in city telephone directories. Questionnaires were sent to individuals accompanied by a cover letter and stamped, self-addressed, return envelopes. Each respondent was asked to rate eight street tree species along nine dimensions: visual aesthetics, shade, drought tolerance, droppings/debris, disease and insect resistance, pruning requirements, problems caused by roots, growth rate of mature trees, and overall suitability as a street tree. Characteristics were rated along 5-point scales from *very good* to *very poor,* with an additional column for *unable to rate.* In addition, respondents were asked to list their membership in professional organizations, certificates and licenses, length of experience, and previous involvement in street tree selection and maintenance.

The eight species rated were *Magnolia grandiflora* (Southern magnolia), *Liquidambar styraciflua* (American sweetgum), *Pistacia chinensis* (Chinese pistache), *Geijera parviflora* (Australian willow), *Podocarpus gracilior* (Fern pine), *Celtis sinensis* (Chinese hackberry), *Platanus occidentalis* (American sycamore), and *Fraxinus velutina* 'Modesto' (Modesto ash). All eight species are currently planted in Redwood City and Sunnyvale and selected by the city arborists as species about which they desired additional information or public response.

Sample characteristics. Our goal in the mail survey was to obtain 20-25 returned questionnaires from members of each profession. Since

most of the arborists and landscape architects were identified by name, we expected a better return from them than from gardeners, most of whose questionnaires would be sent only to a company name. Thus a larger number of questionnaires was sent to gardeners in order to obtain the desired number of replies.

Questionnaires were mailed to 57 arborists, 48 landscape architects, and 107 garden supply firms in the south San Francisco Bay area. Usable replies were received from 28 arborists, 20 landscape architects, and 25 gardeners. The three groups had considerable experience in their respective fields. Arborists averaged 16.5 years (range 3-35 years), gardeners 20.9 years (10-40 years) and landscape architects 20.8 years (range 10-50 years). The difference in length of experience among the three professions was not statistically significant.

Significantly more landscape architects (89%) and arborists (79%) than gardeners (48%) had been involved in street tree selection, while significantly more arborists (89%) than either gardeners (56%) or landscape architects (28%) had been involved with street tree maintenance.

Results

Comparison of Species. Table 1 shows the mean rating for each species along each of the nine dimensions for the combined sample. ANOVA tests were used to test overall differences among species, followed by Scheffé tests for multiple comparisons.

Overall Suitability. The top-rated trees were the Chinese pistache which was rated significantly higher than five of the other species, and the Chinese hackberry, which was rated significantly higher than four other species.

Visual Aesthetics. The top-rated trees in aesthetics were the Chinese pistache and American sweetgum, each of which was rated significantly higher than the two lowest-rated species, the fern pine and the Australian willow.

Shade. The American sycamore was rated as significantly superior in shade to five other species, and the Modesto ash to four other species.

Drought Tolerance. The Chinese pistache was rated as significantly better than two other species while the Australian willow was rated as significantly better than three other species.

Droppings and Debris. The Australian willow

Table 1. Mean rating for eight street tree species.

| Species [a] | Mean rating by practitioners (5=very good; 1= very poor) | | | | | | | | | |
	1	2	3	4	5	6	7	8	ANOVA F	p
Visual aesthetics	4.2	4.4	4.3	3.5	3.6	4.1	4.0	3.9	8.6	.001
Shade	4.1	3.8	3.5	3.1	3.2	4.5	3.8	4.3	25.1	.001
Drought tolerance	2.8	4.1	2.7	4.0	3.2	3.5	3.8	3.7	21.0	.001
Debris	2.3	3.4	2.2	4.1	3.5	2.4	3.4	2.9	26.1	.001
Disease resistance	4.0	3.7	3.6	3.8	3.7	2.6	3.6	2.6	20.3	.001
Pruning requirements	3.6	3.2	3.4	3.4	3.3	3.1	3.3	2.7	4.9	.001
Root problems	2.1	3.8	1.7	3.7	3.6	3.2	3.5	2.6	38.1	.001
Growth rate	3.4	3.5	3.6	3.4	3.3	3.8	3.6	3.4	1.7	.NS
Overall suitability	2.9	4.1	2.6	3.2	2.9	3.2	3.8	2.8	14.9	.001

[a] 1. *Magnolia grandiflora,* 2. *Pistacia chinensis,* 3. *Liquidambar styraciflua,* 4. *Geijera parviflora,* 5. *Podocarpus gracilior,* 6. *Platanus occidentalis,* 7. *Celtis sinensis,* 8. *Fraxinus velutina.*

was rated as superior to five other species and the fern pine to three other species.

Disease and Insect Resistance. The American sycamore and Modesto ash were tied for last place; each was rated as significantly worse in disease and insect resistance than the remaining six species.

Pruning Requirements. The Modesto ash was seen as having significantly more pruning requirements than three other species.

Root Problems. Two species, the American sweetgum and the southern magnolia, fared poorly on this dimension. The sweetgum had significantly more root problems than six other species, and the southern magnolia than five other species.

Growth Rate of Mature Trees. There were no significant differences among the eight species on this dimension.

Agreement among professions. The Kendall coefficient of concordance (W) was used to test the degree of agreement among the three professions on each dimension. The most striking aspect of Table 2 was the high degree of agreement among the three occupational groups. Looking at the overall ratings of the eight street trees in Table 2, the coefficient of concordance (W) was .78, p <.01. Of the specific characteristics rated, the highest degree of agreement was in regard to shade and debris, followed by root problems, and drought tolerance. The only characteristic where there was not significant agreement was growth characteristics of mature trees.

There were significant interactions between species and professions on all rated dimensions. However, these did not fall into clear patterns. Gardeners had the most favorable opinion among the tree groups toward the sweetgum and Modesto ash, while landscape architects had the most favorable opinions of the American sycamore. For the other five species, no clear trends emerged.

Written comments. The rating scale for each species was followed by a blank space for comments. The professional groups differed in the extent to which they wrote comments. Fifty-seven percent of the arborists made comments, compared with 36 percent of landscape architects, and 18 percent of gardeners, $F_{(2/23)} = 36.8$, p

Table 2. Agreement among professions in evaluating species characteristics.

Characteristics	Coefficient of concordance (W)	p
Shade	.94	.01
Debris	.90	.01
Root problems	.81	.02
Overall suitability	.78	.02
Drought tolerance	.77	.02
Pruning requirements	.75	.05
Visual aesthetics	.68	.05
Disease resistance	.67	.05
Growth rate of mature trees	.47	NS

<.001. Some respondents wrote general compliments (e.g., "Good choice") or criticisms (e.g., "Don't plant!") without mentioning specific characteristics. The Chinese pistache and fern pine received six and five general compliments, respectively, and no general complaints. Conversely, the Modesto ash and Southern magnolia received three and two general complaints, respectively and no general compliments.

Table 3 summarizes the specific complaints offered about each of the eight species. It should be noted that these are spontaneous comments, offered in addition to the ratings made on the scale. Undoubtedly there were many respondents who felt a low rating on a dimension was sufficient without the need for elaboration in the comments section. The American sweetgum and southern magnolia were criticized for severe root and debris problems, the Australian willow and fern pine for susceptibility to frost, and American sycamore and Modesto ash for susceptibility to disease. There was a significant relationship between overall ratings of tree suitability and the number of problems mentioned for each tree in the comments section (r = .75, p <.05); the Chinese pistache and Chinese hackberry were top-ranked trees by the professionals in regard to overall suitability, and also had the least number of problems mentioned in the comments section.

Table 3. Number of times problems were cited in comment section.

| | Number of times problems were cited Species [a] | | | | | | | | |
Problem	1	2	3	4	5	6	7	8	Total
Susceptibility to cold	0	0	0	26	23	0	0	0	49
Root damage	11	0	21	0	0	5	1	5	43
Disease resistance	2	5	0	0	0	15	0	15	37
Debris, mess	9	3	15	0	0	7	0	2	36
Needs pruning	3	4	1	5	4	1	2	3	23
Poor form	0	8	3	4	2	1	1	2	21
Excessive size	0	0	0	0	0	5	1	2	8
Slow growing	3	1	0	0	3	0	0	0	7
Insects	0	0	0	1	0	1	0	5	7
Wind damage	2	0	1	0	0	0	0	2	5
Drought intolerant	2	0	2	0	0	0	0	0	4
Lack of nursery stock	0	3	0	1	0	0	0	0	4
Other	2	0	1	3	4	2	2	2	16
Total	34	24	44	40	36	37	7	38	260

[a] 1. *Magnolia grandiflora*, 2. *Pistacia chinensis*, 3. *Liquidambar styraciflua*, 4. *Geijera parviflora*, 5. *Podocarpus gracilior*, 6. *Platanus occidentalis*, 7. *Celtis sinensis*, 8. *Fraxinus velutina*.

Discussion

Street tree agencies and homeowners depend heavily on expert judgment in determining the suitability of species for local areas. The high degree of consensus among members of different professions in rating individual species supports the reliability of present procedures for obtaining professional evaluation of tree suitability. Committees for selecting street trees can be constituted using members of the same or different tree-related professions without fear that this will unduly influence the outcome of the ratings.

Gardeners were more reticent about making comments than either arborists or landscape architects. This difference is even more substantial in the context of a 51 percent return rate for arborists compared with 25 percent for gardeners. In any attempt to obtain systematic tree evaluations from gardeners, special efforts should be made to address questionnaires to individuals by name and encourage them to provide additional comments.

The surveys also produced practical information for the parks department in the two cities. Practitioners are a storehouse of valuable experience about individual varieties planted in their area. Survey research provides a means of tapping this experience and making it available for local or regional dissemination.

Earlier papers from our research team explored the value of surveys of residents' opinions of trees planted in front of their homes (1, 2). It was inherent in this approach that lay residents be asked only about the single species with which they had first-hand experience. In contrast, the wealth of experience among the practitioners in the present sample, opens up a wider range of survey possibilities. The present questionnaire, covering eight species and nine characteristics, took only a few minutes to complete. With statewide or regional coordination, an expanded questionnaire could be used to assess all species planted

within an area, in order to produce a computerized databank of professional opinion, which would include not only quantitative ratings but also qualitative comments on species characteristics and maintenance. Our experience in the dissemination of survey results indicates that many tree agencies and practitioners were more interested in specific experiential comments than a mass of statistics. This suggests the importance of making available both quantitative and qualitative information. We hope that other researchers can use the method in other regions with different species.

Literature Cited
1. Sommer, R, and C. L. Cecchettini. *Location and sidewalk management preferences of urban householders.* J. Arboric. J. Arboric 18:188-191.
2. Sommer, R., H. Guenther, and P.A. Barker. 1990. *Surveying householder response to street trees. Landscape J. 9: 79-85.*

Department of Environmental Design
University of California
Davis, California 95616