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Key Words: Urban tree benefits; urban tree annoyances; socioeconomic variables

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ASSESSING RESIDENTS' WILLINGNESS TO PAY TO PRESERVE THE COMMUNITY URBAN FOREST: A SMALL-CITY CASE STUDY

by Alfredo B. Lorenzo¹, Catalino A. Blanche², Yadong Qi³, and Malcolm M. Guidry⁴

Abstract. Residents' willingness to pay for community urban forest preservation was assessed using a survey questionnaire mailed to 3,009 households in the city of Mandeville, a suburb of New Orleans, Louisiana, United States. Survey responses indicated the following: 1) residents' willingness to pay for urban forest protection and preservation is positively associated with their perceptions of the benefits of trees but negatively associated with their perceptions of the annoying features of trees; 2) the willingness to pay a higher premium (>\$12) for tree preservation and protection is directly related to income levels; 3) more female than male respondents are willing to pay \$6 to \$12 per year for tree preservation but more male than female respondents are willing to pay more than \$12 per year for tree preservation; 4) age, level of education, and type of residential ownership are not significantly associated with willingness to pay for tree preservation and protection; 5) more than 80% of respondents view the protection and preservation of urban trees as very important functions of the city and are willing to pay additional taxes for tree protection and preservation; and 6) more than 88% of respondents rate the city's overall performance in tree protection and maintenance as good to excellent. The survey results may find utility in crafting more effective support programs for urban tree protection and preservation.

Key Words. Urban tree benefits; urban tree annoyances; socioeconomic variables.

Trees perform a variety of beneficial functions and are arguably the most important form of vegetation in urban communities (Hitchmough 1994). Urban trees enhance air and water quality, moderate microclimate, reduce noise levels, provide wildlife habitat, and increase property values (Miller 1997). Consequently, urban and community forests have become widely recognized as an important component of the infrastructure in urban communities. As the urban population continues to grow and urban areas expand, the preservation and protection of trees is becoming an increasing concern for many communities. Strong and responsive programs similar to those focused on other important components of community infrastructure such as streets, sidewalks, sewers, and utilities are

needed in communities to protect and preserve their valuable trees and forests. Unfortunately, urban tree and forest programs are likely to face significant competition for scarce funds. The availability of funds and support for these programs will depend significantly on public awareness and knowledge of the benefits of community trees.

A critical step in building public support for urban forestry programs is to determine the public's knowledge and perception of the urban forest and the importance the public attaches to it. Thus, the objective of this study was to gather information on residents' knowledge and perceptions of urban trees and forests. Additionally, we examined how selected socioeconomic variables relate to residents' willingness to support urban forestry programs. Ultimately, this study provides recommendations for developing and implementing sustainable tree care programs for the protection and preservation of urban forests.

SURVEY METHODOLOGY AND DATA ANALYSIS
This study was conducted in the city of Mandeville, a suburb of New Orleans, Louisiana, United States. Mandeville epitomizes the challenges and opportunities facing the suburbs of metropolitan areas as a result of the massive influx of urban residents. A survey questionnaire was patterned after Sommer et al. (1989) and Schroeder and Ruffolo (1996) with the following modifications: 1) questions that were not appropriate for this study were discarded, and 2) questions eliciting information on the amount the residents were willing to pay in taxes to protect and preserve their urban forest were added. In preparing and mailing the questionnaires, efforts were made to follow as closely as possible Dillman's Total Design Method (Dillman 1978) for mail surveys relative to formatting, arrangement of questions, and number of follow ups. The questionnaire was four pages long. It was on white 11-by-17-in. paper folded into an 8.5-by-11-in. brochure. The questionnaire was sent to 3,009 Mandeville households included in the

city's utilities database. The questionnaire was accompanied by a cover letter on City of Mandeville letterhead and a postage-paid return envelope. The cover letter, signed by the city's mayor, explained the relevance of the survey and the importance of representative participation in the survey.

Three weeks after the mail-out, a follow-up letter was sent reminding residents about the questionnaire, reiterating the importance of representative participation in the survey, and offering a replacement copy of the questionnaire if necessary. The follow-up letter was sent to everyone because the earlier mailings were not traceable to the individual. Because the follow-up letter brought in only less than 8% additional responses, a third mailing was considered unnecessary.

The data were validated and double-checked to minimize errors prior to analysis. Data analyses were conducted with SPSS Release 8.0. The responses to each item on the survey concerning benefits and annoyances of trees were ranked as very important (2), important (1), don't know/no opinion (0), and not important (-1). The association between willingness to pay and tree benefits/tree annoyances was analyzed using Spearman's correlation. The relationships between willingness to pay and the socioeconomic variables in this study were evaluated using chi-square analysis.

RESULTS AND DISCUSSIONS

Response Rate

Of the 3,009 questionnaires mailed, 800 were returned for an overall response rate of 26.6%, but only 648 were completed, reducing the effective response rate to 22%. This response rate is relatively low compared to the established average of 40% in similar studies (Mitchell and Carson 1989). The use of only one follow-up letter might have contributed to the low response rate. Also, the relatively long questionnaire might have discouraged many of the respondents. In addition, the survey was done in the middle of the summer when many families are preoccupied with family vacations and recreational programs. Despite the moderately low response, there were statistically significant trends indicated.

Respondents' Characteristics

Socioeconomic questions included sex, age, education, occupation, size of household, income, and loca-

tion of neighborhood. This information was used to determine whether the survey respondents came from the same population and whether this was the same as the population from which the respondents were drawn. It was also used to determine if any particular characteristics were associated with willingness to pay for urban forestry programs.

The respondents were about evenly distributed between male (51.2%) and female (48.8%), with an average age of 47 years and a median household income of \$65,000 (U.S. dollars). Most respondents (92.9%) had attended college, with over 26% having graduate degrees. The average household size was three, with at least one adult employed full-time. The average length of residence occupancy was nine years, with more than 90% owning their homes.

Socioeconomic Comparison of Respondents

The socioeconomic characteristics of the survey respondents (i.e., sex, age, and income) were compared to corresponding information from the 1990 census data for Mandeville using chi-square analysis. The gender and income characteristics of the respondents were not significantly different from those of the resident population (Table 1). However, the age of the respondents was significantly different from those of the resident population. The distribution of respondents by age was left-skewed, with a mean of 47. The pattern could be attributed to the low response rate from the younger age group because of the fact that this group remained at about 47% of the total population in 1999 (CACI 1999). The distribution of respondents' income was left-skewed, with a mean of \$65,000. The income questions had the highest nonresponse rate, which might have contributed to this pattern.

Association of Beneficial Roles of Trees with Willingness to Pay

The benefits of trees ranked as most important reasons for protecting and preserving neighborhood/urban trees were "aesthetic/visual," "gives shade, reducing glare/reflection and energy consumption" (Figure 1). Other very important benefits included "trees attract birds and other wildlife," "enhance city/urban climate," "increases privacy," and "increases property value."

The benefits ranked least important were "fall color marking change in season" and "flowers in tree."

Table 1. Comparison of characteristics of respondents with 1990 census data.

Characteristic	Census (%)	Survey (%)
Gender		
Male	48	51
Female	52	49
Age category		
< 30	47.3	3.6
30–49	31.3	57.8
>50	21.4	37.6
Income category		
<24,999	18.9	5.3
25,000–39,000	15.5	10.2
40,000–54,000	12.5	12.2
55,000–69,000	9.5	10.7
70,000–84,000	9.5	11.4
>85,000	34.1	26.0

These findings probably reflect the fact that most tree species on public property do not have showy flowers (based on tree inventory of the city). Other benefits that were ranked low included “stormwater control,” “control of dust/particulate matter,” and “wind control.” The low ranking of these benefits might be because they are not readily observable and there may be a lack of clear public understanding of the role of trees on these physical phenomena.

All of the tree benefits used in this study are positively correlated with willingness to pay additional amounts for the protection and preservation of trees. This finding implies that respondents who assigned high importance to the individual benefits of trees also tended to be willing to pay additional amounts for the protection and preservation of trees and forests. “Aesthetic/visual,” “increases sense of community,” “trees attract birds and other wildlife,” and “increases property value,” “enhance city/urban climate,” “gives shade, reducing glare/reflection and energy consumption,” “reduces noise,” “fall color marking change in season,” “flowers in tree,” “wind control,” “increases privacy,” and “control of dust/particulate matter” were the benefits highly correlated with willingness to pay. On the other hand, “stormwater control” was the only tree benefit weakly correlated with willingness to pay. It appears from the results that respondents’ willingness to pay increased with more readily recognizable benefits of urban trees. Thus, the less commonly known benefits should be emphasized in outreach and educational programs to

enhance the public’s perception and therefore increase their willingness to support urban forestry programs.

Association of Annoying Features of Trees with Willingness to Pay

The annoyances of trees ranked important involved “falling limbs,” “roots clog sewers,” and “disease in trees.” (Figure 2). The lowest-ranked annoyances as reasons for not protecting and preserving neighborhood/urban trees were those involving “mistletoe in the tree,” “leaves falling continuously throughout summer,” “branches or suckers grow around base of the tree,” and “fallen leaves, flowers, fruit, or seed pods from the tree.” The relatively minor importance of these annoyances may be attributed, in part, to the dominance of pine trees in the area and the relative scarcity of hardwoods and flowering tree species (seasonal falling of leaves).

Overall, the annoyances were rated as less important than the benefits. Even the strongest annoyance was rated on average between “slightly important” and “moderately important.” This suggests that, although noticeable problems may occur with public trees, the annoyances from these trees generally are less prominent in people’s minds than the benefits. As a result, residents appear to tolerate what generally are perceived as annoyances associated with urban trees.

A majority of the individual tree annoyances is negatively correlated with the willingness to pay for the protection and preservation of trees. The annoyances negatively associated with willingness to pay are “leaves fall continuously,” “fallen leaves, flowers, fruits,” “trees attract bees and squirrels,” “roots too close to surface,” and “sap drips from tree.” “Roots send up suckers in yard,” “roots clog sewers,” and “causes allergies” are the only annoyances that do not appear to be associated with willingness to pay. These results imply that the presence of what are commonly considered annoying tree properties did not actually reduce residents’ willingness to pay.

Association of Socioeconomic Factors with Willingness to Pay

The association between willingness to pay and basic socioeconomic variables such as ownership, gender, income, age, and education were tested using Pearson chi-square analysis (Table 2). The amounts residents are willing to pay were significantly different between gender and among income levels. More than 42% of female respondents are willing to pay between \$6 and

\$12 per year, as opposed to 31% for male ($\chi^2 = 9.600$, $\rho = 0.02$). However, more males (25%) than females (18%) are willing to pay more than \$12 per year in additional taxes for the protection and preservation of trees and community forests. Approximately the same percentage (39%) of respondents are willing to pay between \$6 and \$12 per year across income levels ($\chi^2 = 46.117$, $\rho = 0.001$). Interestingly, the willingness to pay more than \$12 per year increases with income level. Type of ownership, age, and level of education did not have a significant association with the amount residents stated that they were willing to pay (Table 2).

Perceptions of the Urban Forestry Program
On a scale of 1 to 5 (1 being very poor and 5 being excellent), respondents were asked to rate the city's overall performance in tree maintenance and protection. More than 88% of respondents rated the city's overall performance in maintaining and protecting their trees between good and excellent. However, the

Table 2. Percentage of respondents willing to pay additional amount, by socioeconomic variables.

Variable/ characteristic	None	Less than \$6	\$6–\$12	More than \$12
Gender				
Male	33.7	9.8	31.3	25.3
Female	29.9	10.0	42.1	18.0
Age category				
< 30	21.7	13.0	43.5	21.7
30–49	33.0	10.2	33.8	23.1
>50	30.1	9.6	40.6	19.7
Income category				
<24,999	31.3	2.5	40.6	15.6
25,000–39,999	27.9	11.5	45.9	14.8
40,000–54,999	31.5	6.8	39.7	21.9
55,000–69,999	35.9	7.8	42.2	14.1
70,000–84,999	30.9	7.4	38.2	23.5
>85,000	25.0	7.1	30.1	37.8
Ownership type				
Homeowner	32.4	9.6	37.0	21.0
Renter	25.8	14.5	32.3	27.4
Educational attainment				
Some elementary	0.0	100	0.0	0.0
Some high school	25.0	25.0	50.0	0.0
Completed high school	23.5	17.6	47.1	11.8
Some college	36.6	10.4	34.3	18.7
Completed college	34.9	9.6	33.7	21.7
Some graduate school	33.3	5.9	39.2	21.6
Completed graduate school	23.8	8.3	41.1	26.8

high rating for the city's performance was not significantly associated with willingness to pay for protecting and preserving neighborhood/urban trees. A majority also does not know of any additional maintenance services the city can provide trees.

Respondents also were asked "Has your opinion of neighborhood/urban trees changed over time?" More than 75% of respondents indicated that their opinion of trees in their neighborhood has not changed over time. On the question "How important to you is the protection of neighborhood/urban trees?", 86% indicated that protecting their neighborhood/urban trees is very important. Of this group, more than 80% (which represents 70% of total respondents) were willing to pay additional taxes for the purpose of protecting and preserving trees. The 30% who were not willing to pay any additional amount for the protection and preservation of trees selected the following reasons from a list that was presented to them.

Reason	Percentage of respondents
The city should protect trees using taxes already paid	78.0
Not enough information is given	22.5
The city has more important problems than protecting trees	22.0
I did not want to put a dollar value on protecting trees	16.0
I can't afford to pay anything	12.5
I object to the way the question is asked	6.5
Protecting trees is not worth anything to me	0.5

(Total percentage sums to more than 100% because respondents were allowed to select multiple responses.)

CONCLUSIONS AND RECOMMENDATIONS

A clear understanding of the public's perceptions of the benefits and annoyances of trees and the availability of better information about their willingness to pay for the protection and preservation of urban forests can improve the development and implementation of sustainable urban forestry programs. The most commonly perceived benefits of trees are positively associated with residents' willingness to pay additional taxes to support urban forestry programs. In contrast, properties of trees commonly perceived annoying are nega-

tively associated with residents' willingness to pay additional taxes to support urban forestry programs. Gender and income are socioeconomic variables that contribute to residents' willingness to pay specific levels of support. Although other basic socioeconomic variables showed no significant associations with willingness to pay, this finding needs to be confirmed by a larger population.

Overall, the profile of individuals likely to support urban forestry programs includes male or female, 30 years or older, income of at least \$40,000, with college education, and having a great appreciation of the benefits of urban trees. In contrast, the profile of individuals unlikely to support urban forestry programs is a male or female, 50 years or older, income less than \$25,000, limited education (high school), and little appreciation of the benefits of urban trees.

The results suggest opportunities exist to enhance public's appreciation of urban trees and increase support for urban forestry programs. To capitalize on the

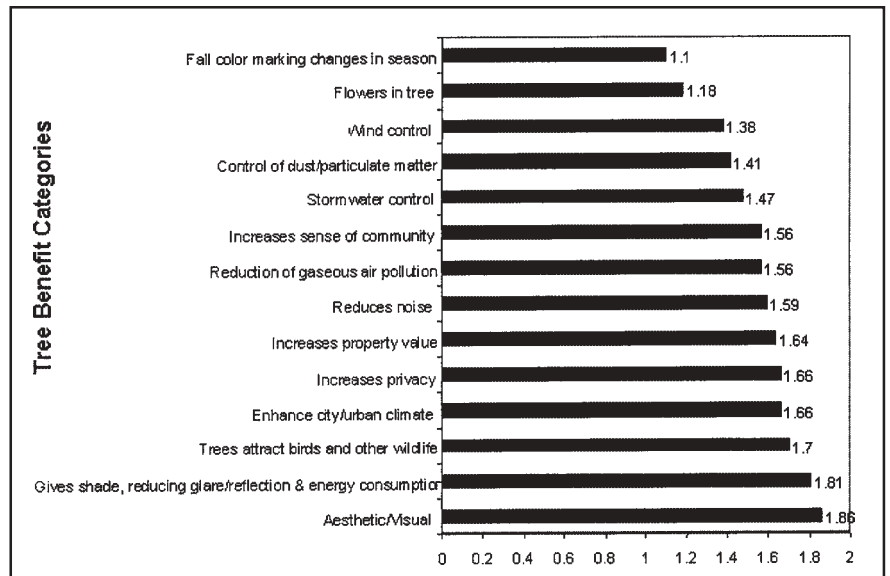


Figure 1. Mean ranking of beneficial role of trees.

information generated from this study, we recommend the following:

- Initiatives to build support for urban forestry programs must pay significant attention to the more commonly recognized benefits of urban trees. For instance, the "aesthetics/visual," dimension of the program could be emphasized in selecting trees for planting and replacement projects whenever and wherever feasible.
- Because the amount residents are willing to pay is associated with total household income, a

tiered solicitation that takes into account the different income levels in the community might be a more effective tool for seeking support for urban forestry programs than traditional techniques.

- A majority of the residents is willing to pay at least \$6 per year to protect and preserve the urban forests. This finding may serve as a basis for revising the \$2 per-capita requirement or criterion for selecting recipients of Tree City USA designation.

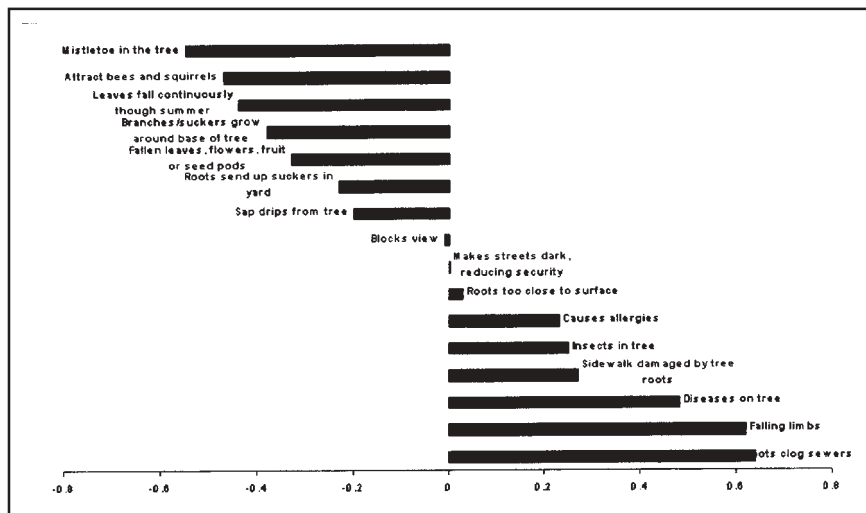


Figure 2. Mean ranking of annoying features of trees.

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Résumé. La volonté des gens à payer pour la préservation des arbres publics de la communauté a été évaluée au moyen d'un questionnaire posté à 3009 propriétaires de maisons de la ville de Mandeville, une banlieue de la Nouvelle-Orléans en Louisiane. Les réponses de cette enquête ont révélé ce qui suit: a) la volonté des résidents à payer pour la protection et la préservation de la forêt urbaine est positivement associée à leur perception des bénéfices des arbres mais négativement à celle problèmes vécus avec les arbres, b) la volonté de payer un supplément plus élevé (plus de 12\$) pour la préservation et la protection des arbres est directement reliée à celle du revenu, c) plus de femmes que d'hommes sont disposés à payer entre 6 et 12\$/année pour la préservation des arbres, d) l'âge, le degré de scolarisation et le type de propriété résidentielle ne sont pas reliés de façon significative avec la volonté de payer pour la protection et la préservation des arbres, e) plus de 80% des résidents voient la protection et la préservation des arbres urbains comme très importante pour leur ville et sont d'accord de payer des taxes additionnelles pour la protection et la préservation des arbres, f) plus de 88% des répondants ont jugé la performance globale de la ville pour la protection et la préservation des arbres comme bonne à excellente. Les résultats de cette enquête peuvent s'avérer utiles pour bâtir des programmes de support plus efficaces pour la protection et la préservation des arbres.

Zusammenfassung. Durch einen per Post zugestellten Fragebogen wurden in einer Vorstadt von New Orleans, Mandeville, 3009 Haushalte befragt, ob sie bereit wären, für die Baumerhaltung in ihrer Kommune einen finanziellen Beitrag zu leisten. Die Antworten zeigten folgendes: a.) die Bereitschaft der Anwohner zu zahlen ist positiv assoziiert mit den für sie verbundenen Vorteilen durch die betreffenden Bäume und negativ assoziiert durch die entstehenden Nachteile; b.) die Bereitschaft mehr als \$12 für Baumerhalt und -schutz zu zahlen, ist stark einkommensabhängig; c.) mehr Frauen als Männer sind

bereit, \$6 bis \$12 pro Jahr für Baumschutz zu zahlen; d.) Alter, Bildungsgrad und Art der Hauseigentumsverhältnisse sind nicht unbedingt mit der Bereitschaft zu zahlen, assoziiert; e.) über 80 % der Befragten gaben an, daß für die Stadt die Erhaltung und der Baumschutz wichtiges Anliegen sei und daß sie bereit wären, dafür mehr Steuern zu zahlen und f.) mehr als 88 % der Antworten stufen die bisherige Baumpflege und Baumerhaltung der Stadt als gut bis ausgezeichnet ein. Die Ergebnisse der Umfrage können nun zur Entwicklung von effektiveren Pflegeprogrammen verwendet werden.

Resumen. Se evaluó la disposición de los residentes a pagar por la preservación y conservación de los bosques urbanos, usando una encuesta enviada por correo a 3009 casas en la ciudad de Mandeville, un suburbio de New Orleans, Louisiana, U.S.A. Las respuestas a la encuesta indicaron lo siguiente: a) la buena disposición de los residentes a pagar por la protección y preservación está positivamente asociada con sus percepciones de los beneficios de los árboles pero negativamente asociada con su percepción de las características molestas de los árboles; b) la buena disposición a pagar altas tasas-primas (mayor que \$12) por la preservación y protección de los árboles está directamente relacionada a los niveles de ingreso; c) más mujeres que hombres están dispuestos a pagar \$6-12/año por la preservación de los árboles; d) la edad, nivel de educación y tipo de propiedad residencial no están significativamente asociados con la disposición a pagar por la protección y preservación de los árboles; e) por encima del 80% de los encuestados ven la protección y preservación de los árboles urbanos como muy importante y están dispuestos a pagar impuestos adicionales, y f) más del 88% estimó de bueno a excelente el desempeño de la ciudad en la protección y preservación de los árboles. Los resultados de la encuesta pueden encontrar utilidad en crear apoyo más efectivo a los programas de protección y preservación de los árboles urbanos.