Articles

The Impact of Parks on Property Values: A Review of the Empirical Evidence

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The real estate market consistently demonstrates that many people are willing to pay a larger amount for a property located close to a park than for a house that does not offer this amenity. The higher value of these residences means that their owners pay higher property taxes. In many instances, if the incremental amount of taxes paid by each property which is attributable to the presence of a nearby park is aggregated, it is sufficient to pay the annual debt charges required to retire the bonds used to acquire and develop the park. This process of capitalization of park land into the value of nearby properties is termed the "proximate principle."

Results of approximately 30 studies which have empirically investigated the extent and legitimacy of the proximate principle are reported, starting with Frederick Law Olmsted's study of the impact of New York's Central Park. Only five studies were not supportive of the proximate principle and analysis of them suggested these atypical results may be attributable to methodological deficiencies.

As a point of departure, the studies' results suggest that a positive impact of 20% on property values abutting or fronting a passive park area is a reasonable starting point. If it is a heavily used park catering to large numbers of active recreation users, then the proximate value increment may be minimal on abutting properties, but may reach 10% on properties two or three blocks away.

KEYWORDS: *Parks, open space, property values*

Introduction

The difficult fiscal environment that prevails in many cities, and the escalation of urban land values, have made the economic justification of park land and open space increasingly necessary in order to rebut the persuasive rhetoric of those who say: "I am in favor of parks and open space but we cannot afford the capital costs of acquisition and development because of more pressing priorities, or the loss of operational revenue that will accrue if the land is removed from the tax rolls." Government officials often seek to enhance the tax bases of their communities by encouraging development. There is a widespread belief that this strategy raises additional revenues from property taxes, which then can be used to improve community services without increasing the taxes of existing residents. The notion that development brings prosperity is deeply embedded in the American psyche. In contrast

to the enhanced tax revenues accruing from development, contemporary conventional wisdom among many elected officials and decision makers is that open space and park land is a costly investment from which a community receives no economic return. The social merit of such investment is widely accepted, but social merit amenities frequently are regarded as being of secondary importance when budget priorities are established.

Advocates of park and open space provision view this economic conceptualization of parks as flawed. They exhort the adage that much of the value of properties on the tax roll is acquired from amenities that are off the tax roll, and that the contributions of these amenities to the tax base are likely to be at least as substantial as those forthcoming from residential real estate developments. This paper reviews empirical evidence in the literature relating to three key questions: (1) Do parks and open spaces contribute to increasing property values (the proximate principle)? (2) What is the magnitude of this effect? and (3) How does distance effect the proximate principle?

The Basic Principle

The premise that parks and open space have a positive impact on property values derives from the observation that people frequently are willing to pay a larger amount of money for a home located close to these types of areas, than they are for a comparable home further away. If this observation is empirically verified, then owners of the enhanced property are likely to pay higher property taxes to governments because of the increase in the property's appraised value. In effect, this represents a "capitalization" of park land into increased property values for proximate land owners. Conceptually, it is argued that the competitive market will bid up the value of property just equal to the capitalized value of the benefits that property owners perceive they receive from the presence of the park or open space. Economists refer to this approach as "hedonic pricing." It is a means of inferring the value of a non-market resource (a park) from the prices of goods actually traded in the market place (surrounding residential properties).

In some instances if the incremental amount of taxes paid by each property that is attributable to the presence of the park or open space is aggregated, it will be sufficient to pay the annual debt charges required to retire the bonds used to acquire and develop the park. In these circumstances, the park is obtained at no long-term cost to the jurisdiction.

This principle is illustrated by the hypothetical 50 acre park shown in Figure 1. It is a natural, resource oriented park with some appealing topography and vegetation. The cost of acquiring and developing it (fencing, trails, supplementary planting, some landscaping) is $20,000 an acre, so the total capital cost is $1 million. The annual debt charges for a 20 year general obligation bond on $1 million at 5% are approximately $90,000.

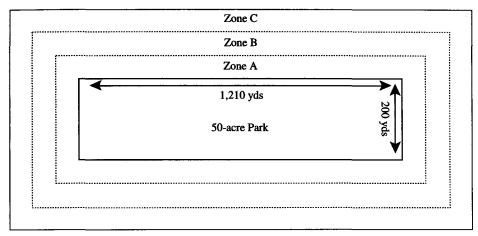A projected annual income stream to service the bond debt was calculated using the following assumptions:

Figure 1. Layout of a 50 acre Natural Park and the Proximate Neighborhood Area

• If properties around the park are 2,000 sq ft homes on half-acre lots (40 yd × 60 yd) with 40 yd frontages on the park, then there would be 70 lots in Zone A (30 lots along each of the 1,210 yd perimeters and 5 lots along each of the 200 yd perimeters).
• Assume total property taxes payable to city, county, and school district are 2% of the market value of the property.
• Assume the market value of similar properties elsewhere in the jurisdiction beyond the immediate influence of this park is $200,000.
• Assume the desire to live close to a large natural park creates a willingness to pay a premium of 20% for properties in Zone A; 10% in Zone B; and 5%, in Zone C, and that there are also 70 lots in Zones B and C.
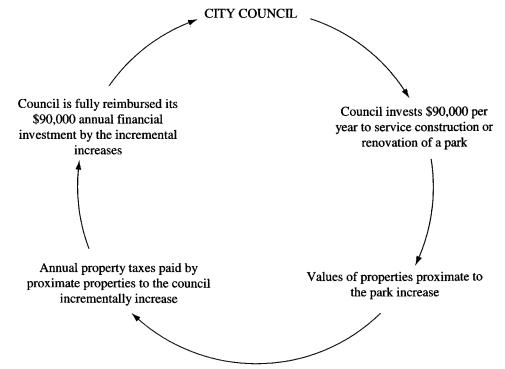
Table 1 shows that, given the above assumptions, the annual incremental property tax payments in the three zones from the premiums attributable to the presence of the park amount to $98,000. This is sufficient to pay the $90,000 annual bond debt charges.

The flows of this investment cycle are shown in Figure 2: (i) the council invests $90,000 a year for 20 years (annual debt charges on a $1 million bond) to construct or renovate a park; (ii) which causes the values of properties proximate to the park to increase; (iii) leading to higher taxes paid by the proximate property owners to the council; (iv) that are sufficient to fully reimburse the $90,000 annual financial investment made by the council.

There are five additional points worth noting which may further strengthen the economic case. First, this illustration assumes no state or federal grants are available to aid in the park's acquisition and development. If they were available to reduce the community's capital outlay, then the incremental property tax income stream would greatly exceed that required to

Table 1
Property Taxes Pay the Annual Debt for Acquisitions and
the Development of the Park

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

CITY COUNCIL

Council is fully reimbursed its $90,000 annual financial investment by the incremental increases

Council invests $90,000 per year to service construction or renovation of a park

Annual property taxes paid by proximate properties to the council incrementally increase

Values of properties proximate to the park increase

Figure 2. The Investment Cycle Associated with a Local Government's Investment in a Park

service the debt payments. Second, the incremental property tax income will continue to accrue to the community after the 20-year period during which the debt charges will be repaid, at which time the net return to the community will be substantially enhanced.

Third, there is evidence to suggest that investment in parks affects the comparative advantage of a community in attracting future businesses and desirable residential relocators such as retirees (Crompton et al, 1997). However, the proximate capitalization approach does not capture the secondary economic benefits attributable to park provision that accrue from such sources.

Fourth, a park of the size shown in Figure 1 is likely to improve the quality of life and, thus, have some economic value to urban residents living beyond Zone C. In all the studies reviewed in this paper, the capitalization of benefits ceased at a selected distance, usually somewhere between 500 feet and 3000 feet away from the park perimeter in urban contexts. However, it is unlikely that park users and beneficiaries will be restricted only to those individuals located within such a narrowly defined service area (Lynn, 1972).

Finally, there is convincing evidence that the public costs associated with residential development exceed the public revenues that accrue from it by, on average, approximately 15% (Crompton, in press). Thus, if the annual tax yield to a community was $1 million from a residential development, the median cost of servicing it is likely to be $1.15 million. In this case, if the operation and maintenance costs associated with using the land as a park or open space were less than $150,000, then it would be a more cost effective use of the land for the community than residential development.

A determining factor of the magnitude of a park's impact on the property tax base is the extent of the park's circumference or edge (Little, 1990). If a 100 acre park is circular in shape, then it has a relatively small circumference. If the 100 acres is distributed more linearly, then the amount of edge increases substantially. The principle is illustrated by the calculations in Figure 3. The increased amount of edge means that more property can be sited adjacent to the park and the aggregate enhancement value of the property tax base is likely to be larger. This edge principle has been widely

A circular park that is 100 acres in area will have a radius of 1,177.8 feet. Given that the circumference of a circle is two times pi, times the radius ($2\pi r$), the amount of edge will be 7,396.7 feet.

Assume this park is unpeeled into a long strip of green which is one square acre wide (209 feet)—in effect, laying one acre next to another in a line. To find the length of the edge of 100 acres in this configuration 209 feet is multiplied by 100 times two, since there are two sides to this strip. The result is 41,800 linear feet, 5.65 times as much edge compared with a circular park of the same number of acres. That is the edge effect.

Source: Little, C. E. (1990).

Figure 3. Illustrating the Edge Effect

embraced in the design of golf courses which are incorporated into residential real estate developments.

It is important to recognize that some types of parks are more desirable than others as places to live nearby. For example, there is convincing evidence that large flat open spaces which are used primarily for athletic activities and large social gatherings, are much less preferred than natural areas containing woods, hills, ponds or marsh (Kaplan & Kaplan, 1990). Further, it must be recognized that there are contexts in which parks exert a negative image on property values. A useful analogy is with a well-groomed front lawn which is likely to increase the value of a home, but if it is overgrown with weeds then the property value is likely to be diminished (Fox, 1990).

This point was made by the deputy director of the Parks Council, a nonprofit advocacy organization in New York City when she observed: "We have many poor neighborhoods in the South Bronx near parks. But the parks are not helping them. If you put money into a park, chances are that you will improve one portion of the neighborhood. But if the park does not have proper security and maintenance, it becomes a liability for nearby homes" (Tibbets, 1998, p. 9). Adverse impacts may result from nuisances such as: congestion, street parking, litter and vandalism which may accompany an influx of people coming into a neighborhood to use a park; noise and ballfield lights intruding into adjacent residences; poorly maintained, or blighted derelict facilities; or undesirable groups congregating in a park engaging in morally offensive activities.

In rural contexts, the proximate presence of undeveloped public park or open space is likely to be regarded by many landowners as an asset. However, in some contexts it may be viewed negatively because of trespass concerns. Hence, many proximate landowners in rural areas post and fence their land against trespassing (Gartner, Chappelle & Giraud, 1996).

A final negative impact is that appreciation of property values results in higher property taxes. Residents who have lived in a location for a long time and have no interest in selling their property, may see no personal benefits accruing to them from development or major renovation of a nearby park. Nevertheless, they are required to pay higher taxes because the appraised value of their property has increased.

The conceptual outcomes discussed in the previous paragraphs are summarized in Figure 4 which recognizes that both positive and negative impacts on property values are possible. The top half of Figure 4 suggests that property value benefit increments associated with proximity and accessibility will decay as distance from the park increases. The lower half of Figure 4 suggests that any negative values are likely to be limited to properties in close proximity to the park and these will decay more rapidly than positive impacts as distance from the park increases—that is, the positive curve is likely to be flatter than the negative curve (Li & Brown, 1980). Thus, in the negative scenario property in the park's service area but beyond (say) 500 feet is still likely to experience an increase in value, since some benefits of access to the
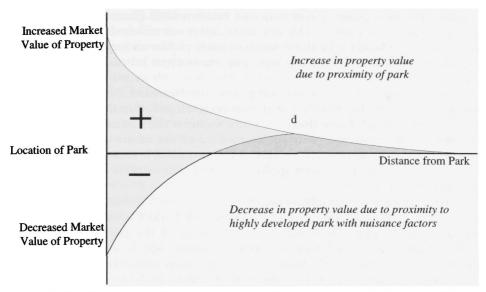
Figure 4. The Positive and Negative Impacts of Parks on Residential Property Values. Source: Li, N. M. and Brown, H. J. (1980).

park's amenities accrue to these homeowners but they avoid the nuisance costs inflicted on those who live close to it.

The Early Empirical Studies

The legitimacy of the proximate principle was conventional wisdom that prevailed among park professionals, landscape architects and urban planners in the early years of the twentieth century. Given his legendary, inspirational role in the architecture, design and popularization of parks in the United States, it should come as no surprise that this conventional wisdom emerged from the work of Frederick Law Olmsted.

Before funding for Central Park was committed, Olmsted explained how the proximate principle would result in the park being self-financing and his argument convinced key decision-makers. Thus, the New York City Comptroller, writing in 1856 shortly after the city acquired title to the land for Central Park, said, "the increase in taxes by reason of the enhancement of values attributable to the park would afford more than sufficient means for the interest incurred for its purchase and improvement without any increase in the general rate of taxation" (Metropolitan Conference of City and State Park Authorities, 1926, p. 12).

Olmsted consolidated the initial conceptual acceptance of the proximate principle for Central Park by subsequently providing empirical verification of it. He was responsible for the earliest documentation of the rela-

tionship between public parks and real estate values (Fox, 1990). His data are summarized in Table 2. This documentation was widely disseminated and was a powerful weapon in the armory of early public and open space advocates seeking to persuade communities to commit new investments into these amenities.

Soon after Central Park was completed, the New York Parks Commission was able to assert that before the park was developed, the three wards adjacent to the park paid one dollar in every thirteen the city received in taxes; but after its development they paid one-third of the entire expenses of the city, even though acquiring the land for Central Park removed 10,000 lots from the city's tax roll (Metropolitan Conference of City and State Park Authorities, 1926).

Attributing all the high increase in the property values in these three wards to the park, as Olmsted and the New York Parks Commission claimed, was probably inappropriate and an exaggeration of the park's influence. It is likely that natural growth in the city's population which caused a northerly movement of people would have created increased property values in these wards without the park. Indeed, the average values in other parts of the city increased approximately 100% during this time period. However, if this average rate of increase had been applied to the three wards contiguous to Central Park then their property value would have been about $53 million;

Table 2
Frederick Law Olmsted's Documentation of the Impact of Central Park on the Property Tax Base of the Three Proximate Wards

Assessed value in 1873		$236,081,515.00
Assessed value in 1856		26,429,565.00
Showing an increased valuation of		$209,651,950.00
The total expenditure for construction, from May 1st, 1857 to January 1st, 1874, is		$8,873,671.50
The cost of land of the Park to the city is		5,028,844.10
The cost of the Park to the city is		$13,902,515.06
The rate of tax for the year 1873 is 2.50, yielding on the increase of valuation as above stated, increase of tax amounting to $5,241,298.75.		
Total increase of tax in three wards		$5,241,298.75
The annual interest on the cost of land and improvement of the Park, up to this time, at six percent	$834,150.94	
Deduct one percent, on $399,300 of stock, issued at five percent	3,933.00	
		830,157.94
Excess of increase of tax, in three wards, over interest on cost of land and improvements		$4,411,140.81

Source: Fox, T. (1990).

whereas it was actually $236 million. Thus, even when this is considered, the park's influence remained considerable.

The highly publicized financial success of Central Park generated calls for the scenario to be replicated elsewhere in the New York City area. For example, in a letter to the New York Times in 1882 a correspondent noted that Central Park "has not only paid, but it has been a most profitable investment, and regarded in the light of a real estate transaction alone, it has been a great success" (New York Times, 1882, Jan. 9, p. 3). He went on to observe that "those who want a reduction in the tax rate and those who favor the movement for its effect on real estate" were now "certain" to support development of future parks. As a result of the Central Park success, the letter writer advocated a proposal to acquire and develop two new 2,000 acre parks on the periphery of the city before its expanding population reached those areas. He argued:

> Four or five millions of dollars at the utmost will be sufficient and, as experience has proved, the City will not only be reimbursed for the outlay, but will receive in the increased tax income collected on the enhanced value of land contiguous to the proposed parks much more than will be required for maintenance and other accounts, leaving, as in the case of Central Park, a handsome profit on the investment (p. 3).

Similar arguments were used in many other locales, as local governments realized that large public parks encouraged new residential development on the periphery of a city which they believed expanded and strengthened the tax base (Fox, 1990). The documented evidence from Central Park established the proximity principle as conventional wisdom among planners and park advocates, and resulted in it being used to justify major park investments in many other communities, most notably in nearby Brooklyn, in Boston and in Kansas City. In Brooklyn, for example, it was a prime factor in stimulating development of the 526 acre Prospect Park, which Olmsted and his partner Calvert Vaux also designed and built, since one of the main purposes of that park was to stimulate new real estate development (Fox, 1990).

The first county park system in the U.S. was the Essex County Park Commission in New Jersey which was established in 1895. Much of its early justification for park investment was based on the proximate property principle. In 1915, the Commission engaged a consultant to assess the impact on land values of four Newark parks—Eastside, Westside, Weequahic, and Branch Brook (Weir, 1928). The results are summarized in Table 3. They showed that over a 12 year period, the increased taxes paid to the county by adjacent property owners, which were attributable to the four parks, were sufficient to pay all debt charges and almost all of the maintenance costs.

Similar results were reported in a study undertaken by a firm of accountants for the neighboring Union County Park System in New Jersey in 1928 (The Playground, 1928). The study focused on property adjacent to Warinanco Park in both the City of Elizabeth and the Borough of Roselle,

Table 3
The Impact of Four Newark Parks on Adjacent Property Values

Rate of Increase in Property Values

Park	Property Adjacent to Parks	Rest of Same Taxing District	Adjacent Taxing Districts
Eastside	9 times	2¼ times	2½ times
Westside	15 times	3 times	3 times
Weequahic	14 times	7 times	3 times
Branch Brook	5 times	2½ times	3⅔ times
			(part adjoins park)

Source: Weir, L. H. (1928).

for the years 1922 and 1927. For comparative purposes, the study reported assessed values of the City of Elizabeth; the Tenth Ward of that city in which the park was located; and of the balance of the taxing district of Roselle, for the same years. Results of the study are summarized in Table 4.

The consultants reported that the increase in assessed values in the Elizabeth Tenth Ward outside the area adjoining the park in this period was 64.1%. If the area adjoining the park had increased in value at that rate since 1922, then its assessed value would have increased by only $450,000, giving a total for 1927 of $1.15 million instead of the $3.77 million shown in Table 4. The difference of $2.62 million they believed was attributable directly to the influence of the park.

A similar situation was evident on the Roselle side of the park where the rate of increase for the Borough property beyond the park area was

Table 4
The Influence of Warinanco Park on Adjacent Land Values in the City of Elizabeth and the Borough of Roselle 1922-1927

	City of Elizabeth	Tenth Ward in Elizabeth	Adjacent to Park on Elizabeth Side	Borough of Roselle	Adjacent to Park in Roselle
1922 Assessed Value*	83.90	16.10	0.703	7.10	1.07
1927 Assessed Value*	125.13	29.05	3.770	11.57	2.65
% Increase	49.1%	80.4%	436.1%	62.8%	147.0%

*Values are in $ millions.
Source: County parks increase property values. The Playground, March 1928: 633-634

34.5%. If this rate were applied to the park area property, then the increase in assessment values from 1922 to 1927 would have been $370,000 giving a total of only $1.44 million instead of the actual total of $2.65 million shown in Table 4. Again, the difference of $1.21 million was attributed by the consultants to the influence of the park.

A subsequent update of this study reviewed the 17 year period from 1922 to 1939 (Herrick, 1939). It reported that there was a 632% increase in assessed valuations on properties adjacent to Warinanco Park during this period. This was nearly 14 times the average increase of 46% for the entire city during the same period of years. The property in Elizabeth adjacent to the park which was assessed at $703,000 in 1922, rose to $5.1 million in 1939. A similar, though less spectacular, increase was shown on lands adjacent to the park in Roselle where valuations on land adjacent to the park increased by 257%.

In the first third of the twentieth century, developments of parkways and playgrounds were considered to be as central economic, social, and political issues, as the development of parks. Development and maintenance of parkways was a major responsibility of some urban park departments, and their positive impact on proximate land values was a primary justification for their development. The prevailing mind-set was that parkways were analogous to linear parks and, thus, a similar premium attributable to their aesthetic appeal would be present. Empirical studies appeared to confirm this premium (Nolen & Hubbard, 1937). However, it was not possible to untangle the myriad of influences accounting for the increases, and historical perspective suggests that much of the value increase was attributable to more effective and efficient access for traffic and transit, rather than to the parkways' aesthetics.

In most communities today, the distinction between parks and playgrounds has disappeared. Typically, playground equipment is one of multiple features incorporated into the design of parks. Playgrounds as independent entities are confined primarily to inner city neighborhoods where they are vestiges of a previous planning era. However, in the first third of the twentieth century, independent playgrounds were a common feature in the urban landscape. These entities were defined as, "spaces wholly designed for play, and having little or no park-like qualities" (Stoney, 1927, p. 324).

It had been claimed that playgrounds were likely to depreciate land values in their vicinity, but the empirical evidence suggested this concern was generally unfounded, especially in proximate rather than abutting properties (Stoney, 1927; Feldman, 1929). The cases investigated indicated that, for the most part, playgrounds did not retard the natural rise of land values. In residential neighborhoods, playgrounds tended to increase the value of proximate property at a greater rate than in neighborhoods where business and industry were present. These conclusions were based on the results from only two studies. However, both studies were carefully executed and were comprehensive involving 22 different sites in three different communities, and

they reached similar conclusions. These characteristics suggested that a reasonable level of confidence could be placed in the generalizability of their findings.

The relatively small number of early studies relating to the impact of parks on property values was supplemented by many subsequent studies in later years. These reflected the continued central role of urban parks in communities throughout the century. In contrast, the role of parkways and stand-alone playgrounds diminished considerably in later years, which explains the subsequent absence of studies measuring their impact.

Throughout the time period of the studies reviewed here—from the earliest days of urban park development in the 1850s, through the 1930s— there was an insistent, almost inviolate conviction among park and open space advocates of the legitimacy of the proximate principle. It was conventional wisdom among them and was also espoused by elected officials. However, in many ways, these early studies creating this conventional wisdom were naïve, reflecting the underdeveloped nature of the statistical tools and research designs in the early years of the field. They were limited to simple calculations of increased tax receipts accruing from properties in proximity to parks, parkways and playgrounds (Fox, 1990). This approach ignored the necessity of unraveling the complicated plexus of factors that may influence property values in addition to parks. It was noted that these "are not merely additive, but react on each other and may react in opposite directions in different cases" (Nolen & Hubbard, 1937, p. 124).

In subsequent eras, substantial improvements were made in methods used for quantifying the impact of parks and open space on real estate values. Statistical techniques, such as regression analysis, made it possible to identify the relative influence on property values of factors other than parks. The emergence of these analytical tools defined the end of the era of "early" empirical studies rather than any specific date, but this tended to occur in the 1930s.

The Later Empirical Studies

The review of later empirical studies is divided into three main sections. The first section chronologically reviews studies reporting results in urban areas. With the exception of a pioneering, pathfinding study completed in the late 1930s (Herrick, 1939), these studies were all undertaken after 1960. The growth in their number after this time was coincident with the increasing capability of computing. Almost all of the later studies used least squares regression analysis as their primary statistical tool. Typically, property prices or assessed valuations were regressed against a measure of distance and a set of control variables which measured the contributions of other potential influences on property value as well as parks and open space. The increased sophistication of computing made feasible more complex analyses containing a greater number of control variables. The key questions these analyses addressed were:

(i)   Did parks and open space contribute to increasing property values when other potential influences on those values were also taken into account?

(ii) How large was the proximate effect?

(iii) Over what distance does the effect extend?

A sub-section reviews studies that did not treat parks and open spaces as being homogeneous, but which recognized there are qualitative differences among them that are likely to result in different impacts on proximate property values.

Findings emerging from studies of parks and open spaces in urban areas may not be generalizable to non-urban or to large state and national level parks because of differences in context, scale or mission. For this reason, results from studies undertaken in those contexts also are reviewed in separate sub-sections. Results from water based parks are not reviewed here because they add a level of complexity to the discussion that was deemed to be outside the scope of this paper. In the final section, studies are reviewed whose findings did not endorse the proximate principle.

Results from the Urban Studies

The shift from the rudimentary early empirical studies to stronger methodological approaches was initiated by Herrick (1939). His primary purpose was "to show the possibilities of a simple method of analysis applied to available data" (Herrick, 1940, p. 96). It was 25 years before others emulated his approach which highlighted the pioneering nature of the study. Pioneers of new methods by definition expose themselves to criticism. Colleagues identified what they believed to be significant weaknesses in the mathematical models he developed, but at the same time they acknowledged, "Mr. Herrick's paper is an interesting first approach" (Ackerman & Goodrich, 1940, p. 56).

He was the first to use statistical techniques to try and isolate the unique contribution of parks to property value increases vis-à-vis other factors. It was an attempt to rectify the fundamental weakness inherent in the early studies of ascribing all increases to the existence of a park and disregarding the array of other factors that may have contributed to the increases, such as differences in the size, age and quality of residences erected on lots; lot size; proximity to a Central Business District, schools, or shopping centers; and access to other facilities and amenities which generate real estate value. Herrick (1939) used regression analysis to identify the impact of park acreage and population density on real estate value in Washington, DC for the 1911-1937 period.

Herrick concluded that his analyses suggested: "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" (p. 92). However, the dramatic findings and conclusions of this study have to be tempered by the reservations expressed by critics about the application of the regression analysis

(Ackerman & Goodrich, 1940). In the long term, the study's main contribution was its pioneering illustration of the role of statistical tools in investigating this issue.

Although no additional work evaluating the proximate principle was reported after Herrick's study for 25 years, the principle retained its status as the prevailing conventional wisdom through the 1940s and 50s. For example, in their *Home Builders' Manual for Land Development,* the National Association of Home Builders noted: "In the vicinity of park and recreation areas, enhanced values of building sites up to 15% to 20%, with a high level of sustained value over the years, are not uncommon experiences" (Little, 1960, p. 85). However, in 1961 the lack of convincing scientific evidence to support such anecdotal and experiential conclusions caused William Penn Mott Jr., who at that time was Superintendent of Parks for the city of Oakland, to write a letter to the Caro Foundation in San Francisco stating the "need for concrete evidence to indicate that parks are good business and that the purchase of park lands for future use is good business for a city" (Wonder, 1965, p. 3).

As a result of that letter, the Caro Foundation sponsored a study focused on two parks in Oakland (Wonder, 1965). The samples were relatively small, but they confirmed the positive impact of parks on the assessed values of proximate properties. The results are summarized in Table 5.

Clinton Park was in a relatively affluent area, while the San Antonio Park neighborhood property values were substantially lower. In both locations, the mean assessed values (which were supplied by the Tax Collector's Office) of properties fronting the park were dramatically higher than those of properties located one or two blocks away from the parks. A third neighborhood relatively close to the San Antonio Park was used as a control area. It mirrored the San Antonio neighborhood in size, type of dwelling units, ethnic composition, median family income, and education level, but was not subject to the influence of a park. Thus, its first zone fronted on to other

Table 5

The Impact of Two Parks in Oakland on the Assessed Values of Properties in the Surrounding Neighborhoods

Name of Park	Properties Fronting the Park	Properties One Block from the Park	Properties Two Blocks from the Park
Clinton Park	$3,416	$2,300	$2,355
San Antonio Park	$1,489	$940	$932
Control Area*	$876	$932	$1,195

*In the control area, the first zone fronted on to other houses rather than a park, so these values were not subject to the influence of a park.
Source: Wonder, R. L. (1965)

houses rather than a park. Its aggregate assessed values were substantially lower than those of the San Antonio neighborhood, but all the difference was attributed to properties on the block that immediately fronted the San Antonio Park.

The wider availability and greater capacity of computing in the 1970s and 1980s stimulated an increase in the number of empirical studies investigating the issue. A Philadelphia study focused on seven sites, at three parks, three schools, and one school-park combination (Lyon, 1972). During the sample years of the study, 1,725 property sales were recorded in the neighborhoods around the sites. As a percentage of total housing units in each area, the sample size ranged from 12% to 25.5%. In all seven neighborhoods regression analyses indicated that distance from the site had an impact on property values, enabling the author to conclude, "there appear to be locational advantages to school and park facilities, and these advantages have been capitalized in the sale price of nearby property" (p. 126).

Another Philadelphia study in 1974 analyzed the impact on sales price of 336 properties in the vicinity of Pennypack Park (Hammer, Coughlin & Horn, 1974). This 1,294 acre stream-valley park is in north-east Philadelphia and was surrounded by residential areas developed at a density of approximately ten dwelling units per acre. The area around the park was comprised of "unimaginative housing, heavy in scale with natural landscaping losing out to concrete and stone" (p. 275). Based on their subjective evaluation of the area, the researchers hypothesized that "the residents do not consider natural amenity to be very important" so "public open space would be expected to have a relatively low effect on land values compared to other neighborhoods" (p. 275).

Despite the authors' pessimistic prognosis, regression analysis indicated that the park accounted for 33% of land value at 40 feet. This dropped to 9% at 1,000 feet and 4.2% at 2,500 feet which was the peripheral limit set for the study. From these data, the authors concluded that a net increase in real estate value of $3.3 million was directly attributable to the park.

The most frequently cited study in this literature examined the effect of greenbelts on property values in three different areas of Boulder, Colorado (Correll, Lillydahl & Singell, 1978). A total of 1,382 acres of greenbelt had been purchased adjacent to residential developments in the 10 years prior to the 1978 study. The sample consisted of properties from each area that sold in a selected calendar year which were located within 3,200 feet of the greenbelt ($n = 82$).

Variables in the regression model that were believed likely to influence the sales price of these single family homes were: (i) walking distance in feet to the greenbelt; (ii) age of each house; (iii) number of rooms in each house; (iv) square footage of each house; (v) lot size; (vi) distance to the city center; and (vii) distance to the nearest major shopping center. The regression results showed that, other things being equal, there was a $4.20 decrease in the price of residential property for every foot one moved away from the

greenbelt. This suggested that if other variables were held constant, the average value of properties adjacent to the greenbelt was 32% higher than those located 3.200 walking feet away. These results are shown in Table 6.

One of the three neighborhoods had been able to take much greater advantage of the open space amenity in its planning than the other two neighborhoods, so the authors initiated further analyses on it. In this neighborhood, price decreased $10.20 for every foot one moved away from the greenbelt. This resulted in:

> the aggregate property value for the neighborhood being approximately $5.4 million greater than it would have been in the absence of greenbelt. This increment resulted in an annual addition of approximately $500,000 to the potential neighborhood property tax revenue. The purchase price of this greenbelt for the city was approximately $1.5 million, and thus, the potential property tax revenue alone would allow a recovery of initial costs in only three years (p. 215).

There is an important caveat to these positive results in that 86% of the $500,000 proximate increment of property tax revenue accrued to taxing entities other than the city, i.e. county, school district, and other independent districts. Thus, the incremental return to the city alone was not sufficient to pay the costs incurred by the city in purchasing the greenbelt. This creates a major policy issue. However, it should not inhibit the purchase of park and open space areas because overall economic benefits accrue to taxpayers whose revenues fund all the governmental entities. Resolution of this conundrum requires one of two actions. The first requires a city to be prepared to accept the inevitable criticism that is likely to occur when it raises taxes to purchase the land, knowing that its taxpayers indeed will benefit when return on the investment is viewed in the broader context of total tax payments to all governmental entities. The alternative strategy is to persuade the other taxing entities to jointly fund purchase of the open space areas, since all will reap proximate tax revenue increments deriving from them.

A study undertaken in Worcester, Massachusetts, in the early 1980s examined the relationship between four parks and the values of all properties sold within a 4,000 foot radius of each park during the preceding five years ($n = 170$) (Hagerty, Stevens, Allen & More, 1982; More, Stevens & Allen,

Table 6
Value of the Average House and Greenbelt Proximity

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

Source: Correll, M. R., Lillydahl, J. H., & Singell, L. D. (1978).

1982; More, Stevens & Allen, 1988). The multiple listing service from which the study's data were derived recorded actual sale price of a house, along with information on other characteristics that might effect the sale price including lot size, number of rooms, age, garage, taxes paid and condition. Distance to the park in feet was added to this set of variables. The results showed that, on average, a house located 20 feet from a park sold for $2,675 more than a house located 2,000 feet away. However, 80% of the aggregate increase in value derived from properties located within 500 feet of the parks. Effects could not be traced beyond 2,000 feet from the parks. Using these data, it was estimated that the aggregate property value increase attributable to these parks was $3.5 million.

The impact of two parks on the values of proximate residential developments in Dayton and in Columbus, Ohio was reported in 1985 (Kimmel, 1985). The 170 acre Cox Arboretum in Dayton was a wooded open space containing specialized herb, ornamental and other plant gardens. Its impact on an adjacent fairly new sub-division of 300 properties was assessed. The 152 acre Whetstone Park in Columbus, contained ball-fields, trails, natural areas and a 13 acre rose garden, and it was adjacent to an older residential area. In both cases, samples of approximately 100 residences were used in the study.

The regression analyses indicated that for every additional foot of distance a property was located away from Cox Arboretum and Whetstone Park, the selling price decreased $3.83 and $4.87, respectively. The average distance of properties in the study areas were 814 feet and 973 feet from Cox Arboretum and Whetstone Park, respectively, and these properties yielded proximate premiums of $3,100 and $4,700. Given the average selling prices of properties in the residential areas were $58,800 and $64,000, the park premium represented 5.13% in the Cox Arboretum subdivision and 7.35% at the Whetstone Park residential area. In neither case was an assessment made of how this average premium varied between properties immediately abutting the parks and those located (say) 2,000 feet away, which presumably were much less impacted by the parks.

An empirical investigation in Salem, Oregon, in 1986 reported that open space in the form of greenbelt at the fringe of the urban area exerted an influence on urban land values that extended inward from the urban boundary about 5,000 feet (Nelson, 1986). The researcher concluded that urban land adjoining farmland zoned exclusively for agriculture was worth $1,200 per acre more than similar land 1,000 feet away.

The Influence of Different Park Design and Use Characteristics

While the above studies consistently reported that parks and open space had a substantial positive impact on proximate property values, other studies have refined this conclusion by identifying differences in the magnitude of this impact based on a park's attributes. These differences pertained to (i) whether a park was designed to service active recreation users or to offer

users a more passive, contemplative experience; and (ii) whether a park was easily visible from adjacent streets or was sufficiently obscured from public view that it encouraged anti-social behavior.

Results from an early study undertaken in the city of Spokane, Washington, are shown in Table 7 (Sainsbury, 1964). This was a relatively naive study devoid of sophisticated statistical controls, but it was the first to empirically verify a continuum of effect between active and passive parks. Parks were classified into the three categories of active, combined active and passive, and passive. The values of residential properties adjacent to or surrounding parks were positively impacted regardless of the type of park, and magnitude of the impact declined with distance from the parks. However, there were substantial differences in impact along the active/passive continuum with active parks exercising the least positive impact and passive parks the most positive impact.

A more detailed study with better controls pertaining to this issue was undertaken soon after in Dallas (Hendon, Kitchen & Pringle, 1967). Ten parks were selected for study. The impact on properties within 500 feet of each park was compared with that on properties which were beyond 500 feet but still within the park's service area and zone of influence. In half of the parks the main feature was a playground, while the other five parks were larger and featured community playing fields.

The data in Table 8 show that properties within 500 feet of a playground park were of lesser value than other properties beyond 500 but within the park's service area. However, the inner area values were higher than those of properties that were outside the playground parks' service areas. In contrast, properties around the larger playing field parks were of higher value than properties that were more distant in the service area. The authors of the study stated: "In conclusion, it appears that the community playfield

Table 7
The Impact of Different Types of Parks on Residential Property Values

	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%

Source: Sainsbury, C. (1964).

Table 8

A Comparison of Mean Assessed Values of Properties Within 500 feet and Beyond 500 feet of 10 Parks in Dallas, Texas

Type of Park	Properties Within 500 Feet		Properties Over 500 Feet		Ratio: Under 500 / Over 500
	Mean Assessed Value ($)	Number of Properties	Mean Assessed Value ($)	Number of Properties	
Playground Parks					
Casa View	3,637.00	128	3,778.00	485	.96
Beckley Heights	3,390.00	141	4,197.00	760	.81
Hattie Rankin Moore	1,372.00	179	1,528.00	301	.90
Sleepy Hollow	2,683.00	39	2,556.00	55	1.05
Preston Hollow	9,039.00	154	11,207.00	516	.81
Playfield Parks					
Harry Stone	5,058.00	195	5,040.00	707	1.00
Pleasant Oaks	6,980.00	171	5,879.00	505	1.19
Beckley-Saner	3,436.00	250	2,742.00	494	1.25
Martin Weiss	3,335.00	262	3,258.00	741	1.02
Exline	2,382.00	113	2,254.00	594	1.06

Source: Hendon, W. S., Kitchen, J. W., & Pringle, B. (1967).

park, because of its large size, generally acts to increase property values of properties immediately adjacent to it while the playground generally decreases the values of similar properties" (p. 74).

The authors attributed the reasons for the adverse impact on nearby property of the playground parks not only to noise and the flow of additional people into the area, but to their quality. For example, in the Preston Hollow neighborhood, the park's adverse impact was relatively strong (20%). In this area property values were high, $9,039 within 500 feet compared to $11,207 in the rest of the service area (Table 8). The authors offered the following explanation for the adverse effect:

> The detrimental character of the park appears to lie in its appearance relative to the rest of the neighborhood. Probably if the appearance were improved, by plantings or some form of redesign, the adverse effect would be diminished.
>
> It seemed to be true in all cases, that the aesthetically pleasing park (one which had an attractive design, was well maintained, and highly landscaped) caused an increase in property values of properties around the park, relative to other properties...The parks which were well shaded, well designed and were of pleasing appearance had a positive impact, while those which were poorly designed had an adverse effect upon property values (p. 74).

Added dimensions to these findings were reported in a study which employed sophisticated statistical controls (Weicher & Zerbst, 1973). It fo-

cused on five parks in Columbus, Ohio: Audubon, Kenlawn and Linden parks were on the north side of the city, while Hauntz and Westgate were on the west side. All were located in neighborhoods comprised predominately of single family homes. However, the spatial relationships between the parks and adjacent residential properties differed in two ways. First, at Hauntz, Linden and Westgate, houses faced the park with a street between them; while at Audubon and Kenlawn, houses backed on to the parks separated from them only by a fence. Second, most houses had a view of open space, trees, grass etc., but those around Linden Park, and part of Audubon Park looked out on intensively used recreation facilities.

Prices of properties which had been sold in the previous five years that were immediately adjacent to these neighborhood parks constituted the dependent variable. The regression analysis controlled for house age, number of rooms, year of sale and lot size. The study differentiated between property (1) facing a park across a street; (ii) backing on to a park; and (iii) facing a heavy recreation use area or park building. The first category was comprised of properties facing Westgate and Hauntz Parks. These homes sold for approximately 7% more than identical properties located away from the park.

In contrast, there was no proximate premium associated with homes in the second category around Audubon and Kenlawn which backed on to the parks, since they sold for a similar price to those beyond the parks' view zones. Further investigation seeking an explanation of this finding revealed that the city's parks department received frequent complaints from neighborhood residents of drinking and other disturbing activities at night in Kenlawn and Audubon Parks. Kenlawn Park was almost completely surrounded by private residences, so it was almost invisible from the street. Therefore, it was an excellent gathering place for people who wanted to be undisturbed whether for legal or illegal purposes. Audubon Park contained a heavily-used baseball diamond, which meant that homeowners had strangers very close to their backyard for substantial time periods. This lack of privacy may have accounted for the lack of positive impact on property values.

Properties around Linden Park fell into the third category since the park consisted mainly of heavily used recreation facilities, such as baseball diamonds and a children's playground, rather than of passive open vistas. These homes sold for approximately 8% less than identical properties away from the park.

Another study reported in 1973 sought to identify the differential effects of four kinds of open space on property values: (1) public open space with recreation facilities (e.g. playgrounds, athletic fields; (2) public open space without recreational facilities (e.g. parks, arboretums, cemeteries); (3) private open space (e.g. large estates); and (4) institutional open space (e.g. colleges, private schools, country clubs) (Coughlin & Kawashima, 1973). The analysis was undertaken in a large area of northwest Philadelphia. The study compared the value of properties in census blocks that adjoined one of these

open space categories with other census blocks. A total of 1.955 census blocks were included in the analysis and they contained 300,000 inhabitants.

The regression analysis included a large number of other variables that could influence property values, and it identified separately the park impacts on blocks comprised mainly of homeowners and those on which renters predominated. Among both of these groups, access to public open space without recreation facilities was important. Accessibility to private and institutional open space impacted homeowner blocks but not rental blocks, while there was a positive relationship with open space containing recreation facilities and rental blocks but not homeowner blocks.

Table 9 summarizes the implications of the study's findings relating to public open space with no recreation facilities. Based on the average number of dwelling units per acre and the average housing unit value given in the table footnote, the incremental value attributable to three hypothetical different sized open space parks is computed using the analysis results. Computations are made for both individual dwelling units and for their aggregation in the four distance zones.

The percentage increment attributable to the park, increases markedly with the size of the park. Thus, in the case of a 25 acre park, increments range from an average of 9.9% within 1,000 feet of the park, down to 0.17% in the 5,000 to 10,000 feet radius. Despite the low percentage increment in the outer bands, their aggregate incremental contribution to the tax base is substantial because the larger radi and greater width of the outer distance bands means that they embrace a quantumly greater number of properties than the closer bands.

The overall findings strongly supported the proximate principle, but there was one exception in that an anomalous negative impact occurred on properties which backed directly on to the park. The authors attributed this

Table 9
*Effect on Property Value of Public Open Space with No Recreation Facilities**

Distance to Residence (feet)	Total Size of Park			Per Dwelling Unit Size of Park		
	1-Acre Park	5-Acre Park	25-Acre Park	1-Acre Park	5-Acre Park	25-Acre Park
0-1,000	$51,904	$205,788	$498,513	$83.31	$349.98	$1,207.05
1,000-2,500	43,057	215,258	1,076,290	12.97	64.86	324.28
2,500-5,000	37,148	185,740	928,699	3.13	15.67	78.34
5,000-10,000	39,246	196,258	981,292	0.83	4.14	20.69
	$171,355	$803,044	$3,484,794			

*Assuming 8.8 dwelling units per acre, and base value of average housing unit is $12,185.
Source: Coughlin, R. E.,& Kawashima, T. (1973).

to: "abutting owners feeling vulnerable from park users, who may cross over their land and cause annoyance to the owners or even physical damage to their properties. In an attitude survey carried out concurrently with this study, 21% of respondents rated the park poor or bad from the point of view of safety from crime, and an additional 45% rated it only fair" (p. 277).

Finally, results from the study of four parks in Worcester, Massachusetts discussed earlier strongly supported the proximate principle (Hagerty et al, 1985; More et al, 1982; More et al, 1988). However, the authors also reported that parks with natural landscapes created the highest values in adjacent property, while property next to active recreation facilities had slightly lower values which were attributed to noise and pedestrian traffic. Following the models described in Figure 4, these negative influences quickly dissipated and property values one block away from the active parks showed a positive proximate increment.

The empirical literature reviewed in this section offers evidence to support the proximate value curves shown in Figure 4. Properties that face or directly abut parks which primarily serve active recreation users are likely at best to show only a small positive value increment attributable to the park. This is attributable to the noise, nuisance and congestion emanating from the influx and egress of traffic and people. However, values are likely to rise substantially, and negative amounts are unlikely to be present, on properties located beyond the first block adjacent to the park. In contrast, the value of properties close to parks offering users a passive experience generally follow a classic distance decay curve with those closest to the park exhibiting the highest increments of value.

There is some evidence in these studies that parks in which there is antisocial behavior may create a negative impact on properties facing or abutting them. The probability of this type of behavior increases if parks are not easily visible from nearby streets. Again, however, any negative impact is likely to dissipate beyond the first block.

Findings from Non-Urban Studies

Most studies measuring impact of the proximate principle have been undertaken in urban settings. Their findings may not be useful for those whose focus is at the state or national level. For this reason, studies that have been undertaken in those contexts are discussed in this and the following sub-sections of the paper. State and national parks typically are not established and operated primarily to provide benefits to local residents. Their mandate is much broader so their economic contributions are likely to arise from visitor expenditures in the area, rather than be captured in proximate real estate values. Nevertheless, it seems likely that the proximate principle will apply, at least in some cases, even though such an impact may be perceived as incidental to the mission of these parks.

An empirical analysis of determinants of land values in the Adirondack Forest Preserve in New York State was reported in 1978 (Vrooman, 1978). The Preserve is a region within which privately-owned land and state-owned land are interspersed. Of its 6 million acres, 42% are owned publicly and one purpose of this study was to test whether the state-owned land which will remain undeveloped impacted the price of privately-owned land that was adjacent to it. The data consisted of the sale prices of 284 vacant land parcels during a three year period which did not contain buildings and were not waterfront properties. The regression analysis indicated that being adjacent to state land had a large positive impact on price. The price of such parcels was about $20 per acre higher than similar parcels that were not adjacent to state land. Given that the mean price for all sites in the sample was $114 per acre, this represented a 17.5% incremental increase in value.

A 1983 study of the impact of six New York State parks on surrounding property values reported that in four cases there was no impact (Brown & Connelly, 1983). The authors suggested two reasons which may explain these findings. First the areas lacked intense development and were characterized by predominantly mixed rural land uses, so proximate open space had little additional appeal. Second, in areas that were developed around these four parks, the lots were large incorporating backyard pools and other amenities which effectively discounted or nullified the importance of recreational opportunities offered by a nearby state park when the houses were sold.

At the remaining two parks, the analyses showed there was an impact. At Watkins Glen State Park for each 100 feet closer to the park a residence was located, its selling price increased by $50, while at Keewaydin State Park the increase was $72 per 100 feet. The authors used Keewaydin State Park to illustrate the magnitudes of these incremental increases on properties in the three local communities of Town of Alexandria Bay, Village of Alexandria Bay and Town of Orleans where the increments represented 4%, 16% and 16% of the tax base respectively. Table 10 shows the impact of these incremental increases on the tax revenues accruing to the three communities (in 1983 dollars).

A Maryland study reported in 1993 that the preservation of a significant tract of forest land accounted for at least 10% of the value of a house within one mile of the site in Baltimore County: at least 8% in Carroll County; and at least 4% in Howard County (Curtis, 1993). When the radius was reduced to a quarter mile, open space farm land accounted for a minimum of 15% of the value of a house in Baltimore County and 6% in Carroll County, but it depressed home values by at least 7% in Howard County.

Generally, findings from the non-urban studies mirror those from the urban studies in supporting the proximate principle. Despite the concerns of rural landowners relating to adjacent public lands facilitating access to trespassers (Gartner et al, 1996), these findings suggest that properties proximate to public park, forest or open-space land are likely to receive positive increments of value.

	Town of Alexandria Bay	Village of Alexandria Bay	Town of Orleans
Average sale price of properties	$44,272	$41,257	$40,296
Number of properties	557	600	476
Average enhanced assessed value of each property attributable to Keewaydin State Park	$1,703	$6,780	$6,302
Total enhanced assessed value	$948,482	$4,067,820	$2,999,638
Taxes paid attributable to incremental park values (town, village, fire/light district, school district, etc)	$117,981	$633,237	$70,911

*1983 dollar values
Source: Brown, T. L., & Connelly, N. A. (1983).

*The Impact of Large Federal or State Park or Open Space Areas on the Local Tax
Base*

The conventional wisdom among many elected officials, especially in rural areas, is that public acquisition of land for outdoor recreation adversely effects the revenue generating capacity of local jurisdictions. The belief is that since publicly owned land is exempt from taxation, its removal from the tax rolls increases the burden on other taxpayers, and in some instances may lead to the demise of communities. A common context in which controversy on this issue arises is the acquisition and development of new state park sites.

The cumulative research findings of the studies reported in this paper to this point suggest that developing outdoor recreation amenities is likely to lead to a rise in proximate property values which will generate more revenue than is lost by removing the land from the tax base. Two empirical studies were identified which specifically addressed this controversial issue. In both cases, the findings offered support for the proximate principle and did not support the conventional wisdom.

A 1971 study reported the impact of 15 park land acquisitions made in Pennsylvania by the U.S. Corps of Engineers or Pennsylvania State Parks (Epp, 1971). The aggregate property values of the township in which each park was located were compared with the values of the rest of the county which were not subject to the park's immediate influence. Data were derived from assessed values. The values for both areas were tracked for an 11-year period, starting five years before acquisition of park land began. It was as-

sumed that the control sites, comprised of the rest of the county, gave a good approximation of the land values that would have prevailed if the park sites had not been acquired.

In 12 of the 15 park sites the total value of each township's taxable real estate was higher the year after acquisition began than it was in the previous year. At the other three sites, township land values recovered in the second, fourth and fifth years. The author concluded that these results indicated the increase in the value of land remaining on the tax rolls more than offset the loss of taxable land caused by acquisition, so the revenue base of school districts and other local government entities was not adversely affected.

To facilitate comparison between the park sites and the control areas, a dollar value index was developed which established the market value in the year the land was acquired at 100. In the five years before acquisition commenced the value index of land on average across the 15 park site townships was 84, while the value in the rest of the counties was 90. For the five years after acquisition the average values for the park townships and control areas were 115 and 108, respectively. Thus, as a group, the 15 park townships moved from 6% below the control areas values before acquisition, to 7% above them after acquisition. The study's author concluded, "It seems likely that public acquisition of recreational land in amounts up to 60,000 acres does not reduce the real property tax base"(p. 26).

Results of this study suggested that the proximate principle is likely to apply to state and federal parks, even though much of the evidence reviewed in this paper refers to municipal parks. However, in addition to proximate principle benefits, federal and state lands often bring additional revenue benefits to local governments because in some cases they receive payments in lieu of taxes from the federal and state governments.

The compensatory impacts of such payments on local government revenues were believed to explain the findings reported in a 1970 study (Barron & Jansma, 1970). The authors used multiple regression analysis to test the hypothesis that state or federal land ownership in a forested three county area of north-western Pennsylvania adversely affected the fiscal capacity of local government through removal of part of the property tax base. The hypothesis was rejected because it was found that neither higher tax rates on private lands, nor reduced levels of per capita local government expenditures (i.e. counties, townships and school district) were associated with large amounts of public land, indicating that local governments were not placed at an economic disadvantage by public land programs. Indeed, the data "appeared to indicate the reverse" (p. 370).

In the three counties comprising the study area, the proportions of state and federal land were 51%, 48% and 17%. The consequences of the loss of local tax base were recognized by the federal government and the Pennsylvania State government which both provided payments in lieu of taxes on these lands to local jurisdictions. The authors believed these payments explained their results, concluding that "the payments in lieu of taxes effectively substitute for foregone tax revenues" (p. 370).

Table 11
Comparison of Mean Value of Properties within 500 Feet and Over 500 Feet at
Three Fort Worth Parks

	Mean Value Over 500 Feet	Number of Properties	Mean Value 500 Feet and Under	Number of Properties	Difference Significant at .01
Rosemont Park	$5,729	184	$6,562	59	Yes
Marine Park	4,565	162	5,571	48	Yes
Eastover Park	7,358	165	6,419	29	Yes

Source: Hendon, W. S. (1972).

These detailed findings were consistent with those reported by the National Park Service on the impact of two of its facilities (National Park Service, 1961). In Dare County, North Carolina, near Cape Hatteras National Seashore Area, the National Park Service reported that total assessed valuation within the county more than doubled soon after the area was opened. At the same time, tax rates were reduced from $1.00 to 80 cents per $100. Similar conclusions were reported after the expansion of Grand Teton National Park in Teton County, Wyoming.

Findings Not Supportive of the Proximate Principle

Five studies were located which reported findings that did not unequivocally support the proximate principle. A 1966 study used multiple regression to evaluate the relative influence of a combination of 14 independent variables on urban growth patterns, including distance to a playground or recreation area. However, this was not one of the four variables that had a significant influence on land values (Weiss, Donnelly & Kaiser, 1966).

Two studies undertaken in the late 1960s that were directed by the same researcher (Hendon) reported mixed results in that they offered only partial support for the proximate principle. The first site was a two and a half block area of housing (which equated to a depth of five lots) around a 10 acre park in Lubbock, Texas (Kitchen & Hendon, 1967). The area was characterized as "homogeneous" so the influence of other potential influencing variables was not measured. There were 550 properties within this zone of influence of the park, and data were available for 480 of them. Correlation analysis explained their relationship between distance from the park and (i) assessed value of the property; (ii) sale price of properties that had been sold in the previous five years; and (iii) assessed value of the land. There was a significant correlation only with the last of these three measures, and it was a fairly small correlation (−.17).

The second study focused on three parks in the city of Forth Worth (Hendon, 1972). They were: (i) Eastover Park, which was 13.5 acres surrounded by low to middle income residential property primarily occupied by African-Americans; (ii) Marine Park, which was 12 acres with a surround-

ing population characterized as low to middle income and predominantly white; and (iii) Rosemont Park, a community park of 30 acres bordering a large boulevard. Results are summarized in Table 11. In Marine and Rosemont Parks, the mean values of properties within 500 feet of the parks were of significantly greater value than properties more distant from the park. However, this support for the proximate principle was partially offset by the findings at Eastover Park where the direction of the significant relationship was the antithesis of that which was anticipated.

Findings from a large scale study involving 18 park sites in 13 municipalities in Westchester County, New York were reported in 1986. Community parks of 25 acres or more were selected through a systematic process based on a number of pre-established criteria (Yoegel, 1986). The neighborhoods around the selected parks were characterized as being relatively homogeneous. The 18 sites generated approximately 2,500 individual house price/park relationship quantifiable data points. The impact of the park on three zones (termed tiers) was evaluated. Residential properties in Tier 1 were immediately adjacent to a park. Tier 2 comprised the next two rows of residential properties directly behind Tier 1. Tier 3 consisted of the two rows of residential home plots lying behind Tier 2, that is, four and five rows from the park. Tiers 2 and 3 were perceived to be "control areas."

It was anticipated that the findings would endorse the proximate principle, but the regression analyses showed no difference in value between those properties adjacent to a community park and similar properties located in the other two tiers. The study's design may account for the unexpected result because it was different from the design used in most of the other studies reviewed. Given that fairly large community parks (at least 25 acres in size) were used in the study, the lack of a relationship may have reflected the proximity of all three tiers to the park. It seems possible that the adjacent properties of Tier 1 may have experienced a nuisance factor which depressed any incremental value increase to the level of that accruing to properties located 2-5 blocks away in Tiers 2 and 3. This would be consistent with the lower curve in Figure 4. There was no measure of how well the prices of properties in these three tiers compared to those a greater distance away. Thus, it seems reasonable to postulate that if a control area had been established 6-10 blocks away from the parks, instead of 2-5 blocks away, then a distance decay impact on residential properties may have emerged.

Methodological limitations may also have accounted for the findings of a 1982 study which failed to validate the proximate principle (Schroeder, 1982). Using 566 randomly selected residential properties located in several communities in Du Page County, Illinois, the study's objectives were to test for a significant relationship between the value of residential property and (i) per capita expenditures for parks and recreation in those communities; and (ii) the acreage of land per 1,000 population. The regression analysis indicated no evidence of a relationship in either case. It was subsequently suggested that inappropriate statistical procedures may have contributed to the findings of no relationship (Arthur, 1983), but the author rejected this criticism (Schroeder, 1983).

Both variables used in this study are inadequate surrogates for capturing the value of parks in residential property values. The failure of any other researchers working in this area to adopt these operationalizations suggests their fundamental weakness. Per capita expenditure is an input measure not an output measure, whereas the proximate principle relates to quantity and quality of output in the form of parks and open space. It is the tangible output assets which influence the sale price of proximate properties, not dollar inputs.

Both per capita expenditures and acres per 1,000 population are gross aggregate measures which do not relate proximity of residence and park. Any evaluation of the effect of the proximate principle must by definition include a measure of distance decay between park and residence, and this is absent when these gross measures are used.

In conclusion, one of the five studies reviewed in this section 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 control element of distance decay.

Conclusions

Three key questions were posed in the introduction to the review of the later empirical studies. The first question asked whether parks and open space contributed to increasing proximate property values. Results from 25 studies that investigated this issue were reviewed and in 20 of them the empirical evidence was supportive. Examination of the five studies that did not support the proximate principle suggested that in four of those cases the ambivalent findings may be attributable to methodological limitations.

The support extended beyond urban areas to include properties that were proximate to large state parks, forests and open space in rural areas. The rural studies offered empirical evidence to support not only the proximate principle, but also to refute the conventional wisdom that creating large state or federal park or forest areas results in a net reduction in the value of an area's tax base.

Six of the supportive studies further investigated whether there were differences in the magnitude of impact among parks with different design features and different types of uses. The findings demonstrated that parks serving primarily active recreation areas were likely to show much smaller proximate value increases than those accommodating only passive use. However, even with the noise, nuisance and congestion emanating from active users, in most cases proximate properties tended to show increases in value when compared to properties outside a park's service zone. Impacts on prox-

imate values were not likely to be positive in those cases where (i) a park was not well maintained; (ii) a park was not easily visible from nearby streets and, thus, provided opportunities for anti-social behavior; and (iii) the privacy of properties backing on to a linear park was compromised by park users.

The second question posed related to the magnitude of the proximate effect. A definitive generalizable answer is not feasible given the substantial variation in both the size, usage and design of park lands in the studies, and the disparity in the residential areas around them which were investigated. However, some point of departure based on the findings reported here is needed for decision-makers in communities that try to adapt these results to their local context. To meet this need, it is suggested that a positive impact of 20% on property values abutting or fronting a passive park area is a reasonable starting point guideline. If the park is large (say over 25 acres), well-maintained, attractive, and its use is mainly passive, then this figure is likely to be low. If it is small and embraces some active use, then this guideline is likely to be high. If it is a heavily used park incorporating such recreation facilities as athletic fields or a swimming pool, then the proximate value increment may be minimal on abutting properties but may reach 10% on properties two or three blocks away.

The diversity of the study contexts also makes it nonfeasible to offer a generalizable definitive answer to the final question posed in the introduction concerned with the distance over which the proximate impact of park land and open space extends. However, there appeared to be wide agreement that it had substantial impact up to 500 feet and that in the case of community sized parks it extended out to 2,000 feet. Few studies tried to identify impacts beyond that distance because of the compounding complexity created by other potentially influencing variables, which increases as distance from a park increases. Nevertheless, in the case of these larger parks there was evidence to suggest impact beyond this artificial peripheral boundary, since the catchment area from which users came extended beyond it (Allen et al, 1985).

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