

THE RETURN ON INVESTMENT OF PARKS AND OPEN SPACE:
HOW ECONOMICS CAN INFORM DESIGN

by

MYLES MCDONOUGH MALAND

(Under the Direction of Katherine Melcher)

ABSTRACT

Conventional valuation of parks and open space is typically limited to the social, cultural, and aesthetic values associated with these amenities. Perhaps because the primary motivations for building a park or preserving open space have not historically been financial, these spaces are often not evaluated in economic terms. This thesis uses a qualitative meta-analysis to examine and interpret the existing empirical evidence on the impact of parks and open space on residential property values. Specifically, data relating to park attributes, neighborhood characteristics, and surrounding demographics are gleaned and interpreted from hedonic pricing studies to offer designers and planners a comprehensive set of design and development considerations when attempting to maximize the return of investment of parks and open space.

INDEX WORDS: Parks, Open Space, Property Values, Economics, Hedonic, Return on Investment

THE RETURN ON INVESTMENT OF PARKS AND OPEN SPACE:
HOW ECONOMICS CAN INFORM DESIGN

by

MYLES MCDONOUGH MALAND

BS, University of North Carolina at Chapel Hill, 2002

A Thesis Submitted to the Graduate Faculty of The University of Georgia in Partial
Fulfillment of the Requirements for the Degree

MASTER OF LANDSCAPE ARCHITECTURE

ATHENS, GEORGIA

2012

© 2012

Myles McDonough Maland

All Rights Reserved

THE RETURN ON INVESTMENT OF PARKS AND OPEN SPACE:
HOW ECONOMICS CAN INFORM DESIGN

by

MYLES MCDONOUGH MALAND

Major Professor: Katherine Melcher

Committee: Brian LaHaie
Pratt Cassity
Melinda Cochran

Electronic Version Approved:

Maureen Grasso
Dean of the Graduate School
The University of Georgia
August 2012

DEDICATION

To my family

ACKNOWLEDGEMENTS

I would like to thank all my family and friends for their unwavering support. I would also like to thank the members of my thesis committee, Katherine Melcher, Brian LaHaie, Pratt Cassity, and Melinda Cochran, for their insight and guidance through this process. And finally, I would like to thank all of my classmates for their encouragement, assistance, and inspiration over the last three years.

TABLE OF CONTENTS

	Page
ACKNOWLEDGEMENTS	v
LIST OF TABLES	viii
LIST OF FIGURES	ix
CHAPTER ONE: INTRODUCTION.....	1
1.1 The Value of Parks and Open Space	1
1.2 The Role of Economics.....	2
1.3 Research Objective	4
1.4 Delimitations and Limitations.....	6
CHAPTER TWO: THE ROLE OF ECONOMICS	9
2.1 Park Valuation and The Center for City Park Excellence	9
2.2 Property Valuation and Hedonic Pricing	11
2.3 Hypothetical Example.....	18
2.4 Factors Influencing the Capitalization of Parks and Open Space.....	21
CHAPTER THREE: THE EVOLUTION OF THE EMIRICAL EVIDENCE	25
3.1 Summary of Existing Literature.....	25
3.2 Early Evidence of Economic Impacts.....	27
3.3 Later Evidence Using Statistical Methods.....	35
3.4 Conclusions.....	49

CHAPTER FOUR: RESEARCH METHODOLOGY	51
4.1 Introduction.....	51
4.2 Selection Criteria for the Inclusion of Studies	53
4.3 Research Variables and Content Analysis	55
CHAPTER FIVE: META-ANALYSIS OF HEDONIC STUDIES	61
5.1 Introduction.....	61
5.2 Park Size	62
5.3 Park Shape	68
5.4 Park Type and Amenities.....	69
5.5 Park Aesthetics and Land Cover.....	75
5.6 Park Edges and Views/Visibility	77
5.7 Path Directness.....	80
5.8 House/Lot Orientation	83
5.9 Lot Size	85
5.10 Population Density.....	87
5.11 Median Household Income	89
5.12 Age	91
5.13 Race	94
CHAPTER SIX: DESIGN CONSIDERATIONS	9
CHAPTER SEVEN: CONCLUSION	111
7.1 Conclusion	111
7.2 Future Research	115
REFERENCES	117

APPENDICES	122
A APPENDIX A: LITERATURE REVIEW OF HEDONIC STUDIES	122
B APPENDIX B: SUMMARY OF FINDINGS	123

LIST OF TABLES

	Page
Table 2.1 Annual Income Generated in Suburban Context	20
Table 2.2 Annual Income Generated in Urban Context	21
Table 3.1 The Impact of Different Types of Parks on Residential Property Values	39
Table 3.2 Effect of Home Spatial Orientation on Property Values	41
Table 3.3 Value of the Average House Related to Greenbelt Proximity	43
Table 3.4 Definition of Open Space Categories	46
Table 3.5 Variations in Property Values at Different Distances.....	47
Table 4.1 Meta-Analysis Matrix: Park Attributes.....	58
Table 4.2 Meta-Analysis Matrix: Neighborhood Characteristics	59
Table 4.3 Meta-Analysis Matrix: Neighborhood Demographics	60
Table 5.1 Impact of Park Proximity on Home Values.....	66
Table 6.1 Components of Validity Confidence Level	98

LIST OF FIGURES

	Page
Figure 2.1 Hedonic Property Value Model.....	16
Figure 2.2 Layout of 50-Acre Park and Surrounding Neighborhood	19
Figure 3.1 Plan of Regent’s Park in 1968	29
Figure 3.2 Birkenhead Park Lot Sale Plan, 1850.....	31
Figure 3.3 1870 Greensward Plan for Central Park.....	33
Figure 3.4 Net Effects Curve of Positive Impact on a Park.....	40
Figure 3.5 Impact of Proximity to Parks in Dallas-Fort Worth.	48
Figure 4.1 Meta-Analysis Methodology	53
Figure 6.1 Design Consideration #1	99
Figure 6.2 Design Consideration #2	100
Figure 6.3 Design Consideration #3	101
Figure 6.4 Design Consideration #4	102
Figure 6.5 Design Consideration #5	103
Figure 6.6 Design Consideration #6	104
Figure 6.7 Design Consideration #7	105
Figure 6.8 Design Consideration #8	106
Figure 6.9 Design Consideration #9	107
Figure 6.10 Design Consideration #10	108
Figure 6.11 Design Consideration #11	109

Figure 6.12 Design Consideration #12	110
--	-----

CHAPTER ONE

INTRODUCTION

1.1: The Value of Parks and Open Space

The recreational value of public parks has been widely recognized since the first royal gardens and hunting preserves were transformed to accommodate the masses in eighteenth century Europe. However, over the past two centuries public parks have grown to become an integral part of the complex urban infrastructure that supports our very existence. In addition to recreational benefits, these open spaces provide myriad social and cultural, environmental, aesthetic, and economic benefits.

Parks and open space promote physical and mental health, build social capital and stronger communities, while providing employment and educational opportunities and reducing crime. Many reduce stormwater runoff, filter water, recharge underground aquifers, reduce erosion, promote increased biodiversity, provide habitat for wildlife, sequester carbon, reduce air pollutants, reduce the heat island effect, and increase opportunities for pollination. Parks can create a sense of place, provide focal points and visual interest, hide unattractive or distracting land uses, and create opportunities for art, architecture, and urban design. Finally, parks offer economic benefits through the generation of tax revenue through increased property values and by attracting and retaining businesses, tourists, and new residents.

While most people, including elected officials, understand that parks and open space create some value, it is often the social, cultural, environmental, and aesthetic

values that are typically highlighted. Perhaps because the primary motivations for building a park or preserving open space have not historically been financial, these spaces are often not evaluated in economic terms (Crompton 2004).

1.2: The Role of Economics

In the United States, elected and other public officials who make key land use decisions, face mounting economic and political scrutiny as a result of increasingly competitive fiscal environments and escalating urban land values, as well as volatility in financial markets (Garvin 2011). And because there is a historical and marked absence of economic measures of park value, the merits of parkland cannot be objectively prioritized and ranked against other alternatives whose benefits are both measurable and well known (Crompton 2004). As a result, “many community leaders feel they must choose between economic growth and open space protection” (Rogers 1999, 3).

Contemporary conventional wisdom among many elected officials and key decision makers is that parks are a costly investment from which a community receives little if any economic return. While some of the merits of such an investment are frequently accepted, such as social and aesthetic values, these are widely regarded as being of lesser importance when budgetary priorities are being established (Crompton 2004). Because many officials do not understand how parks and open space can generate revenue for a community, they focus solely on the following costs associated with the creation of parks and the protection of open space: (1) costs of acquiring the property; (2) costs associated with developing the property, including design and construction costs; (3) costs associated with operation and maintenance, including employee payroll and

landscaping costs; and (4) the opportunity costs associated with the loss of property tax income that communities would have received if the property had been developed for other purposes. (Since public parkland is owned by the community, it is exempt from property taxes that would apply to land were it commercially developed (Crompton 2004).)

In contrast, the economic benefits associated with commercial and residential land development are well documented and easily understood by most public officials. Developers are also likely to have detailed projections and reports that cite very specific increases in dollar value of the tax base and impacts on local employment. In some cases, they can also represent powerful and wealthy private interests that can commit the resources necessary to influence key decision makers (Crompton 2004). Thus, claims made by developers can help perpetuate the idea that the development of the built environment brings prosperity through an expanded tax base and increases the tax base, while parks and open space are costly expenses that contract it.

The conventional wisdom that parks and open space offer no economic return is, of course, a fallacy – and it is beginning to be replaced with the understanding that these amenities can be important and lucrative stimulants to local economies. Thus, because many development alternatives to parks and open space offer detailed financial projections of increased revenue to the community (primarily through an increased tax base), it is important for park advocates to level the playing field by offering comparable financial projections.

This thesis examines the impact of park design on surrounding real estate prices. This is important to consider because park design can have a wide variation of effects on

property values. If parks are well designed and provide residents with positive recreational and aesthetic opportunities, then property values may increase substantially. Conversely, if parks are poorly designed, dispirited, and/or dangerous, property values may be negatively impacted.

It should also be noted that appreciation of property values is not always perceived by homeowners to be positive. Because higher property values translate to higher property taxes, residents who have lived in a neighborhood for a long time and have no interest in selling their property may see no benefits from the addition or renovation of proximate open space. Nevertheless, they are required to pay higher property taxes because the appraised value of their house has increased. In extreme cases, if resident cannot afford to continue to pay their property taxes, neighborhood gentrification and displacement can occur.

However, in most cases, communities would collectively like to see property values rise because as property values appreciate, so too do the associated property tax revenues, which can be used to pay for the costs of acquiring, developing, and/or maintaining parkland (among other things). Increased property values can also increase the collective wealth of residents and attract other localized investment.

1.3: Research Objective

The purpose of this thesis is to evaluate the existing empirical evidence to determine how design and development characteristics of parks and neighborhoods enhance the value of surrounding properties, and thus the value of the tax base. This is critical for landscape architects, planners, and elected officials to understand because if

designed and developed successfully, parks and open spaces can be acquired and developed at no long term cost to the community. In fact, annual tax revenues can not only pay for the capital costs, but subsequent revenues can serve as a consistent income stream that can be used to pay for park maintenance and future park development.

While a broad objective of this thesis is to help reposition parks as public goods that pay for themselves, it attempts to answer a central question: How can parks and open spaces be designed to increase the return on investment?

Through a qualitative meta-analysis of the most recent sophisticated economic impact studies, this thesis will explore how landscape architects and planners can use the empirical evidence to inform decisions on the design and development of public parks and open space to enhance the value of the tax base through increased property values. To this point, park designers have had an abundance of information about the supply of park design elements (such as, hiking trails, playfields, playgrounds, scenic overlooks, and water features), but know very little about the demand, or willingness of households to pay for such amenities (Miller 2001).

This thesis will first examine the role of economics in park planning, paying particular attention to property valuation, hedonic pricing models, and the factors that influence the economic return, or capitalization, of parks and open space. Next, this thesis will examine the evolution of the empirical evidence relating to parks impacts on the value of residential real estate. From there a research methodology will be set forth for the inclusion of relevant studies, and these studies will be organized, synthesized, and analyzed to reveal how various design attributes, neighborhood characteristics, and

demographics impact residential property values, and thus corresponding annual tax revenues.

Lastly, the results of this qualitative meta-analysis will be compiled into the first-ever comprehensive collection of economically-driven design considerations for designers and planners. While these considerations are intended to be used primarily by landscape architects and land use planners, they can also be used by public officials, developers, park advocates, or any other group attempting to maximize the return on investment of parks and open space. They are only to be considered at the user's discretion within the specific contexts of individual projects and communities. These economically driven considerations must be made in concert with other social, cultural, aesthetic, and environmental considerations in mind.

It cannot be overstated that the design considerations offered in this thesis are based *solely* on the empirical evidence of economic impact studies and therefore are intended to *only* address the economic impacts on property values. (This is particularly true for the considerations dealing with neighborhood demographics, such as race and age.) The considerations presented in Chapter Six are in *no way* intended to address other economic impacts, or the social, cultural, aesthetic, or environmental aspects necessary for quality park design.

1.4: Delimitations and Limitations

The focus of this thesis is on the impact of public parks and open space on single-family home prices within urban and suburban markets within the United States. For the purposes of this thesis, parks and open space refer to tracts of land set aside for

permanent public use. This may include, but is not limited to, mini, neighborhood, urban, community, and regional parks, as well as greenways and urban forests to the extent that they offer recreational opportunities. It does not, however, include private or developable tracts of land, such private property under conservation easement or vacant lots, nor does it include agricultural land. This thesis is also restricted to evaluating parks and open space in urban and suburban markets within the United States; because rural markets value land and open space differently than more urbanized markets, they have been excluded. Furthermore, this thesis only addresses impacts on single-family homes values, and does not address other impacts on renters, businesses, or residents living in multifamily housing.

Finally, there are several limitations that set parameters on the application of this study. The authors of the studies included in the meta-analysis offered in this thesis often have varying definitions of a park (e.g., urban parks vs. greenways); however, while the analysis of this thesis attempts to separate effects of different types of parks, some of the analysis aggregates the results to offer general findings for parks and open space as a whole. Furthermore, because this thesis synthesizes and analyzes the empirical data from multiple studies from across the U.S., many of which have varying research designs, some of the design considerations offered in Chapter Six may not be true for all locations across the country. In addition, the variability in research design, regionality, and results from each study, prevent any precise economic conclusions from being drawn (e.g., no specific dollar amounts can be attributed in individual park amenities). Landscape architects and planners must evaluate the validity of each design consideration based upon the circumstance of their individual projects and/or communities. This thesis will

offer a measure of validity of each consideration, but it is the responsibility of practitioners to decide which treatments work for their projects.

CHAPTER TWO

THE ROLE OF ECONOMICS

This chapter will discuss parks within a context of economics. It will discuss both park and property valuation measures, as well as give a hypothetical example of how parks can be self-financing. This is extremely important for designers and planner to understand when considering the acquisition and development of parkland.

2.1 Park Valuation & The Center for City Park Excellence

In October 2003, The Trust of Public Land's Center for City Park Excellence (CCPE) gathered 24 park experts and economists in Philadelphia for a colloquium to analyze how park systems economically benefit cities. Based on this colloquium and subsequent consultations with economists and academics, CCPE identified seven attributes of city park systems that are both measurable and provide economic value. While many aspects of a park system cannot (yet) be quantified economically, the seven attributes that CCPE enumerated were property value, tourism, direct use, health, community cohesion, clean air, and clean water. Specifically, they contend that parks and open space can economically benefit a community by increasing property values (the subject of this thesis), increasing income from out-of-town visitor spending, increasing direct use value, increasing health value (reducing medical expenditures), increasing community cohesion (a proxy of social capital), reducing the cost of managing urban stormwater, and the removal of air pollution by vegetation (Harnik and Welle 2009).

In the subsequent years, CCPE has partnered with six U.S. cities (Denver, Philadelphia, Charlotte, Seattle, Virginia Beach, and Boston) to offer an analysis of the economic benefits of entire parks systems. It is these analyses that first piqued the interest of the author and led to this research, which focuses on one component of economic valuation – the impacts on surrounding property values.

With regard to the effects that parks systems are having on annual property tax revenues in cities across the U.S., the numbers calculated by CCPE are staggering: property tax revenue attributable to parks in Denver was over \$4 million in 2010; Philadelphia reached over \$18 million in 2007; and tax revenue attributable to parks in Seattle reached a astonishing \$14.7 million in 2009 alone (*The Economic Benefits of Denver's Park and Recreation System* 2010; *How Much Value Does the City of Philadelphia Receive from its Park and Recreation System* 2008; *The Economic Benefits of Seattle's Park and Recreation System* 2011).

As with the vast majority of the other empirical research on the impacts of parks and open space on property values, CCPE calculates residential property values of single-family homes; their calculations exclude effects on businesses, renters, and multifamily housing such as apartment buildings. This occurs for several reasons: (1) electronic access to assessed value and sales price of homes is much easier to obtain; (2) businesses don't turn over as frequently as homes, thus sample sizes are much smaller and changes in sales price cannot be tracked with as much accuracy; and (3) residents in multifamily homes and employees in businesses often have different preferences than residents of single-family homes, and thus their willingness to pay does not correspond directly.

One criticism the author has of the CCPE approach to calculating annual property tax revenues attributable to parks and open space is that it is only an estimate, and has a substantial margin of error. Because of time and resource constraints, CCPE calculates the aggregate impacts of entire city park systems, rather than impacts associated with individual parks. Consequently, they assume that in the aggregate, every park will increase the value of properties within 500 feet of a park by 5%. While the empirical evidence seems to generally support this assumption, it is recognized as only an estimate. It may vastly underestimate the impacts associated with well-designed and popular parks that are highly valued by people living farther than 500 feet away. It may also vastly overestimate the impacts associated with blighted, dispirited, or dangerous parks. Therefore, it must generally be viewed as a conservative, aggregate estimate. This thesis will examine the empirical evidence to determine the various economic impacts that parks and open space have on property values, and how design and development characteristics of parks and the surrounding neighborhoods affect those impacts.

2.2 Property Valuation & Hedonic Pricing

While various methods of ascertaining the economic value of parks and open space exist, the property value technique is the most suitable for this thesis since it focuses solely on impacts on residential real estate. The property value method uniquely analyzes actual situations (rather than hypothetical conditions and events), while also capturing both use and non-use values (Nicholls 2002). This property value method is introduced and described below, followed by a description of the hedonic pricing method and the decision to focus on studies that use hedonic pricing.

The residential housing market is complex and dynamic, and consists not just of one market, but also of a collection of smaller submarkets. Property values fluctuate over time and space, and are subject to a wide variety of influences at many scales, from individual features of a property to accessibility to local services and amenities to national policies and planning controls. The property value approach to measuring the economic impact of amenities such as parks and open space is based on three assumptions: (1) the externalities, both positive and negative, associated with such amenities are capitalized into surrounding property prices; (2) real estate prices reflect the aggregate value of all the advantages and disadvantages associated with a home site; and (3) these prices are assumed to provide a measure of homeowners' preferences regarding proximity to various amenities, including parks. (Nicholls 2002)

While the property value method is unable to account for all the economic benefits of parks and open space, it measures revealed preferences rather than stated preferences. Specifically, rather than asking users what they would be willing to pay for proximity and/or access to a park, the property value method assumes that this willingness to pay for proximity and/or access is actually capitalized into the value of surrounding homes. This suggests that it may be somewhat more accurate than alternative approaches since it is based on actual data rather than respondents' intentions. Furthermore, the property value approach also captures both use and non-use values, meaning for instance that while accessibility to an open space may be one influential factor on property values, a view of such an amenity – regardless of utilization – may be another significant determinant (Nicholls 2002).

Several methods for analyzing property value impacts exist; however in recent years with advances in analytical capabilities, multiple regression techniques have allowed for far more detailed analyses than earlier methods. These multiple regression models can statistically control for variations among properties (e.g., number of bedrooms, square footage, and school districts), and thus allow for the examination of impacts on individual residences rather than groups of residences. This is preferable to the analysis of aggregated properties (as earlier methods did) since homes are assessed and purchased on an individual basis and because this method allows for the analysis of variations in value based on the distance to amenities, such as parks. The hedonic pricing method is one such method of evaluating the worth of underlying elements of property values based on multiple regression analysis (Nicholls 2002).

A product can be viewed as a bundle of characteristics. For instance, a car is made up not just of plastic and steel, but also of attributes related to size, performance, fuel economy, etc. Hedonic pricing models express the price of a product as a function of its characteristics and attributes. The hedonic approach to pricing real estate assumes that a house is composed of a bundle of individual attributes, each of which has its own, implicit value or price. The listed price of a property is made of the sum of the prices of all of these individual characteristics. The purpose then of this approach, then, is “to separate a property into its constituent elements so as to enable calculation of particular attributes’ implicit prices” (Nicholls 2002, 27).

While the idea that consumers get value from the individual attributes embodied in goods is generally attributed to Lancaster (1966), Rosen (1974) goes on to show that, “the economic content of the relationship between observed prices and observed

characteristics becomes evident once price differences among goods are recognized as equalizing differences for the alternative packages they embody” (36). Rosen (1974) also emphasized, however, the indivisibility of goods, and that individual characteristics would have no utility in isolation from the good as a whole.

According to Nicholls (2002), the factors that influence property prices can be divided into six groups of characteristics: (1) physical or structural features of the individual property; (2) neighborhood conditions; (3) community conditions; (4) locational factors; (5) environmental factors; and (6) macroeconomic market conditions at the time of sale.

The physical or structural features of a property refer to the land and buildings constructed upon it. This category may include such factors such as lot size, house size, number of rooms, number of bedrooms and bathrooms, age and condition of the house, and the presence of a garage.

The neighborhood and community conditions both relate to factors beyond the property itself; however, neighborhood conditions refer to factors at small scales, such as the attractiveness of the neighborhood, the quality and condition of neighboring houses, residential density within a subdivision, and neighborhood crime rates, while community conditions refer to factors at broader scales, such as rates of taxation and the provision of local public services.

Locational attributes relate to the proximity or accessibility of land uses or facilities, whether they are desirable or undesirable. In the case of desirable land uses, it is assumed that house prices reflect its owners willingness to pay a premium for a

location proximate to that amenity; alternately, in the case of undesirable land uses, the opposite is true; home owners prefer to live farther away.

Environmental characteristics that impact property values include things like views from the property, as well as levels of noise and pollution. While these characteristics may, in some instances, be strongly correlated with locational attributes, this is certainly not always the case. For example, homes close to a highway interchange may benefit from easier access to the highway than other properties farther away; however they also may be the same homes that suffer from the noise and pollution created by passing traffic.

The final group of attributes relate to macroeconomic conditions at the time a property sells. These might include the month and year of sale, the number of days a property spent on the market, and the rate of interest. The price of a property is, therefore, a result of complex interactions among multiple individual attributes within each of the six groups of influences identified. See Figure 2.1.

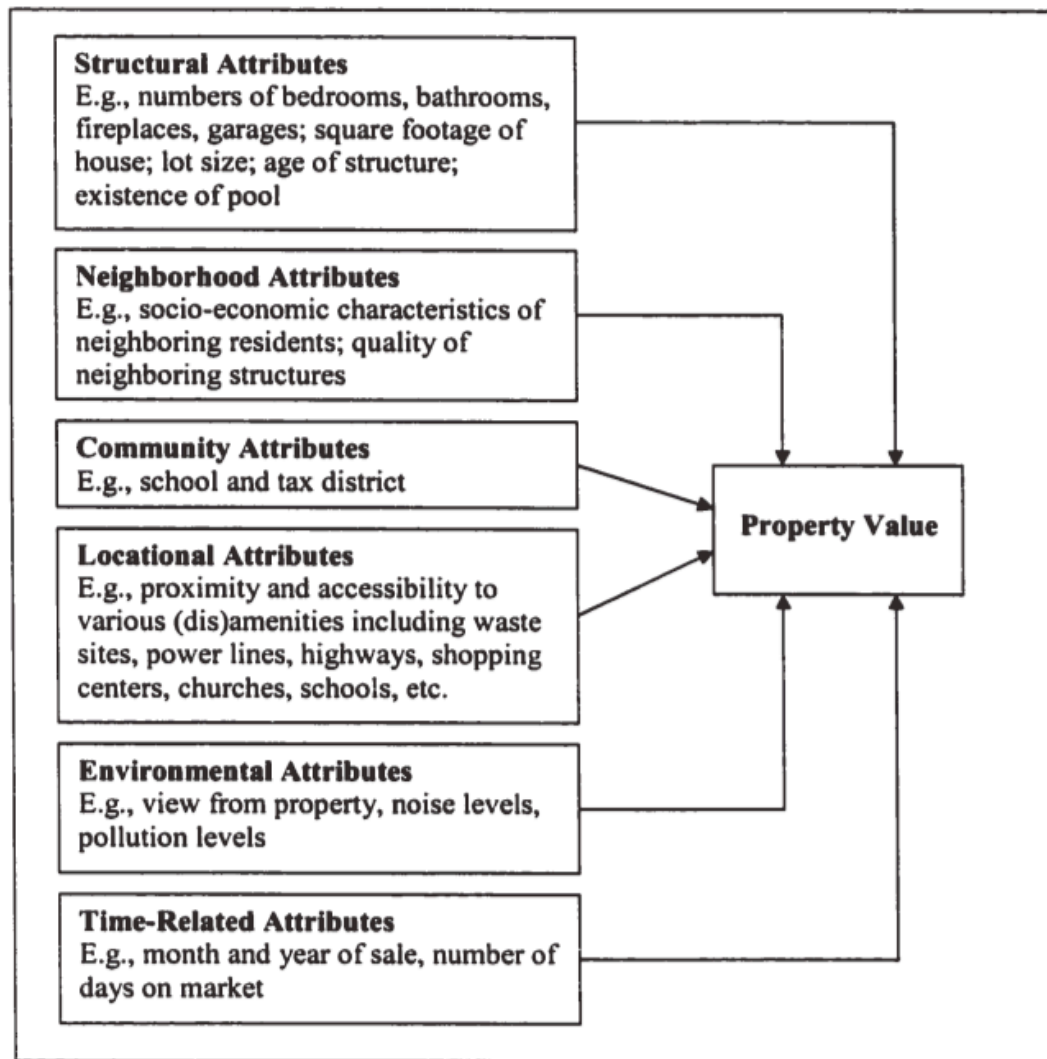


Figure 2.1 Hedonic Property Value Model. Figure courtesy of Nicholls, 2002.

Hedonic models are required because of the heterogeneous housing stock and heterogeneous consumer preferences (Malpezzi 2003). Homebuyers possess unique preferences that cause them value home characteristics differently. These preferences are revealed by the observed behavior of individuals in the marketplace. For example, one household may place more value on the size of the backyard than the number of bathrooms. Each home possesses a bundle of attributes and services, which are unique to

the house, and valued accordingly depending on the preferences of the marketplace. For instance, older homes are typically valued less than newer homes, and garages and central heating have a greater value in colder climates (Sharma 2008). Hedonic pricing models are used to value these components and estimate their implicit prices.

While the analytical specifics of the hedonic pricing model are outside the scope of this thesis, it should be noted,

The implicit price of any individual characteristic within each of these six categories may be obtained by differentiating the model with respect to that attribute. Holding all other variables constant, it is, therefore, possible to ascertain the impact of varying the existence or quantity of the characteristic of interest on overall value. (Nicholls 2002, 30).

Thus, by statistically controlling some variables (e.g., home structural features) the specific effect of parks and open space on home values can be examined.

It must be noted that the hedonic pricing model is subject to four assumptions: (1) the housing market is at equilibrium (supply equals demand) and the home value reflects the present value and the future expectations of amenity levels, (2) a full range of houses with varying attributes is available for homeowners to choose from, (3) homeowners have perfect market knowledge and choose to maximize their utility subject only to budget constraint, and (4) home characteristics exist objectively while consumers, based on their preferences, value homes containing different bundles subjectively (Rosen, 1974). Despite these broad assumptions and some statistical issues, it has been widely adopted by both practitioners and academic researchers interested in estimating the implicit prices of individual characteristics of real estate. In fact, Des Rosiers, Lagana, Theriault, and Beaudoin (1996), state that the hedonic pricing method “has proven most reliable for establishing the implicit price of individual residential attributes (41).”

The hedonic pricing method is thus a tool for inferring the value of a non-market good (e.g., parks and open space) from the prices of goods (residential real estate) actually bought and sold in the marketplace. Conceptually, within the context of parks and open space, the market will bid up the value of property exactly equal to the capitalized value of the benefits that property owners perceive that they receive from the presence of these amenities. As property values increase for individual homes, so to do the corresponding property taxes. This is critical because if the incremental amount of taxes paid by each homeowner that is attributable to the presence of parks is aggregated, it will be sufficient to pay for the annual debt charges to acquire and develop the park, and thus a community can obtain it for no long-term cost (Crompton 2004). Furthermore, once the bond is retired, the increased revenues generated from the impacts of the park on surrounding property values can be applied to maintenance and labor costs, or the income can be diverted for other community needs.

2.3 Hypothetical Example

This principle can be illustrated through an example first set forth by Dr. John Crompton in his seminal work, *The Proximate Principle*, written in 2001. In it Crompton describes a hypothetical 50-acre park situated in a suburban community shown in Figure 2.2. If the cost for acquiring and developing the 50-acre park shown is \$20,000 per acre, then the total capital cost is \$1 million. The hypothetical debt charges then for a 20-year general obligation bond on \$1 million at 5% are approximately \$90,000 annually.

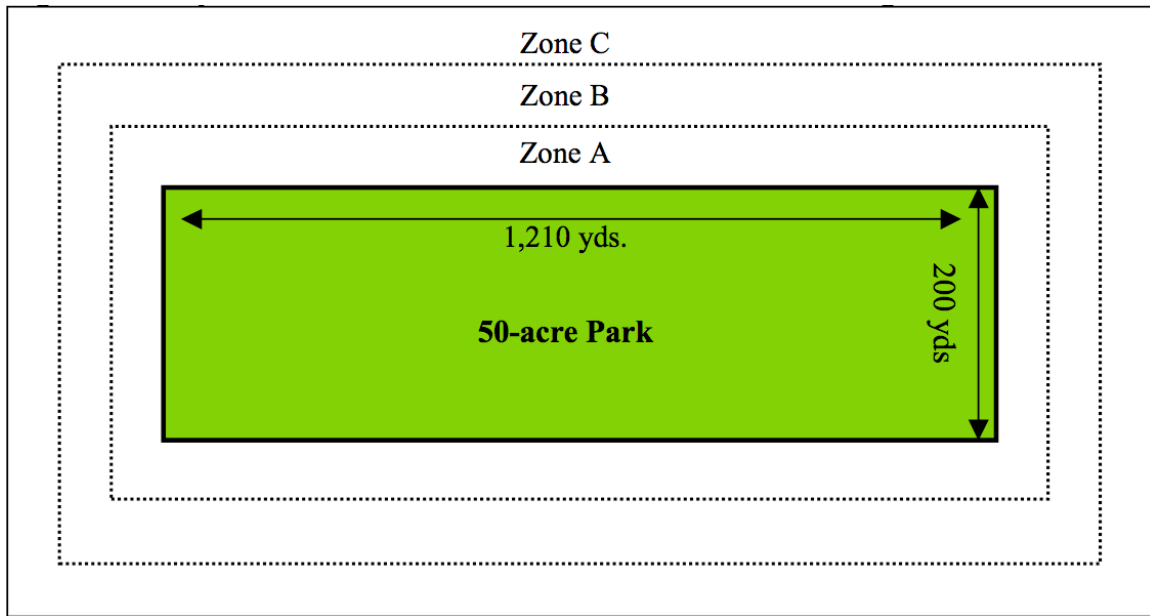


Figure 2.2 Layout of a 50-acre park and surrounding neighborhood. Figure courtesy of Crompton (2001).

The projected annual income derived from a suburban park's impact on surrounding properties is calculated using the following assumptions:

1. If properties around the park are 2,000 square foot homes on half-acre lots (40 yards x 60 yards) with 40 yard frontages on the park, then there would be 70 lots in Zone A (30 lots along each of the 1,210 yard perimeters and 5 lots along each of the 200 yard perimeters).
2. Total property taxes payable to city, county, and school district are 2% of the market value of the property
3. The market value of similar properties elsewhere in the jurisdiction beyond the influence of the park is \$200,000.
4. The desire to live close to the park creates a willingness to pay a premium of 20% for properties in Zone A, 10% in Zone B, and 5% in Zone C. (The literature

review in Chapter 3 will demonstrate that these numbers are a reasonable assumption.)

Based on these assumptions, Table 2.1 shows the annual incremental property tax payments in the three zones from the premiums attributable to the presence of the park to \$98,000 – an amount sufficient to pay the \$90,000 debt charge.

Zone	Market Value of each home	Incremental Value attributed to the park	Total property taxes at 2%	Incremental property taxes attributed to the park	Aggregate amount of property tax increments given 70 home sites
Outside the Park's Influence	\$200,000	\$0	\$4,000	\$0	\$0
A (20% premium)	\$240,000	\$40,000	\$4,800	\$800	\$56,000
B (10% premium)	\$220,000	\$20,000	\$4,400	\$400	\$28,000
C (5% premium)	\$210,000	\$10,000	\$4,200	\$200	\$14,000
					\$98,000

Table 2.1 Annual income generated in suburban context. Table courtesy of Crompton (2001).

If the context is changed from a suburban community to an urban community, and the properties are townhouses constructed at a density of 8 per acre, then the first assumption above would be revised to the following:

1. If properties around the park are 2,000 square feet townhomes on lots sized 20 yards x 30 yards with the 20 yard frontages on the park, then there would be 140 lots in Zone A (60 lots along each of the 1,210 yard perimeters and 10 lots along each of the 200 yard perimeters).

If the remaining assumptions (2 – 4) remained unchanged, then the aggregate annual incremental revenue attributable to the park would be \$196,000. See Table 2.2.

Zone	Market value of each home	Incremental value attributed to the park	Total property taxes at 2%	Incremental property taxes attributed to the park	Aggregate amount of property tax increments given 140 home sites
Outside the Park's Influence	\$200,000	\$0	\$4,000	\$0	\$0
A (20% premium)	\$240,000	\$40,000	\$4,800	\$800	\$112,000
B (10% premium)	\$220,000	\$20,000	\$4,400	\$400	\$56,000
C (5% premium)	\$210,000	\$10,000	\$4,200	\$200	\$28,000
					\$196,000

Table 2.2 Income generated in urban context. Table courtesy of Crompton (2001).

If these two scenarios hold true, then they anecdotally suggest that parks may add more value in urban areas than in suburban areas since denser development means more homes benefit from proximity to a park; however, since urban land values are often substantially higher than in a suburban community, then it is quite possible that the acquisition cost of a 50-acre parcel would also be substantially higher in an urban context. Thus, “if a suburban park is to deliver equivalent proximate impact to the tax base as an urban park, either the premium paid by each home must be substantially higher relative to urban contexts or the cost of land must decrease disproportionately relative to the number of homes around the park” (Crompton 2004, 21).

2.4 Factors Influencing Capitalization of Parks & Open Space

As previously mentioned, because homes located near parks and open space are likely to be appraised at higher values (and thus home owners are likely to pay higher property taxes), this represents a capitalization of parkland into the property values for surrounding home owners. Three primary factors affect the magnitude of capitalization

of parks and open space into property values: (1) the maturation of the amenities, (2) the ratio of supply and demand, and (3) the quality of the park. (Crompton 2004).

Because it takes many new and renovated parks time to mature and grow into the intended design, that capitalization rates might initially be relatively small. However, as young trees grow tall and provide more shade, shrubs and groundcovers fill in the landscape, and the park becomes more attractive, this capitalization rate is likely to increase over time. Thus, while returns might be insignificant immediately following construction, if the park matures into an attractive and useful place for people to experience, the rates of return often increase over time (Crompton 2004).

Secondly, as with any other good, market or non-market, the premiums that people are willing to pay to be close to an amenity such as a park or open space are influenced by the supply of reasonable substitutes. So, if such amenities are relatively abundant, then associated capitalization premiums are likely to be correspondingly small or even non-existent; however, in areas where parks and open space are rare, large premiums can often be attributed to the relative scarcity of such amenities (Crompton 2004).

Finally, the perceived quality of a park can have tremendous effects on the magnitude of capitalization parks and open space have on surrounding property values. Park quality can be perceived of in various ways. Some may evaluate a park's quality in terms of its ability to serve the needs of the surrounding community. Do community members see the park as a desirable place to live near? Does the park offer recreational amenities (e.g., ball fields, jogging trails, swimming pools, etc.) in line with what the local community wants? Because community demographics, lifestyles, preferences, and

interests change over time, some parks, which were once valuable assets, are now “of the wrong kind in the wrong place at the wrong time” (Crompton 2004, 24). It is highly unlikely that these parks will offer much, if any, capitalized value to surrounding properties.

Others may evaluate the quality of parks and open space on how attractive the park is. Is the park well designed? Is the park well maintained? Are the plantings and hardscape perceived to be of high quality? How attractive is the park to look at from surrounding properties?

Still others may evaluate quality based, not upon the positive attributes a park has, but rather what negative attributes it does not. There are contexts in which parks can actually exert a negative impact on property values. For instance, some studies (Lyon 1972; Weicher and Zerbst 1973; Bolitzer and Netusil 2000; Anderson and West 2006) highlight the nuisances that some parks can cause, such as: increased traffic and congestion, limited availability of on-street parking, increased instances of litter and vandalism, increased numbers of undesirables, increased levels of noise and light pollution, poorly maintained facilities, and increased instances of crime and offensive behaviors.

In her groundbreaking work, *The Death and Life of Great American Cities*, Jane Jacobs (1961) describes one Philadelphia park as,

...where the homeless, the underemployed and the people of indigent leisure gather amid the adjacent flophouses, cheap houses, missions, second-hand clothing stores, reading and writing lobbies, pawnshops, employment agencies, tattoo parlors, burlesque houses and eateries. This park and its users are both seedy...it has hardly worked as an anchor to real estate values or to social stability. (120)

She goes on further to say, “like all neighborhood parks, it is the creature of its surroundings” (121). These statements highlight the inexorable link of urban open spaces to the surrounding neighborhood. Irrespective of the design of parks or their surrounding neighborhoods, negative impacts (e.g., vandalism) can emerge if the sites are not well designed or maintained.

The purpose of this thesis is to evaluate the existing empirical evidence to determine how design and development characteristics of parks and neighborhoods enhance the value of surrounding properties, and thus the value of the tax base. As this chapter has shown, this is critical for landscape architects, planners, and elected officials to understand because if designed and developed successfully, parks and open spaces can be acquired and developed at no long term cost to the community. In fact, annual tax revenues can not only pay for the capital costs, but subsequent revenues can serve as a consistent income stream that can be used to pay for park maintenance and future park development. The next chapter will review existing literature and provide an evolution of the research designs of the key empirical studies from the early nineteenth century until today.

CHAPTER THREE

THE EVOLUTION OF THE EMPIRICAL EVIDENCE

3.1 Summary of Existing Literature

This chapter offers a review of the existing literature on the issue of how parks and open space impact surrounding property values. It is by no means intended to be an exhaustive review, but rather it is intended to (1) summarize the results of the existing literature, (2) highlight key studies chronologically, (3) include a historical perspective on the issue, including when methodologies shift (4) and call out particularly strong methodologies that use sophisticated statistical tools.

The contributions of Dr. John Crompton, Distinguished Professor of Recreation, Park, and Tourism Science at Texas A&M University, to this field of research cannot be understated. In both editions (2001 and 2004) of his seminal work, *The Proximate Principle*, he provides near exhaustive literature reviews to date. Crompton (2004) identified 28 studies conducted in urban and suburban areas (in addition to “12 naïve studies” that lacked statistical backing), 23 studies offered empirical evidence in full support of the notion that parks and open space have a positive impact on proximate property values. Crompton refers to this premise as the *proximate principle*. (See Appendix A for a comprehensive list of all empirical studies with statistical backing that address the impacts of parks on surrounding property values, including those identified by Crompton and those that do not support the notion that proximity to parks positively impacts property values.) Of the five studies that did not, Crompton writes,

One reported mixed results, but in two of the three parks which were investigated in it, the proximate principle was supported. In three of the remaining studies, failure to verify the proximate principle may be attributed to unorthodox and flawed measurement measures that were used. These involved failure to control for other influencing variables, an inappropriate control area against which proximate value increments could be measured, and measures which failed to embrace the central element of distance decay. (101)

In addition to the studies identified by Crompton, 27 additional studies have been identified, all but two of which are supportive. In total 55 statistical studies have been identified; only seven of which do not offer unequivocal support of the idea that parks contribute value to surrounding homes. (See Appendix A.)

Several challenges exist when attempting to interpret the existing literature. It can be difficult to compare the results of the empirical studies because they have been ascertained in a variety of manners and have used a number of different measures of value (Nicholls 2005). For instance, many early studies used assessed valuation rather than actual sales price as their measure of property value. Assessed values are not direct substitutes for sales price since some tax assessors are not as likely to consider the proximity of parks in their valuations. Therefore assessed valuations tend to be lower than sales price since tax assessors seek to avoid appeals from property owners challenging their assessments. However, assessed values can be used as a proxy to represent value in the market place (Crompton 2004).

In addition, some studies use dollar figures to describe the results found in the studies, while other studies use percent difference. To illustrate, if the mean value of homes in the area is not reported, then it is unclear whether a \$50,000 increase is a 25% increase in value (if the mean home price is \$200,000) or a 10% increase (if the mean home price is \$500,000).

Lastly, some studies measure distance to a park using a straight-line, or radial distance, from the property to the park, whereas others measure the distance that it would take someone to walk to the park. The latter approach is more accurate and is more frequently used in recent years with the gaining popularity of GIS mapping software. Distances over which the impact was measured also differ from one or two blocks to up to a half-mile or more (Crompton 2004).

The following two sections of this chapter provide a glimpse into the evolution of the concept that parks are investments that pay for themselves over time. The first section explains how the concept originated in England before it was brought to the United States by renowned landscape architect Frederick Law Olmsted. Most of these studies lack sophisticated statistical models and focus primarily on answering the singular question, “Do parks and open space contribute to increasing property values?” The second section details how the concept advanced to the sophisticated hedonic studies conducted today, and attempts to answer two main questions in addition to the one stated above: “How large is the impact on surrounding properties?” and “Over what distance does the impact extend?” (Crompton 2001, 2-3).

3.2 Early Evidence of Economic Impacts

Origins

The strategy of using open spaces to raise the value of surrounding real estate originated with the private squares of England, and subsequently evolved as the foundation for funding the first public parks. While the physical form of the urban squares in Britain were derived from the continental European models of the Italian

piazzi and the *places* of France in the late sixteenth and early seventeenth centuries, much of it is also a result of the British systems of property ownership and social status (Lavedan 1941; Zucker 1959; Lawrence 1993).

In early eighteenth century London, the residential square became one of the primary new forms used to establish new districts for the wealthier classes. From the beginning, the private squares “were intended to be amenities that increased the value of property surrounding them, in speculative construction projects aimed at providing housing for the growing upper-class population in London” (Lawrence 1993, 95). The squares were seen to have had both economic and social roles: “They were seen as economic assets to the ground landlords who owned them, by raising the value of surrounding property, and as social assets by the leasehold tenants who had a sole access to them” (Lawrence 1993, 95).

In the early nineteenth century, the Prince Regent (later King George IV), took the idea of the square further by transforming a royal park into a real estate development targeted at the wealthy (Chadwick 1966). While the land was originally claimed by the Crown as a hunting preserve, and later was cleared and leased as agricultural land, the Prince realized that considerably more income could be generated if it was developed into housing. He charged John Nash with the task of transforming the site into the finest residential development in London (Crompton 2004).

Regent’s Park was completed in 1826, and drew upon Nash’s understanding that “wealthy landowners infinitely prefer living near an open space” (Saunders 1969, 83). In his design, Nash designed classical residential terraces that encircled a picturesque landscape complete with “open space [and] free air and scenery of nature” (Saunders

1969, 83). While the project took 15 years to complete, it proved to be a vastly successful real estate venture in which a substantial portion of the value of the houses was derived in large part from the presence of the park (Chadwick 1966). See Figure 3.1.

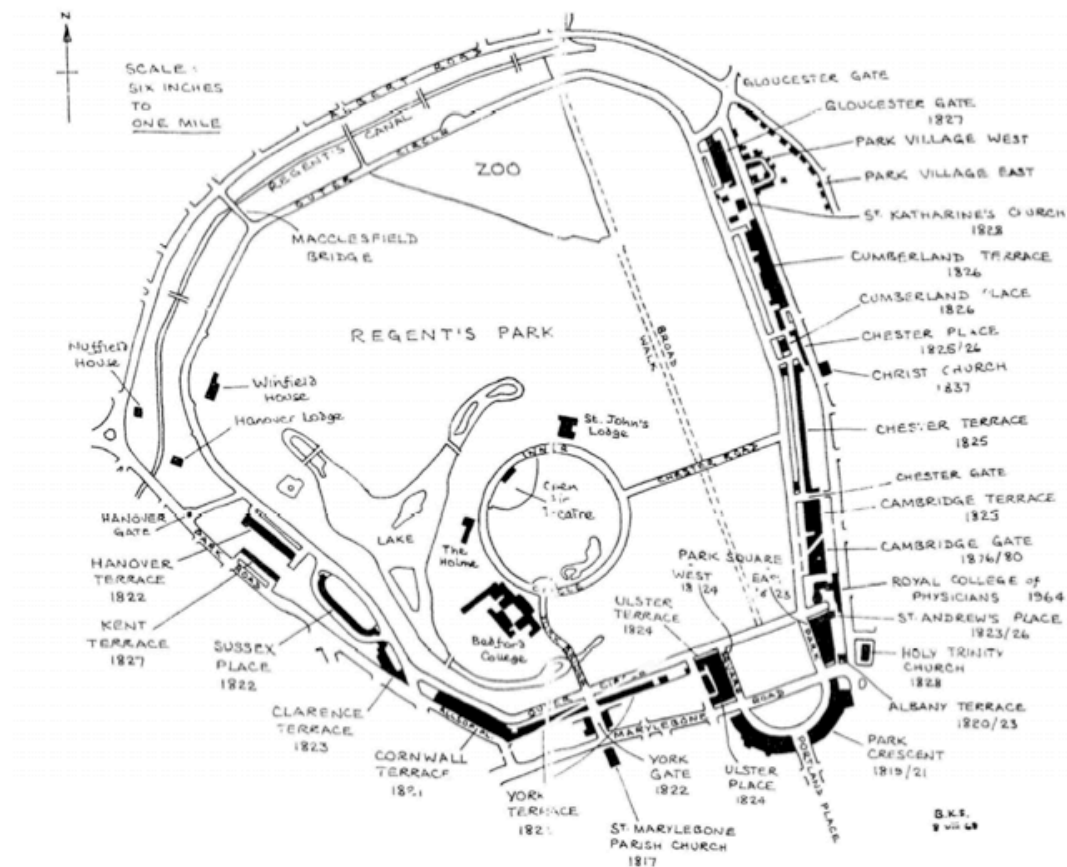


Figure 3.1 Regent's Park in 1968. Each Terrace is marked with its Date of Building. Plan courtesy of Sauders (1969).

In the 1830's, because of increasing concern over health and social problems associated with densely populated industrial cities, the British government began urging cities to develop parks as way to mitigate these ills. However, many cities viewed this as a low priority, reasoning (as many elected officials do today) that developing parks would be restrictively cost prohibitive. Nevertheless, the success of Regent's Park and the potential to appeal to wealthy landowners, led some entrepreneurial developers to use the

model of developing an internal park surrounded by housing built along the periphery to raise the price of surrounding real estate. And while some private land developers were the first to use parks as amenities to achieve immense profits, the evolution to the public realm was not far behind (Crompton 2004).

Birkenhead

In the early 1840's the city of Liverpool was experiencing rapid annual population growth, and as a result, the neighboring village of Birkenhead became an obvious site for absorbing some of this growth. In 1843, an Act of Parliament was passed granting the local commission permission to establish a park in Birkenhead (Tate 2001). The commissioners later purchased a rather unattractive and low-lying 225-acre parcel of land – which was later to become the world's first publicly funded and freely accessible urban park (Crompton 2004).

Birkenhead Park was designed by leading botanist-gardener Joseph Paxton. He started work in 1842 and the park was completed four years later (although it didn't officially open to the public until 1847). In many ways the design of the park reflected the design of Regent's Park, however, it had one major difference: access to the surrounding properties was via public roads extending outside of the park, rather than from a single internal carriage road (Tate 2001). See the Birkenhead Plan in Figure 3.2.



Figure 3.2 Birkenhead Park Lot Sale Plan, 1850. Plan courtesy of Metropolitan Borough of Wirral

Author Alan Tate (2001) notes that the park’s designer “was determined that the park should not be, nor appear to be, the property of the houses which surrounded it” (48).

Thus, the design of the park encouraged use from beyond its edges.

While Birkenhead was the first publicly-funded urban park, it was also the first public park designed to cover the capital costs associated with the acquisition and development of the land. Author and historian Allan Smith (1983) notes,

Birkenhead Park was a self-financing venture employing the simple device of surrounding the park with plots for single houses and terraces, and selling them at an enhanced value because of their relationship with the park. The profit from this paid for the park. (50)

Later investigations have reported that the costs of excavation, construction, planning and associated labor costs totaled approximately £140,000 while projected incomes from estimated home sales were approximately £228,000 (Chadwick 1966; Crompton 2004). This means that in addition to paying for the acquisition and development costs, the home values would have generated a financial surplus as a result of increased annual property taxes.

Birkenhead Park received wide publicity for its inventive design and creative financing. It drew curious visitors from across the globe, one of who was noted landscape architect Fredrick Law Olmsted. After visiting in 1850, he wrote of the park:

“[It is] a perfection that I had never dreamed of. I cannot undertake to describe the effect of so much taste and skill as had evidently been employed...And all this magnificent pleasure-ground is entirely, unreservedly, and forever the people’s own...But you are inquiring who paid for it. The honest owners - the most wise and worthy people of Birkenhead - in the same way that New Yorkers pay for ‘the Tombs,’ and the Hospital, and the cleaning (as they say amusingly) of their streets. (Chadwick 1966, 72)

Olmsted was so inspired by Paxton’s design and so intrigued by the underlying financial arrangements used to fund the venture, that he incorporated many of these same elements in his proposal for the first planned urban park in the United States – New York City’s Central Park.

Central Park

The site that Central Park would one day occupy was considered among most residents of New York at the time to be nothing more than a wasteland. In fact, in his letter to New York's Special Committee on Parks, Olmsted said that the site was located on "grounds almost entirely useless for building purposes, owing to the very uneven and rocky surface" (Olmsted 1873). However, one of the primary objectives of New York City was to encourage real estate development in the surrounding blocks since at the time most city residents lived more than three miles to the south (Garvin 1999). Armed with his knowledge of Birkenhead Park, Olmsted helped convince New York City's commissioners that Central Park was, in fact, an investment that would pay for itself. The funding for Central park was committed in 1856, construction began in 1857, and it was officially completed in 1873 (Crompton 2004). See Figure 3.3.

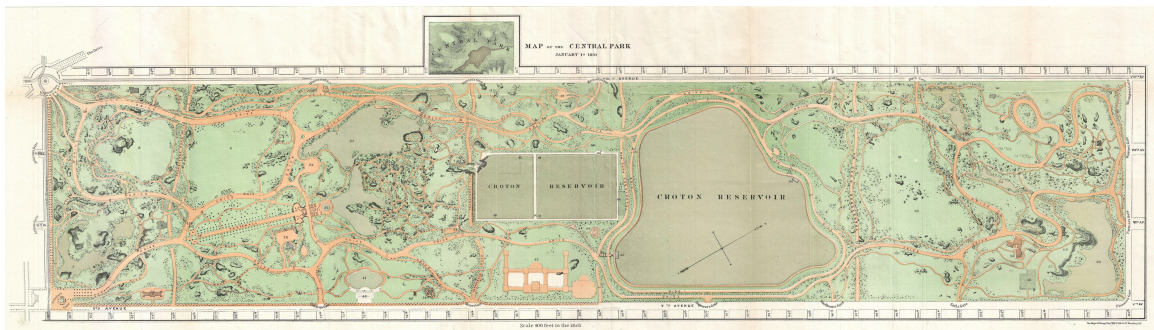


Figure 3.3 1870 Greensward Plan for Central Park by Olmsted and Vaux. Plan courtesy of Gandy (2003).

During this same time period, rather than relying on the information he gleaned from Birkenhead, Olmsted sought to document the relationship between Central Park and the surrounding real estate values. In doing so, he provided the earliest documented relationship between public parks and real estate values. The data he collected were important in both stimulating the creation of the entire New York City park system, and

in supporting the evolution of the public parks movement in the United States in the late-nineteenth and early-twentieth centuries.

In his 1875 report to the Board of Commissioners, Olmsted presented the total costs for the park in addition to the increases in tax revenue from the three wards adjacent to it. He then compared these increases in property value to the average increases in property value in New York City's other wards during the same period. Olmsted understood that the likely natural growth due to rapid population increases would have inevitably pushed people northward, and thus increased property values in the surrounding wards without the park. According to Olmsted, without Central Park the property values in the three wards surrounding the park would have appreciated approximately 100% from 1856 – 1873, the same rate as property in other wards. At that rate the properties in the Twelfth, Nineteenth, and Twenty-Second Wards would have been worth approximately \$53 million in 1873; however their appraised value was approximately \$236 million. Olmsted proposed that these remarkable increases in property value, and thus tax revenue, was a direct result of Central Park (Fox 1990).

The highly publicized financial success of Central Park, in conjunction with the burgeoning park movement, established the self-financing capabilities of parks as conventional wisdom among landscape architects and planners – as well as elected officials – well into the twentieth century. In fact, in 1919 Frederick Law Olmstead Jr. wrote,

It has been fully established that...a local park of suitable size, location and character, and of which the proper maintenance has been reasonably assured, adds more to the value of the remaining land in the residential area which it serves than the value of the land withdrawn to create it (14).

While much of the early evidence is overwhelmingly supportive of the potential of parks to increase the tax base, these studies ignore the array of factors that may influence property values in addition to parks. (See Figure 2.1.) Instead, they were simple calculations of increased tax receipts accruing from properties surrounding these parks. However, in subsequent years as statistical tools and research designs became more sophisticated, significant improvements were made in the methods used for quantifying the impacts of parks and open space on real estate values.

3.3 Later Evidence Using Statistical Methods

Beginning in the 1930's, the idea that parks and open space could be used as an investment to generate income for a community virtually disappeared from public discourse. While there were some scattered references to it in various publications, they were rare. There seem to have been two main reasons for this decline: (1) a shift in municipal government spending and (2) an awareness of the simplistic nature of earlier studies (Crompton 2004).

In the early days of local governments, these entities funded only a limited set of public services in addition to parks, such as schools, police, sewer systems, and roads (Crompton 2004). However, as Cranz notes, "local governments assumed responsibilities for an ever-widening array of social welfare functions, the park proportion of the budget declined automatically. Further, parks were once loaded with social tasks now performed by other reform institutions: juvenile courts, public housing, urban planning, pollution control" (1982, 176).

Harnick and Rowe (2002) also noted:

After World War II and with the rise of the suburbs, cities refocused their planning and left parks in a spiraling 50-year decline. Many of the ideas regarding the role parks play in city planning and community socialization were lost. More importantly, ideas about measuring park access, assuring equity, and meeting the needs of changing users languished with the erosion of budgets for city parks. (5)

As expenditures and park maintenance and renovation declined, so did the quality of the parks. Many of them fell into a state of disrepair and attracted people engaging in social deviant behavior. Simon (1976) noted:

For many people a park is no longer an amenity: It represents a threat to their safety and a liability to the value of their property. In a quarter of a century, a long-established philosophy has been overturned. The image of a greensward decorated with a monument to a national hero or a playground filled with happy children has been replaced by visions of acres of weed interrupted by vandalized statues, or playgrounds barren of any usable equipment occupied by the social dregs of the community. (29)

The existence of such parks was a source of declining property values in many urban areas, and the concept that parks could be financed through an increased tax base was eroded from public opinion.

A second reason that public opinion began to turn away from park expenditures was the growing awareness of the simplistic nature of the early economic studies that supported park investment. These studies often ascribed all increases in property value to the existence of a park because they lacked the ability to statistically isolate the factors that may have contributed to such increases. Because property value was increasingly understood to be a result of its relationship to multiple attributes within each of these broad groups of influences, confidence eroded validity of these rudimentary studies (Nicholls 2002). To help sway public opinion back towards the investment in parks and open space, the limitations of early studies would have to be better controlled.

The first study to adopt a more refined analytical approach was reported by Charles Herrick in *The Planners' Journal* in 1939. In his groundbreaking study, Herrick used regression analysis to isolate the impacts of parks and open spaces on property values. In his words, “when enough information is secured it is possible to derive empirical equations which will give the values of one of the factors [parks] in terms of the measurements of the other factors [property values] at any given time” (92). Thus, he became the first person to use statistical tools to isolate the specific contributions of parks to the property value increases, and it was his methodological approach that attempted to resolve the fundamental weakness inherent in earlier studies.

Herrick’s regression analysis attempted to identify the impact of park acreage on real estate values in Washington, D.C. for the period from 1911 – 1937. He proposed that his analysis “made it possible to compute the future average real estate and land values for the city of Washington with any assumed percentage of park and density of population, and so to determine whether the probable increase in values justified the expenditure necessary to produce proposed park lands” (Herrick 1939, 93). Herrick did not focus on the impacts of individual parks on surrounding neighborhoods, but rather he focused on the aggregate impacts on real estate values for the entire city.

The results of his study show that during the 27-year period the total taxes collected that could be attributed to parks was \$69 million. The total expenditures on parks and recreation during the same time period were \$45 million, “leaving a balance of \$24 million, which we might say was contributed by the park system to the maintenance of other municipal services” (Herrick 1939, 94). Moreover, he also argued that in a single year (1937), Washington’s park system produced a net income of over \$3 million.

Herrick went on to suggest that given his analyses, “most cities could afford to have twenty to thirty percent of their areas in parks. The ten percent rule, which has been suggested, is much too low” (Herrick 1939, 94). While these findings were quite dramatic, the application of the regression analysis was challenged by some contemporary critics (Ackerman and Goodrich 1940). However, despite the reservations expressed by some, Herrick’s study was the first of its kind to apply statistical tools to this issue, and it would be 25 years before others would emulate his approach (Crompton 2004).

Another study worth mentioning, albeit it another rudimentary study lacking sophisticated statistical tools, was James Sainsbury’s investigation (1964) of parks in Spokane, Washington. It was the first study to investigate the effects of different types of parks. The author classified each park into one of three categories, active, combined active/passive, and passive. He found that while the values of surrounding properties were positively impacted regardless of park type, and the magnitude of the impact declined with distance from the park, passive parks had the greatest positive impact and active parks had the least positive impact (Sainsbury 1964; Crompton 2004). (See Table 3.1.) Although statistical controls were not used, this study was the first to suggest that the design of the park may have a critical impact on the rate that it is able to generate increased tax revenues to communities. This will be explored in greater detail in Chapter Five.

	Active Recreation Areas	Combined Active and Passive Recreation Areas	Passive Recreation Areas
% change in adjoining lots relative to average value of their census tracts	10%	33%	70%
% change in residential blocks surrounding the parks relative to the average value of their census tracts	7%	14%	63%

Table 3.1 The impact of different types of parks on residential property values. Table courtesy of Sainsbury (1964).

Advancements in computing technology in the 1970's and 1980's prompted a marked increase in the number and quality of hedonic studies investigating the impacts of parks and open space on property values. In his 1972 study, David Lyon examined the impacts of seven sites – three parks, three schools, and one school-park combination – in Philadelphia. He recorded 1,725 property sales prices in the neighborhoods surrounding the sites, and found that in all seven neighborhoods regression analyses indicated that proximity to the site had a positive impact on property values (Crompton 2004). Thus, he concluded that, “there appear to be locational advantages to school and park facilities, and these advantages have been capitalized in the sale price of nearby property” (Lyon 1972, 126).

Lyon's Philadelphia study was one of the first to test for a “net effects” curve which hypothesizes that while there is a positive effect on the value of real estate adjacent to a park, it may be lower than the impact on properties a block or two away which are not subjected to any nuisances created as a result of the park. See Figure 3.4.

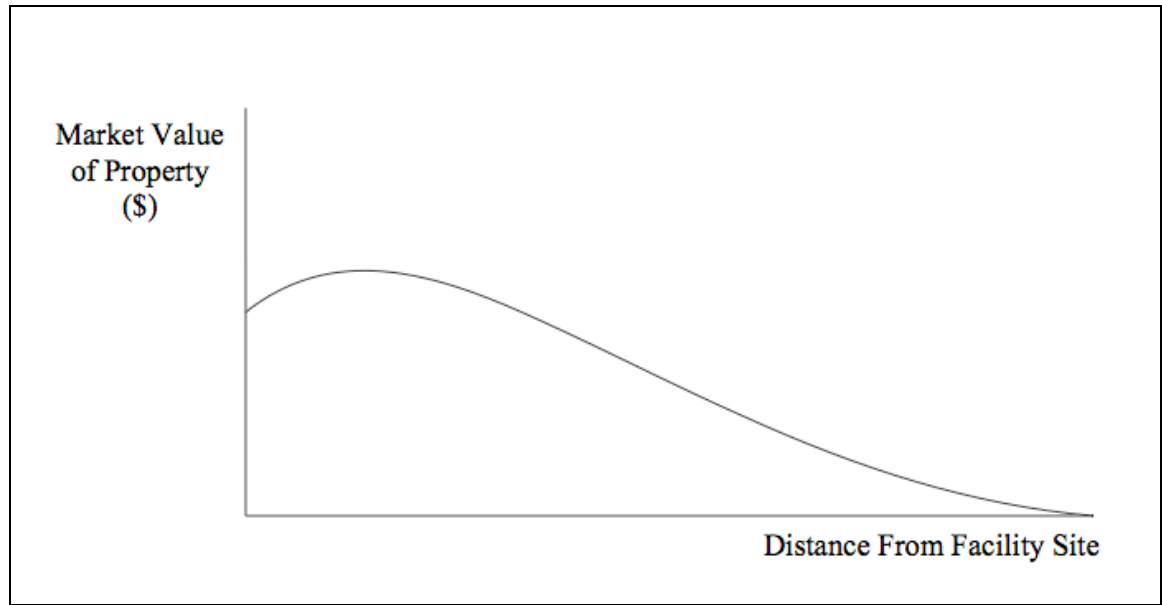


Figure 3.4 Net effects curve of positive impact on a park. Figure courtesy of Crompton (2004).

One site was found to be a good fit to test for this effect – a junior high school with an athletic field. In this case, the maximum impact on property value occurred approximately 600 to 800 feet from the site (Lyon 1972).

In 1973, Weicher and Zerbst examined the effects of five parks in Columbus, Ohio on property values. The dataset consisted of single-family home sales between 1965 and 1969 that occurred up to one block away from the parks. The study was the first to use ordinary least squares multiple regression analysis to measure the impact, as well as the first to investigate the effect of home spatial configuration, relative to parks, on property values. Three parks faced homes with a street separating them (Linden, Hauntz, and Westgate), while two parks (Audubon and Kenlawn) backed onto homes, separated only by a fence. Homes faced green areas in the parks except in two parks (Linden and Westgate) in which buildings and recreation areas obstructed the park view.

The regression analysis controlled for age of house, number of rooms, lot size, sale year, and distance to park.

Table 3.2 shows the impact of homes spatial orientation on home values. Park effects decayed with distance, and houses facing parks sold between 7 and 23 percent more as compared with homes one block from the parks. The positive impact of parks on home sale values was felt only by homes facing parks. On average, the sale value of homes facing parks (Westgate and Hauntz) was greater (\$1,130). The other two spatial configurations sold for less – homes backing onto parks (Kenlawn and Audubon) sold for \$169 less on average; and homes facing heavily used recreational areas (Linden) sold for \$1,144 less on average.

Park name	Home value –adjacent and facing park (\$)	Home value -adjacent and backs to park (\$)	Home value-adjacent and facing recreational area (\$)
Westgate & Hauntz #1	1130		
Kenlawn & Audubon		-169.3	
Linden			-1144
Westgate & Hauntz #2	1609		-178.3
All park combined	3434	-1030	-1057

Table 3.2 Effect of home spatial orientation around parks on property values. Table courtesy of Sharma (2008).

This study is important for multiple reasons: (1) it shows the importance of both park-home distances and home spatial orientations with regard to parks; (2) it infers that high activity areas in parks see a decline in sales value (most likely as a result of nuisance factors like increased noise and traffic); and finally (3) it concludes that the effect of parks on single-family homes and apartments was different – apartments backing onto

parks are less likely to feel the negative effects as compared to single-family homes (implying that single-family homes and apartments should be examined separately).

In 1974, another Philadelphia study examined the impact of Pennypack Park on the sales price of 336 surrounding properties (Hammer, Coughlin, and Horn 1974). The authors were primarily concerned with how distance from the park affected the impact on surrounding real estate prices and ran a regression analysis to determine the effects up to 2,500 feet (approximately one half mile) away. This study was one of the first to use statistical analysis to determine the impacts on land values based at different distances from the park, rather than just aggregating the effects of all values within a certain distance. Based on their own subjective evaluation of the area, the authors hypothesized that, “the residents do not consider natural amenity to be very important” and thus, “public space would be expected to have a relatively low effect on land values compared to other neighborhoods” (Hammer et al. 1974, 275).

The regression analysis showed that despite the authors’ predictions, Pennypack Park did have a significant impact on real estate values, accounting for 33% of the value at 40 feet from the park, 9% of the value at 1,000 feet, and 4.2% of the value at 2,500 feet (the limit of the study). The authors concluded that over \$3.3 million in real estate value was directly attributable to the park (Hammer et al. 1974).

In addition, homes located on corner plots and with a road separating them from the park showed a positive association with surrounding home values, but a negative association was observed for homes with backyards abutting parks. This seems to confirm earlier findings that the spatial orientation of homes with respect to the park impacts property values and that these spatial effects only existed in at close proximity

to the park (one block maximum). Another finding of this study was that roads separating homes and parks affect real estate values, which provides the first indirect evidence that the street network around a park may positively impact property values.

The most commonly cited study in the literature regarding this issue investigated the effect of greenbelts on real estate values on three different neighborhoods in Boulder, Colorado (Correll, Lillydahl, and Singell 1978). In the years prior, the city of Boulder embarked on an ambitious plan to purchase open space within its city limits. By 1978, the city had acquired a total of 1,382 acres of open space adjacent to residential developments. The researchers analyzed 82 properties within 3,200 walking feet of the greenbelt that had been sold within one calendar year (Correll et al. 1978).

The result of the regression analysis showed that, all other variables held constant, there was a \$4.20 decrease in the price of residential real estate for every foot moved away from the greenbelt. This suggested that the average value of properties adjacent to the greenbelt was 32% higher than those located 3,200 feet away (Correll et al. 1978).

See Table 3.3 for the results.

Walking Distance from Greenbelt	Average Value of House
30	\$54,379
1,000	50,348
1,283	49,172
2,000	46,192
3,200	41,206

Table 3.3 Value of the average house related to greenbelt proximity. Table courtesy of Correll et al. (1978).

In the 1980's several studies investigated four parks in Worcester, Massachusetts and the values of all residential properties within a 4,000-foot radius of each park during

the preceding five years (More, Stevens, and Allen 1982; Allen, Stevens, and More 1985; More, Stevens, and Allen 1988). For each of the 170 properties sold within this time period, researchers recorded the sales price, as well as several other variables that might affect the sales price, including lot size, age of house, condition of house, number of rooms, and distance to the park.

The researchers found that, on average, a house located 20 feet from a park sold for \$2,675 more than a house located 2,000 feet away, and that no effects could be traced beyond 2,000 feet from the parks. They also found that 80% of the aggregate increase in value was derived from properties located within 500 feet of the parks. The entire aggregate increase of property value attributable to these four parks was estimated to be approximately \$3.5 million.

This study is noteworthy because it is the first study in which park attributes were explicitly investigated. The researchers hypothesized and found direct evidence for the distinct effect of park attributes on home values. For instance, they generally found that intensive activity areas in parks had a negative effect on real estate values; however, because the tools to separate individual attributes were not available at the time, different types of activities (ball fields and playground, for instance) were combined. While this finding has tremendous implications for park design, these studies contain major shortcomings which compromise the data: (1) The sample size was extremely low (n=219); (2) All the parks used contained some active recreation activities, making evaluation of variation in features difficult; and (3) Homes under the effects of two parks were not separated making unique park effects impossible to isolate.

The late 1980's and early 1990's saw similar studies to the studies mentioned above. The vast majority of the studies supported the claims that (1) parks add value to properties, and (2) that the magnitude of the impact decreased with distance from the park. While these studies did contribute to the body of knowledge surrounding this issue, few advanced the research designs of the studies. The turn of the century, however, brought several studies with new and exceptionally strong methodologies.

In 2000, Bolitzer and Netusil examined the effects from 193 parks from 9,318 recorded home sales (a substantially large data set) during a three-year period from 1990 to 1992 in Portland, Oregon. The impact on properties within a 1,500-foot radius of these parks was measured. Since the authors estimated a block to be approximately 200 feet, the 1,500-foot radius was assumed to be an average distance of 7.5 blocks. The authors also categorized each open space as either *public parks*, such as those spaces owned by organizations such as municipal governments or The Trust for Public Land, or *private parks*, such as spaces owned by private developments, including golf courses and cemeteries (Bolitzer and Netusil 2000). This study used a total of 21 variables in two models.

The authors' results show that after two statistical models were applied to the data set that homes within 1,500 feet of a public park increased in value by \$2,262 (3.5%) or \$845 (1.2%) depending on the model used. In their evaluation of the impact of different distances within the 1,500-foot radius, the authors found that the premiums ranged from \$5,023 (7.6%) and \$3,527 (5.3%) for properties within 100 feet of the park, to \$2,109 (3.8%) and \$1,004 (1.5%) for properties located 1,301 to 1,500 feet away. The positive effect of parks declined and became negligible at around 1,500 feet. The values of homes

closest to parks (less than 100 feet, or one half block) showed a non-significant association with park distance, which could be due to negative externalities present in close proximity to the park. Save for golf courses, private parks were found to have no statistically significant effect on house prices (Bolitzer and Netusil 2000).

A second paper, by Lutzenhiser and Netusil in 2001, used the same Portland data set; however, the authors classified the public parks further into four different categories: urban parks, natural area parks, specialty parks, and golf courses. These categories are defined in Table 3.4. The authors' results show that houses near urban parks have lower prices, if all other variables are held constant, while those near natural areas or specialty parks have higher prices. Specifically, the results show that living within 1,500 feet of a natural area park accounted for \$10,648 (16.1%) of a home's sales price, while the impacts of specialty parks/facilities and urban parks were \$5,657 (8.5%) and \$1,214 (1.8%), respectively. The impact of distance from each of three types of public parks on home value is shown in Table 3.5. This study included a total of 23 variables in two models.

Open Space Type	Definition
Urban Park	More than 50% of the park is manicured or landscaped and developed for nonnatural resource dependent recreation (e.g., swimming pools, ballfields, sports courts).
Natural area park	More than 50% of the park is preserved in native and/or natural vegetation. Park use is balanced between preservation of natural habitat and natural resource-based recreation (e.g., hiking, wildlife viewing, boating, camping). This definition includes parcels managed for habitat protection only with no public access or improvements).
Specialty park/facility	Primary use at the park and everything in the park is related to the specialty category (e.g., boat ramp facilities).

Table 3.4 Definition of open space categories. Table courtesy of Lutzenhiser and Netusil (2001)

Variable	Urban Park	Natural Park	Specialty Park/facility
Distance $\leq$ 200	\$1,926	\$11,210	\$7,396
Distance 201 - 400	2,061	10,216	5,744
Distance 401 - 600	1,193	12,621	10,283
Distance 601 - 800	817	11,269	5,661
Distance 801 - 1,000	943	8,981	4,972
Distance 1,001 - 1,200	1,691	8,126	4,561
Distance 1,201 - 1,500	342	9,980	3,839

Table 3.5 Variations in property values at different distances for each open space type (1990 dollars). Table courtesy of Lutzenhiser and Netusil (2001).

The results from the Lutzenhiser and Netusil (2001) study support the earlier findings from Sainsbury's simplistic 1964 study that park design and use have differing effects on residential housing prices, however it does so for the first time using sophisticated statistical models and increasing numbers of independent variables. The results also show a significant positive effect on home values located within 100 feet of the park, which was not observed in the earlier study. This provides some evidence that well-designed parks reduced the negative effects associated with proximity. These results will be discussed at greater length in Chapter Five.

Another technically strong study completed in 2001 examined the economic impact of 14 neighborhood parks in suburban areas in Dallas-Fort Worth on 3,200 residential real estate transactions over a 2.5 year period from 1998 – 2000. In his study, Andrew Miller went to great measures in selecting parks that would be representative of the area, stating, “the premiums derived from the research reflect a standard of park quality well within reach of an even marginally committed developer. National monuments these are not” (Miller 2001, 169). He also included a complex regression

model that incorporated 29 variables that could potentially influence sales price (Miller 2001).

In his results, the author found that homes adjacent to parks received an approximate price premium of 22% relative to homes a half-mile away. He also found that approximately 75% of the value associated with parks occurred within 600 feet of a park and 85% within 800 feet. The impacts on home price were found to be insignificant at approximately 1,300 feet (a quarter of a mile) away, while no price effects were recorded after 2,000 feet. See Figure 3.5.

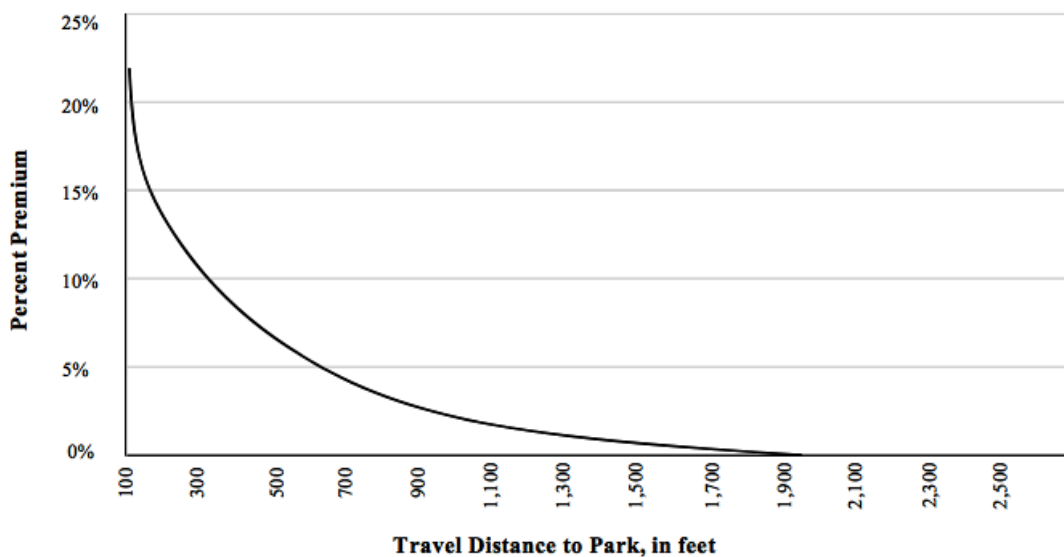


Figure 3.5 Impact of proximity to parks in Dallas-Fort Worth. Graph courtesy of Miller (2001)

The methodology set forth by Andrew Miller was an important contribution to the academic discourse on this issue for a two primary reasons: (1) it attempted to control a considerable number of external factors (ranging from distance to commercial centers to changes in demographic characteristics of surrounding neighborhoods) to clarify the

effects of the park, and (2) it also analyzed park design within a context of neighborhood characteristics to offer greater insight on how design affects real estate values. Over the course of the last decade researchers investigating this topic have used similar methodologies to continue to add to the contemporary academic discourse.

3.4 Conclusions

Most of the literature surrounding parks impact on home values has focused on (1) the effects of parks, (2) the magnitude of the effects, and (3) the distance of the effects. An analysis of the literature shows that both the effects and distance of those effects can be summarized in the following: In the vast majority of studies, parks do positively impact home values. And a general consensus among the studies is that parks have a substantial impact up to approximately 500 to 600 feet; however, effects may extend out as far as about 1,500 – 2,000 feet (although after 500 – 600 feet the impact is small). In most cases, the effects on property values were positively associated with proximity to the park; however, in some cases, those effects were mitigated by property directly adjacent to parks as a result of increasing noise and/or traffic.

Unfortunately, with regard to the specific magnitude of the effects parks have on real estate values, a definitive answer is not feasible given the substantial variation in the size, usage, and design of parks and open space, as well as regional and local differences associated with the surrounding residential neighborhoods. Nevertheless, in recent years numerous studies from across multiple disciplines (park and recreation studies, landscape and planning policy, land use policy, urban affairs, ecological economics, etc.) have examined the effect of park attributes, neighborhood characteristics, and demographics

on home values. The following chapter will introduce the research methodology used to select these diverse and sophisticated studies and glean the appropriate information from them to ultimately derive the first-ever comprehensive collection of economically-driven design considerations for landscape architects and planners.

CHAPTER FOUR

RESEARCH METHODOLOGY

4.1 Introduction

To determine how parks and their surrounding neighborhoods can be designed and developed to maximize the return on investment, a research methodology was chosen. The method chosen was a qualitative meta-analysis. The basic idea of qualitative meta-analysis is to provide a concise and comprehensive picture of findings across studies that investigate the same general research topic. Schreiber, Crooks, and Stern (1997) characterize qualitative meta-analysis as, “the aggregating of a group of studies for the purposes of discovering the essential elements and translating the results into an end product that transforms the original results into a new conceptualization” (312).

This thesis uses a modified qualitative meta-analysis to select and analyze reports and articles for the purpose of creating a comprehensive set of design considerations for landscape architects and planners. This method does not generate primary data, but rather focuses on the sampling and selection processes to gather primary data, and then analyzes and synthesizes that data in one report. While meta-analyses have been widely used for quantitative applications in the past, a quantitative approach is not aligned with the objective of this thesis for one primary reason: The hedonic studies show wide variations in their measurement and specification of open space and design considerations, which reduces the possibilities to transform outcomes of studies into a

common metric. For instance, many hedonic studies define parks differently, often concentrating on niche open space (such as greenways). Moreover, many of the conclusions of the authors of these studies make with regard to design considerations are simply implications from the quantitative data, requiring a degree of interpretation before they can be synthesized (Brander and Koetse 2011).

Recently several social science disciplines have started adopting meta-analysis for qualitative applications (Gaber and Gaber 2007). Such qualitative meta-analysis offers three advantages for this research: (1) it allows for a comprehensive understanding of the impacts that specific parks and neighborhood attributes have on housing prices; (2) it shows where current research findings converge and diverge, and (3) it shows where there are gaps in the current research.

The basic process for completing a qualitative meta-analysis involves gathering, organizing, and analyzing the data (Gaber and Gaber 2007). The meta-analysis methodology this thesis uses breaks these three basic steps into the following six detailed steps: (1) populate a list of hedonic studies relating to the impacts of parks and open space on residential property values; (2) refine the original list using the delimitations set forth in the introduction; (3) define the research categories; (4) perform a content analysis; (5) organize the data into research variables within each category; and (6) analyze data within each variable. See Figure 4.1.

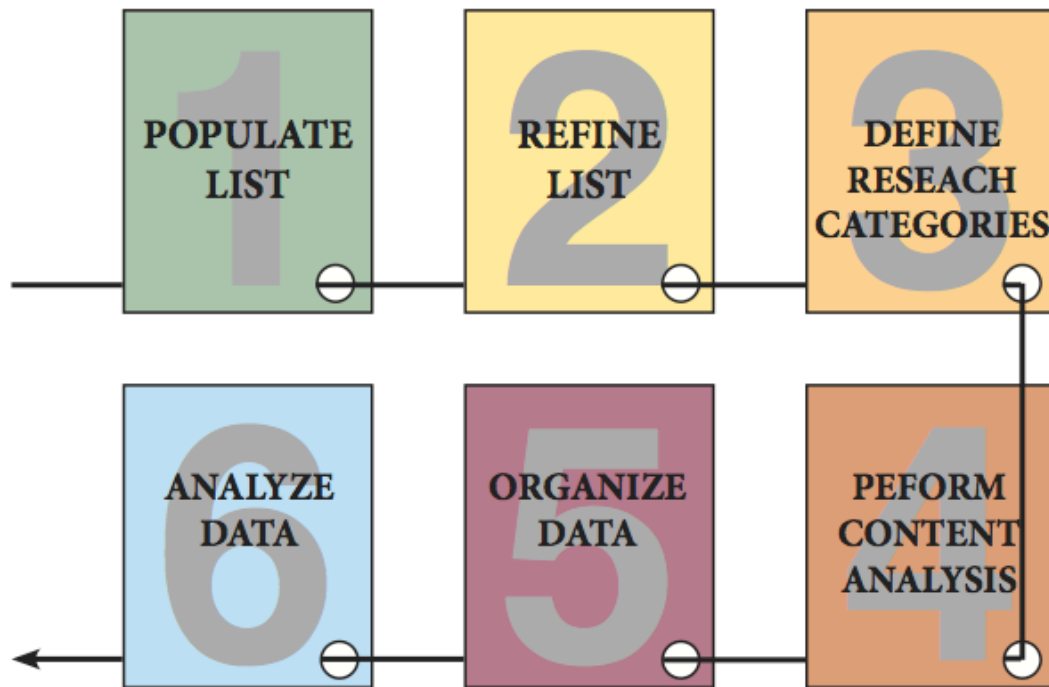


Figure 4.1 Meta-analysis methodology

4.2 Selection Criteria for the Inclusion of Studies

The author of this thesis collected 55 hedonic pricing studies using various search terms, both in isolation and combination (e.g. parks, open space, hedonic pricing, property values, valuation, urban, suburban) in several online search engines, including Google Scholar, LexisNexis, and Science Direct. The only criteria that studies must have met to populate the original list were that they needed to be a hedonic pricing study that addressed the valuation of urban and suburban parks and open space (as defined by the delimitations set forth in the introduction) using house price (either market or assessed value) as the dependent variable, and should have some characteristic of parks and/or open space among the explanatory variables (e.g. distance to park). As is the case for

most hedonic pricing research, the studies display wide variation in their characteristics with respect to research design, sample size, and time period.

The author then refined the original list by including only studies that (1) were published in 2000 or later; (2) had a large sample size (over 700); (3) were conducted in the United States; and (4) investigated effects on single-family houses.

First, the author selected studies that were published in 2000 or later. Although many earlier studies have adequate methodologies, more recent studies have several advantages: (1) authors are able to correct the research design errors made by their predecessors and highlighted by their peers; (2) authors have access to more sophisticated computerized mapping and computing technology, (3) recent studies focus more on individual attributes of parks and neighborhoods (since earlier studies have well established that generally parks have a positive impact on property values), and (4) recent studies reflect a more accurate understanding of modern preferences and values for parks and open space.

Moreover, in the review of the empirical evidence in the last chapter the author cited small sample size as one of the primary limitations of some earlier studies (e.g. More et al., 1988). Thus, the author selected studies with sample sizes of 700 or greater – over three times as many as the study conducted by More et al. (1988). (Only one study included in this final list, Nicholls and Crompton (2005), has a sample size less than 1,000.)

Of the remaining 30 studies, two studies were excluded because they studied high-rise residential values rather than single-family home values. As noted by Weicher and Zerbst (1973), because spatial effects are likely to be different for apartments (and

because very little literature exists on that topic), this thesis investigates effects on single-family houses alone.

Finally, because many preferences and values differ across cultures, it seems plausible that preferences for open space likely differ to varying degrees across international borders. Further, since the aim of this thesis is to provide landscape architects and planners with design considerations for maximizing impacts on real estate in the United States, it follows that all studies selected for inclusion in this analysis be conducted in this country. Four additional studies were eliminated because they were conducted abroad.

All of the final studies included in this analysis have either (1) been published in peer-reviewed journals or (2) have been praised in critical analyses of the existing literature on the topic. All but two of the included studies use sales price, rather than the auditor's assessed value of the home. Sales value more accurately reflects actual market conditions. However, since the studies that used assessed value (Sharma 2007; Sharma 2008) offer interesting findings that highly applicable to objectives of this thesis, they were included in the meta-analysis. This should not disrupt the findings of this thesis, since it is not concerned with precise economic impacts, but rather more general observable effects associated with various parks and neighborhood design considerations.

4.3 Research Variables and Content Analysis

While the data from these studies were loosely organized as part of ongoing process during the data-gathering phase, the next steps in the methodology were to define the areas, or research categories, important in furthering the objective of this thesis.

Because the primary objective of this thesis is to establish design considerations that make the greatest economic impact on surrounding home values, the research categories needed to address both attributes of parks and the characteristics of the surrounding neighborhood. As landscape architects and planners work to create new parks, or rehabilitate existing ones, they cannot treat a park as an island and develop their efforts in isolation. Because it is important to consider how a park or open space will be affected by, and will affect other dimensions of the neighborhood, the research categories needed to reflect both the park and neighborhood characteristics, as well as neighborhood demographics. Therefore, the predefined research categories established for this thesis were those terms exactly: (1) park attributes, (2) neighborhood characteristics, and (3) neighborhood demographics.

The next step was to critically review the studies using a content analysis to search for terms related to the three research categories. Analyzing the data in a meta-analysis involves a careful reading of each publication and searching out the relative concepts as they relate to the research categories (Gaber and Gaber 2007). While the research categories were predefined, specific variables within in each category were not predefined, and therefore were gleaned from the documents during the content analysis. The content of each document was analyzed for relevance, and the variables within each study were categorized into one of the three research categories. At the end of the analysis a detailed summary of each of the 11 included studies was produced, connecting the findings of the studies to the defined research categories. (See Appendix B.)

In addition, the author created meta-analysis matrices for each of the three research categories. Table 4.1, 4.2, and 4.3 show the research variables identified within

the parks attributes, neighborhood characteristics, and neighborhood demographics categories respectively. These tables also illustrate which study or studies will be analyzed within each research variable in the next chapter.

In conclusion, the qualitative meta-analysis methodology set forth in this chapter establishes a way to collect, organize, and analyze the results of various hedonic studies. This chapter focuses primarily on collecting and organizing the data, while Chapter Five focuses on analyzing it.

Meta-Analysis Matrix - Park Attributes									
Studies	Research Variables								
	Park Size	Park Shape	Park Type	Park Amenities	Park Aesthetics	Land Cover	Park Attractiveness		
Bolitzer & Netusil (2000)	●		●						
Epsey & Owusa-Edusili (2001)	●		●	●			●		
Lutzenhiser & Netusil (2001)	●		●						
Miller (2001)	●	●		●					
Nicholls & Crompton (2005)									
Anderson & West (2006)	●		●						
Cho, Poudal, & Roberts (2008)					●	●			
Sharma (2007)			●						
Sharma (2008)			●	●					
Poudyal, Hodges, & Merrett (2009)	●								
Sander & Polasky (2009)						●			

Table 4.1 Meta-analysis matrix - park attributes

Meta-Analysis Matrix - Neighborhood Characteristics					
	Research Variables				
Studies	Park Edge	Path Directness	House Orientation	Views/Visibility	Lot Size
Bolitzer & Netusil (2000)					
Epsey & Owasu-Edusdi (2001)					
Lutzenhisser & Netusil (2001)					
Miller (2001)	●	●	●	●	●
Nicholls & Crompton (2005)	●	●	●	●	
Anderson & West (2006)					●
Cho, Poudal, & Roberts (2008)					
Sharma (2007)					
Sharma (2008)		●			
Poudyal, Hodges, & Merrett (2009)					●
Sander & Polasky (2009)	●	●		●	

Table 4.2 Meta-analysis matrix - neighborhood characteristics

Meta-Analysis Matrix - Neighborhood Demographics				
Studies	Research Variables			
	Pop. Density	Median Income	Age	Race
Bolitzer & Netusil (2000)				
Epsey & Owasu-Edusdi (2001)				
Lutzenhiser & Netusil (2001)				
Miller (2001)				
Nicholls & Crompton (2005)				
Anderson & West (2006)	●	●	●	
Cho, Poudal, & Roberts (2008)	●			
Sharma (2007)				
Sharma (2008)				
Poudyal, Hodges, & Merrett (2009)	●	●	●	●
Sander & Polasky (2009)				

Table 4.3 Meta-analysis matrix - neighborhood demographics

CHAPTER FIVE

META-ANALYSIS OF HEDONIC STUDIES

5.1 Introduction

This chapter offers an analysis of each of the research variables defined in the methodology explained in Chapter Four. The research variables identified in the last chapter were Park Size, Park Type, Park Amenities, Park Aesthetics, Park Attractiveness, Land Cover, Park Edges, View/Visibility, Path Directness, House/Lot Orientation, Lot Size, Population Density, Median Household Income, Age, and Race. Although Park Attractiveness is a factor, the variable has been eliminated from this analysis because the only study that addressed this issue did not precisely define park attractiveness, and it failed to provide details of the criteria used to designate parks as attractive (Epsey and Owusu-Edusei 2001). In addition, several research variables are combined for the purposes of this analysis. The Park Type and Park Amenities variables both address the physical attributes of a park and therefore constitute much of the same research and implications for design. For example, active recreation parks contain amenities such as playgrounds, ball fields, and/or courts. The amenities offered in active recreation parks are what make them active recreation parks. For this reason Park Type and Park Amenities have been grouped together. Also, because Park Edge and View/Visibility variables both address the physical and visual accessibility of parks and open space, they were also combined for the purposes of this analysis.

The discussion of each research variable (or combination of variables) below includes a brief introduction to the variable, a list of the studies that addressed that variable (or variables), a description of each of these studies and the significant findings, an analysis of the findings, and any conclusions that can be drawn (including any limitations). In addition, past studies not included in the meta-analysis that address the variable(s), whether supportive or contradictory of the conclusions drawn by this thesis, will also be included in the analysis. Chapter Six will then offer design considerations based on this analysis.

Park Characteristics

5.2 Park Size

Of the six studies included in the meta-analysis that address park size, four of the studies (Bolitzer and Netusil 2000; Lutzenhiser and Netusil 2001; Miller 2001; Poudyal et al. 2009) show house sales price positively and significantly correlated to park size (i.e., the larger (smaller) the park, the greater (less) the impact on sales price), while two studies (Epsey and Owasu-Edusdi 2001; Anderson and West 2006) do not. The inconsistencies of the two unsupportive studies may be a result of research design defects and explainable proximity effects.

Bolitzer and Netusil (2000) studied the impacts of four different types of open spaces in Portland, Oregon: public, private, cemeteries, and golf courses. Public parks made up the majority of open spaces in the study (193), and are the sole focus of this thesis. The size range of the parks was 0.20 acres to 580 acres with a mean size of 20 acres. Two models (linear and semi-log) were used to investigate the relationship

between sales price of homes in the study area and the size of open spaces located within 1,500 feet of a home.

Open space size was found to be an important factor in both models. In the linear model, each additional acre of open space was estimated to increase a home's sales price by \$28-33. The authors also found that a home located within 1,500 feet of a 20-acre open space, the mean size of public parks in the study area, was estimated to sell for approximately \$2,670 more, holding all other factors constant, than a home that was more than 1,500 feet from any open space. In the semi-log model, the size of an open space also was found to have a positively and statistically significant influence on a home's sales price. Using the mean real estate price for homes in the data set, "a home within 1,500 feet of a 20-acre open space is estimated to sell for \$1,247 more, holding all else constant, than a home that is more than 1,500 feet from an open space" (Bolitzer and Netusil 2000, 6)

The authors also investigated the effect of close proximity (one half block) to open spaces, anticipating that that these homes would incur negative externalities such as noise due to proximity. The authors found, however, that the coefficient associated with close proximity was not statistically significant in either model. This may reflect a small sample size (66 observations) or a zero net gain/loss of positive and negative externalities.

In a 2001 study using the same original same dataset as Bolitzer and Netusil (2000), Lutenhiser and Netusil support these general results, finding that the size of urban parks, natural parks, and specialty parks/facilities was positively and strongly correlated with residential sales price. Interestingly, the researchers also found that natural area

parks require the largest amount of land to maximize a home's sales price (258 acres), followed by urban parks (148 acres) and specialty parks/facilities (112 acres), suggesting that park types may have greater implications on maximizing tax revenue through appropriate park sizing.

In another study, Andrew Miller (2001) studied the impacts of a series of neighborhood parks in the Dallas-Forth Worth metropolitan area on residential property values. He found that park size is positively and strongly correlated with sales price, stating, "the coefficient of parks size...suggests that the increase of one acre in the size of a park has a marginal, positive impact of 2.75% in the contract price of a nearby home" (89). However, Miller also found that the effect that park size has on home prices is small relative to the effect of general proximity of homes adjacent to the park (i.e., being closer to a park is a better indicator of increased value than how big the closest park is). One implication of this seems to be that a network of smaller parks will generate larger premiums than a single, consolidated park. This is so because a series of smaller parks has a larger perimeter than a consolidated park, and thus more houses can be located in the zone of impact. Miller states,

if only part of the price effect of acreage is due to the marginal benefits that come from having a larger park, while part reflects the value that comes simply from having additional park acreage in the neighborhood (as people generally like living in lush, attractive neighborhoods), the benefit of increasing the size of a park, relative to adding a second park, will be even lower. (89)

This implication supports the findings of Moranco (2003), a hedonic study conducted in Spain (and therefore not included in the meta-analysis), in which the author concluded that retaining numerous small green areas throughout a city is preferred to a smaller number of large parks.

The Poudyal et al. study (2009) focused on 46 urban recreation parks in Roanoke, Virginia. The size of the nearest urban recreation park was significant and positively related to house price. (It should be noted that the authors do not explicitly define urban recreation park in the study.) A one percent increase in square footage of the urban park in the neighborhood increased the real sales price of the house by 0.03%. Taking the mean price of the house in the area (\$95,133.99) into account, the model estimates that a 100 square foot increase in the size of the park results in an \$80 increase in nearby homes. This finding supports the previous findings that the size of the nearby (urban recreation) parks has a small, but significant and positive relationship to property price.

Two studies do not support a significant positive correlation between park size and home sales price. The first is a study conducted by Epsey and Owusa-Edusei (2001), in which the authors grouped the study parks in Greenville, South Carolina into four categories. The first category consisted of 12 small (0.36 to 2.01 acres) unattractive neighborhood parks having play equipment in sandy areas, small grassy areas with weeds, and bare spots. Four attractive small (0.4 to 1.61 acres) parks, with some playground equipment, formed the second category. The third category consisted of six medium sized (4.84 to 25.28 acres) attractive parks, which had ball fields, walking trails, and natural areas. The last category consisted of two medium (2.19 to 3.89 acres) parks, with fewer facilities and no natural area.

The researchers found that there is a significant positive impact of proximity to small attractive parks (Type 2) within 600 feet, but no significant impact beyond that. They conclude that small basic parks (Type 1) significantly and positively impact residential sales price from 300 – 1,500 feet, but not within 300 feet. In addition,

medium attractive parks positively impact real estate values from 200 – 1,500 feet, but not within 200 feet. Medium basic parks do not positively impact property values.

Park type	Distance range (feet)	Number of homes in range	Effect on home values (%)
Small unattractive	<300	26	-14*
	300-500	70	15*
	500-1500	434	6.5*
Small attractive	<600	80	11*
	600-1500	289	0
Medium attractive	<200	28	0
	200-1500	289	6*
Medium unattractive	<600	5	-51*
	600-1200	79	0

Note: * statistically significant

Table 5.1 Impact of park proximity on home values

There may be several flaws associated with these findings: (1) The sample size of medium parks is less than half of the sample size of small parks (401 vs. 899) which may help explain inconsistencies with the previous meta-analysis studies; (2) The study failed to provide details of the criteria used to designate parks as small or medium. (The authors chose to group parks in an arbitrary fashion. For example, the largest *small park* was recorded as 2.01 acres, while the smallest *medium park* was only 2.19 acres. Also, a wide variation existed in the sizes of medium sized parks – 2.19 to 25.28 acres). The finding that small parks produce greater effects on home values may have arisen due to the arbitrary classification system followed in this study; (3) Lastly, 1997 U.S. Census data indicates that the median household income for homes located within 1,500 feet of the small basic parks is more than twenty percent lower than the rest of Greenville (\$26,500 vs. \$34,000). This suggests that the positive impacts associated with the size of

small neighborhood parks, may be artificially amplified as a result of neighborhood demographics trends (i.e., the results may reflect an omitted covariate associated with median household income). (See Median Household Income section for more information.)

Anderson and West (2006) studied neighborhood and special parks in the Minneapolis-St. Paul metropolitan area. For the purposes of this study, the authors' defined special parks as "national, state, and regional parks, arboretums, nature centers, natural areas, and wildlife refuges," in order to distinguish these areas from neighborhood parks, which they described as, "generally are more urbanized and provide fewer...natural amenities." (Anderson and West 2006, 779). The researchers found that the amenity value of proximity to a neighborhood park falls as park size increases. They found that, "the interaction was small, however, and that such an unexpected result may be caused by some omitted disamenity associated with large parks, such as increased noise or traffic." (Anderson and West 2006, 782). (They did not investigate this by measuring specific impacts at various distances.)

The researchers also found that the amenity value of proximity to special parks rises with amenity size, though this interaction effect is small as well. However, if the authors' assertion that special parks are more natural and neighborhood parks are more urbanized with fewer natural amenities is held to be true, then this finding seems to also confirm the results from Lutzenhiser and Netusil (2001): natural parks are more valuable when they are larger, and more urbanized parks are more valuable when they are smaller.

Given the flaws in the two studies that did not support the correlation between park size and house sales price, it is highly likely that the larger the size of the park, the

larger the sales price of nearby houses (up to a point of diminishing returns). This finding supports the earlier findings of Hendon (1972) (conducted in Dallas, Texas) and Coughlin and Kawashima (1973) (conducted in Philadelphia, PA), which are not included in the meta-analysis since they were conducted before the year 2000.

While there are differing results associated with proximity to some parks, such as large parks, that may have disamenities, Bolitzer and Netusil (2000) offer a very plausible explanation: Even if there is a disamenity effect for houses that are adjacent to parks, because the effects extend beyond that (up to approximately a half mile radius, and beyond in some cases) many more houses are positively impacted than negatively in these instances, making the net impact overwhelmingly positive.

5.3 Park Shape

While Miller (2001) is the only researcher who addresses park shape with this meta-analysis, he does not study it empirically – only anecdotally through a hypothetical example in Dallas-Fort Worth; however, because previous research, as well as general logic confirms his findings, and because it is an important design consideration, the topic is included within this thesis.

Miller (2001) found that elongated parks are preferable to square parks because they have greater perimeters. For example, in a square park with edges of one mile, the area of the park is one square mile and the perimeter is four miles. If that same one square mile area is distributed in a more elongated fashion with two edges of two miles and two edges of half a mile, then the corresponding perimeter of the elongated parks is five miles.

This finding supports the earlier conclusions of Little (1990) (conducted at various locations across the U.S. and not included in this meta-analysis). Little compared the perimeter of a circular park and a linear park, and found that the impacted area – what he called the “apparent area” – was different for each park shape. The apparent area of a linear park was 5.65 times more than a circular park. In economic terms, this means that spending in the apparent area of a circular park need to be more than five times that in the apparent area of a linear park to obtain the same “edge effect.”

Since the empirical evidence overwhelmingly supports the idea that proximity to parks and open space significantly and positively impacts surrounding property values, it only makes sense to maximize the number of properties that are impacted. One way to do this is through elongated parks, which increase the park perimeter, thereby boosting the net proximity premium provided by that park. (Higher density is another way, which when dealing with single-family housing translates to smaller lot size. These options are discussed in subsequent sections.) It should be noted, however, that there is a point of diminishing, and even negative, returns as parks become more elongated. If the functionality, views, and aesthetics of park is altered in an attempt to exaggerate the size of a park along one dimension, then the returns associated with parks size may decrease substantially.

5.4 Park Type & Amenities

Seven studies in this meta-analysis address park type and amenities: Two studies cannot be used because of issues with research design (Bolitzer and Netusil 2000; Epsey and Owusa-Edusei 2001); four studies find generally that passive, natural resource-based

parks and more valuable than active recreation facilities (Lutzenhiser and Netusil 2001; Anderson and West 2006; Sharma 2007; Sharma 2008); and one study is inconclusive on the effects of individual amenities (Miller 2001).

Bolitzer and Netusil (2000) differentiate open space by type – public, private, cemetery, and golf course - but since this thesis only addresses impacts associated with public parks and open spaces, and the authors do not study typologies within public parks, the data cannot be used for the purposes of this thesis.

As previously mentioned, Espey and Owusu-Edusei (2001) do address park type and amenities to some degree, but again, because many of the attributes of the parks are aggregated into some arbitrary classification of aesthetics, the data cannot tell us much. For instance, in their categorization of medium aesthetic parks, the authors explain how the parks vary in terms of amenities available, grouping baseball fields, playgrounds, walking trails, and natural areas. They go on to describe medium basic parks, as “less attractive with few amenities and no natural area” (Espey and Owusu-Edusei 2001, 488). This type of analysis does not further the objective of this thesis.

Lutzenhiser and Netusil (2001), use the same Portland data set as Bolitzer and Netusil (2000); however, the authors classify public parks further into four different categories: urban parks, natural area parks, specialty parks, and golf courses. These categories are defined in Table 3.4. The authors’ results show that houses near urban parks have lower prices, if all other variables are held constant, while those near natural areas or specialty parks have higher prices. Specifically, the results show that living within 1,500 feet of a natural area park accounted for \$10,648 (16.1%) of a home’s sales price, while the impacts of specialty parks/facilities and urban parks were \$5,657 (8.5%)

and \$1,214 (1.8%), respectively. The impact of distance from each of the three types of public parks on home value is shown in Table 3.5.

It should be noted that the researchers found that natural area parks and specialty parks/facilities have positive and statistically significant effects on a home's sales price for all distances studied. The results also show a significant positive effect on home values located within 100 feet of the park, which was not observed in the Bolitzer and Netusil (2000) study. This provides some evidence that well-designed parks can reduce the negative effects associated with proximity. They conclude that urban parks have a positive and statistically significant impact on homes located up to 600 feet and within 1,001 and 1,200 feet of the park, but no statistically significant effect for the other distances. (It is unclear why there is no significant effect between 600 – 1,000 feet.)

The results from the Lutzenhiser and Netusil (2001) study support the earlier findings from Sainsbury (1964) and Coughlin and Kawashima (1973) (not included in this meta-analysis) that park design and use have differing effects on residential housing prices. While the terminology the authors' use to describe the types of parks is different (Sainsbury (1964) and Coughlin & Kawashima (1973) use passive/active classification, while Lutzenhiser and Netusil (2001) use natural area/urban/special), the categories do align somewhat, with the combined results suggesting that parks designed with more passive, natural resource-based recreation are, as a whole, more valuable to homeowners than parks with more active recreation (such as playgrounds, ball fields, or sports courts).

This also supports the earlier findings of the Worcester, Massachusetts studies mentioned in Chapter Three (also not included in this meta-analysis) (More et al. 1982; Allen et al. 1985; More et al. 1988). Although there were some methodological flaws,

the authors generally found that intensive activity areas in parks also had a negative effect on real estate values.

Sharma (2007) takes this research even further in his research of parks in Cincinnati, Ohio, by separating the effects of active and passive recreation facilities. While he too found that home values were positively associated with passive recreation facilities, he also found positive effects associated with active recreation facilities with attractive children's play equipment. For active recreation facilities containing ball fields and courts, however, he found negative effects on home values.

Anderson and West (2006) have similar results. As previously stated, the authors' define special parks as "national, state, and regional parks, arboretums, nature centers, natural areas, and wildlife refuges," in order to distinguish these areas from neighborhood parks, which they claim are "generally are more urbanized and provide fewer...natural amenities" (779). The value of the average home increases 0.0035% (of sales price) for every one percent decrease in the distance to the nearest neighborhood park, while homes close to special parks accumulates 0.0252% in value for every one percent decrease in the distance. This result indicates that special parks (which include many parks designed with more natural resource-based, passive activities in mind) are more valuable to residents than neighborhood parks (which include many parks that are urbanized with fewer natural amenities).

In Sharma's (2008) research of parks operated by the Cincinnati Park Board, he investigated park types and amenities by grouping combinations of park amenities into *composite factors* (rather than using individual park amenities). The four (factors) – Physical Activity Resources, General Services, Family Facilities, and Aesthetics – were

extracted from the dataset and the reasons for labeling are as follows:

Walking paths and ball game grounds promote physical activity; therefore, this combination of elements was called Physical Activity Resources. Unstructured open spaces and greenery please the senses and were accordingly, categorized as Aesthetics. Restrooms, tables, and benches provide services to park users and were labeled as a General Services. Finally, grill pits/fire pits and picnic areas combine with children's play equipment to generate the Family Facilities factor. This is an area in the park in which children play while parents and friends picnic. (166)

Sharma finds that *active use zones* that is, Physical Activity Resources and Family Facilities, are negatively associated with home values. Specifically, the negative association is with homes within close proximity to parks with the following combinations of elements: (1) ballgame grounds plus pathways, and (2) children's play equipment plus eating and drinking features (drinking water fountains, grill pits/fire pit, picnic areas, and vending). Again, it is likely that most households do not prefer active elements in parks because of the nuisance caused by picnicking families, who use grills and often leave trash behind; and the noise generated by baseball fields and basketball courts, which also have the potential to be used during nights.

In contrast, Sharma finds that informal open spaces (open spaces, meadows, wooded areas) and supporting areas (benches, tables, restrooms, and shelters) are found to be positively associated with home values. This finding supports previous studies (in this meta-analysis (Lutzenhiser and Netusil 2001; Anderson and West 2006; Sharma 2007), while simultaneously adding more detail to the academic discourse.

In his research, Miller (2001) also chose to investigate the impacts of park amenities; however, rather than aggregating the amenities into composite factors, as Sharma (2008) did, he explored the individual effects of water features, soccer fields,

tennis courts, basketball courts, and baseball diamonds on surrounding property values. Unfortunately, his results are inconclusive. Miller suggests that because of correlation between the amenity variables and park size, acreage may capture the primary benefits of scale in neighborhood parks.

In this meta-analysis the included studies show some discrepancy in how they define park types, as well as what park amenities they measure and how they do so. For instance, many authors' definitions of park type are not perfectly aligned, which creates some room for interpretation; however, if we organize park typology along a gradient ranging from passive, natural resource-based recreation to active recreation involving playing fields, playgrounds, and team participation, it's clear from the meta-analysis that the former seems to make more of an impact on residential real estate than the latter. The meta-analysis suggests that homeowners value unstructured, natural open spaces and that the noise, nuisance, and congestion caused by human activity reduces home values.

This, of course, is not and should not be the only consideration of park planning and design agencies. Active recreation amenities are an essential part of park systems. And since the space requirements and expenses associated with the development and maintenance of active recreation amenities, such as soccer fields or tennis courts, are so great, most homeowners cannot afford to build these spaces. It only makes logical sense to incorporate active recreation amenities on public lands as part of a comprehensive park plan.

5.5 Park Aesthetics & Land Cover

Two studies in this analysis address park aesthetics and land cover (Cho et al. 2008; Sander and Polasky 2009). While the authors address a slightly different aspect of these topics, they generally agree that value associated with aesthetics and land cover varies with the degree of urbanization.

In 2008, Cho et al. conducted a spatial analysis of the amenity value of green open space in Knoxville and its contiguous Town of Farragut, in Knox County, Tennessee. The authors investigated how spatial configuration and species composition of open space land cover affected the sales prices of nearby homes.

As obtained by the National Land Cover Database (NLCD 2001), the authors separated the open spaces into three categories: evergreen (if 75% of the patch was dominated by trees whose canopy was never without green foliage), deciduous (if the patch was dominated by 75% of tree species that shed foliage in response to seasonal change), and mixed wood (if neither evergreen nor deciduous vegetation predominated). In addition to examining these land cover types, the authors, using GIS technology, also evaluated sales values in terms of patch density (which captured the visual and scenic diversity caused by fragmented patterns of open space within a neighborhood) and edge density (captures the value scenic diversity and the complexity of open space boundaries (Nelson et al. 2004; Palmer 2004).

The Cho et al. (2008) study indicates, “amenity values of different open space features vary according to the degree of urbanization” (415). The authors go on to conclude that in the urban core, “deciduous trees and mixed forests species in larger blocks, and smoothly trimmed and man-made boundaries are more highly valued,” and in

areas approaching the urban-rural interface “evergreen trees in a diverse landscape with fragmented [open space] patches and more complex and natural-looking forest edges are more highly valued” (415). Many of the authors’ findings are consistent with findings by Geoghegan et al. (1997) conducted in Washington, D.C. (not included in this meta-analysis), in which fragmentation is valued more highly in less urbanized areas where conveniences and facilities are scarcer. These findings have further implications with regard to the population density of proposed development sites. (See section on Population Density).

In another study, Sander and Polasky (2009), also using GIS technology, investigated how the composition and richness of views from surrounding single-family homes into open spaces affected the residential sales price in highly urbanized Twin Cities of Minnesota (Minneapolis and St. Paul). To identify the composition of each viewshed in terms of land covers, the authors created three land cover categories – forest (including areas of contiguous tree cover), water (including lakes and streams), grassy areas – and calculated the percentage of each viewshed composed of each of these land covers. To compute richness or complexity of each viewshed, the authors used the percentage of possible land covers it contained. For example, a home with a viewshed containing 5 of 15 possible land cover types would have a calculated richness of 33%.

The authors’ results indicate that view attributes do, in fact, influence home sales price. The coefficients for most view variables, including all three land cover categories were positive, although the coefficient for percentage of forest did not significantly impact home sale values. This indicates that homeowners more highly value homes with large views including water and grassy areas, while forested areas are not as desirable in

residential views. (Perhaps forested areas are not as highly valued because trees can restrict views.)

The authors also find that view richness, which measures the number of land types visible, was negative and significant, suggesting like Cho et al. (2008), that homeowners in highly urbanized areas value fewer land cover types. This finding, and its implications, will be discussed further in the next section addressing Park Edges and Views/Visibility. Because of regional differences and the limited amount of research devoted to the effects associated with specific combinations of land cover types (e.g., evergreen versus deciduous trees), it is difficult to draw any last conclusions on the what plant species should be used in different locations.

Neighborhood Characteristics

5.6 Park Edges & Views/Visibility

Three studies in this meta-analysis address park edges and views/visibility (Miller 2001; Nicholls and Crompton 2005; Sander and Polasky 2009). Two of the studies generally support one another (Miller 2001; Sander and Polasky 2009), while the third (Nicholls and Crompton 2005) was inconclusive.

Miller's 2001 study provides the most comprehensive hedonic analysis of neighborhood characteristics of any study included in this thesis. In examining park edges and view/visibility, he hypothesized that parks that are more visible to the neighborhood will be more appreciated by residents, and as a result more valuable to them. To test this, he constructed variables to categorize each park by the percent of its perimeter devoted to five different uses. These included ordinary (low to moderate

capacity) roads, arterials (higher moderate capacity urban roads), private lots, alleys, and drainage channels. Miller's argument was that parks bordered by streets would be more visible to the neighborhood than parks bordered by private lots or physical barriers; and thus, they would be more valuable to nearby residents.

Of the variables, the percent of the perimeter comprising both ordinary roads and residential arterials were found to be significant and positive. This finding suggests that the openness of the park perimeter (as defined by road access) is positively, but mildly, related to the overall value of homes. Miller also found that properties near parks with abutting residential arterials have, on average, higher property values than those near parks with only ordinary street access. This implies that visibility is the principal benefit accruing to parks on significant streets, and likely the cause of the price premium.

Furthermore, in his hedonic analysis, Miller also found that parks are more valuable to surrounding homeowners when ringed by roads of any type, rather than when bordered by lots. This finding further supports his hypothesis that park visibility is valuable to the surrounding neighborhood.

Sander and Polasky (2009) also found that view attributes influence home sales price. As previously stated, in their study the coefficients for all the land covers studied – water, grassy areas, and forested areas – were positive, although only the coefficients associated with views of water and grassy areas significantly impacted home values. This indicates that homeowners put a higher value on homes with large views including water and grassy areas, while forested areas are not as desirable in residential views. (Perhaps forested areas are not as highly valued because trees can restrict views.)

In addition, the authors also find that view richness, which measures the number of land types visible, was negative and significant, suggesting that homeowners in highly urbanized areas value fewer land cover types. The authors of this study did not anticipate these results. Rather, they based their hypothesis on a previous study (Bastian et al. 2002) that found increased diversity in views to be highly valued. However, because that study was conducted in Wyoming, a rural land market, increased diversity likely corresponded to an increase in natural and agricultural land cover types visible.

The Sander and Polasky (2009) study was not conducted in a rural land market, however. It was conducted in the Greater Minneapolis-St. Paul metropolis where higher view richness likely increases the number of undesirable urban land uses, rather than rural or natural land uses, visible from a home.

The final study that addresses Park /Edges and Views/Visibility is one conducted by Nicholls and Crompton in 2005. In it the authors investigated the effect of greenways on residential property values in three neighborhoods in Austin, Texas. In their results, Nicholls and Crompton found that two neighborhoods properties with a view of the greenbelt, but that were not directly adjacent to it, saw no significant rise in residential value in either case. There were, however, no negative effects associated with residential housing prices in the two neighborhoods either. (The third neighborhood was not tested for views because topography did not allow for non-adjacent properties to enjoy a greenbelt vista.)

While the Nicholls and Crompton (2005) study does not offer any empirical evidence in support of the added value of views/visibility of green space. This may be a result of restricted views caused by tree cover. In addition, this research focused solely

on greenways, and little hedonic pricing research has been conducted on this type of open space. In fact, to date the authors of this study found “only one analysis of the impacts of greenways on recorded property values” (327). Because there is little evidence associated with greenways, and the evidence presented in this study does not find either positive or negative economic effects associated with greenways, the findings of Miller (2001) and Sander and Polasky (2009) will guide the considerations set forth in this thesis. Both of these studies confirm the conclusions of an earlier study conducted by Weicher and Zerbst (1973) in Columbus, Ohio (not included in this meta-analysis), where properties with views of attractive open space commanded premiums of up to several thousand dollars.

In summary, the treatments of Park Edges and Views/Visibility are important considerations for designers when attempting to maximize the economic impact on surrounding residential property values. The empirical evidence presented in this meta-analysis suggests that parks edges should be both physically and visually open. To create the most value, roads, particularly residential arterial roads, should surround parks, rather than lots, and views into the park from surrounding homes should be unobstructed, and consist of expansive vistas of primarily grass and/or water.

5.7 Path Directness

Of the four studies that address path directness, three are generally supportive of one another (Miller 2001; Sharma 2008; Sander and Polasky 2009), while one is generally unsupportive (Nicholls and Crompton 2005). However, research design may explain the differences in results of the unsupportive study.

Sander and Polasky (2009) researched the effects of proximity to parks by measuring the effects associated with road distance (or travel distance) and the effects associated with radial distance (or direct distance). Their results show that homeowners place greater value on travel distance than on direct distance (although the difference is marginal). This suggests that residents may value access to parks by roads, either for driving or walking, and perceive proximity to them more by the road distance than by straight-line distance.

In addition to his research on Park Edges and Views/Visibility, Miller (2001) also provides a comprehensive study of the characteristics of paths that lead to neighborhood parks. One of his principal assumptions was that if the value of neighborhood parks depended on their accessibility to residents, then the travel distance was a better measure of proximity value than direct distance. To measure the indirectness of a path to a neighborhood park, the author used an additional variable he called *detour*, which was the difference between actual travel and direct distance. His hypothesis was that a park reached by a complicated, indirect path should be used less frequently than a more accessible park at a similar travel distance, and should therefore add less value to the home.

Miller found a significant inverse association between home values and travel distance, but an insignificant association with direct distances (i.e. the *detour's* effect on total sales price varied with respect to distance). He also found that for homes located very close to the park simple radial distance is the primary determinant of value because the characteristics of the path are not enough to detract from the value of the park. However, he also found that path characteristics become much more important for houses

at the edge of the park's zone of impact (approximately 1,300 feet in this study). These homeowners farther away from the park value convenience of travel (path directness) more as a percent of total benefits provided by the park, than the residents adjacent to the park. These findings together suggest that homeowners value radial and travel distances very differently depending on how far they live from the park.

In contrast, Nicholls and Crompton (2005) used travel distance and got contradictory results during their investigation of the effect of a greenway on three neighborhoods located along its borders. One primary reason for the ambiguous results was the method used to compute travel distances. Miller computed the travel distances from multiple points around the park, but Nicholls only used the official entry points to the greenway park. This discrepancy is addressed below.

Sharma (2008) found that people living closer to parks place lower values on travel distance. Comparing homes located within one-eighth mile with homes located farther away showed that as distance from the park increased residents began to place a greater value on travel distances. Most likely, residents living closer to parks are able to enjoy park views and pass by the park several times of the day; therefore, the value placed on travel distance was reduced. On the other hand, residents living farther away are able to enjoy park views only when they visit the parks, and thus the value of travel distance becomes more important. The results of Sharma (2008) support the general findings of Sander and Polasky (2009) and Miller (2001) in this meta-analysis.

The findings of Sharma (2008) also suggest that direct and travel distances interact, which provides an explanation for the inconsistencies stated above. Miller (2001) computed travel distances from multiple points on the park perimeter; therefore,

travel distances captured a large part of the effects of direct distance leading to a significant inverse relationship between home values and park-home travel distance. However, Nicholls and Crompton (2005) used the travel distance from a few official entry points around the park, i.e., the travel distance could no longer capture the effects of direct distance, which led to inconsistent results.

In summary, this meta-analysis reveals that travel distance is important and a valuable characteristic of park accessibility, especially for homeowners who live farther from a park (but still within its zone of influence). Designers and planners should carefully consider path directness and network porosity when making decisions about the development and redevelopment of parks and their surrounding neighborhoods.

5.8 House/Lot orientation

Two studies address the effect of spatial orientation of homes on property value (Miller 2001; Nicholls and Crompton 2005); however, these two studies have conflicting results.

Miller (2001) found that for properties abutting neighborhood parks, the largest premiums were associated with houses that faced the park. Houses located with the park to one side and houses that backed up to the park still, on average, saw premiums associated with proximity, however these premiums were lower.

Nicholls and Crompton (2005), on the other hand, found that in the two neighborhoods that saw substantial impacts associated with greenbelt adjacency, in all cases this premium was represented by properties backing onto the amenity.

The discrepancy between the findings of these two studies may be explained by the levels of development and spatial arrangement of adjacent properties. In the case of Miller (2001) the study area consisted of relatively compact, developed neighborhoods throughout the Dallas-Fort Worth Metro area. Conversely, Nicholls and Crompton (2005) describe their study area west of downtown Austin, Texas as, “exhibiting very low levels of development,” with use tending “to occur at some distance from adjoining properties” (338).

The discrepancy in findings may be further explained by examining the proximate effects in each study. Miller (2001) finds a significant effect of neighborhood parks on property values up to approximately a half-mile (1,300 feet) away. Nicholls and Crompton (2005), however, reveal that the primary source of positive property value impact of the greenbelt is actual physical adjacency to the greenbelt. This is illustrated by the insignificance of the variables representing both quarter and half-mile distances. If the homes close to a greenbelt draw the majority of their amenity value from adjacency to the greenbelt (rather than general proximity), then it reasons that spatial orientation of surrounding houses, may not be as important a consideration.

The findings of Miller (2001) support two studies not included in this meta-analysis (Weicher and Zerbst 1973 (in Columbus, Ohio); Hammer et al. 1974 (in Philadelphia, Pennsylvania)). Both studies investigated the economic impact of parks on adjacent homes that faced parks, adjacent homes that back to parks, and adjacent homes that face high-activity recreation areas. They found that the positive effect of parks on home sales value was felt only by homes facing parks. On average, the sale value of

homes facing parks was greater while the other two spatial configurations sold for the same or less.

5.9 Lot Size

Three studies in this meta-analysis address lot size of properties surrounding parks and open space (Miller 2001; Anderson and West 2006; Poudyal, et al. 2009). While Miller (2001) and Poudyal et al. (2009) offer evidence in support of one another, the results of Anderson and West (2006) are unsupportive (although perhaps explainable).

Miller (2001) anticipated that homes on smaller parcels would value proximity to a park more than homes on larger parcels. He reasoned that privately owned yard space acted as a partial substitute for public park space. Thus, residents with large yards would have less need of a park within walking distance, since they could more easily accommodate on their private property, the activities that a neighborhood park provides. To test this hypothesis, the data set was divided in both halves and quartiles based on lot size, and regressions were run for each group.

Miller (2001) found that an increase in park size of one acre is associated with home prices that are 6.7% higher for small parcels, but only 1.65% higher for large parcels. Further, since he found relative insignificance of the coefficient associated with the top quartile (those lots with more than 11,900 square feet of lot area), this suggests that substitution of private yard space for public park space does occur. Thus, his findings imply that to maximize the value of land, the parks should be located closest to the small surrounding lots since it is these lots that will see the highest spikes in

associated value due to proximity. In a development of single-family houses, an additional effect of decreasing surrounding lot size is that population density rises. As density rises, more parcels will be within walking distance of the park, and each of those parcels, being smaller, will value the park more as a percent of home value. Thus, holding other factors constant, higher densities will produce higher premiums. (See Population Density section.)

Similarly, Poudyal et al. (2009) also found that proximity to urban recreation parks is a substitute for lot size. As they state, “The coefficient of implicit prices of lot size was positively and significantly related to demand for park acreage at the 1% level, confirming that the lot size was a substitute for the size of nearby parks” (981). This, along with Miller’s (2001) results, support another study conducted in Wisconsin (not included in this meta-analysis) by Thorsnes (2002), in which the author found that larger lot sizes to be to some degree a substitute for open space in forest preserves.

Anderson and West (2006) found contradictory results based on park type. As the reader will recall, the authors distinguished between special parks (which include national, state, and regional parks, arboretums, nature centers, natural areas, and wildlife refuges) and neighborhood parks (which they consider to be generally more urbanized, providing fewer natural amenities). Their hypothesis, like Miller (2001), was that lot size would be a substitute for public open space, and thus the amenity value of proximity to both neighborhood and special parks would be higher for homes with smaller lots. However, this hypothesis only held true in the case of neighborhood parks. In the case of special parks, the amenity value was higher for homes with large private lots, indicating that special parks and private lots are complements.

These surprising results may, however, be flawed. Because this thesis deals only with effects associated with single-family houses, lot size and population density should be highly correlated (i.e. the exclusion of multi-family housing prevents spikes in population density per lot). However, as discussed later in the Population Density section, Anderson and West (2006) find that increased population density increases the amenity value of parks. (In neighborhoods that are twice as dense as average, the amenity value of proximity to neighborhood parks is nearly three times higher than average, and the value of special parks is two-thirds higher than average.) Therefore, it seems logical that if increased population density increases the amenity value, that lot size would as well (when dealing with single-family homes). Thus, the unexpected correlation on the interaction between lot size and amenity value of homes could reflect an omitted variable (correlated with lot size) that has been from this study. When the authors attempted to explore this issue further, however, the results were inconclusive.

Neighborhood Demographics

5.10 Population Density

All three studies that address the effects of population density on the value of parks and open space to homeowners agree that density increases the value of parks and open space (Anderson and West 2006; Cho et al. 2008; Poudyal et al. 2009).

In their investigation of the effects on home value of proximity to neighborhood parks and special parks (defined as regional, state, and federal parks and natural areas) in the Minneapolis-St. Paul area, Anderson and West (2006) look closely at how the effects of proximity depend on neighborhood characteristics and demographics. In addition to

varying by open space type, the authors anticipated that the amenity value of open space to depend on a home's location and surroundings. They hypothesized that parks in "the dense clutter of the central city" to be more valuable than in "relatively wide-open suburbs" (774).

As expected, Anderson and West found that the amenity value of proximity to both neighborhood and special parks rises with population density. Specifically, their results indicate that density has a more profound effect on neighborhood parks than on special parks; they found that in neighborhoods that are twice as dense as average the amenity value of associated with proximity to neighborhood parks is almost three times higher than average, while the value of special parks is two-thirds higher than average.

Similarly, Poudyal et al. (2009) found a similar correlation in their study of the effect of urban recreation parks in Roanoke, Virginia. Among the neighborhood variables, the authors found that population density was both positive and significant, suggesting, quite logically, that as land and open space becomes scarcer due to the increased levels of development, the amenity value associated with parks and open space increases.

Cho et al. (2008) extend the discourse even further in their spatial analysis of the amenity value of green open space in Knoxville and its contiguous Town of Farragut, Tennessee. In their study, the authors show empirically that amenities of different features of open space vary according to the degree to urbanization. In summary, they found that evergreen trees, a diverse landscape with fragmented forest patches, and more complex and natural forest edges are more highly valued in Rural-Urban interfaces [and] deciduous and mixed forests, larger forest blocks, and smoothly trimmed and man-made

forest patch boundaries are more highly valued in urban core areas” (403). This suggests that amenity values differ along an urban-rural spectrum, and highlights the need for site-specific park design and land use management to fit the local characteristics of a neighborhood.

The findings of these three hedonic analyses are not surprising. Population density is a proxy for several things, including a measure of the scarcity of open space and a measure of crowdedness of a neighborhood. Thus, the results that population density increases the amenity value associated with parks make sense in that the value of the spaces increases with scarcity of open space and crowdedness. As discussed in the Park Shape and Lot Size sections, by maximizing density, designers and planners can also maximize the number of homes in a park’s zone of influence, which in turn, increases the tax base on affected residential properties. This finding supports several studies not included in this meta-analysis (Geoghegan 1997 (conducted in Washington, D.C.); Jim and Chen 2009 (Conducted in Hong Kong); Brander and Koetse 2011 (conducted throughout the U.S.). It should be noted, however, that if population density increases to levels where parks and open space, cannot sufficiently handle the number of visitors comfortably, then the positive impact associated with population density may decrease or reverse.

5.11 Median Household Income

Two studies within this meta-analysis address the effects of household income on hedonic value of parks and open space on home prices (Anderson and West 2006;

Poudyal et al. 2009). Both studies agree that as measures of resident wealth increase, so does that associated amenity value of parks and open space.

With regard to proximity to both neighborhood parks and special parks in the Twin Cities of Minnesota, Anderson and West (2006) found that amenity value rises with the median household income of residents. In fact, they found that in neighborhoods that are twice as wealthy as the average neighborhood, the amenity value of neighborhood parks is more than four times higher than average, and the value of special parks is more than two times higher than average.

Similarly, in their study of the effect of proximity to urban recreation parks in Roanoke, Virginia, Poudyal, et al. (2009) used a Two Stage Least Square estimation of demand function, and found that median household income of the purchaser of a home was positively and significantly related to park demand. In fact, they state that median household income is, “the most important predictor of demand for park acres after park size, and living area [of the home]” (981). This increased demand from wealthy residents indicates a willingness to pay a premium for proximity to park and open space amenities, and thus suggests that home prices are more positively impacted by this segment of the housing market.

In addition, the researchers also tested how percentages of the population in poverty related to impacts on home price. Their results show that percentages of the population below the poverty line (in the census group) are negatively related to house price, which further supports their previous findings.

It is especially interesting to consider the findings on median household income in light of the previous findings related to lot size. A common assumption that is often

made in the United States is that as people's wealth increases, so typically does their living space. As young professionals mature financially, most typically move into larger homes on larger lots where they can raise a family. However, this assumption is not supported in this empirical research. This meta-analysis reveals a positive correlation between median household income and associated impacts of parks and open space on home values. Yet it also reveals an inverse relationship between lot size and impact on home sales price (i.e., as lot size increases, the associated amenity value of proximity to parks and open space decreases). While this meta-analysis cannot explain these relationships fully, it seems reasonable that the size of living space (i.e., square footage of a home) is more directly associated with income than lot size.

Taken in concert with the findings of Anderson and West (2006), the findings of Poudyal et al. (2009), suggest that in order to receive the largest return on investment (as a result of an increased tax base), communities should locate parks and open space in the wealthiest communities. And while this thesis deals exclusively with economics, it must be reiterated that decisions concerning parks and open space must be made with more than just economics in mind. Designers, planners, and park and elected officials must also consider issues of equity/fairness and accessibility of these public resources, especially when dealing with minority and disenfranchised communities.

5.12 Age

Anderson and West (2006) and Poudyal et al. (2009) also address the issue of how the age of surrounding residents affects the amenity value associated with parks and

open space. They generally agree, although there is some variation in research design and findings.

Poudyal et al. (2009) again used the Two Stage Square estimation of demand function (as they did with Median Household Income) and discovered that median age of the surrounding neighborhood was positively and strongly related to the demand for park acres. However, when the authors tested the square of this variable, it had a negative impact on demand (implying that older residents do not value parks as much as their younger counterparts). One possible explanation of these results might be related to the declining mobility of senior citizens and their increasing inability to use park and open space resources as they age. Thus, residents desire to be close to parks during the ages that they remain physically active, but that demand could diminish as resident ages and become limited physically.

Anderson and West (2006) took a different approach to testing the effects of resident age in Minneapolis-St. Paul. Instead, of looking at median age, they tested impacts associated with children/adolescents and the elderly by using variables in their hedonic pricing analysis that represented percent of population less than 18 years old and percent of population aged 65 years of older. The results of their analysis showed that the amenity value of proximity to neighborhood parks rises with the fraction of the population under age 18, while the amenity value of proximity to special parks falls with the fraction of the population under age 18. Similarly, their results also indicate that the amenity value of proximity to neighborhood parks rises with the fraction of the population under over 65, while the amenity value of proximity to special parks falls with

the fraction of the population under over 65; however, neither of these latter two effects were significant.

One explanation of these results might be related to the authors' definitions of each type of park. As the reader will recall, they defined special parks as national, state, and regional parks, arboretums, nature centers, natural areas, and wildlife refuges to distinguish these areas from neighborhood parks, which they considered to be generally more urbanized, providing fewer natural amenities. By defining parks this way, it seems reasonable that residents with kids may value proximity to parks that have more urbanized amenities focusing on active recreation, such as playgrounds and ball fields, since many children regularly participate in activities that utilize these features. In fact, the convenience of proximity to these spaces may even outweigh the disamenity effects associated with increase noise, light, and traffic for some families with kids who use the neighborhood parks regularly.

It also seems reasonable given that many children are not as involved in more passive recreation activities at special parks, such as bird watching, hiking, and picnicking, that families with kids may not value these spaces quite as much as neighborhood parks. And although the inverse relationship between amenity value of special parks and the percentage of the population under the age 18 cannot be explained entirely, it may be a result of some perceived disamenity associated with these more expansive natural landscapes, or another factor not accounted for in the demand model.

Moreover, although the effects associated with the senior citizen population were not significant, they may also rely on the definition of park type and seniors' declining mobility. Because neighborhood parks are, by definition, located in more urbanized areas

and integrated within neighborhoods, it seems to reason that older adults would use the resources more than the national, state, and regional parks, arboretums, nature centers, natural areas, and wildlife refuges that tend to be located some distance away from most neighborhoods.

Thus, it seems homeowners demand proximity to parks and open space during the ages that they and their families remain physically active. Furthermore, this demand seems to be shaped according to the personal preferences and perceived benefits associated with each park type. It should be reiterated that this finding is based solely on the economic evidence presented in this thesis, and is not supported by social and/or cultural research.

5.13 Race

Only one study in this meta-analysis addresses how the race of residents close to parks and open space impacts amenity values observed in home sales price (Poudyal et al. 2009). In the study, conducted in Roanoke, Virginia, the researchers tested race as a predictor of demand for park acres by including a demographic variable describing the percentage of African-American population in the census block group. Their results reveal that the percentage of African-Americans was negatively related to park acres (at the 10% level). From these findings, the authors suggest that non-whites are less likely to demand park acres, and therefore less likely to be willing to pay a premium for them. However, this implication groups all minority groups and in doing so, marginalizes the cultural differences among tremendously diverse groups of people.

While the authors suggest that in order to receive the economic benefit, communities should locate parks and open space in the communities with the greatest percentage of white residents (or in communities with the least percentage of non-white residents), because there is little empirical evidence addressing race and associated effect of amenity values of parks and open space, and because this sole study is focused on such a small geographic area, it is not enough to draw any lasting conclusions. It must be also be reiterated that decisions concerning parks and open space must be made with the needs of the community in mind. Designers, planners, and park and elected officials must consider issues of equity/fairness and accessibility of these public resources, in concert with economics, when making decision about the development of parks and open space.

In conclusion, this chapter has offered an analysis of each of the research variables uncovered in the included empirical evidence. The next chapter will take this analysis a step farther by offering design considerations for design and planning practitioners.

CHAPTER SIX

DESIGN CONSIDERATIONS

Based on the results of the meta-analysis in the previous chapter, this chapter offers a series of considerations, for designers and planners to contemplate when attempting to maximize the economic impacts of parks on surrounding residential real estate values – thus increasing the return of investment through tax payments to the community. The variability in research design, regionality, and results from each study, prevent any precise economic conclusions from being drawn (e.g., no specific dollar amounts can be attributed in individual park amenities); however, these considerations offer a glimpse at the general trends of the economic empirical evidence.

Again, while this thesis deals exclusively with economics, it must be reiterated that decisions concerning parks and open space must be made with more than just economics in mind. Designers and planners, as well as park and elected officials must also consider the social, cultural, aesthetic, and environmental issues concerning these public resources.

Because this meta-analysis does not generate primary data, but rather organizes, reviews, and analyzes it, questions of external validity arise when attempting to draw conclusions on a larger scale. Since the objective of this thesis is to create a series of design considerations, based upon the empirical evidence of park economics, for practitioners throughout the U.S. to consider when making design and planning decisions

regarding parks and open space, then questions about the generalizability of the research finding must be answered.

Each consideration presented in this chapter, is accompanied with a measure of confidence in the validity of the guideline. This Validity Confidence Level is based on five components: (1) The number of studies in the meta-analysis that address the topic; (2) The support of other studies in the meta-analysis; (3) The support of other empirical evidence in the literature, not included in the meta-analysis; (4) The geographic diversity of all supportive studies; and (5) The face validity of the consideration (i.e., does it appear to be logical and make sense). The icons in Table 6.1 represent the components of the Validity Confidence Level. The qualifications necessary to receive an accompanying icon are also listed. It is up to design and planning practitioners to evaluate the validity of each design consideration based upon the circumstance of their individual projects and/or communities. All the Design Considerations are presented in Figures 6.1 – 6.12.

Validity Confidence Level	
Icon	Must achieve the following:
	At least three studies in the literature address the research variable
	At least two studies in the meta-analysis support the consideration
	At least one other study not included in the meta-analysis is supports the consideration
	At least two distinct geographic regions are represented in the supportive studies
	The consideration is logical and makes sense

Table 6.1 Components of Validity Confidence Level

Figure 6.1: Design Consideration #1

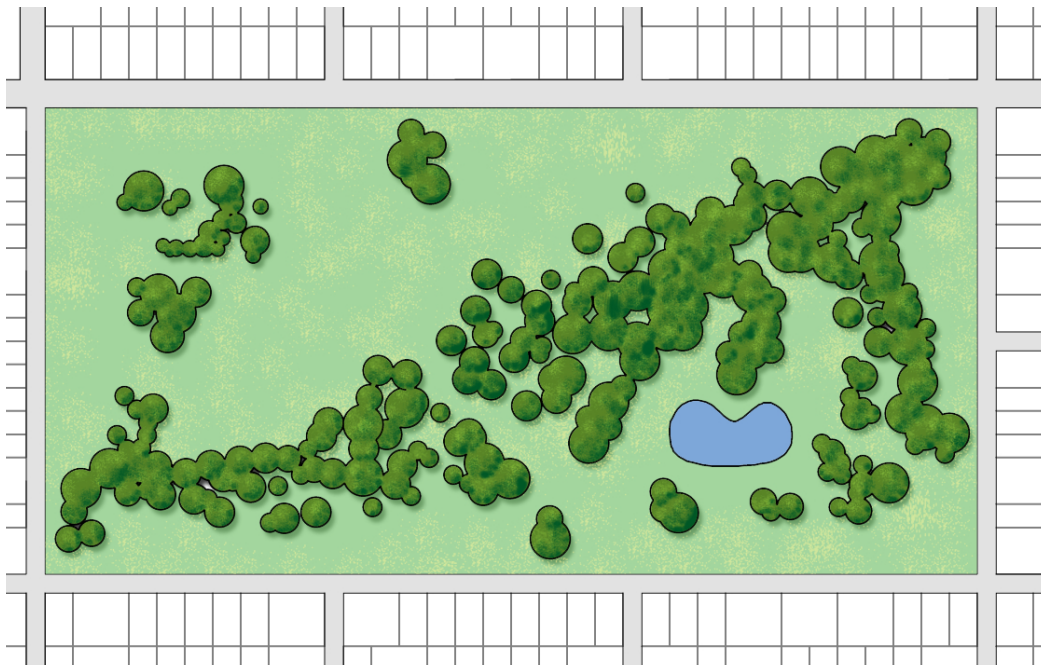
Design Consideration #1: Large parks are more valuable than small parks



Small park

Large parks typically have more amenities, accommodate larger numbers of patrons comfortably, and attract users from a larger zone of impact. Practitioners should understand that there is a point of diminishing and even negative returns as park size continues to grow. To get the greatest return on investment, practitioners must understand the needs of the community, as well as plan for changes in the population in the 21st century.

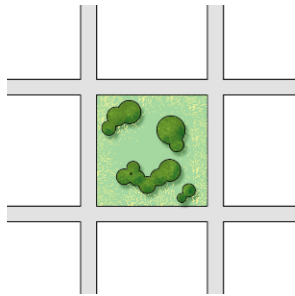
There is a caveat to this guideline – see Design Consideration #2.



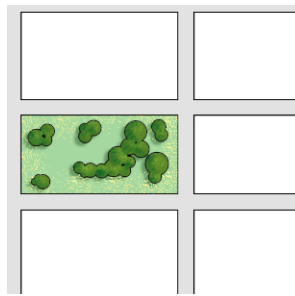
Large park

Figure 6.2: Design Consideration #2

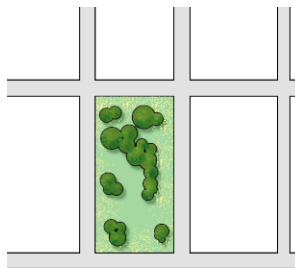
Design Consideration #2: A network of small parks is more valuable than one large, consolidated park



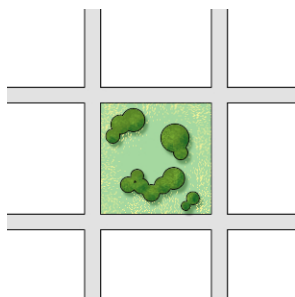
Park A



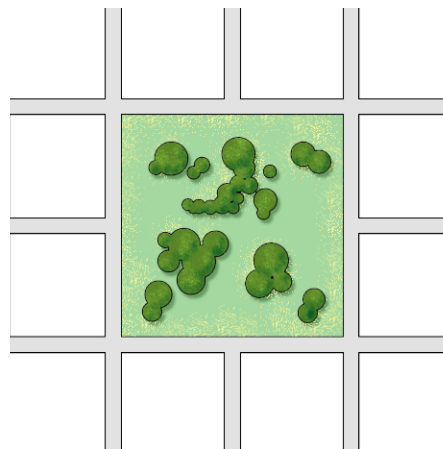
Park B



Park C



Park D



Park E

Proximity to parks is often a better indicator of value than the size of the park alone. Thus, creating a series of distributed parks that has an aggregate perimeter greater than that of a single park could create several non-competing zones of impact, and thus increase annual tax revenues.

It must be noted, however, that a series of distributed smaller parks will in all likelihood have higher construction and infrastructure costs, and may be less efficient to operate over time. Communities must decide whether higher property tax revenue over the long-term outweighs these added short-term costs.

In this example, the collective acreage of Parks A, B, C, & D is equal to that of Park E; however, the collective perimeters of the series of parks is more than double that of Park E. In addition, because Parks A, B, C, and D can be distributed throughout the community, they can generate more tax revenue than Park E.

Figure 6.3: Design Consideration #3

Design Consideration #3: Elongated, linear parks are preferable to square parks



Like the previous guideline, as compared to square parks elongated parks have longer perimeters, thus have larger zones of impacts. Elongating a park certainly has limitations, however. If a park's length becomes so exaggerated that the perceived benefits of the park decrease as a result of a dramatically decreased width, then there may be no, or even negative associated economic impacts. This may be a cause of the varied results among greenways.

Despite having the same total areas, Park B has a 6% longer perimeter than Park A, and Park C has a 39% longer perimeter than Park A.

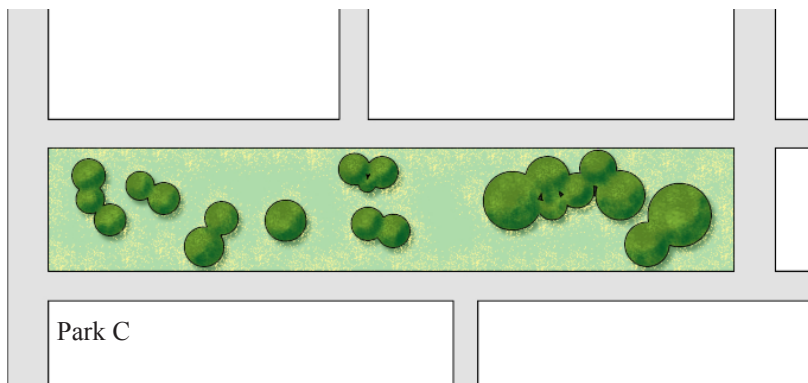
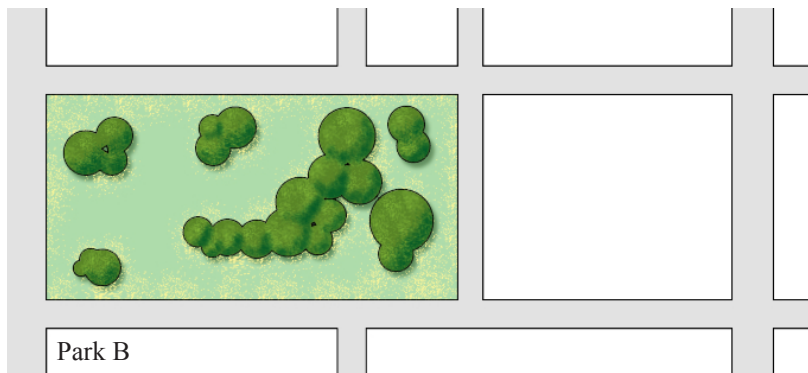
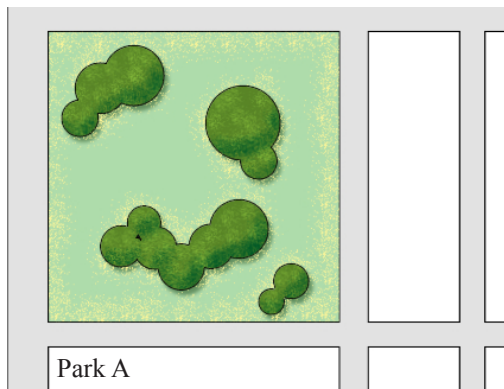
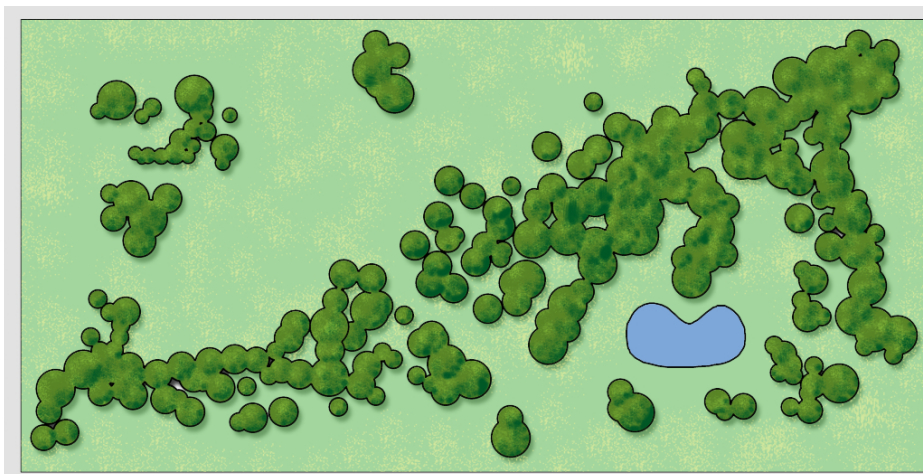


Figure 6.4: Design Consideration #4

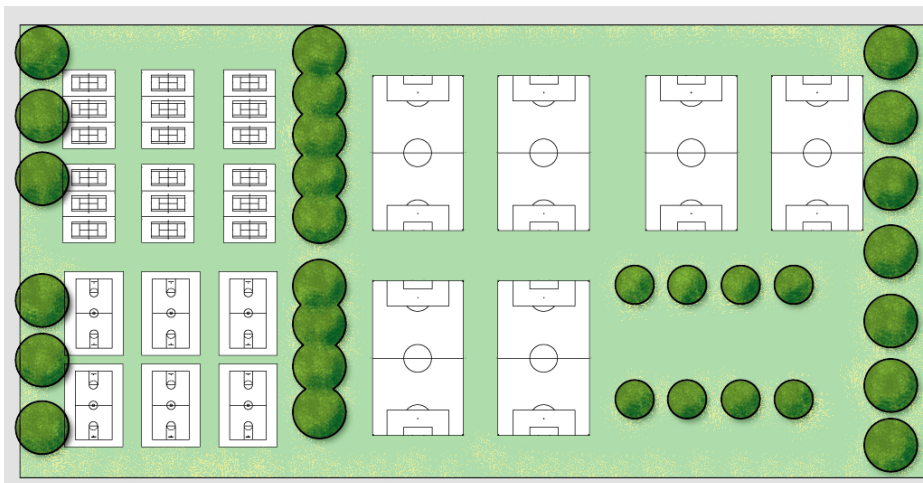
Design Consideration #4: Passive, natural resource-based parks are, as a whole, preferable to parks focusing on active recreation



Unstructured, natural open spaces are more highly valued by homeowners than active recreation parks containing playing fields/courts and playgrounds that increase that the noise, nuisance, and congestion caused by human activity.



Natural resources-based passive recreation park



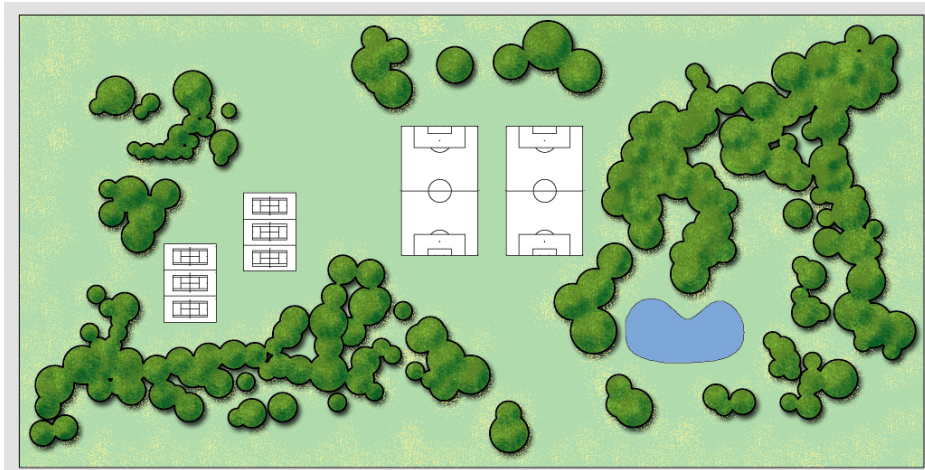
Active recreation park containing soccer fields and soccer and tennis courts

Figure 6.5: Design Consideration #5

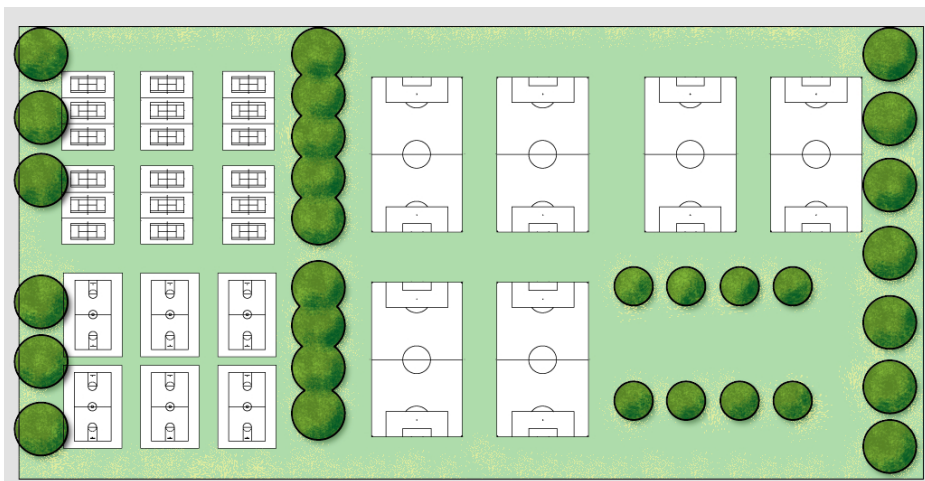
Design Consideration #5: Locate active use areas and parking near the center of a park, rather than around its edges



Because a need exists for active recreation opportunities, high-use areas such as ball fields/courts and parking, that can reduce surrounding property values should be located in the interior of a park to reduce noise and light pollution and traffic experienced by adjacent homeowners.



Combined active/passive recreation park, with active recreation focused on park's interior



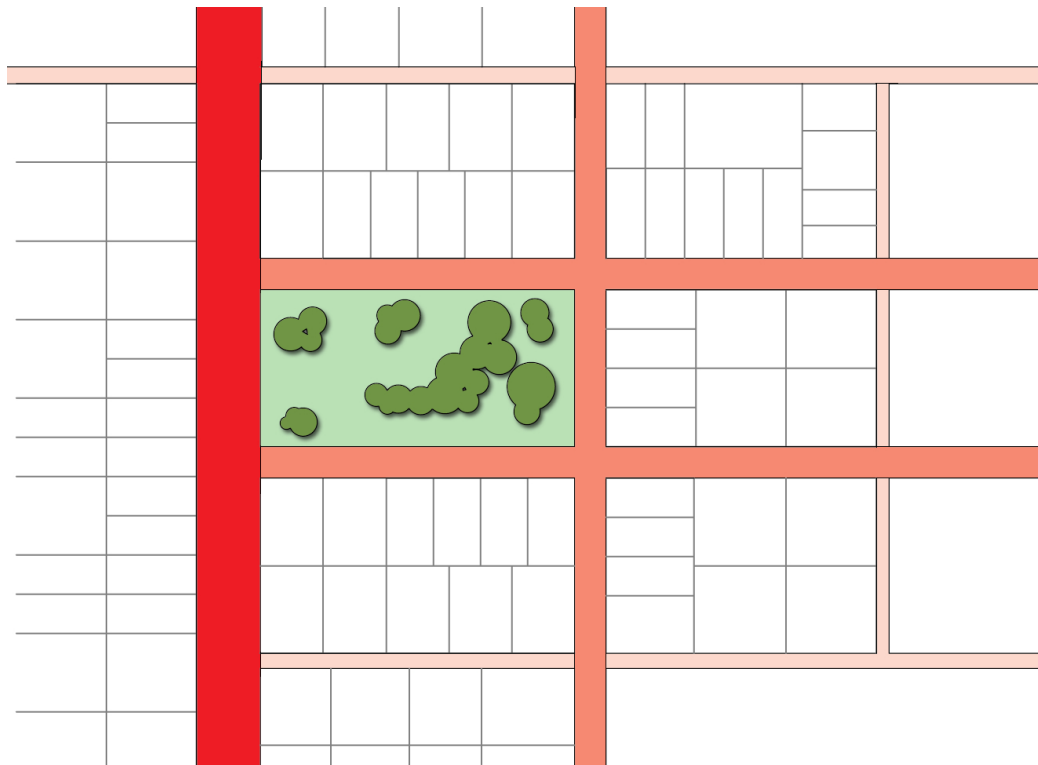
Traditional active recreation park containing soccer fields and soccer and tennis courts

Figure 6.6: Design Consideration #6

Design Consideration #6: Parks ringed by roads, rather than abutted by residential lots are more valuable. When possible, these roads should be the principal residential roads of a neighborhood to maximize visibility.



The empirical evidence shows that park edges should be both free of both physical and visual barriers. Further, it suggests that parks bordered by roads with low to moderate capacity (as opposed to private lots) increase surrounding property values. Therefore, ordinary residential roads and residential arterials should provide physical and visual accessibility to parks and open space. However, these roads must be planned and designed appropriately to prevent both restricting accessibility and creating unwanted nuisance behavior as a result of traffic, congestion, and parking. In the graphic below, road capacity is represented by the width of the road and intensity of the color red.



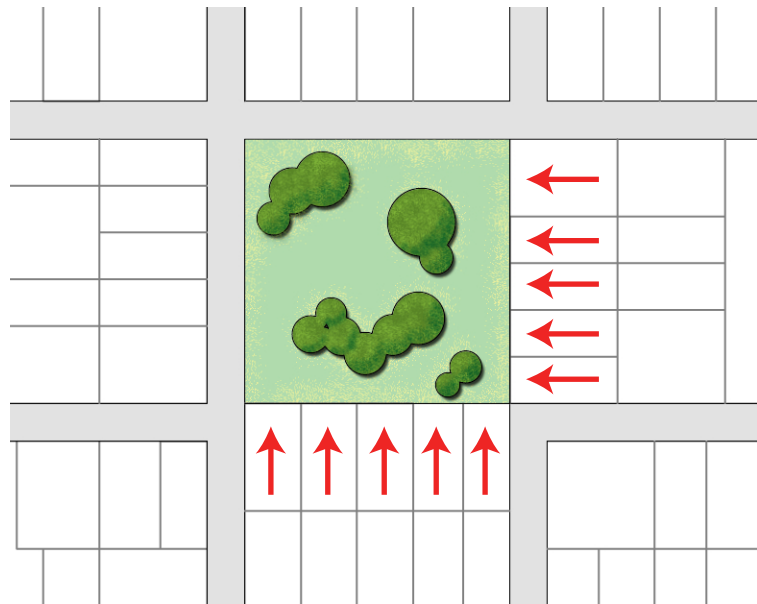
Neighborhood park bordered by both ordinary residential roads (light red) and a residential arterial (dark red)

Figure 6.7: Design Consideration #7

Design Consideration #7: Homes on adjacent lots are more highly valued if they face the park



The empirical evidence shows that homes adjacent to parks are more valuable if they face them rather than if they connect via the side or back of the property. This is likely an effect of how Americans value private property - the front yard is often viewed as public space where interaction with neighbors is acceptable, whereas the back and side yards are more private spaces where only invited interaction is customary.



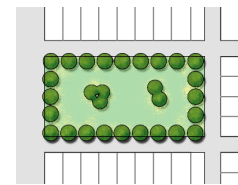
Houses adjacent to parks should front them, rather than back up to them or abut them to the side

Figure 6.8: Design Consideration #8

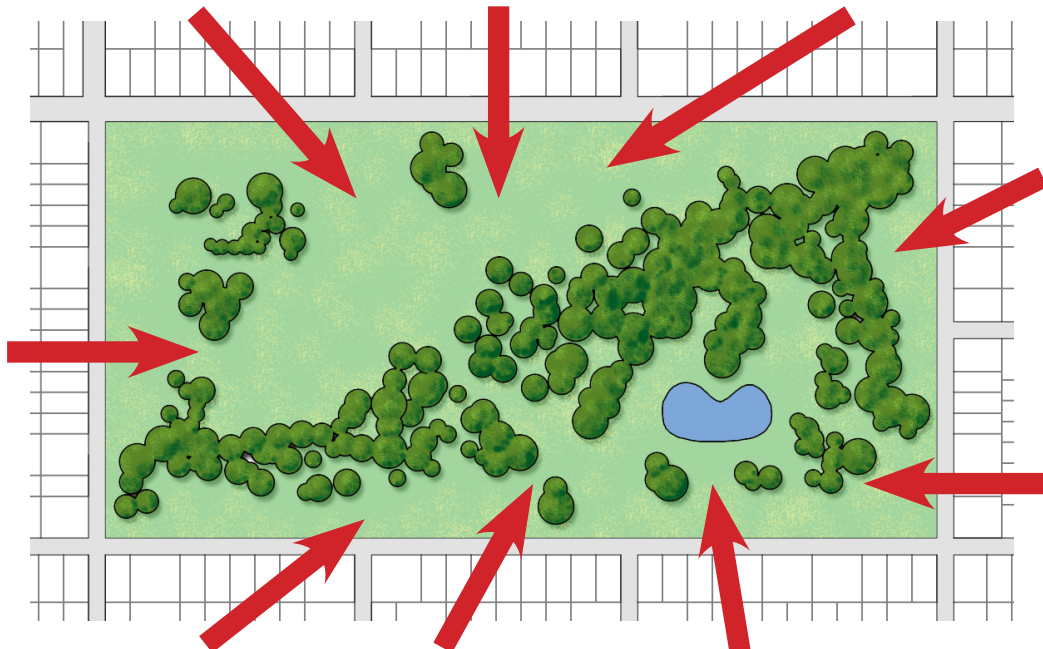
Design Consideration #8: Parks that offer expansive views from the surrounding neighborhood, containing meadows, lawns, and water features, are more highly valued by homeowners.



View from surrounding real estate are important considerations for designers when attempting to maximize the economic impact on surrounding residential property values. The empirical evidence suggests that parks edges should be visually open. To create the most value, views into the park from surrounding homes should be unobstructed, and consist of expansive vistas of primarily grass and/or water.



Park with restricted views



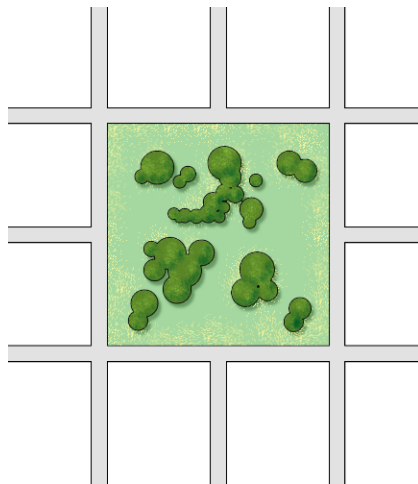
The red arrows represent expansive views of the park, including grassy areas and water features

Figure 6.9: Design Consideration #9

Design Consideration #9: Parks surrounded by highly porous street grids and walking paths, which minimize user travel time, are highly valued by homeowners.



Travel distance is an important and valuable characteristic of park accessibility, especially for homeowners who live farther from a park. Designers and planners should carefully consider path directness and network porosity when making decisions about the development and redevelopment of parks and their surrounding neighborhoods. As network porosity increases, so too does the amenity value associated with parks and open space.



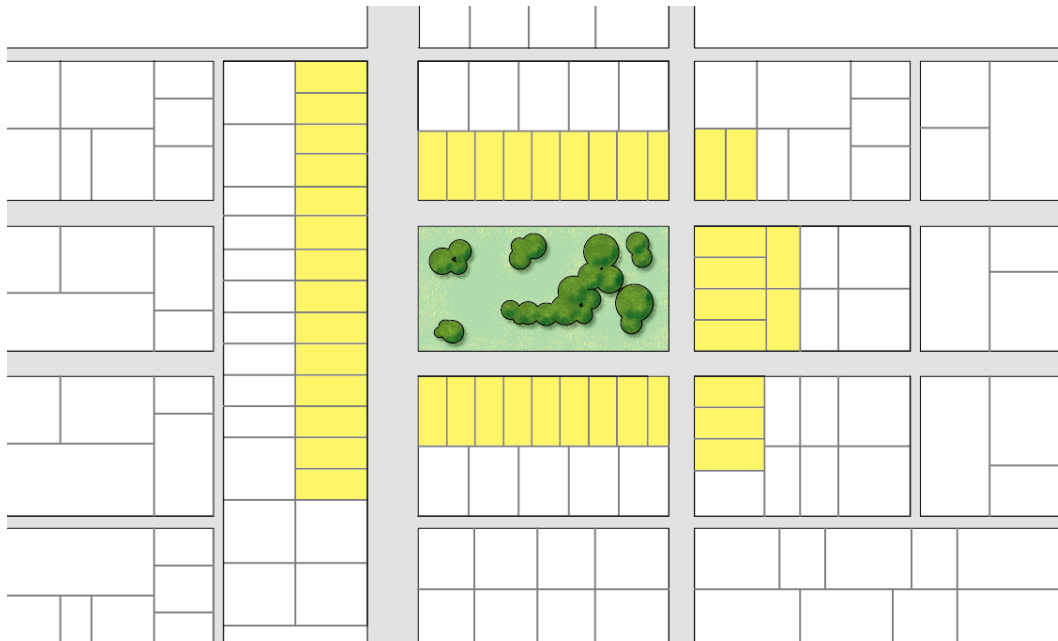
Highly porous street grid surrounding park

Figure 6.10: Design Consideration #10

Design Consideration #10: To maximize value the smallest residential lots should be located closest to a park



The empirical evidence suggests that lot sizes are to some degree a substitute for open space. Therefore, to maximize the value of land, parks should be located closest to the small surrounding lots since it is these lots that will see the highest spikes in associated value due to proximity.



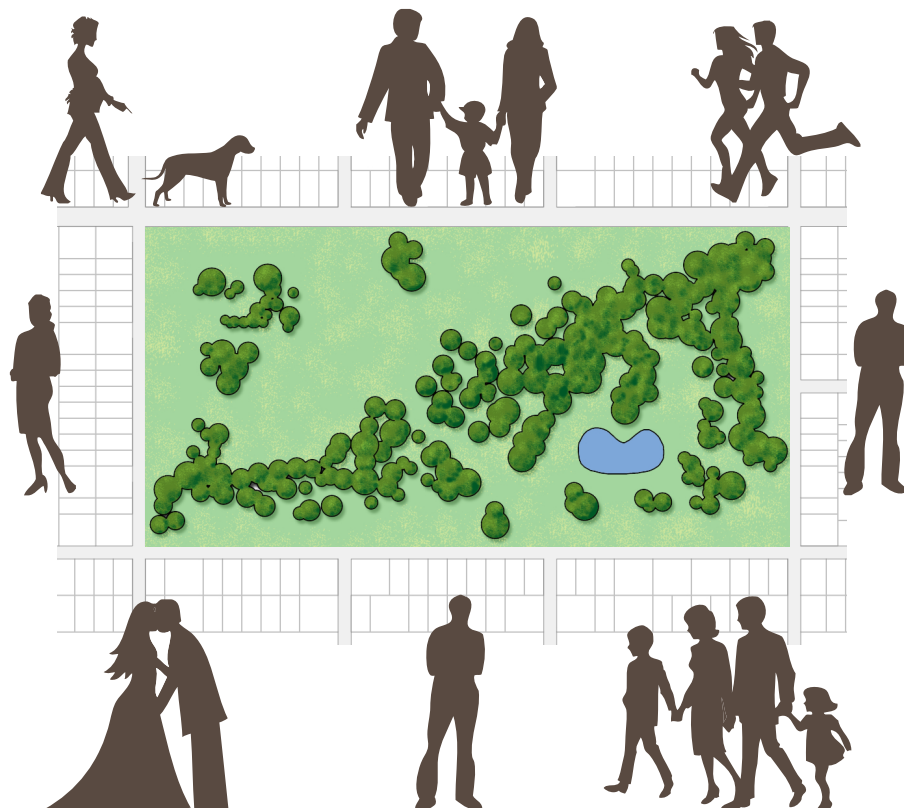
The smallest lots of an area are closest to the neighborhood park (represented in yellow)

Figure 6.11: Design Consideration #11

Design Consideration #11: In terms of economics, parks should be located in areas with the highest population density and where residents' ages do not preclude them from using the park



Population density is a proxy for several things, including a measure of the scarcity of open space, as well as measure of crowdedness of a neighborhood. As population density increases the amenity value associated with parks increases as a result of scarcity of open space and crowdedness. However, if population density increases to the point where surrounding open space capacity cannot meet the population's requirements, amenity values can begin to fall. Similarly, parks are more highly valued by residents of an age who can utilize them. Homeowners demand proximity to parks and open space during the ages that they and their families remain physically active. Furthermore, this demand seems to be shaped according to the personal preferences and perceived benefits associated with each park type.



This park is situated in a high density neighborhood filled with physically active residents (represented by the figures above).

Figure 6.12: Design Consideration #12

Design Consideration #12: Parks are more valuable when the located in areas with the highest median income



To receive the largest return on investment, communities should locate parks and open space in the wealthiest neighborhoods. However, decisions concerning parks and open space must be made with more than just economics in mind. Designers, planners, and park and elected officials must also consider issues of equity/fairness and accessibility of these public resources, especially when dealing with minority and disenfranchised communities.



This park is situated a neighborhood with a relatively high median household income

CHAPTER SEVEN

CONCLUSION

7.1 Conclusion

As urbanization intensifies in the 21st century, there will be increasing demands for and on open space. This thesis can assist in understanding how residents respond to different types of open space development and insure that proposed acquisitions and renovations could be justified by the anticipated economic gains. The primary goals of this thesis are to reposition parks and open space as public goods that pay for themselves, and to investigate how to maximize the return on investment through increased property values. While many people implicitly understand that parks are an important part of urban and suburban life, too often they are thought to be less valuable than roads, bridges, sewers, and other built infrastructure, despite the fact that with proper maintenance, they do not inherently depreciate over time (as this other built infrastructure does). Consequently, many elected officials under economic and political scrutiny, see parks and economic development as an *either-or* decision. And until the public is explicitly convinced that money spent on parks is an investment that accrues value over time, the true economic value of parks will not be recognized.

As presented in Chapter Two, the residential housing market is complex and dynamic, and property values are based on a bundle of characteristics relating to physical or structural features of the individual property, neighborhood conditions, community conditions, locational factors, environmental factors, and macroeconomic market

conditions. The hedonic pricing models studied in this thesis statistically control some of these variables so that the specific effect of parks and open space on home values can be examined. This is critical for landscape architects, planners, and elected officials to understand because if designed and developed successfully, parks and open space can be acquired and developed at no long term cost to the community. Annual tax revenues can not only pay for the capital costs, but subsequent revenues can serve as a consistent income stream that can be used to pay for park maintenance and future park development, among other things.

In Chapter Three, a review of the empirical evidence on the impact of parks and open space on surrounding property values highlighted key studies and particularly strong research designs, and provided a historical perspective on the issue. Early simplistic studies conducted in both Europe and the United States in the eighteenth and nineteenth centuries were replaced by more sophisticated statistical models which were able to better isolate the impacts of parks and open space while controlling for other variables. These models overwhelmingly support the notion that parks and open space have a significant positive effect on real estate values.

Chapter Four explains the qualitative meta-analysis methodology used in this thesis to select, organize, and analyze the empirical evidence related to the impacts that specific park and neighborhood attributes have on housing prices. This qualitative meta-analysis allows for a comprehensive understanding of the impacts that specific parks and neighborhood attributes have on housing prices and shows where current research findings converge and diverge. The original review of 55 hedonic pricing studies was refined to include only studies that (1) were published in 2000 or later; (2) had a large

sample size (over 700); (3) were conducted in the United States; and (4) investigated effects on single-family houses. Eleven studies were included in the final analysis. Next the studies were critically reviewed using a content analysis to search for terms related to park attributes, neighborhood characteristics, and neighborhood demographics.

Chapter Five offers an analysis of each of the following research variables defined in the methodology: Park Size, Park Type, Park Amenities, Park Aesthetics, Land Cover, Park Edges, View/Visibility, Path Directness, House/Lot Orientation, Lot Size, Population Density, Median Household Income, Age, and Race. From this analysis, Chapter Six offers a series of considerations, for designers and planners to contemplate when attempting to maximize the economic impacts of parks on surrounding residential real estate values. Each consideration presented in this chapter, is accompanied with a measure of confidence in the validity of the guideline. This Validity Confidence Level is based on five components: (1) The number of studies in the meta-analysis that address the topic; (2) The support of other studies in the meta-analysis; (3) The support of other empirical evidence in the literature, not included in the meta-analysis; (4) The geographic diversity of all supportive studies; and (5) The face validity of the consideration (i.e., does it appear to be logical and make sense).

The results of the meta-analysis suggest the following:

1. Large parks are more valuable than small parks
2. A network of small parks is more valuable than one large, consolidate park
3. Elongated, linear parks are preferable to square parks
4. Passive, natural resource-based parks are, as a whole, preferable to parks focusing on active recreation

5. Locate active use recreation areas and parking near the center of a park, rather than around its edges
6. Parks ringed by roads, rather than abutted by residential lots are more highly valued by homeowners. Specifically, principle residential roads of a neighborhood, which maximize visibility, create the most value
7. If homes are adjacent to parks, they are more highly valued if they face the parks, rather than connect through a back or side spatial orientation.
8. Parks that offer expansive views from surrounding neighborhoods, containing meadows, lawns, and water features, are more highly valued by homeowners.
9. Parks surrounded by highly porous street grids and walking paths, which minimize user travel time, are more valuable than parks with not surrounded by such porous networks.
10. To maximize value, small residential lots should be located closest to a park.
11. Parks located in high-density areas where residents' ages do not preclude them from using the park are more valuable to homeowners than parks located in low-density areas where residents' ages prevent them from utilizing the amenity.
12. Parks located in neighborhoods with high median household incomes are more valuable to parks located in neighborhoods with lower incomes.

While these considerations are intended to be used primarily by landscape architects and land use planners, they can also be used by public officials, developers, park advocates, or any other group attempting to maximize the return on investment of parks and open space. They are only to be considered at the practitioner's discretion within the specific contexts of individual projects and communities. These economically driven

considerations must be made in concert with other social, cultural, aesthetic, and environmental consideration in mind.

7.2 Future Research

While this research offers a series of design considerations based upon the existing literature, there are several ways in which future research could provide a clearer understanding of the economic value of parks and open space. First, researchers could benefit significantly from standardizing research designs and conducting studies across different regions with different scarcity and types of open space and neighborhood characteristics and demographics to help uncover the changing marginal value of these amenities. Collaboration among researchers from across the country would allow for great confidence levels in any future design considerations based on this research.

Second, specific park attributes and amenities should be the focus of future studies. While Miller (2001) attempted to do this, and Sharma's (2008) research begins to reveal the value of specific amenities, such as playgrounds, picnic areas, ball fields, and meadows, more researchers need to investigate the associated economic effects. With the sophistication of the statistical models used today, researchers should be able to appropriately isolate the impacts of these attributes and amenities.

In addition, the effects related to neighborhood demographics, such as age and race of surrounding homeowners, need to be explored more thoroughly. Because people of different age and race often value parks for different things (e.g., jogging vs. picnicking vs. having a nice view), researchers should focus on separating out the associated amenity values for each of these market segments. This research would allow

designers and planners to provide parkland that is more suitable for each demographic in (in the absence of public planning sessions or surveys).

Moreover, more research needs to examine the proximate effects of greenways on property values. There is a dearth in the literature, and while some researchers are beginning to uncover the associate effects, there is a severe shortage of findings compared to other open space types.

And finally, it is important for researchers to consider the social, cultural, environmental, aesthetic, health, and recreation benefits, in addition to the pure economic benefits when valuing parks and open space. While the Center for City Park Excellence has taken some great strides in ascribing value to a variety of these aspects of parks and open space, more information is needed, across numerous disciplines, to provide researchers and the public at-large with a more accurate value of these critical amenities.

In conclusion, as urbanization intensifies in the 21st century, landscape architects, planners, developers, and public officials will be forced to make important decisions about the types and arrangement of urban land uses. Parks and open space are a critical part of this urban infrastructure, and research linking economic evidence with land use will have increasing design, planning, and policy implications. The appropriate design and development of parks and open space can provide clear value in the economic, as well as social, cultural, environmental, aesthetic benefits that they provide.

REFERENCES

- Ackerman, Frederick L. and Goodrich, Ernest P. (1940). The effects of parks upon land and real estate values: Discussion. *The Planners Journal*, 6(2), 53-56.
- Anderson, Soren T. and West, Sarah E. (2006). Open space, residential property values, and spatial context. *Regional Science and Urban Economics*, 36(6): 773-789.
- Bastain, C.T., McLeod, D.M., Germino, M.J. Reiners, W.A. Blasko, B.J. (2002). Environmental amenities and agriculture land values: A hedonic model using geographic information systems data. *Ecological Economics*, 40(3), 337-349.
- Bolitzer, B. and N.R. Netusil (2000). The impact of open spaces on property values in Portland, Oregon. *Journal of Environmental Management*, 59, 185-193.
- Brander, Luke M. and Koetse, Mark J. (2011). The value of urban open space: Meta-analyses of contingent valuation and hedonic pricing results. *Journal of Environmental Management*, 92, 2763-2773.
- Chadwick, George F. (1966). *The park and the town: Public landscape in the 19th and 20th centuries*. New York: Praeger.
- Cho, Seong-Hoon, Neelam C. Poudyal, and Roland K. Roberts. (2008). Spatial analysis of the amenity value of green open space. *Ecological Economics*, 66, 403-416.
- Correll, Mark R., Lillydahl Jane H., and Singell, Larry D. (1978). The effect of greenbelts on residential property values: Some findings on the political economy of open space. *Land Economics*, 54(2), 207-217.
- Coughlin, Robert E. and Kawashima, Tatsuhiko. (1973). *Property values and open space in Northwest Philadelphia: An empirical analysis*. Philadelphia: University of Pennsylvania, Regional Science Research Institute, Discussion Paper #4.
- Cranz, Galen (1982). *The politics of park design*. Cambridge, MA: The MIT Press.
- Crompton, John. (2001). *The proximate principle: The impact of parks, open space and water features on residential property values and the property tax base*. (First Edition). National Recreation and Park Association, Ashburn, Virginia.
- Crompton, John. (2004). *The proximate principle: The impact of parks, open space and water features on residential property values and the property tax base*. (Second

- Edition). National Recreation and Park Association, Ashburn, Virginia.
- Des Rosiers, F., Lagana, A., and Thériault M., and Beaudoin, M. (1996). Shopping centres and house values: An empirical investigation. *Journal of Property Valuation and Investment*. 14(4), 41-62.
- The economic benefits of Denver's park and recreation system: A report by the Trust for Public Land's Center for City Park Excellence and County of Denver*. (2010). San Francisco: The Trust for Public Land.
- The economic benefits of Seattle's park and recreation system: A report by the Trust for Public Land's Center for City Park Excellence and County of Denver*. (2011). San Francisco: The Trust for Public Land.
- Espey, M. and Owusu-Edusei, K. (2001). Neighborhood parks and residential property values in Greenville, South Carolina. *Southern Agricultural Economic Association* 33(3): 487-492.
- Fox, Tom (1990). *Urban open space: An investment that pays*. New York: The Neighborhood Open Space Coalition.
- Gaber, John and Gaber, Sharon. (2007). *Qualitative Analysis for Planning and Policy: Beyond the Numbers*. American Planning Association, Washington, D.C.
- Gandy, Matthew. (2003). *Concrete and clay: Reworking nature in New York City*. Cambridge, MA: MIT Press.
- Garvin, Alexander (1999). A parks agenda for the 21st century. *The Millennium vision. A Supplement to Parks and Recreation*, October: 27-37.
- Geoghegan, Jacqueline, Wainger, Lisa, and Bockstael, Nancy. (1997). Spatial landscape indices in a hedonic framework: An ecological analysis using GIS. *Ecological Economics*, 23, 251-264.
- Hammer, Thomas R, Coughlin, Robert E., and Horn, Edward T. (1974). Research report: The effect of a large park on real estate value. *Journal of the American Institute of Planners*, 40 (July), 274-277.
- Harnik, Peter and Rowe, Katherine L. (2002). *The excellent city park system: What makes it great, and how to get there*. San Francisco, California: The Trust for Public Land.
- Harnick, Peter and Welle, Ben. (2009). *Measuring the economic value of a city park system*. San Francisco: The Trust for Public Land.
- Herrick, Charles (1939). The effects of parks upon land real estate values. *The Planners Journal*, 5(4), 89-94.

Hendon, William S. (1972). The park as a determinant of property values. *The Real Estate Appraiser*, September/October, 73-79.

How much value does the city of Philadelphia receive from its parks and recreation system? A report by the Trust for Public Land's Center for City Park Excellence and the Philadelphia Parks Alliance. (2008). San Francisco: The Trust for Public Land.

Jacobs, Jane (1961). *The death and life of great American cities*. New York: Random House.

Jim, C.Y. and Chen, Wendy. (2009). Consumption preferences and environmental externalities: A hedonic analysis of the housing market in Guangzhou. *Geogforum*, 38, 414-431.

Lancaster, Kelvin. (1966). A new approach to consumer theory. *The Journal of Political Economy*, 74(2), 132-157.

Lavedan, Peirre. (1941). Histoire de l'urbanisme, vol. 2. *Renaissance et temps modernes*. Paris: Henri Laurens.

Lawrence, Henry W. (1993). The greening of the squares of London: Transformation of urban landscapes and ideals. *Annals of the Association of American Geographers* 83(1), 90-118.

Little, Charles E. (1990). *Greenways for America*. Baltimore: Johns Hopkins University Press.

Lutzenhiser, Margot and N.R. Netusil (2001). The effect of open spaces on a home's sale price. *Contemporary Economic Policy*, 19(3), 291-298.

Lyon, David W. (1972). *The spatial distribution and impact of public facility expenditures*. Berkeley, California: University of California, Department of City and Regional Planning. Ph.D. dissertation.

Malpezzi, Stephen. (2003). Hedonic pricing models: a selective and applied review. *Housing economics and public policy: essays in honor of Duncan MacLennan*, ed. T. O. Sullivan and K. Gibbs. Oxford, U.K: Blackwell.

Miller, Andrew R. (2001). *Valuing open space: Land economics and neighborhood parks*. Cambridge, MA: MIT Center for Real Estate.

Morancho, Aurelia. (2003). A hedonic valuation of urban green areas. *Landscape and Urban Planning*, 66, 35-41.

More, Thomas A., Stevens, Thomas H., and Allen, P. Geoffrey (1982). The economics of urban parks: A benefit/cost analysis. *Parks and Recreation*, August, 31-33.

- More, Thomas A., Stevens, Thomas H., and Allen, P. Geoffrey (1988). Valuation of urban parks. *Landscape and Urban Planning*, 15, 139-152.
- Nelson, N., Kramer, E., Dorfman, J., Bumback, B. (2004). Estimating the economic benefit of landscape pattern: a hedonic analysis of spatial landscape indices and a comparison of build-out scenarios for the protection of ecosystem functions. Working paper. Institute of Ecology, University of Georgia.
- Nicholls, Sarah (2002). *Does open space pay? Measuring the impact of green spaces on property values and the property tax base*. College Station, Texas: Texas A&M University, Department of Recreation, Park and Tourism Sciences, Ph.D. Dissertation.
- Nicholls, Sarah and Crompton, John L. (2005). The impact of greenways on property values: Evidence from Austin, Texas. *Journal of Leisure Research*, 37(3), 321-341.
- NLCD. (2001). National Land Cover Database. U.S. Department of the Interior, U.S. Geological Survey.
- Olmstead, Frederick Law. (October 11, 1873). Letter to Salem H. Wales, President of the Board. *Papers of FLO*, 6, 651-657.
- Olmsted, Frederick Law, Jr. (1919). *Planned residential subdivisions*. Proceedings of the Eleventh National Conference on City Planning. Harvard University Press: 14-15.
- Palmer, J.F., 2004. Using spatial metrics to predict scenic perception in a changing landscape: Dennis, Massachusetts. *Landscape and Urban Planning*, 69, 201–218.
- Poudyal, Neelam, C., Hodges, Donald G., and Merrett, Christopher D. (2009). A hedonic analysis of the demand for and benefits of urban recreation parks. *Land Use Policy*, 26, 975-983.
- Rogers, Will (1999). in the Introduction to *The economic benefits of parks and open space* by Steve Lerner and William Poole. San Francisco: The Trust for Public Land.
- Rosen, Sherwin. (1974). Hedonic prices and implicit markets: product differentiation in pure competition. *The Journal of Political Economy*, 82(1), 34-55.
- Sainsbury, James C. (1964). *The impact of urban parks on surrounding residential areas: A case study*. Seattle: University of Washington, M.S. thesis.

- Sander, Heather A. and Polasky, Stephen. (2009). The value of view and open space: Estimates from a hedonic pricing model for Ramsey County, Minnesota, USA. *Land Use Policy*, 26, 837-845.
- Saunders, Ann (1969). *Regent's park: A study of the development of the area from 1086 to the present day*. New York: Augustus M. Kelley.
- Schreiber, R., Crooks, D., and Stern, P. N. (1997). Qualitative meta-analysis. In J. M. Morse (Ed.), *Completing a qualitative project* (pp 311-326). Thousand Oaks, CA: Sage.
- Sharma, Sameer. (2007). *Quantifying the effect of activity areas in parks on home values: using the Environmental Assessment of Public Spaces (EAPRS) tool*. Cincinnati, Ohio, University of Cincinnati, Department of Design, Art, Architecture, and Planning, Master's Thesis.
- Sharma, Sameer. (2008). *Valuing park attributes, moderation effects of walkability and social capital: A multilevel approach*. Cincinnati, Ohio: University of Cincinnati, Department of Design, Art, Architecture, and Planning, Ph.D. Dissertation.
- Simon, Donald E. (1976). A prospect for parks. *The public Interest*, 44 (Summer), 27-39.
- Smith, Allan (1983). Paxton's park. *Architects Journal* 179, (51/52), 48-51.
- Tate, Alan (2001). *Great city parks*. New York: Taylor and Francis.
- Thorsnes, P. (2002). The value of suburban forest preserves: Estimates from sales of vacant residential building lots. *Land Economics*, 78(3), 426-441.
- Weicher, John C. and Zerbst, Robert H. (1973). The externalities of neighborhood parks: An empirical investigation. *Land Economics*, May, 99-105.
- Zucker, Paul. (1959). *Town and square: From the agora to the village green*. New York: Columbia University Press.

Appendix A

Literature Review of Hedonic Pricing Studies			
Study	Location	Studies Identified by John Crompton	Studies not Supportive of Positive Proximity Effects
Herrick (1939)	Washington, DC	✓	
Sainsbury (1964)	Spokane, WA	✓	
Wonder (1965)	Oakland, CA	✓	
Ward (1966)	Spokane, WA		
Weiss, Shirley et al. (1966)	North Carolina	✓	✓
Hendon et al. (1967)	Dallas, TX	✓	
Kitchen and Herndon (1967)	Lubbock, TX	✓	✓
Hendon (1972)	Dallas, TX	✓	✓
Coughlin and Kawashima (1973)	Philadelphia, PA		
Lyon (1972)	Philadelphia, PA	✓	
Hendon (1973)	Dallas, TX		
Weicher and Zerbst (1973)	Columbus, OH	✓	
Hammer et al. (1974)	Philadelphia, PA	✓	
Hendon (1974)	Dallas, TX		
Correll et al. (1978)	Boulder, CO	✓	
Hagerty et al. (1982)	Worcester, MA	✓	
More et al. (1982)	Worcester, MA	✓	
Schroeder (1982)	Du Page County, IL	✓	✓
Kimmel (1985)	Dayton & Columbus, OH	✓	
Nelson (1986)	Salem, OR	✓	
Yoegel (1986)	Westchester County, NY	✓	✓
More et al. (1988)	Worcester, MA	✓	
King (1991)	Tucson, AZ		
Peiser and Schwann (1993)	Dallas, TX		
Geoghegan (1997)	Washington, DC		
Boelitzter and Netusil (2000)	Portland, OR	✓	
Acharya and Bennett (2001)	New Haven County, CT	✓	
Irwin and Bockstael (2001)	Maryland		
Lutzenhiser and Netusil (2001)	Portland, OR	✓	
Miller (2001)	Dallas/Fort Worth, TX	✓	
Epsey and Owusu-Edusei (2001)	Greenville, SC	✓	✓
Riddel (2001)	Boulder, CO		
Shultz and King (2001)	Tucson, AZ		
Geoghegan (2002)	Maryland		
Irwin (2002)	Maryland	✓	
Nicholls (2002)	Texas	✓	
Sielski (2002)	Washington County, WI	✓	
Smith et al. (2002)	North Carolina		
Cape Ann Economics (2003)	Leon County, FL	✓	
Pincetl et al. (2003)	Los Angeles, CA	✓	
Ready and Abdulla (2003)	Berks County, PA	✓	
Hobden et al. (2004)	Surrey, British Columbia		
Nicholls and Crompton (2005)	Austin, TX		✓
Anderson and West (2006)	Minneapolis/St. Paul, MN		
Sharma (2007)	Cincinnati, OH		
Cho et al. (2008)	Knoxville and Farragut, TN		
Neumann et al. (2008)	Middlesex County, MA		
Poudyal et al (2008)	Roanoke, VA		
Sander and Polasky (2008)	Ramsey County, MN		
Sharma (2008)	Cincinnati, OH		
Troy and Grove (2008)	Baltimore, MD		
Jim and Chen (2009)	Guangzhou, China		
Mayor et al. (2009)	Dublin, Ireland		
MacDonald et al. (2010)	Adelaide, South Australia		
Brander and Koetse (2011)	Throughout US		

APPENDIX B

<i>Author</i>	<i>Location</i>	<i>Research Variables</i>	<i>Findings</i>
Bolitzer & Netusil (2000)	Portland, OR	Park Size Park Type	Open space size is an important factor and statistically significant in both models used. In the linear model, each additional acre of open space is estimated to increase a home's sales price by \$28-33. A home located within 1,500 feet of a 20-acre open space, then mean size of public parks in the study are is estimated to sell for approximately \$2,670 more holding all other factors constant, than a home that is more than 1,500 feet from any open space In the semi-log model a home within 1,500 feet of a 20-acre open space is estimated to sell for \$1,247 more holding all else constant, than a home that is more than 1,500 feet from an open space. Public park coefficients were statistically significant (as were coefficients for golf courses); however, private parks and cemeteries were found to have no significant effect on a home's sale price.

<i>Author</i>	<i>Location</i>	<i>Research Variables</i>	<i>Findings</i>
Epsey & Owasu-Edusdi (2001)	Greenville, SC	Park Size Park Attractiveness Park Amenities Park Type	“Small basic neighborhood parks” have a negative impact on home adjacent to them There is a significant positive impact for homes between 300 – 500 feet of “small basic neighborhood parks”. Homes between 500 – 1,500 feet from a “small basic park” show a significant positive, though smaller, impact. There is a significant positive impact of proximity to “small attractive parks” within 600 feet, but not beyond that. For “attractive medium sized parks” there was no statistically significant impact on houses adjacent to them, but a positive impact on homes between 200 and 1,500 feet. The greatest impact on housing values was found with proximity to “small neighborhood parks,” with property values as much as 13% higher for homes between 300 – 500 feet and 6.5% higher for homes between 500 – 1,500 feet of such parks.

<i>Author</i>	<i>Location</i>	<i>Research Variables</i>	<i>Findings</i>
Lutzenhiser & Netusil (2001)	Portland, OR	Park Type	“Natural area parks,” on average, have the largest statistically significant effect on a home’s sales price holding all other factors constant. Golf courses, “specialty parks/facilities,” and “urban parks” are also found to have a positive and statistically significant effect. Cemeteries, on average, do not have a statistically significant effect on a home’s sales price. “Natural parks” and “specialty parks/facilities” are found to have a positive and statistically significant effect on a home’s sales price for every distance zone studied (from $\leq$ 200 feet to 1,500 feet). “Urban parks” have a positive and statistically significant effect for homes up to 600 feet and within 1,001 and 1,200 feet of the park.

<i>Author</i>	<i>Location</i>	<i>Research Variables</i>	<i>Findings</i>
Miller (2001)	Dallas/Ft. Worth, TX	Path Directness Park Edges View/Visibility Park Size Park Shape Park Amenities House Orientation Lot Size	A park reached by a more complicated, indirect path adds less value to the property than an accessible park at a similar travel distance – and this becomes more pronounced an increased distances. Parks bordered by roads are substantially more valuable to the surrounding neighborhood than parks bordered by private lots; parks bordered by subcollector roads are valued more still. Park size is positively and strongly correlated with sales price. Marginal effect on home prices of an increase in park size is small relative to the effect of proximity on homes adjacent to the park (implying a network of smaller parks will generate larger premiums than a single, consolidated park). The presence of specific amenities in a park - water features, soccer fields, tennis courts, basketball courts, and baseball diamonds - were inconclusive. Park proximity and acreage is valued more highly by the owners of smaller lots indicating a clear correlation between lot size and a preference for park space, and indicating the ambivalence of owners of the largest lots toward additional public open space. Elongated parks are more valuable than square parks. Houses abutting parks are more valuable if they face onto those parks, rather than adjacent streets.

<i>Author</i>	<i>Location</i>	<i>Research Variables</i>	<i>Findings</i>
Nicholls & Crompton (2005)	Austin, TX	Views/Visibility Path Directness Park Edge House Orientation	Adjacency to a greenbelt had a highly significant and positive impact on two out of three study areas. In the third study area, because of topography and land cover, houses that were adjacent did not have views into the greenbelt. Greenbelts with several points of access offer greater impacts to surrounding homes. Porosity of pedestrian paths does not impact home values. (There is no association between network distances and home values.) Greenbelts with less scrub and more tall trees, as well as several grassy areas, - and therefore better views into the greenbelt, provide a greater impact on homes' sale values than greenbelts with dense scrub and obstructed views.

<i>Author</i>	<i>Location</i>	<i>Research Variables</i>	<i>Findings</i>
Anderson & West (2006)	Minneapolis/St. Paul, MN	Park Size Park Type Population Density Median Income Age	The sales price of an average home increases with proximity to both “neighborhood parks” and “special parks;” however, “special parks” have a greater impact on sales price than “neighborhood parks.” The amenity value of proximity to a “neighborhood park” falls as park size increases; the authors interpret this to effect to be caused by increased noise and traffic flow associated with large parks. The amenity value of proximity to a “special park” rises with amenity size, although the effect is small. Neighborhoods with more residents per square mile value open space more than neighborhoods with fewer residents per square mile. Wealthy neighborhoods value open space more than poorer neighborhoods. Neighborhoods with more children value open space more than neighborhoods with fewer children.

<i>Author</i>	<i>Location</i>	<i>Research Variables</i>	<i>Findings</i>
Cho, Poudal, and Roberts (2008)	Knoxville & Farragut, TN	Population Density Land Cover Aesthetics	Proximities to evergreen trees (conifer species) are valued positively in “Rural-Urban Interfaces.” Proximities to deciduous trees and mixed forest are valued positively in the “Urban Core Area.” Positive effects of patch density are found in “Rural-Urban Interfaces” while negative effects are found in “Urban Core Areas.” Positive effect of edge density in northeast part of the city that is characterized by “Rural-Urban Interfaces,” and negative effects in the “Urban Core Area.” Positive effects of mean forest patch size are found within the “Urban Core Area,” while negative effects are found at the “Urban-Rural Interface.” Thus, evergreen trees in a diverse landscape with fragmented forest patches and more complex and natural-looking forests edges are more highly valued in “Rural-Urban Interfaces.” In contrast, deciduous trees and mixed forests in larger blocks and smoothly trimmed and man-made boundaries are more highly valued in the “Urban Core.”

<i>Author</i>	<i>Location</i>	<i>Research Variables</i>	<i>Findings</i>
Sharma (2007)	Cincinnati, OH	Park Type	Home values are positively associated with neighborhood walkability and attractive children's play equipment; and negatively associated with ball fields and courts.
Sharma (2008)	Cincinnati, OH	Park Amenities Park Type Path Directness	"General Services" and "Aesthetics" were found to be positively associated with home values and "Physical Activity Resources" and "Family Facilities" showed a negative relationship. Specifically, the negative association was with the following combinations of park elements: (1) ballgame grounds plus pathways, and (2) children's play equipment plus eating and drinking features (drinking water fountains, grill pits/fire pit, picnic areas, and vending). In contrast, informal open spaces (open spaces, meadows, wooded areas) and supporting areas (benches, tables, restrooms, and shelters) were found to be positively associated with home values. Travel distance moderated the relationship between home values and direct distance. (Home values are reduced if homes are connected by convoluted paths to the park.) Households located beyond walking distances, value travel distance more than families living closer to parks.

<i>Author</i>	<i>Location</i>	<i>Research Variables</i>	<i>Findings</i>
Poudyal, Hodges, and Merrett (2009)	Roanoke, VA	Park Size Population Density Lot Size Median Income Age Race House Price?	Areas with higher population density value “urban recreation parks” more than areas with lower population density The size of the nearest urban recreation park was significant and positively related to house price. (Urban residents prefer larger parks to smaller ones, but they possess a diminishing willingness to pay for the extra acreage.) Living area was positively and significantly related to demand for park acreage confirming that the house was a substitute for the size of nearby parks. Proximity to park is a substitute for size. The median household income was positively and significantly related to demand. The median age of the resident was positively and strongly related to demand. Race was another predictor of demand for park acres. The percentage of African-Americans was negatively related to park acres, suggesting that non-whites are less likely to demand park acres. This study confirmed that the price of the living space and the proximity to the nearest park were substitutes for the acres of nearby urban parks.

<i>Author</i>	<i>Location</i>	<i>Research Variables</i>	<i>Findings</i>
Sander & Polasky (2009)	Ramsey County, MN	Views/Visibility Land Cover Park Edge Path Directness	Both open space proximity and view attributes influence a home's sales price. The variables "view area" and "view percent composition of water and grassy areas" were significant and positive. (This illustrates a preference for homes with large views including these land cover types.) Although the percentage of a view composed of forest was positive, this variable did not significantly impact home sales values (indicating that forested areas are not particularly desirable in residential views). View richness, which measures the number of land types visible, was negative and significant. Proximity to parks on roads increases home values.