THE CONTRIBUTION OF TREES TO RESIDENTIAL PROPERTY VALUE

by Dominic J. Morales

Abstract. This study was conducted to determine whether or not trees contribute to residential property value and the extent of that contribution in the areas observed. To accomplish this, homes were observed with a substantial amount of mature tree cover and homes were observed without tree cover. It is realized that there are other variables that contribute to residential property value and this information was obtained from tax cards on file in the town tax assessor's office. All possible variables were noted for each house observed including the sale price. Factor and multiple regression analysis was used to determine the effect of the independent variables on the dependent variable which is sales price of the house. The results showed that trees do contribute to property value in the areas observed. By using the equation formulated by the regression analysis, we can predict the value of homes. From the values derived by the regression analysis, it was found that good tree cover added $2,686 (or six percent of the total) to the property value of the homes observed.

Individuals in the field of tree evaluation can easily arrive at and agree upon the value of a tree as it relates to timber use and aesthetic shade value. Formulas have been developed for calculating such values (1).

The U.S. Forest Service in a study conducted in Amherst, Massachusetts, showed that trees contribute seven percent to the value of the average property and as much as 15 percent to some lots (3).

In this study, an effort has been made to measure the value of residential trees by incorporating tree cover as one of many variables that contribute to residential property value and by comparing property values of residences with and without tree cover. Market analysis and property value can be used in determining the value of trees. "Trees in residential areas are usually valued and may serve in a considerable array of benefits. It will take much research to identify, sort out, and measure the components involved. To a degree, however, they are synthesized in prices people pay for housing" (4). Other studies have indicated that firm values are difficult to obtain and suggest that assigning a value to intangibles and amenities such as tree cover may not dictate whether a property with trees sells faster than a

property without (2).

This study is directed to help narrow some of these discrepancies by developing a methodology which can provide some insight to the problem of tree cover as a contributing factor in residential property value.

Methodology

Sample Selection. The object of this study is to measure the contribution of trees to residential property value. One method of accomplishing this is to observe houses with and without mature tree cover and observe how this affects the sale price of these houses.

As an initial step in the development of this study, a test area had to be designated. The town of Manchester, Connecticut, was selected. Manchester is a suburban town located southeast of the city of Hartford. As a means of becoming familiar with certain neighborhoods in the test area and to aid in selecting comparable areas, local real estate agents and construction firms were contacted. "Comparable" areas are those where houses have similar real estate characteristics.

A total of sixty recently-sold homes were obtained from the town assessor's office. These homes were between four and five years old at the time of resale. These houses were then observed for good or poor tree cover. Thirty homes had a substantial amount of mature tree cover on the lot and thirty homes had no tree cover on the lot.

The town assessor's office was contacted again to obtain additional information for each of the sixty residences observed. The following information was obtained from property tax record cards on file in the town assessor's office.

	Variable #	Variable Name
Dependent	1	Sales price of each house
Independent	2	Square footage of house
	3	Number of rooms
	4	Number of bedrooms
	5	Number of baths

6	Square footage of lot
7	Whether house has on-site or city utilities
8	Number of fireplaces
9	Number of garages
10	Age of house
11	Date of sale
12	Loan to value ratio

Location and tree cover factor of each residence was noted for further use.

Method of analysis. A preliminary computer run found that there may be a substantial inter-correlation among some of the variables. In order to determine which of the variables are significant a factor analysis was used. The factor analysis reduces the correlated variables to a smaller set of uncorrelated variables.

After the factor analysis was run, a step-wise regression was used. The regression analysis is a valid valuation approach since it is the estimate of the total value of a set of components by adding up their individual contribution (1, 6).

Introduction of location and tree cover variable. Location is a complex variable which has a major effect on selling price. It involves access to many goods and services such as shopping areas, employment, schools, zoning regulations and the immediate environment. In order to assess this, each location was coded and a variable number was given to each neighborhood.

Coding	Neighborhood Name
10	= Forest Hills
01	= Redwood Farms
00	= Dartmouth Heights

A tree cover factor was established by simply observing residences with a substantial amount of mature tree cover versus residences with no tree cover. Substantial for the purpose of this study means between fifty and sixty percent of the lot was in mature tree cover.

Coding	
0	= No tree cover
1	= Mature tree cover

All the information obtained for each observed residence was analyzed and processed using the previously mentioned programs.

Results and Discussion

Factor analysis. The factor analysis determined which variables were significant. The analysis showed that there was four significant factors to be considered. The loading of high values for the variables, city utilities and location gave a good indication that *location* was significant as Factor 1. The loading of high values for variables, square feet in house, number of rooms, number of bedrooms and number of baths, indicated that *house size* was significant as Factor 2. *Date of sale* was indicated as Factor 3. *The extras,* tree cover and number of fireplaces, can be justified as Factor 4. These four factors (location, house size, date of sale and extras) with the variables they represent can now be used in the multiple regression analysis for final results.

Results from the multiple regression analysis. The sixty comparable market sales data and the information from the factor analysis were analyzed using a multiple regression analysis. Factors influencing sales price which entered into the regression equation were (*in rank order*):

1. Date of sale (Variable 11)
2. Number of bathrooms (Variable 5)
3. Square foot of house (Variable 2)
4. Number of garages (Variable 9)
5. Number of fireplaces (Variable 8)
6. Tree cover (Variable 13)
7. Location (Redwood Farms) (Variable 15)
8. Location (Forest Hills) (Variable 16)

From the data received it was found that:

1. Date of sale had an effect on sales price. Recently sold houses sold at a higher price than houses sold a few years earlier.

2. As the number of bathrooms in a house increased so did sales price.

Figure 1. Example of a house with good tree cover.

3. As square feet of house increased so did sale price.

4. As the number of garages increased so did sales price of the house.

5. As the number of fireplaces increased in a house so did sales price.

6. Tree cover was significant in adding to sales price. Sales price was higher if the house had mature tree cover on the lot.

7. If a house was located in the Redwood Farms area, sales price would be less than a comparable house in Dartmouth Heights.

8. If a house was located in Forest Hills area, sales price would also be less than a comparable house in Dartmouth Heights.

The data also showed that houses that were observed with "good mature tree cover" were somewhat larger in size than houses with "no tree cover". However, houses that had "good mature tree cover" were usually on smaller size lots than houses that had "no tree cover".

Development of a formula from regression analysis. The basic formula developed by the regression analysis is

$$Y = a + b_1x_{11} + b_2x_5 + b_3x_2 + b_4x_9 + b_5x_8 + b_6x_{13} - b_7x_{15} - b_8x_{14}$$

Where:

Y = Predicted sales price of house

a and b = Values calculated by computer from market data

x's = Amounts of each variable for the subject as follows

x_{11} = Dale of sale

x_5 = Number of baths

x_2 = Square foot of house

Figure 2. Example of a house with poor tree cover.

x_9 = Number of garages

x_8 = Number of fireplaces

x_{13} = Tree cover

x_{15} = Location (Redwood Farms)

x_{14} = Location (Forest Hills)

By substituting the values produced by the computer from the data above we arrive at the following formulation.

Sales price of house $= -337.845 + 4.88756 (x_{11}) + 3.02947 (x_5) + 0.0586 (x_2) + 2.30949 (x_9) + 2.38361 (x_8) + 2.68604 (x_{13}) - 2.94185 (x_{15}) - .3242 (x_{14}).$

By using the original formula we arrived at a base price of \$44,834.76. When we interject the "tree cover" and "location" variables to the basic formula the following assumptions can be made on how tree cover contributes to residential property value in the areas observed.

Redwood Farms. Houses in this area had the largest reduction in price. A comparable house sold for less in this area as compared to the other areas. If a house in this area had "good tree cover," it would just barely offset the location factor. But, if a house had "poor tree cover" and was located in this area the sales price would be approximately \$2,941.85 less.

On the average the values of a house:
With good tree cover = \$44,578.95
With poor tree cover = \$41,892.91

Dartmouth Heights. Tree cover had the greatest effect on sales price in this area. Location was not detrimental to sales price in this area because of a fairly good school district and higher priced houses surrounding the area.

On the average the value of a house:
With good tree cover = \$47,520.80
With poor tree cover = \$44,837.65

Forest Hills: Houses in this neighborhood suffered a minimal loss in sales price due to location. As a matter of fact, the average loss per house due to location was only \$324. Therefore tree cover had a significant effect on the sale price in this area, almost as much as Dartmouth Heights.

On the average the value of a house:
With good tree cover = \$47,196.68
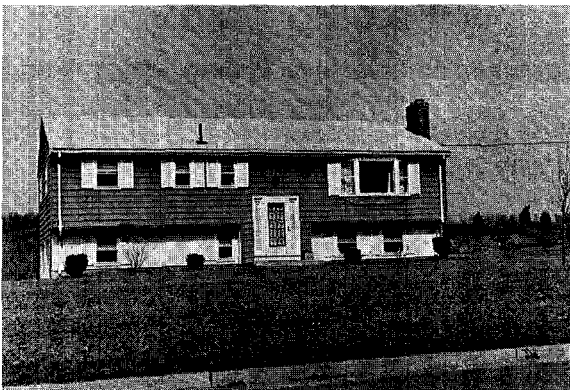With poor tree cover = \$44,510.64.

Conclusions

This study shows that tree cover does contribute to residential property value in Manchester, Connecticut. It shows that, all other things being equal, if a house in the areas observed has good tree cover, as much as six to nine percent of the total sales price of that house can be attributed to the good tree cover.

This study may also suggest that, by considering the variables used in the resulting equation, and by locating a house in a favorable area with good tree cover, a developer can anticipate extra profits of $6,000 or more than he might anticipate by locating in an unfavorable area with no tree cover. What determines favorable or unfavorable areas depends on school districts, economic facilities, and zoning. A little foresight on the developer's part can make the difference in profits if he is willing to assume the responsibility of preserving mature tree cover already on the site.

This study is not intended to be conclusive for all areas and/or locations where tree cover is involved, even though the procedure followed in this study may apply to other locations as well.

It is hoped that the conclusions arrived at in this study will benefit developers, appraisers, and homeowners when considering tree cover as a contributing factor to residential property value.

Literature Cited

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ABSTRACT

Phillips, L.E., Jr. 1979. **Implementing a street tree inventory and planning system.** Weeds Trees & Turf 18(12): 18-20, 22-23.

The planting of street trees has become very scientific and highly specialized. Because so many things must be taken into consideration when planting trees along our streets, it is most important to select the right trees and place them properly for permanent growth and lasting beauty. This article is intended to summarize two urban forestry studies. The first is the complete inventory and analysis of the existing street trees within a community. This is often followed by the computerization of tree data for ease with record maintenance and information retrieval. The second study pertains to the development of a comprehensive Master Street Plan. This plan documents and summarizes the inventory and provides the analysis needed to permit the development of a comprehensive master plan. Why should all of this planning be undertaken for the sake of a few trees? Community trees are like any other community asset, they have value and they must be maintained to protect that value.