VISUAL QUALITY OF RESIDENTIAL STREETS: BOTH STREET AND YARD TREES MAKE A DIFFERENCE

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Abstract. Past research has shown that street trees have a powerful impact on how people judge the esthetic quality of residential streets. In the study reported here, observers' ratings of the scenic quality of streets in photographs showed that trees on private property in front of homes also enhance the quality of the view down the street. Street trees contribute most to the visual quality of the street where there are few yard trees, and the least where there are many yard trees. This implies that arborists and urban foresters should give highest priority to planting street trees in neighborhoods where there are few yard trees.

Résumé. Des recherches passées ont montré que les arbres de rues ont un impact notable sur l'évaluation de la qualité esthétique des rues résidentielles par la population. Dans la présente étude, l'évaluation de la qualité scénique des arbres sur des photographies par des observateurs a montré que les arbres situés sur la propriété privée dans la marge avant des maisons améliorent la qualité de la vue sur la rue. Les arbres de rues contribuent le plus à la qualité visuelle d'une rue lorsqu'il y a peu d'arbres en parterre, et le moins lorsqu'il y beaucoup d'arbres dans la cour avant. Ceci implique que les arboriculteurs et les forestiers urbains devraient donner une plus grande priorité à la plantation d'arbres de rues dans les quartiers où il y a peu d'arbres dans les cours avant.

Annotation. Examines how trees on streets and private property in front of homes contribute to viewers' ratings of the esthetic or scenic quality of residential streets.

Urban trees provide many kinds of benefits to city residents (4). The effect of trees on people's subjective experiences, moods, and feelings may be one of the most important of these benefits (5, 9). Urbanites seem to place particularly high importance on trees located along residential streets (3). Research has shown that street trees have a powerful positive impact on people's preferences for visual quality of street scenes, and that large street trees are especially preferred (1, 6, 7, 8).

But street trees on public rights-of-way are not the only vegetation that contributes to the quality of the view along a street. Trees on private property in front of homes are also visible from the street (Fig. 1). Most research on the esthetic impact of trees along streets has not considered yard trees, because the municipalities that researchers view as their clients do not manage yard trees, and because inventory data needed for research on yard trees are generally not available.

In an earlier analysis based on vegetation visible in photographs (7), we reported that yard trees had a significant impact on scenic quality of streets. This paper examines in greater detail the contribution of trees to the visual quality of residential streets in Ohio communities. To provide a more complete and accurate source of data for analyzing public preference for street scenes in this study, we conducted a special inventory to obtain data on the numbers and sizes of trees both on the street and in front yards.

Methods

Eighty residential street segments in six Ohio communities were inventoried in the summer of 1982. The length of the segments ranged from .1 to .4 mile, with an average length of .22 mile. The diameter and species of all trees on each street segment were recorded. Separate tallies were kept for street trees maintained by the municipality and for trees in front yards maintained by property owners. Each tree was categorized into one of five size classes: 1-3", 4-10", 11-15", 16-24", and over 24" diameter at breast height (dbh). After field crew members inventoried the trees on each street segment, they took

Figure 1. Trees in yards away from the street can contribute to the visual quality of the view along the street.

photographs from each end of the segment looking toward the center, using a 35mm camera with a 50mm lens.

From the complete set of photographs, a subset of 60 was selected and shown to observer groups. The subset was chosen to represent a range of tree densities, sizes, species, diversity, and types of neighborhood. The photos were shown to four high school biology classes and a vocational school horticulture class in the town of Delaware, Ohio, and were rated on a scale of 0 (low scenic beauty) to 9 (high scenic beauty). From these ratings we calculated a scenic beauty value for each slide, using the method of Daniel and Boster (2). These scenic beauty values represent the consensus of the combined groups about the scenic beauty of the scenes.

We assigned each tree a value of 1 if it was in the smallest size class, 2 if in the second smallest size class, and so on up to 5 for the largest size class. We then averaged these values separately for both yard and street trees, yielding a single number for the average size class for each type of tree on each street. We also calculated tree densities in trees per mile for street and yard trees on each street. Each slide was matched with the data on tree size and density for the street on which it was taken, and was treated as an individual case in the subsequent analyses.

Results

Table 1 summarizes the data. We analyzed how scenic beauty is related to average tree size and number of trees per mile because these variables were good predictors of street scenic beauty in earlier studies. Table 2 shows the correlations between the variables in our data set. (A correlation of 1.0 would mean that two variables are perfectly related. A correlation of 0.0 would mean that two variables are completely unrelated.) Correlations are fairly strong among average size class of street trees (SSIZE) and yard trees (YSIZE), street tree density (SDENS), and the visual quality scale (VQUAL). This means that streets with many street trees tend to have large trees both on the street and in yards. These streets also tend to have the highest visual quality. The density of yard trees (YDENS), on the other hand, has low correlations with the other variables, that is, the number of yard trees is not strongly related to the size of street and yard trees or to the density of street trees.

Using multiple regression analysis, we tried several ways of combining the tree size and density variables to predict visual quality. The most successful analysis is shown in Table 3. With a multiple R of .818, this regression analysis is quite good at predicting visual quality. (An R of 1.0 would mean that visual quality could be perfectly predicted from the other variables. An R of 0.0 would mean that visual quality could not be predicted at all.) The resulting equation describes how scenic quality is related to tree size and density for this set of data:

$$\text{VQUAL} = -14.685 + (.129\ \text{YSIZE} - .150)\ \text{YDENS} + (.138\ \text{SSIZE} - .00038\ \text{YSIZE*YDENS})\ \text{SDENS}.$$

From this equation we estimated the relative contribution of street and yard trees to the scenic quality of an average street. We substituted the

Table 1. Summary statistics.

Variable	*Description*	*Min.*	*Max.*	*Mean*	*SD*
SSIZE	Average size class of street trees	1.0	4.0	2.30	1.28
YSIZE	Average size class of yard trees	1.0	3.4	2.36	0.73
SDENS	Street tree density (trees per mile)	0.0	410.0	157.01	112.62
YDENS	Yard tree density (trees per mile)	25.0	606.7	222.32	116.37
VQUAL	Visual quality scale	-76.8	139.2	44.78	51.03

Table 2. Correlations among variables.

	SSIZE	*YSIZE*	*SDENS*	*YDENS*	*VQUAL*
SSIZE	1.00				
YSIZE	0.666	1.000			
SDENS	0.684	0.548	1.000		
YDENS	0.024	0.075	0.232	1.000	
VQUAL	0.775	0.726	0.648	0.136	1.000

average values for the size and density of street and yard trees (from Table 1) into the equation and then calculated the effect of increasing the density of street trees and yard trees by one tree per mile. The resulting estimates are that an additional street tree per mile increases the visual quality measure by .119, while an additional yard tree per mile increases visual quality by only .015. Thus, for an average street in our data set, a yard tree contributes about one-eight as much as a street tree to the street's visual quality.

Two additional relationships are supported by the equation. First, the influence of both street trees and yard trees depends on their size, with large trees producing a stronger positive effect. Second, the influence of street trees depends on the number and size of yard trees. The more and larger the yard trees, the lower the positive influence of street trees. Table 4 illustrates the contribution to visual quality of one additional street tree per mile under different conditions of tree density and size.

Discussion

Our analysis indicates that both street and yard trees contribute significantly to the visual quality of residential streets. The contribution of a single yard tree was only a fraction of the contribution made by a single street tree. The total contribution of yard trees to scenic quality was significant, however, perhaps because there were generally more yard trees than street trees on the streets we inventoried. Street trees obviously should continue to have high priority in urban tree management, but programs designed to encourage homeowners to plant trees in their yards and to assist them in caring for the trees may also yield esthetic benefits to the public.

An important management implication of this research is that street trees contribute the most to the visual quality of the street where there are few yard trees, and least where there are many yard trees. This implies that arborists and urban foresters should give highest priority to planting street trees in neighborhoods where there are few yard trees (Fig. 2). It also suggests that street tree inventories should include some information about yard trees, so that urban tree managers can determine which streets lack trees on private property. Even though yard trees are not directly under the control of the municipality, information about them would help the arborist or forester manage public street trees in ways that will most effectively contribute to the visual quality of the community.

Table 3. Regression of visual quality (VQUAL) on size and density of street and yard trees (Multiple R = .818).

Variable	*Coefficient*	*Significance (p)*
CONSTANT	-14.685	0.305
YDENS	-0.150	0.105
YDENS*YSIZE	0.129	0.001
SDENS*SSIZE	0.138	0.000
YSIZE*YDENS*SDENS	-0.00038	0.002

Table 4. Estimated contribution to visual quality of one additional street tree per mile.

Average tree size class	*Yard tree density (trees per mile)*	*Increase in visual quality*
1.5	100	.15036
1.5	200	.09372
1.5	300	.03708
3.5	100	.35084
3.5	200	.21868
3.5	300	.08820

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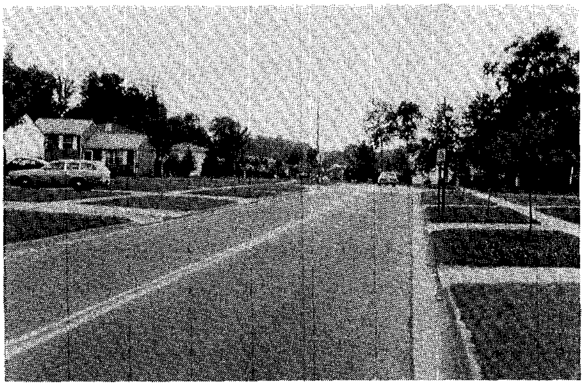

Figure 2. Neighborhoods with few yard trees may benefit the most from street tree plantings.

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Abstracts

MIELKE, JUDY L. 1986. **Trees for southwest landscapes.** Am. Nurseryman 164(10): 85-92.

Shade is a welcome commodity in the desert Southwest, especially when temperatures top the century mark. Trees such as mulberry, ash and elm have traditionally been used to provide shade in desert areas, but with the recent emphasis on water conservation, drought=tolerant trees are appearing more often in landscapes. The trees highlighted in this article are suitable for much of the area covered by the Mojave, Sonoran and Chihuahuan deserts. Although some areas receive annual precipitation exceeding 15 inches and moisture may be seasonally abundant, evapotranspiration exceeds rainfall in these desert regions. Although native desert trees are drought- and heat-tolerant and accept a wide variety of soils, they need some help to get established.

CATHEY, HENRY M. 1986. **New maps fight plant decline in North America.** Am. Nurseryman 164(2): 69-75.

Through the years, horticulturists have attempted to address the problem of determining whether or not a particular species or cultivar would be successful in a particular landscape. To aid gardeners in resolving this problem, they proposed hardiness zone ratings as simple guides. In 1927, Alfred Rehder, working at the Arnold Arboretum, Jamaica Plain, MA, proposed the first hardiness zone rating in his *Manual of Cultivated Trees and Shrubs*. In another scheme, Dr. Henry Skinner of the national arboretum, working in close cooperation with the American Horticultural Society and a panel of advisors from across the country proposed a hardiness map based on a list of indicator plants. The Arnold and USDA maps are not compatible. They are based on different temperature scales and different areas of the North American Continent. Environmental factors to which plants must adapt are the following: day lenght, radiation, low temperatures, high temperatures, wind velocity, rainfall, and soil type and pH. We at the National Arboretum propose to collect observations, to be translated into maps, of which plants are flourishing where, throughout the wide expanse of North America.