

CITY TREES AND PROPERTY VALUES

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Originally published in Arborist News, August 2007. This version contains all references and citations.

Urban nature in all its forms—urban forests, parks, greenbelts—provides a range of benefits and services to society, most of which are not readily bought and sold. Economists calculate the “use value” of nature and ecosystems when tangible goods can be exchanged at market prices, such as timber or fisheries products. “Non-use values” set up a more complex economic puzzle. How can we estimate values for the many indirect, intangible services and functions that urban nature provides, such as beauty, ecosystem services, and psychological benefits?

The issue of valuation has become paramount in our society. What is not counted does not count in today’s public arena. When markets do not exist for a resource in question then efforts are made to derive monetary value¹. Natural settings, ranging from wildland to urban, offer many beneficial life-support functions. Nonmarket valuation techniques arose from the desire to represent the natural environment in the decision-making calculus² within communities.

This article serves two purposes. First, it will discuss the need for nonmarket valuations in local decision making. Then it will introduce the technique called hedonic pricing, including a summary of valuation studies over several decades.

VALUATION AND DECISIONS

Land ownership and improvements can be expensive in urban areas. If the values of intangibles are not represented, hard costs become powerful disincentives to invest in natural capital. Without some indicator of economic value, there is little financial incentive to consider urban nature in land-use decisions, market transactions, and capital investment budgets.

In the public sector, local leaders often make decisions about natural resources based on cost–benefit analysis. Any public investment or policy proposal that incurs public costs or affects private development brings forward advocates with evidence on how much market value will be gained or lost. Those who favor conserving or creating nonproductive nature are often at a disadvantage, as they cannot readily express the monetary gains or losses arising from environmental changes.

The challenge is that city trees and open space are public goods.³ Consumption of a public good by one individual does not reduce the amount of the good available for consumption by others. Another key property of public goods is that they are nonexcludable. Any number of people who walk under a splendid street tree will enjoy its shade and beauty immediately or over the course of several decades, irrespective of who pays for the planting and maintenance

of the tree. It is nearly impossible to exclude any nonpaying individuals from consuming the good.

Government authorities have often invested in public goods that members of society accept as providing value, such as education or emergency response systems. Having some way to estimate the value of nature's services helps local governments to weigh costs against returns from development or prioritize payments for green versus gray infrastructure.

Nonmarket valuation is helpful in the private sector as well. The pursuit of profit is based on estimates of costs and revenues. Nonmarket valuations offer the developer and land manager information to estimate return on investment for land development projects. For instance, there may be extra costs associated with taking greater care to protect trees during site preparation, but those costs may be offset by higher purchase prices for the building lots.

HEDONIC PRICING METHOD

Although the value of nature to property owners and communities is rarely known in precise dollars, its existence can be detected indirectly. Methods for nonmarket valuation include travel cost method, deferred and replacement cost analysis, and contingent valuation method.⁴

Hedonic pricing is a revealed willingness-to-pay technique. It attempts to capture the proportion of property prices that are derived from the non-use value of trees and other natural elements. It is a partial measure of value, obtained from indirect inferences about spending and prices.

Hedonic pricing studies have been done since the 1960s. Most use least squares regression analysis as the primary statistical tool. Property prices or assessments are regressed against sets of control variables: environmental attributes of the house or property, other neighborhood variables (such as the quality of local schools), and structural characteristics of the house (such as number of bedrooms). One can then estimate how a change in a natural feature, such as yard trees or proximity to a nearby park, is related to a change in property value, holding other characteristics of the property constant. The advantage of this method over others is its use of actual market transactions versus hypothetical questionnaires or indirect assessments.

Urban areas are ideal for application of hedonic pricing because there is usually a wealth of data available on house and property sales. Geographic databases enable analysis of value increments based on proximity to natural features such as parks. Hedonic values can be capitalized by local governments as increased property tax assessments or as excise taxes paid on property sales.⁵ The calculated value across all properties influenced by a natural feature can be aggregated, and the case may be made that the sum is adequate to pay for annual debt and maintenance of the feature, such as street trees or greenspace.

REVIEW OF VALUATIONS

This overview of hedonic studies focuses on properties in urban settings. There have also been polls of appraisers' judgments of property valuations and surveys of homebuyers' opinions to calculate economic value. The remainder of this section emphasizes studies using statistical analysis of market sales or appraisals.

Yard and Street Trees

Studies about trees and residential property values have evaluated a range of urban forest and landscape conditions on single-family homes. Although there have been a few exceptions, homes with trees are generally preferred to comparable homes without trees, with the trend across studies being a price increase of about seven percent. Here are results from a selection of studies:

<i>Price Increase</i>	<i>Condition</i>
2%	mature yard trees (greater than 9-inch dbh) ⁶
3-5%	trees in front yard landscaping ⁷
6-9%	good tree cover in a neighborhood ⁸
10-15%	mature trees in high-income neighborhoods ⁹

Price effect is variable and depends on how tree presence is defined. In addition, the socioeconomic condition of a residential area makes a difference. For instance, greater increments of value are seen for tree planting and landscape improvements in lower-quality neighborhoods.^{10,11}

Tree Retention in Development

Many communities have codes or ordinances that regulate tree preservation on residential development sites. Site developers may argue that tree protection costs are prohibitive. Understanding potential market values in different forest conditions is an important step in understanding the economics of forest protection.¹² Market price studies of treed versus untreed lots show this range:

<i>Price Increase</i>	<i>Condition</i>
18%	building lots with substantial mature tree cover ¹³
22%	tree-covered undeveloped acreage ¹⁴
19-35%	lots bordering suburban wooded preserves ¹⁵
37%	open land that is two-thirds wooded ¹⁶

Generally, trees and forest cover in development growth areas add value to parcels. One study found that development costs were 5.5 percent greater for lots where trees were conserved.¹⁷ Given increased lot and home valuations, builders have reported that they were able to recover the extra costs of preserving trees in a higher sales price for a house and that homes on wooded lots sell sooner than homes on unwooded lots.¹⁸

Parks and Open Space

More than 30 studies have shown that people are willing to pay more for a property located close to an urban open space than for a house that does not offer this amenity, a finding known as the “proximate principle.”¹⁹ The studies include parks and open spaces usually containing trees and forests.

<i>Price Increase</i>	<i>Condition</i>
10%	inner-city home located within 1/4 mile of a park ²⁰
10%	house two to three blocks from a heavily used, active recreation park ²¹
17%	home near cleaned-up vacant lot ²²
20%	home adjacent to or fronting a passive park area ²³
32%	residential development adjacent to greenbelts ²⁴

With few exceptions,^{25, 26} studies find that homes adjacent to naturalistic parks and open spaces are typically valued at about 8 to 20 percent more than comparable properties.²⁷ Values show a linear decline with distance from the edge of an open space, with a positive price effect declining to near zero at about a half mile away.^{28, 29, 30} Other factors include usage rate (more park users = lower values), user activity (athletic fields and games = lower value up to 500 feet away), and care and upkeep (lower maintenance = lower values). For instance, the values of properties close to heavily used or unkept parks are typically less than similar properties farther away.

View of Forests

Another method of valuing forests has been to analyze improvements in visual quality provided by trees or forest cover. Forest proximity may indicate recreational value, while tree cover on a residential lot can incorporate benefits such as noise reduction and energy use. Views are largely about aesthetic qualities and have been studied to a limited degree.

<i>Price Increase</i>	<i>Condition</i>
4.9%	multifamily unit with view of forested open space ³¹
8%	house with a park view ³²

Retail and Commercial

Most hedonic valuation studies have focused on residential properties. Yet tree planting programs are often an important part of revitalization efforts in retail and commercial districts. A few studies (using hedonic and other valuation techniques) hint at potential returns from tree investment on nonresidential sites.

<i>Price Increase</i>	<i>Condition</i>
7%	rental rates for commercial offices having quality landscape ³³
9-12%	reported increase in consumer spending in forested business districts ³⁴
23%	homes within 1/4 mile of “excellent” commercial corridor ³⁵

VARIABILITY AND LIMITATIONS

Decades of research findings indicate that property values are consistently higher with the presence of trees, particularly in residential settings. There are a few studies that show modest or no results, but even fewer show any negative price effect for city trees. In studies where distance effects can be measured, properties closest to naturalistic parks and greenspace have greatest value.

Despite these general patterns, there is great variability in hedonic analysis valuations. Why would that be? First, the statistical models may omit house or property characteristics that can bias estimates of amenity value. Such omissions may be due to inadequate research design, or the data for a key characteristic simply may not be available at a reasonable effort.

From a statistical standpoint it is assumed that there is an additive influence of city trees on property prices. Yet a causal relationship is rarely so simple, and all possible environmental inputs are difficult to capture, nor are they independent of each other.

These difficulties raise more philosophical questions. Is it really possible to calculate a price that communicates all the services and benefits that trees provide? There are some very practical limitations of hedonic analysis.

Trees and forests provide diverse environmental services such as air and water quality improvements, flood control, and wildlife habitat. Such benefits extend beyond the boundaries of a single parcel or may be invisible to buyers and so may not be adequately captured in hedonic analysis. Urban forest analysis tools (such as STRATUM, UFORE, and cityGreen) address the economics of distributed services, and some include hedonic analysis as one input in a broader economic model. Yet local decision makers may not understand the nuances of resource economics and may assume that property values represent the sole economic contribution of trees. The true and full value of city trees and forests will usually be greater than the value estimated by hedonic analysis alone.

Finally, in communicating about trees in terms of price, there is the risk of reducing the meaning of trees to purely economic terms. Hedonic calculations may be an awkward and incomplete way to describe the range of values that people place on having quality trees and forests in their communities.³⁶ For most people, there are matters of meaning and principle that are beyond economic calculations of nature.³⁷ Keen observers of nature have noted the beauty and restorative qualities of trees for centuries. Recent studies of the human dimensions of urban forests are just starting to reveal the breadth and depth of benefits from the human experience of nature. Talking about trees in terms of a narrow estimation of value may limit public debate about the importance of trees in communities.

Hedonic pricing and other nonmarket valuations are important contributions to local decision making. Yet those who use and report such studies must understand that the valuation process is fraught with uncertainty and assumptions. The point of using any valuation analysis is not so much to think exclusively in money or market terms but to

frame choices and make clear the trade-offs between alternative outcomes.³⁸ How do the costs and benefits of investments in natural capital compare to investments in other urban services such as law enforcement or education? Is the trade-off worthwhile? These are the types of questions for which even preliminary valuation can provide useful information. Quantifying the value that society assigns to trees and greenspaces, hedonic analysis can inform public discussions about urban forest investment and stewardship.

References

- ¹Boyd, J.W. 2006. The Nonmarket Benefits of Nature: What Should be Counted in Green GDP? Resources for the Future, Discussion Paper No. 06-24. Washington DC: Resources for the Future.
- ²Boyer, T., and S. Polasky. 2004. Valuing Urban Wetlands: A Review of Non-Market Valuation Studies. *Wetlands* 24, 4: 744–755.
- ³Samuelson, P.A. 1954. The Pure Theory of Public Expenditure. *Review of Economics and Statistics* 36, 4: 387-389.
- ⁴de Groot, R.S., M.A. Wilson, and R.M.J. Boumans. 2002. A Typology For the Classification, Description and Valuation of Ecosystem Functions, Goods and Services. *Ecological Economics* 41: 393–408
- ⁵Crompton, J.L. 2001. The Impact of Parks on Property Values: A Review of the Empirical Evidence. *Journal of Leisure Research* 33, 1: 1-31.
- ⁶Dombrow, J., M. Rodriguez, and C.F. Sirmans. 2000. The Market Value of Mature Trees in Single-Family Housing Markets. *Appraisal Journal* 68, 1: 39-43.
- ⁷Anderson, L.M., and H.K. Cordell. 1988. Influence of Trees on Residential Property Values. *Landscape and Urban Planning* 15: 153-164.
- ⁸Morales, D.J., B.N. Boyce, and R.J. Favretti. 1976. The Contribution of Trees to Residential Property Value: Manchester, Connecticut. *Valuation* 23, 2: 26-43.
- ⁹Theriault, M., Y. Kestens, and F. Des Rosiers. 2002. The Impact of Mature Trees on House Values and on Residential Location Choices in Quebec City. In Rizzoli, A.E. and Jakeman, A.J. (eds.), *Integrated Assessment and Decision Support, Proceedings of the First Biennial Meeting of the International Environmental Modeling and Software Society, Volume 2*: 478-483.
- ¹⁰Morales, D.J., B.N. Boyce, and R.J. Favretti. 1976. The Contribution of Trees to Residential Property Value: Manchester, Connecticut. *Valuation* 23, 2: 26-43.
- ¹¹Wachter, S.M., and K.C. Gillen. 2006. Public Investment Strategies: How They Matter for Neighborhoods in Philadelphia, Working Paper. The Wharton School, University of Pennsylvania.
- ¹²Nelson, N., J. Dorfman, and L. Fowler. 2002. The Potential For Community Forests to Be Self-Financing: An Hedonic Analysis of The Enhancement Value of Georgia's Trees. University of Georgia: Department of Agricultural and Applied Economics.

- ¹³Morales, D.J., F.R. Micha, and R.L. Weber. 1983. Two Methods of Valuating Trees on Residential Sites. *Journal of Arboriculture* 9: 21-24.
- ¹⁴Payne, B.R., and S. Strom. 1975. The Contribution of Trees to the Appraised Value of Unimproved Residential Land. *Valuation* 22, 2: 36-45.
- ¹⁵Thorsnes, P. 2002. The Value of a Suburban Forest Preserve: Estimates from Sales of Vacant Residential Building Lots. *Land Economics* 78, 3: 426-441.
- ¹⁶Payne, B.R. 1973. The Twenty-Nine Tree Home Improvement Plan. *Natural History* 82, 9: 74-75.
- ¹⁷Hardie, I., and C. Nickerson. 2004. The Effect of a Forest Conservation Regulation on the Value of Subdivisions in Maryland. WP 03-01 (Revised). Department of Agricultural and Resource Economics, University of Maryland, College Park.
- ¹⁸Seila, A.F., and L.M. Anderson. 1982. Estimating Costs of Tree Preservation on Residential Lots. *Journal of Arboriculture* 8: 182-185.
- ¹⁹Crompton, J.L. 2001. The Impact of Parks on Property Values: A Review of the Empirical Evidence. *Journal of Leisure Research* 33, 1: 1-31.
- ²⁰Wachter, S.M., and K.C. Gillen. 2006. Public Investment Strategies: How They Matter for Neighborhoods in Philadelphia, Working Paper. The Wharton School, University of Pennsylvania.
- ²¹Crompton, J.L. 2001. The Impact of Parks on Property Values: A Review of the Empirical Evidence. *Journal of Leisure Research* 33, 1: 1-31.
- ²²Wachter, S.M., and K.C. Gillen. 2006. Public Investment Strategies: How They Matter for Neighborhoods in Philadelphia, Working Paper. The Wharton School, University of Pennsylvania.
- ²³Crompton, J.L. 2001. The Impact of Parks on Property Values: A Review of the Empirical Evidence. *Journal of Leisure Research* 33, 1: 1-31.
- ²⁴Correll, M.R., J.H. Lillydahl, and L.D. Singell. 1978. The Effect of Greenbelts on Residential Property Values: Some Findings on the Political Economy of Open Space. *Land Economics* 54, 2: 207-217.
- ²⁵Luttik, J. 2000. The Value of Trees, Water and Open Space as Reflected by House Prices in the Netherlands. *Landscape and Urban Planning* 48: 161-167.
- ²⁶Schroeder, T.D. 1982. The Relationship of Local Park and Recreation Services to Residential Property Values. *Journal of Leisure Research* 14, 3: 223-234.
- ²⁷Crompton, J.L. 2001. Parks and Economic Development. Washington D. C.: American Planning Association.
- ²⁸Hammer, T.R., R.E. Coughlin, and E.T. Horn. 1974. Research Report: The Effect of a Large Park on Real Estate Value. *Journal of the American Institute of Planners* 40: 274-277.
- ²⁹Tyrväinen, L., and A. Miettinen. 2000. Property Prices and Urban Forest Amenities. *Journal of Environmental Economics and Management* 39: 205-223.

- ³⁰More, T.A., T.H. Stevens, and P.G. Allen. 1988. Valuation of Urban Parks. *Landscape and Urban Planning*, 15: 139-152
- ³¹Tyrväinen, L., and A. Miettinen. 2000. Property Prices and Urban Forest Amenities. *Journal of Economics and Environmental Management* 39: 205-223.
- ³²Luttik, J. 2000. The Value of Trees, Water and Open Space as Reflected by House Prices in the Netherlands. *Landscape and Urban Planning* 48: 161-167.
- ³³Laverne, R.J., and K. Winson-Geideman. 2003. The Influence of Trees and Landscaping on Rental Rates at Office Buildings. *Journal of Arboriculture* 29, 5: 281-290.
- ³⁴Wolf, K.L. 2005. Business District Streetscapes, Trees and Consumer Response. *Journal of Forestry* 103, 8: 396-400.
- ³⁵Wachter, S.M., and K.C. Gillen. 2006. Public Investment Strategies: How They Matter for Neighborhoods in Philadelphia, Working Paper. The Wharton School, University of Pennsylvania.
- ³⁶Price, C. 2003. Quantifying the Aesthetic Benefits of Urban Forestry. *Urban Forestry and Urban Greening*, 1: 123-133.
- ³⁷Ackerman, F., and L. Heinzerling. 2004. Assessing Natural Resources: Price vs. Value. *Renewable Resources Journal* 22, 3: 16-21.
- ³⁸Boyer, T., and S. Polasky. 2004. Valuing Urban Wetlands: A Review of Non-Market Valuation Studies. *Wetlands* 24, 4: 744-755.
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