

URBANITIES WILLINGNESS TO PAY FOR TREES AND FORESTS IN RECREATION AREAS

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Abstract. A study of urbanites who use parks and forest preserves indicates that they are willing to pay substantial amounts to have trees and forests in recreation areas. Individuals were asked to choose from paired descriptions of hypothetical recreation areas that varied widely in attributes, including user fees. Analysis indicated the additional fees they would willingly pay for particular attributes, for example, an additional \$1.60 per visit to have a site that was "mostly wooded, some open grassy areas under trees," rather than "mowed grass, very few trees anywhere." Variations in preferences and willingness to pay were identified for five distinct market segments. The results reaffirm the importance of trees and forests in recreation areas to urbanites, and identify variations in preferences.

Résumé. Une étude des citoyens qui fréquentent les parcs et les espaces boisés indique qu'ils sont prêts à payer des sommes substantielles pour avoir des arbres et des espaces boisés dans les sites de récréation. Les individus avaient à choisir entre des paires de sites de récréation hypothétiques dont les attributs variaient largement, incluant les frais d'utilisation. L'analyse a indiqué les frais additionnels qu'ils seraient prêts à déboursier pour certains attributs. A titre d'exemple, un montant supplémentaire de \$1.60 par visite serait déboursé pour avoir un site "largement boisé, avec quelques espaces ouverts herbeux sous les arbres" plutôt qu'une "surface gazonnée avec peu d'arbres". Les variations dans les préférences exprimées et la volonté de payer furent rattachées à cinq districts de marché. Les résultats réaffirment l'importance de la présence d'arbres et d'espaces boisés dans les sites de récréation pour les citoyens et identifient des variations dans les préférences.

Public programs to enhance trees and forests in the urban environment are often scrutinized to determine what benefits the public is likely to receive from public expenditures. Many decision-makers would like to see the benefits of public investments measured in dollars so they could be compared with the returns from other investments in the urban infrastructure (i.e., increased tax revenues from urban redevelopment, reduced street maintenance costs after reconstruction of roadbed). Studies of people's preferences for trees, forests, and associated greenspace in urban environments show that people value these resources (1, 6) but there is little direct evidence

of what people are willing to pay for them. Nevertheless, what people are willing to pay for the experiences provided by urban trees and forests can be estimated indirectly.

A previous article showed that people are willing to pay substantial amounts to visit three Chicago area sites where trees and forests are major attractions (2). On average, users were willing to pay \$4.54 for a visit to an arboretum, and \$8.68 and \$12.71 for visits to two conservatories. This approach, based on travel cost, is widely used for estimating the value of recreation sites, but it doesn't readily separate the value attributable to trees and forests from other site attributes, such as lake or stream, bike trail, or lack of vandalism.

Methods

To estimate how much people were willing to pay for particular attributes of recreation areas such as trees, forests, and lakes, as well as facilities such as picnic areas and bike trails, we contacted park and forest preserve users from northwest Chicago and its northwestern suburbs randomly from telephone directories. Those who agreed to participate were mailed a questionnaire that included written descriptions of 16 pairs of hypothetical park settings that differed in terms of 22 attributes found to be important in earlier work on park choice (4, 5, 11). These attributes included vegetation, terrain, water features, recreation facilities, types of users, maintenance, travel time from home, and entry fees. The choices were designed to permit estimation of the importance of each attribute in choosing a site. Respondents were asked which one park in each pair they would prefer for an outdoor day-trip in the Chicago area. They were then asked whether they would realistically prefer to go to the park chosen or engage in some other outdoor activity instead.

Out of 478 park users who were contacted by

phone, 285 agreed to complete the mail survey, and 210 returned usable surveys. Thus the total return rate was 44%, which is quite good for this type of survey.

From the choices made by 210 respondents among the descriptions of diverse hypothetical parks, we constructed models (discrete logit choice models) to predict the likelihood of an individual choosing any option described in terms of the 22 attributes—as well as the option of choosing not to visit a recreation site (8, 9). Since one of the attributes that varied over the choices was entry fees, we could estimate willingness to pay to have other attributes at a site. This was determined by what increase in user fees would be needed to just offset the effect of a particular attribute on the probability of visiting a site. For example, to estimate willingness to pay to have a bike trail at a site we first calculated how the probability of choosing a site would increase if a bike trail were added. Then we used the model to estimate how large a fee would be required to reduce the probability of selecting this site back to its original level. This fee represents maximum willingness to pay for the trail, because if users had to pay more than this, the probability of selecting the site would be lower than if there were no trail and no special fee. The entry fees included in the choice options ranged up to a maximum of \$3.00.

Results and Discussion

For the sample of respondents as a whole, all the park attributes had a statistically significant influence on choices, with the exception of presence or absence of police patrols. Of perhaps greatest interest to arborists, foresters, landscape architects, and others who plan for and manage vegetation on urban recreation sites is the willingness of users to pay for trees and forests. On the average, and with all other attributes held the same, users were willing to pay up to \$1.60 more for a visit to a site that was “mostly wooded, some open grassy areas under trees” than for a site with “mowed grass, very few trees anywhere.” Two other choices represented intermediate amounts of vegetation. Individuals were willing to pay \$0.21 more per visit for “mowed grass, scattered trees, no woods” and \$0.99 more for “mowed grass, scattered trees, some

dense woods” than for the option with fewest trees (Table 1).

The willingness of users to pay for the trees and forests on a site becomes substantial given the relatively high value per visit and the large number of visits to some urban parks and forest preserves. For example, the Ned Brown Forest Preserve located northwest of Chicago and managed by the Forest Preserve District of Cook County receives more than 2,500,000 visits per year. An estimate of \$1.00 per visit attributed to this Forest Preserve’s vegetation—a mixture of mowed grass, scattered trees, and forests—would total up to \$2,500,000 per year, suggesting that the trees and forests on the area are indeed valuable assets that merit considerable attention.

While the willingness of users to pay for trees and forests is not surprising, it is somewhat surprising that users were willing to pay the most for the most heavily forested areas. Many studies of visual preferences for urban forest environments suggest that a somewhat open stand of trees or a savannah-type environment would be the most preferred (3, 7, 10). However, such studies of visual preferences were based on photographs of forest settings that probably conveyed more information about the visual environment than the short verbal descriptions of vegetation used in this study.

While users are willing to pay a substantial amount for trees and forests, they are willing to pay even more for water resources; lack of crowding, vandalism, or litter; and a certain age distribution of users (Table 1). In terms of what users were willing to pay, trees and forests ranked sixth overall among 20 site attributes (excluding entry fees and travel times). These results suggest that trees and forests certainly can claim their share of attention by managers of urban parks and recreation areas.

The above findings offer strong support for the planting and preservation of trees in urban recreation areas, but public support for tree maintenance efforts beyond those essential for tree survival is difficult to identify from this study. Several of the attributes included in the choices do, however, point to the importance of maintenance—and might be extended to suggest support for tree

Table 1. Dollar values for levels of park attributes presented in the experiment

Attribute	Willingness to pay for change from level one Dollars
Vegetation	
1. Mowed grass, very few trees anywhere	--
2. Mowed grass, scattered trees, no woods	.21
3. Mowed grass, scattered trees, some dense woods	.99
4. Mostly wooded, some open grassy areas under trees	1.60
Water	
1. No streams, rivers, ponds, or lakes	--
2. Small stream or small pond	2.54
3. Large stream or river a major feature	1.73
4. Large natural or man-made lake a major feature	3.00**
Terrain	
1. Mostly flat	--
2. Rolling hills with some flat areas	.41
Grass	
1. Grass needs mowing	--
2. Grass recently mowed	.33
Maintenance	
1. Structures and facilities need repair	--
2. Structures and facilities well-maintained	.49
Crowding	
1. Little traffic, very few people, many places for privacy/quiet	--
2. Light traffic, some people, a few places for privacy & quiet	-.54*
3. Moderate traffic, people almost everywhere, little privacy, some noise	-3.00**
4. Lots of traffic, very crowded, no privacy, quite noisy	-3.00**
Age distribution	
1. Mostly teenagers and young people	--
2. Mostly families and older people	1.90
Ethnicity and race	
1. Mostly ethnically and racially mixed	--
2. Mostly ethnically and racially like yourself	.73
Police, sheriff, or ranger patrols	
1. Few police patrols, rarely seen	--
2. Regular police patrols, highly visible	.01
Bicycling trails	
1. Absent	--
2. Present	1.54
Picnic areas and tables	
1. Absent	--
2. Present	1.47
Picnic shelters	
1. Absent	--
2. Present	1.15
Hiking trails	
1. Absent	--

2. Present	.81
Children's playground	
1. Absent	--
2. Present	.81
Swimming pool	
1. Absent	--
2. Present	.75
Rowboat or canoe rental or launch site	
1. Absent	--
2. Present	.73
Athletic fields	
1. Absent	--
2. Present	.55
Fishing	
1. Absent	--
2. Present	.54
Litter/trash	
1. Present	--
2. Absent	3.00 or greater
Vandalism	
1. Present	--
2. Absent	3.00 or greater

* minus means people would have to be paid this amount to accept the changes from level 1

** or greater than 3.00

maintenance. For example, average willingness to pay, per visit, was \$0.33 for mowed grass, \$0.49 for "structures and facilities well maintained," and in excess of \$3.00 for an absence of litter/trash, and an absence of vandalism. Taken together, these responses reflect support for overall maintenance of the area that perhaps may extend to trees.

Variations in preferences and values. The foregoing results reflect the average preferences of the total set of respondents. However, we have reason to suspect that there may be substantial variations in their preferences for an willingness to pay for trees and forests. Individuals landscape their homes in different ways, they are drawn to various kinds of settings in urban parks and forest preserves, and they engage in a wide range of outdoor recreation activities—many of which require quite different outdoor environments. In previous research, variations in preference have been related to two major attributes of forest sites; the density of vegetation and the intensity of development. Inner city natives seem to prefer neatly maintained sites with not too many trees, while suburban residents prefer densely forested,

natural sites (6, 12).

To identify variation in preferences in this study, respondents were clustered into "market segments"—based on similarities in their park visitation patterns and socio-economic characteristics. Each of the five "market segments" that contained a sufficient number of respondents to support statistical analysis was then analyzed separately.

Across the segments, trees and forests varied in importance from second to tenth among the 20 site attributes (excluding user fees and travel times). The only site attribute that was more important than vegetation for all five segments was crowding. While the ranking of the attributes varied significantly over the five segments, trees and forests always ranked higher than terrain, childrens playgrounds, or athletic fields.

To illustrate some of the variation in choices made by different users, consider an example involving four parks that differ only in vegetation. Table 2 shows how users from each market segment, as well as the total, would distribute themselves over the four parks (assuming all other attributes remain the same). All five segments would make some use of each park. Segment 3 would make the least use of a park with very few trees, while segments 2 and 5 would make the heaviest use of densely forested sites. Four of the five segments would be most likely to choose the most heavily wooded site, although one of those segments would be almost as likely to choose the second most forested site. One segment would be most likely to choose the second most forested site.

Three market segments (containing 29% of the respondents) were attracted to sites with higher fees. This may have been out of a belief that sites with higher fees would somehow be more desirable due to lower levels of use, absence of anti-social behavior, etc. Consequently, we were able to estimate the willingness of users to pay for particular attributes for only two segments. This situation also lowered the "average-willingness-to-pay" values for attributes calculated for the entire set of respondents, including the values presented above for trees, forests, and maintenance.

Willingness of users to pay for the most wooded

site over the least wooded site were \$1.23 per visit and \$2.75 per visit for the two market segments for which comparisons could be made. This is a fairly substantial range of values and indicates how much preferences for trees and forests can vary among individuals.

Mowed grass was viewed positively by two of the five market segments (i.e., it increased their probability of choosing a site), and well-maintained structures and facilities were viewed positively by four of five market segments. For the two market segments for which calculations could be made, one was willing to pay an average of \$0.36 for mowed grass and the other was willing to pay an average of \$1.03 per visit to have grass that was not mowed. This variation in preferences for "naturalness" may have significant implications for managing sites with trees and forests.

The characteristics and preferences of the five market segments are complex and difficult to interpret straightforwardly. The following examples offer some insight into two of the segments—with reference to trees and forests. The segment with the highest willingness to pay for a heavily forested site has the strongest aversion to mowed grass, likes hiking, but not picnicking. This conjures up the image of users who prefer a relatively "natural" forest for their outings. The segment that appears least attracted to heavily forested sites is heavily oriented to state and county parks and likes fishing, swimming, picnicking, and

Table 2. Estimated distribution of use among four parks that differ in terms of vegetation, by market segment.

Vegetation by Park	-----Market Segments-----					
	All	1	2	3	4	5
	-----Percent of Visits-----					
Park 1 mowed grass, very few trees anywhere	21	21	20	12	23	18
Park 2 mowed grass, scattered trees, no woods	22	22	21	28	22	21
Park 3 mowed grass, scattered trees, some dense woods	27	28	26	29	31	24
Park 4 mostly wooded, some open grassy areas under trees	30	29	34	31	24	38

athletic fields—activities associated with open and fairly treeless areas.

Continued research on the preferences and choices of forest users will better define market segments, perhaps focusing on particular activities or groups of activities. We are currently focusing on urban and suburban bicycle trails—the recreation facility that had the highest average utility in this study. At the same time, different levels of tree and forest maintenance should be specified in the choices—perhaps through photographs. Users differ in their preference for urban forest areas that are “well manicured” versus those that present a “natural environment.” It is not yet clear what standards of tree and forest management the recreationists want, but given the high cost of maintenance, it is reasonable to conduct additional research to identify their preferences and willingness to pay for the results of these activities.

The fact that some segments preferred sites with higher fees made it difficult to estimate the willingness of users to pay for a particular attribute. Individuals probably associated higher fees with other attributes such as reduced crowding and more “respectable” users. The same may be true with litter/trash, vandalism, and conflict among users. In future research we must design and present the choices in a manner that minimizes such confounding. Given users’ willingness to pay for site attributes, the range of fees should be extended beyond \$3.00.

Two potential sources of bias must be considered in interpreting the results of this study. First is non-response bias, due to the fact that only 44% of the park users randomly contacted by telephone actually completed the survey. If this 44% differs in some way from the users who did not complete the survey, then their choices may not be representative of the general population of park users. This potential source of bias is present in any research in which respondents have a choice of whether to participate or not.

The second potential source of bias is due to the hypothetical nature of the choices in the scenario. We do not know how well choices among hypothetical, verbally described parks correspond to real choices among real parks. Data from an earlier study of park choices in Iowa (4)

suggest that people’s real choices are reasonably similar to their choices among hypothetical parks, but a definitive test of the correspondence has not yet been made.

Summary

Trees and forests are important to the users of urban parks and forest preserves. This importance is reflected in users’ willingness to pay to have these features in a park and their likelihood of choosing a park with these attributes. The dollar values of trees are substantial and compare favorably with dollar values of other park resources. Although the willingness of users to pay for tree maintenance in parks was not directly addressed, their willingness to pay for other maintenance suggests that tree maintenance may also be important, and the results argue strongly for those maintenance activities essential to maintaining a forest environment in parks. The data also revealed substantial variations in individual preferences for vegetation in urban parks—with implications for trees, forests, and their management.

Literature Cited

1. Dwyer, J.F. 1984. *Looking at the economic value of urban plants*. Am. Nurseryman. 159(12):69-79.
2. Dwyer, J.R., Peterson, G.L., and Darragh, A.J. 1983. *Estimating the value of urban forests using the travel cost method*. J. Arboric. 9:182-185.
3. Kaplan, R. 1984. Dominant and variant values in environmental preference. In A.S. Devlin and S.L. Taylor (Eds.), *Environmental Preference and Landscape Preference*. New London: Connecticut College.
4. Louviere, J.J., and Woodworth, G.G. 1984. Models of park choice derived from experimental and observational data: A case study in Johnson County, Iowa. Unpublished report to the North Central Forest Experiment Station, USDA Forest Service, Chicago, IL.
5. Louviere, J.J., Schroeder, H.W., Louviere, C.H., and Woodworth, G.G. 1986. Do the parameters of choice models depend on differences in stimulus presentation: Visual versus verbal presentation? In *proceedings of Association for Consumer Research* (pp. 79-82). October 1986, Toronto, Canada.
6. Schroeder, H.W. 1989. Environment, behavior, and design research on urban forests. In E.H. Zube and G.T. Moore (eds.) *Advances in environment, behavior, and design* (vol. 2). Plenum.
7. Schroeder, H.W. 1986. *Estimating park tree density to maximize landscape esthetics*. J. Environ. Management 23:325-333.

8. Schroeder, H.W., Dwyer, J.F., Louviere, J.J., and Anderson, D.H. 1989. Monetary and nonmonetary tradeoffs of urban forest site attributes in a logit model of recreation choice. Proceedings of IUFRO Subject Group S6.01 (In Press)
9. Schroeder, H.W., Louviere, J.J., and Anderson, D.H. 1989. Factors affecting users' choices of Chicago-area forests and parks. Proceedings 1988 Annual Meeting of the Society of American Foresters pp. 380-384.
10. Schroeder, H.W., and Green, T.L. 1985. *Public preference for tree density in municipal parks*. J. Arboric. 11:272-277.
11. Schroeder, H.W., and Louviere, J.J. 1986. A model for predicting distribution of recreational use over a system of parks. In proceedings of the Forestry Microcomputer Software Symposium (pp. 623-631). July 1986. Morgantown, West Virginia.
12. Talbot, J.F., and Kaplan, R. 1984. *Needs and fears: The response to trees and nature in the inner city*. J. Arboric. 10:222-228.

Annotation. Reports on a logit choice model for urban recreation areas that was developed from an experiment in which Chicago residents who use parks and forest preserves were asked to choose between paired descriptions of hypothetical recreation areas.

This manuscript was written and prepared by U.S. Government Employees on official time and therefore in the public domain.

Abstracts

KLETT, J.E., P. EVANS, M. PRATT and M.S. SCHNELLE. **Routine pruning may not be warranted.** Am. Nurseryman 169(3):99-101.

Growers often routinely remove 30 percent of the shoots from bare-root trees before planting them. We examined root production for possible changes due to shoot pruning. We found no significant differences when we examined leaf to new root ratios and compared them against those for control trees. Pruning did not appear to improve first-year survival and overall growth.

DAY, S.J. 1989. **Alkaline water can sabotage your spray tank.** Colorado Green 4(4):4-5.

Alkaline, or high pH, tank mixes can significantly reduce the effectiveness of your pesticide applications. Why the concern with high pH? Many pesticides commonly used in the green industry are seriously affected by high pH. Certain products begin to break down, or hydrolyze, in water with a neutral pH of 7.0, and even faster in more alkaline water. This phenomenon, also referred to as pesticide hydrolysis or alkaline hydrolysis, is an irreversible process that breaks down pesticides into a form that has no pesticidal activity. A pH of 7.5 to 8.5 is common for many water sources in the U.S. Before high pH of your water has a chance to sabotage your spray tank, take a little time to check it out and make appropriate adjustments.