The Economic Benefits of Seattle's Park and Recreation System

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The Trust for Public Land
Center for City Park Excellence

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Executive Summary

Seattle has long been a city of great parks. Found in more than 5,400 acres within the city's boundaries, the parks have countless amenities—26 recreation centers, 114 ball fields, 165 tennis courts, trails for bike commuters, and even a mountain bike course underneath a freeway colonnade. While the natural beauty of the Northwest is evident in the views of Puget Sound and Mount Rainier, it is the many verdant outdoor spaces and vibrant public places that define the Emerald City. From the city's first public park—Denny Park, built in 1887—to the parkways laid out by famous designer John Charles Olmsted; to the Forward Thrust investments pushed by James Ellis, Mayor Dorm Braman, and others; to the recent addition of Lake Union Park and the expansion of Cal Anderson Park; this enduring legacy has great economic value.

Seattle's park system was always thought of partly as an economic development tool. In fact, the Olmsted Brothers firm was hired to design a showcase system for the millions of people who came to the 1909 Alaska-Yukon-Pacific Exposition. Yet the actual economic value of this asset has never been measured. Now this study provides it. Knowing the numbers can help planners and policymakers recognize the role of parks not just in sound-good buzzwords such as "quality of life" and "livability" but in terms of the real economic development of the city, quantifying past investments and informing future spending and budgetary decisions.

This study enumerates seven major factors that relate to the economic value of Seattle parks: *property value, tourism, direct use, health, community cohesion, clean water, and clean air*. While the science of city park economics is in its infancy, the numbers reported here have been carefully tabulated, considered, and analyzed for the most recent year available at the time of this study. The valuation includes Seattle's entire park and recreation system—its trails, natural areas, neighborhood and community parks, and parkways.[1]

Two of the factors provide Seattle with *direct income* to the city's treasury. The first is increased property tax from the increase in value of residences that are close to parks. This came to nearly $15 million. The second consists of sales tax receipts from tourism spending by out-of-towners who came to Seattle primarily because of its parks. This value came to nearly $4.4 million.

In addition to increased tax money, these same factors bolstered the *collective wealth* of Seattleites—by more than $80 million in total property value and by more than $30 million in net income from tourist spending.

Two other factors provided Seattle residents with *direct savings*. The larger by far stems from Seattleites' savings by using the city's public parks, recreation centers, trails, and facilities instead of having to purchase these items in the private marketplace. This value came to more than $447 million. Second is the health benefit—savings in medical costs—from getting physical activity in the parks. This came to just over $64 million.

The last three factors also provided savings, but to city government rather than to individuals. The first involves water pollution reduction—the fact that the trees and soil of Seattle's parks retain rainfall and thus cut the cost of treating stormwater. This value came to just over $2.3 million. The second concerns air pollution—the fact that park trees and shrubs absorb a variety of air pollutants. This value came to nearly $530,000. Third is the community cohesion benefit of people banding together to save and improve their neighborhood parks. This "know-your-neighbor" social

[1] The study does not include every potential value aspect of a park system. For instance, the dollar value of the mental health benefit of a walk in the woods has not yet been documented and is not counted here.

capital, while hard to tabulate exactly, helps ward off all kinds of antisocial problems that would otherwise cost the city more in police, fire, prison, counseling, and rehabilitation costs. We estimate this value at just over $9.5 million.

The park system of Seattle thus has provided the city with annual revenue of $19.2 million, a municipal cost savings of $12.4 million, a resident savings of $511.6 million, and a collective increase of resident wealth of $110.8 million.

Summary: Estimated Annual Value of the Seattle Park and Recreation System

Revenue-producing factors for city government	
Tax receipts from increased property value	$14,771,258
Tax receipts from increased tourism value	$4,389,440
Total	**$19,160,698**
Cost-saving factors for city government	
Stormwater management value	$2,313,341
Air pollution mitigation value	$526,768
Community cohesion value	$9,537,639
Total	**$12,377,748**
Wealth-increasing factors for citizens	
Additional property sales value attributable to park proximity	$80,794,098
Profit from park-related tourism	$30,027,760
Total	**$110,821,858**
Cost-saving factors for citizens	
Direct use value	$447,501,085
Health value	$64,087,756
Total	**$511,588,841**

Source: Center for City Park Excellence, The Trust for Public Land, December 2010.

Background

Cities are economic entities. They are made up of structures entwined with open space. Successful communities have a sufficient number of private homes and commercial and retail establishments to house their inhabitants and give them places to produce and consume goods. Cities also have public buildings—libraries, hospitals, arenas, city halls—for culture, health, and public discourse. They have linear corridors—streets and sidewalks—for transportation. And they have a range of other public spaces—parks, plazas, and trails, sometimes natural, sometimes almost fully paved—for recreation, health provision, tourism, sunlight, rainwater retention, air pollution removal, natural beauty, and views.

In successful cities the equation works. Private and public spaces animate each other, the value of the whole surpassing the sum of its parts. In unsuccessful communities, some aspect of the relationship is awry: production, retail, or transportation may be inadequate; housing may be insufficient; or the public realm might be too small or too uninspiring.

A city's park system is integral to this equation, but research on the topic has largely been absent in cities even though the economic impact of stadiums, convention centers, and museums has been promoted widely. Based on a two-day colloquium of park experts and economists held in Philadelphia in October 2003 (see Appendix II), the Center for City Park Excellence believes that there are seven attributes of a city's park system that are measurable and provide economic benefits to the city. (For a listing of studies done on these issues, including some by colloquium participants, see Appendix III.)

What follows is a description of each attribute and an estimate of the specific economic value it provides in Seattle. The numerical calculation sheets can be obtained from the Center for City Park Excellence or accessed at **tpl.org/seattleparkvalue**.

1. Hedonic (Property) Value

Numerous studies have consistently shown that parks and open space have a positive impact on nearby residential property values. The evidence reveals that most people are willing to pay more for a home close to a nice park. Economists call this phenomenon "hedonic value." (Hedonic value also comes into play with other amenities such as schools, libraries, police stations, and transit stops. Commercial office space near parks may also command increased value, but no study has yet been able to quantify it.) Incidentally, property value goes up even if the resident never goes into the park; simply a view of a park can be worth extra value for some.

Benjamin Benschneider

Aerial view of Olympic Sculpture Park from Elliott Bay. Parks enhance property values around their edges, which helps bring in additional tax revenue.

Property value near parks is affected primarily by two factors: distance and the quality of the space. While proximate value (i.e., the "nearness" factor) has been documented for up to 2,000 feet from a large park, studies found most of the value to be within the first 500 feet. To be conservative, we have limited our measurement to this shorter distance. As for park quality, beautiful natural resource parks with great trees, trails, meadows, and gardens are markedly valuable to surrounding homes. Excellent recreational facilities are also desirable (though with some reductions in value due to issues of noise, nighttime lighting, and parking). Less attractive or poorly maintained parks, however, are only marginally valuable. And parks with dangerous or frightening aspects can reduce nearby property values.

Determining a park-by-park, house-by-house property value for a city is technically feasible, but it is prohibitively time-consuming and costly. Thus we formulated an extrapolative methodology to arrive at a reasonable estimate. Using computer-based mapping, we identified all residential properties within 500 feet of every significant park and recreation area in Seattle. (We defined "significant" as parks of one acre or more that are publicly owned within the city limits, excluding water areas outside the city's land boundary.) According to property records of the King County Assessor's Office, there are over 63,000 residential properties within 500 feet of parks in the city of Seattle. A residential property is defined as a unit that is owned and taxed. A single-family house is one property, a 100-unit rental building is one property, and a 100-unit condominium building is 100 properties. These properties when measured in 2010 had a combined market value of $33.9 billion.

To scientifically analyze the hedonic values conferred by parks, TPL then conducted a regression analysis of all residential property sales from mid-2005 to mid-2010. We chose this five-year period in order to have a large enough sample size. Our regression showed a 4.84 percent park effect. Using this, we calculated that the property value attributable to parks in Seattle is just over $1.6 billion. We then applied the park-effect coefficient in two ways—to determine additional property tax income to the city in 2009 and also to determine additional personal income to those homeowners who sold their dwellings in 2009.

Using data provided by the assessor's office, we calculated that just over $305 million of property tax was collected from properties within 500 feet of parks. Since 4.84 percent of this was due to parks, the increment came to $14.77 million. We also determined that based on the assessor's data for the homes sold in 2009 (the last complete year of residential sales data available), the proximate park value realized at the time of sale was $80.79 million.

We consider these to be conservative estimates for three reasons. First, they do not include the effects of small parks (under an acre), although it is known that even minor green spaces have a property value effect. Second, they leave out all the value of dwellings located between 500 feet and 2,000 feet from a park. Third, they do not include the potentially very significant property value for commercial offices located near parks.

Table 1. Effect of Seattle Parks on Residential Property Values

Value of properties within 500 feet of parks, 2010	$33,929,843,080
Value attributable to parks (4.84%)	**$1,642,204,405**
Property tax revenue from properties within 500 feet of parks, 2010	$305,191,275
Tax revenue attributable to parks (4.84%)	**$14,771,258**
Value of properties sold in 2009 within 500 feet of parks	$1,669,299,551
Value attributable to parks (4.84%)	**$80,794,098**

2. Tourism Value

Seattle's place as a city on the sea with mountain views from its seven hills, combined with its cultural offerings, nightlife, and heritage, makes it a popular city to visit. A significant portion of the city's tourism can be attributed to its park system—visitors either coming to see specific parks or taking part in park-based events.[2] The evidence can be found in travel writing alone. For instance, noting Seattle's great outdoor opportunities, Fodor's lists Gas Works Park among the city's top attractions and also spotlights Discovery Park. *The New York Times*' "36-hour visit" to the city highlights the Olympic Sculpture Garden as a "must." And Wikitravel's contributors tout the park system through such activities as biking on the Burke-Gilman Trail. When it comes to large outdoor events, most take place within parks: the Danskin Triathlon attracted more than 12,000 people and Hempfest pulled in more than 200,000.

Joe Mabel

Children's Festival at the Seattle Center. Parks contribute to the tourist economy—both as event venues and as attractions in their own right.

Determining the contribution of parks to the tourism economy requires knowledge of tourist activities, the number of visits, and the level of spending. In Seattle, while attendance at some events is known, there is no comprehensive survey regarding tourism due primarily to parks. Nevertheless, Seattle's Convention and Visitors Bureau does have data on visits to King County, the level of spending, and a limited variety of reasons for the trip. This data, supplemented by interviews with local tourism experts, enabled us to estimate the economic value of park visitation by tourists.

[2] By definition, local users are not tourists—any spending they do at or near the park is money not spent locally somewhere else, such as in their immediate neighborhood.

We first reduced the total amount of King County tourist spending by half because about one out of every two county visitor dollars is spent in Seattle itself. Then, after eliminating all business and conference visitors, we used data on primary reasons for visits, conversed with local tourism and event specialists, and employed knowledge of statistics in other cities. We determined that approximately 3.44 percent of King County tourists visit Seattle primarily because of the city's parks. This is a broad group that includes, for instance, a suburban day visitor to the Filipino festival, an overnight traveler to Hempfest, and a family traveling to see Gas Works Park, boat from Magnuson Park, and bike on the Burke-Gilman Trail.

The level of tourist spending ranges considerably, from the high level of overnight hotel guests to the midlevel of overnighters staying with family and friends to the lower level of day visitors who might only eat lunch or a snack and make fewer other purchases. We thus calculated that park-based tourists who stayed overnight in hotels spent $51.8 million, those who stayed with friends and family spent almost $22.5 million, and those who came for the day spent $11.4 million in 2009. We then factored the sales tax rate for the city of Seattle—3 percent for food and other purchases and 10 percent for hotel rooms.[3] For overnight visitors staying at a hotel, we assumed an average tax rate of 6.5 percent, splitting the difference between the lodging tax and the sales tax on all other purchases. The resulting tax revenue gain to the city came to $4.39 million in 2009.

In addition, since economists consider about 35 percent of every tourist dollar to be profit (the rest of the income being pass-through to pay for expenses), the Seattle citizenry's collective increase in wealth from park-based tourism was just over $30 million.

Table 2. Tourism Value of Seattle Parks

Visitor spending attributable to parks	
Spending of overnight visitors staying in hotels	$51,875,200
Spending of overnight visitors staying with friends or relatives	$22,497,600
Spending of day visitors	$11,420,800
Total visitor spending	$85,793,600
Profit to Seattle residents (35% of visitor spending attributable to parks)	**$30,027,760**
Sales tax receipts attributable to parks	
Sales tax receipts from overnight visitors staying in hotels (6.5% of spending)	$3,371,888
Sales tax receipts from overnight visitors staying with friends or relatives (3% of spending)	$674,928
Sales tax receipts from day visitors (3% of spending)	$342,624
Total tax receipts	**$4,389,440**

[3] The rest of the sales tax is collected by the State of Washington. Of course, a portion of state spending benefits the City of Seattle, but determining that amount is beyond the scope of this study.

3. Direct Use Value

Perhaps even more important than their indirect value for property and tourism, Seattle parks provide huge direct benefit to residents: scores of playgrounds, nature trails in Discovery Park, basketball and tennis courts in Jefferson Park, gyms in numerous community centers, the golf course at Green Lake Park, the pickup Frisbee fields of Cal Anderson Park, and much more. Economists call activities on these facilities "direct uses."

Even though most direct uses in Seattle parks are free of charge, economists can still calculate their value by determining the consumer's "willingness to pay" for the recreation experience in the private marketplace. In other words, if Seattle's park system were not available, how much would the resident (or "consumer") pay for similar experiences in commercial venues? Thus, rather than income, the direct use value represents the amount of money residents save by not having to pay market rates to indulge in the many park activities they enjoy.

Seattle Parks and Recreation

The Burke-Gilman Trail. If Seattle residents didn't have public access to park and trail amenities, they would have to spend millions of dollars to obtain these benefits from the private marketplace.

The data for quantifying the benefits received by direct users stems from a detailed, professionally conducted, random-digit-dialed telephone survey on park use of 600 Seattle residents. The model used is the "unit day value" method as documented in Water Resources Council recreation valuation procedures by the U.S. Army Corps of Engineers. The unit day value model counts park visits by specific activity, assigning each activity a dollar value. For example, playing in a playground is worth $3.50 each time to each user. Running, walking, or in-line skating on a park trail is worth $4, as is playing a game of tennis on a public court. For activities for which a fee is charged, such as golf, using a weight room, or playing league sports, only the "extra value" (if any) is assigned: that is, if a round of golf costs $20 on a public course and $80 on a private course, the direct use value of the public course would be $60. Under the theory that the second and third repetitions of a park use in a given period are slightly less valuable than the first use (i.e., the value to a child of visiting a playground the sixth time in a week is somewhat lower than the first), we incorporated an estimated sliding scale of diminishing returns for heavy park users. For example, playground value diminishes from $3.50 for the first time to $2.25 for the sixth time in a week. We also estimated a seasonal length for different park uses to take into account reduced participation at certain times of the year. (Although some people are active in parks 365 days a year, we chose to be conservative and eliminated seasons with low participation levels. Naturally, some activities such as using an indoor community center or pool are year-round.)

The phone survey, which has an accuracy level of plus or minus 3 percent, revealed residents' park activities and the number of times residents engaged in each activity. Residents were asked to answer for themselves; a representative proportion of adults with children under the age of 18 were also asked to respond for one of their children.[4]

The result of the Direct Use Calculator was $447,501,085 for 2010.

While it can be claimed that this very large number is not as "real" as the numbers for tax or tourism revenue, it nevertheless has true meaning. Certainly, not all these activities would take place if each had to be purchased, but Seattle residents are unquestionably getting pleasure and satisfaction from their use of the parks. If they had to pay and if they consequently reduced some of this use, they would be "poorer" from not doing some of the things they enjoy.

Table 3. Direct Use Value of Seattle Parks

Facility/activity	Person-visits	Average value per visit	Value
General park use (playgrounds, trails, dog walking, picnicking, sitting, etc.)	97,427,055	$1.95	$260,718,966
Sports facility uses (tennis, team sports, bicycling, running, etc.)	38,515,753	$3.38	$155,335,172
Special uses (fishing, kayaking, gardening, festivals, concerts, attractions, etc.)	4,648,049	$6.77	$31,446,947
Total value of direct use of parks			**$447,501,085**

[4] The survey covered only Seattle residents; the value from nonresident users is captured under tourism.

4. Health Value

There is increasing evidence from experts that obesity and physical inactivity have become a major public health problem that has expensive economic consequences. A report released in August 2009 by the U.S. Centers for Disease Control and Prevention estimated that $147 billion in added costs could be attributed to obesity the previous year. Experts have called for a more active lifestyle, and research suggests that nearby parks, programming at playgrounds, and a walkable urban environment can help people increase their level of physical activity. From the Burke-Gilman Trail, to the tennis courts in Jefferson Park, to the organized sports provided by the Associated Recreation Council, parks and programs help residents become and stay healthier.

The Health Benefits Calculator measures the collective economic savings that Seattle residents realized by their active use of parks. The key data input for determining medical cost savings is the number of park users indulging in a sufficient amount of physical activity to make a difference. The CDC defines this as at least 150 minutes of moderate activity or at least 75 minutes of vigorous activity per week.

The same telephone survey that collected the direct use data (see page 10) also determined residents' physical activities and their frequency. The survey also identified older user respondents by age since seniors typically incur two or more times the medical care costs of younger adults. In order to modify the results to serve the health benefits study, low-heart-rate uses such as picnicking, sitting, strolling, and birdwatching were eliminated. Also, all respondents who engaged in strenuous activities fewer than three times per week were dropped as not being active enough

Seattle Parks and Recreation

Rock climbing with the Outdoor Opportunities program. Parks improve their users' health and reduce healthcare costs by providing a venue for different types of outdoor exercise.

for health benefit, in accordance with CDC guidelines. Likewise, for less vigorous activity, respondents were not valued if they did not engage in activities at least four times per week. Based on studies from seven different states, we assigned a value of $351 as the medical savings for those who exercise regularly. For persons over the age of 65, that value has been doubled to $702. The calculator then makes one additional computation, applying a small multiplier (0.95) to reflect the fact that Washington medical care costs are 5 percent lower than those of the United States as a whole.

In Seattle, we estimated that 179,061 residents—165,926 younger than 65 and 13,135 older than 65—engaged actively enough in parks to cut their health costs. The combined health savings due to park use for 2010 was $64,087,756.

Table 4. Health Value of Seattle Parks

Adults younger than 65 years of age	
Average annual medical care cost difference between active and inactive persons younger than 65 years of age	$351
Number of adults younger than 65 years of age physically active in parks*	165,926
Medical care cost savings subtotal	**$58,240,026**
Adults 65 years of age and older	
Average annual medical care cost difference between active and inactive persons 65 years of age and older	$702
Number of adults 65 years of age and older physically active in parks*	13,135
Medical care cost savings subtotal	**$9,220,770**
Subtotals combined	$67,460,796
Regional multiplier for medical care costs	0.95
Total annual value of medical care cost savings attributable to parks	**$64,087,756**

*Calculations are based on adults engaging in moderate or vigorous activity as defined by the CDC.

5. Community Cohesion Value

Along with schools, churches, and other social gathering spaces, parks are key sources of community cohesion. Studies show that the institutions and places that make up this web of human relationships can make a neighborhood stronger, safer, and more successful. This network, for which urbanist Jane Jacobs coined the term "social capital," is strengthened in some communities by parks. From playgrounds, sports fields, swimming pools, and ice skating rinks, to park benches, chessboards, and flower gardens, parks offer opportunities for people of all ages to communicate, compete, interact, learn, and grow. The acts of improving, renewing, or even saving a park can build extraordinary levels of social capital in a neighborhood that may be suffering from fear and alienation partially owing to the lack of safe public spaces. Groups such as the Seattle Parks Foundation, the Friends of Seward Park, and the Cal Anderson Park Alliance have garnered support for parks and gathered neighbors for their cause.

The economic value of social capital is not entirely identifiable and is in some ways priceless, but it is possible to tally up a proxy based on real numbers—the amount of time and money that residents donate to their parks. Seattle has thousands of park volunteers who do everything from picking up trash and pulling weeds to planting flowers, raising playgrounds, teaching about the environment, educating public officials, and contributing dollars toward a better city.

Art Wolfe

Pelly Place. Parks are places where people come together. The economic value of this social capital can be measured in volunteer hours and the contributions of nonprofit groups.

To arrive at the proxy number, we tallied all the financial contributions made to "friends of parks" groups, community park organizations, nonprofits, and foundations in 2009, the most recent year available. We also included all the hours of volunteer time donated directly to the city's adopt-a-park and other volunteer programs as well as to park organizations; we then multiplied the hours by the $20.85 value assigned to volunteerism in 2009 by the Washington, D.C.-based organization Independent Sector.

The result of the Community Cohesion calculation for the city of Seattle—financial contributions plus the dollar value of people's time—was $9,537,639.

Table 5. Community Cohesion Value of Seattle Parks

Dollars donated	$2,212,992
Hours of time donated (51 organizations)	351,302
2009 value of a volunteer hour	$20.85
Value of hours donated (line 2 times line 3)	$7,324,647
Total community cohesion value	**$9,537,639**

6. Stormwater Retention Value

Stormwater runoff is a significant problem in cities. When rain flows off roads, sidewalks, and other impervious surfaces, it carries pollutants with it, causing significant ecological problems.

The lush parks of Seattle, from the trees of Ravenna Park to the large absorbent surfaces of Discovery and Magnuson Parks, reduce stormwater management costs by capturing precipitation and/or slowing its runoff. Large permeable surface areas allow precipitation to infiltrate and recharge the groundwater. Also, vegetation provides considerable surface area that intercepts and stores rainwater, allowing some to evaporate before it ever reaches the ground. In effect, urban green spaces function like mini-storage reservoirs and are the original form of green infrastructure.

Seattle Housing Authority

High Point Pond. Parks are green infrastructure, filtering and absorbing stormwater otherwise bound for the city's gutters and sewer system.

Our calculation methodology compares actual runoff with parks against the theoretical runoff that would occur if there were no parks. To determine the water retention value of Seattle's parks, we compared the perviousness of the entire park system with the perviousness of the more built-up surrounding city as a whole. The parks are largely pervious, of course, although they also contain impervious roadways, asphalt trails, parking areas, buildings, and hard courts.

Next, we analyzed the same data for the amount of perviousness of the rest of Seattle—in other words, the city without its parkland. The pervious land consists largely of residential front and backyards and private natural areas such as cemeteries, institutional grounds, and office campuses. Naturally, the city as a whole has a higher percentage of hardscape than its parks.

Third, we plugged in the amount and characteristics of rainfall for the city. Seattle receives just under 39 inches of precipitation per year, largely in the form of fall-winter-spring drizzle.

The Western Research Station of the U.S. Forest Service in Davis, California, has developed a sophisticated model to estimate the value of retained stormwater runoff due to vegetation. Inputs to the model consist of geographic location, climate region, surface permeability index, park size, land cover percentages, and types of vegetation. Using that, we compared the modeled runoff with the hypothetical runoff that would leave the same acreage developed at the average density of Seattle (i.e., with streets, rooftops, parking lots, etc.). In other words, how much more water would flow off the land if Seattle had no parks? This number comes to 171,358,581 cubic feet of water per year.

The final step is to calculate what it costs to manage stormwater using "hard" infrastructure (e.g., concrete pipes, sewers, large holding tanks, and the like). This is not a generally known number and, in fact, is difficult to ascertain. Therefore, to obtain an estimate, we divided citywide spending on stormwater facilities for 2009 by the total amount of water conveyed by the city's system (i.e., the rain falling on the developed areas of the city). This works out to a cost for stormwater conveyance of $0.0135 per cubic foot.[5]

Thus, by knowing the stormwater retained by the parks and what the cost of treating that water would have been, we obtained a total annual Stormwater Retention Value of $2.3 million for the park system of Seattle.[6]

Table 6. Stormwater Retention Value of Seattle Parks (Typical Year)

Typical year	Inches	Cubic feet
Rainfall	38.95	773,112,318
Runoff from parkland		170,915,287
Runoff from same acreage if there were no parks (theoretical)		342,273,869
Runoff reduction due to parks		171,358,581
Cost of treating stormwater (per cubic foot)		$0.0135
Total savings from runoff reduction attributable from parks		**$2,313,341**

[5] This is likely a low number because it does not fully account for the far greater initial costs of the system that have been paid off since pipes were laid down.

[6] We also obtained an alternative estimate from city stormwater staff using billing records. In 2009, the Seattle Parks and Recreation Department was assessed $3.3 million in drainage fees based on the parkland's rate of imperviousness. However, if parks had the same rate of imperviousness as the rest of the city, the department would have been assessed $7.3 million. The rate structure thus implies a $4 million value to the runoff reduction of parks, an even higher estimate than ours.

7. Air Pollution Removal Value

Air pollution in cities can harm health and damage structures, creating both environmental and economic problems. Human cardiovascular and respiratory systems can be affected with broad consequences for health costs and productivity—something seen in the many urban-dwelling children with asthma. In addition, acid deposition, smog, and ozone increase the need to clean, repair, or repaint buildings, bridges, and other costly infrastructure.

With its cool, slightly dry summers and damp winters, Seattle is a place where vegetation abounds, and the "urban green" of park trees and shrubs have the ability to remove air pollutants such as nitrogen dioxide, sulfur dioxide, carbon monoxide, ozone, and some particulate matter. Leaves absorb gases and particulates adhere to the plant surface.

The Northeast Research Station of the U.S. Forest Service in Syracuse, New York, has designed a calculator to estimate air pollution removal by urban vegetation. This program, which is based on the Forest Service's earlier Urban Forest Effects (UFORE) model, is location-specific, taking into account the air characteristics of the city of Seattle. Cities generate dissimilar results based not only on numbers of trees but also on differences in ambient air quality.

Using aerial photography and computerized mapping, we obtained land cover information for all of Seattle's parks. (Seattle has numerous trees on private property as well as on streets, but this study counts only the value of park trees.) We calculated that 48.1 percent of the city's 5,468 acres of parks—2,630 acres—are tree-covered.

Joe Mabel

Kobe Terrace. Vegetation in Seattle parks helps clear the air of pollutants.

We then considered the pollutant flow through the area within a given time period (known as pollutant flux), taking into account the concentration of pollutants and the velocity of deposition. (The calculator uses 2000 Environmental Protection Agency hourly pollution concentration data.) We also took into account the resistance of the tree canopy to the air, the behavior of different types of trees and other vegetation, and seasonal leaf variation. We then multiplied the total pollutant flux by tree-canopy coverage to estimate pollutant removal. Finally, we determined the monetary value by multiplying by the median U.S. externality values for each pollutant. The externality value refers to the amount it would otherwise cost to prevent a unit of that pollutant from entering the atmosphere. For instance, the externality value of preventing the emission of a short ton of carbon dioxide is $870; the externality value of the same amount of sulfur dioxide is $1,500.

The result of the Air Quality Calculator for the park system of Seattle in 2010 was a savings of $526,769.

Table 7. Air Pollution Removal Value of Seattle Parks

	Tons removed	Savings per ton removed	Pollutant removal value
Carbon dioxide	7.61	$870	$6,624
Nitrogen dioxide	17.55	$6,127	$107,533
Ozone	38.76	$6,127	$237,502
Particulate matter	36.34	$4,091	$148,674
Sulfur dioxide	17.62	$1,500	$26,436
Total savings			**$526,769**

Conclusion

While reams of urban research have been carried out on the economics of housing, manufacturing, retail, and even the arts, there has been until now no comprehensive study in Seattle on the worth of the city's park system. The Trust for Public Land believes that answering this question—How much value does a city park system bring to a city?—can be profoundly helpful and useful. For the first time, parks can be assigned the kind of numerical underpinning long associated with transportation, trade, housing, and other sectors. Urban analysts will be able to obtain a major piece of missing information about how cities work and how parks fit into the equation. Housing proponents and other urban constituencies will potentially be able to find a new ally in city park advocates. And mayors, city councils, and chambers of commerce may uncover the solid, numerical motivation to strategically acquire parkland in balance with community development projects.

Seattle would not be the Emerald City without its lush offerings of parks, parkways, and trails. From Seward Park's forest, to Discovery Park's trails, to the development-enhancing power of Lake Union Park, Seattle provides outstanding value to residents and visitors alike—and the city reaps the benefits.

Research by economists Gerald Carlino and Albert Saiz has concluded that metropolitan areas rich in amenities such as parks, historic sites, museums, and beaches have "disproportionately attracted highly educated individuals and experienced faster housing price appreciation." Additional research and writing by academics such as Richard Florida and John Crompton have indicated that great parks, trails, and recreational amenities are key ingredients to attracting talent and distinguishing a city as good place to live.

This study has shown local benefits from Seattle's parks on property values and taxes, increased economic development and tax revenue from tourism, improved quality of life from publicly available amenities, a healthier and more interconnected citizenry, and an enhanced ability to deal with the environmental challenges of stormwater management and air pollution.

Determining the economic value of a city park system is a science still in its infancy. More research and analysis are needed regarding park usership, park tourism, adjacent property transactions, water runoff and retention, and other measures. In fact, every aspect of city parks—from design, to management, to programming, to funding, to marketing—will benefit from much deeper investigation and analysis. This study is offered as a mechanism to begin a conversation about the present and future role of parks within the life—and economy—of Seattle.

Appendix I – Acknowledgments

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Appendix II – Colloquium Attendees

The following individuals took part in the Colloquium, "How Much Value Does a Park System Bring to a City," in October 2003.

Susan Baird, Denver Department of Parks and Recreation, Denver, Colorado
Kathy Blaha, The Trust for Public Land, Washington, D.C.
Blaine Bonham, Pennsylvania Horticultural Society, Philadelphia, Pennsylvania
Glenn Brill, Ernst & Young, New York, New York
Valerie Burns, Boston Natural Areas Network, Boston, Massachusetts
Patrice Carroll, Philadelphia Managing Director's Office, Philadelphia, Pennsylvania
Donald Colvin, Indianapolis Department of Parks and Recreation, Indianapolis, Indiana
Ernest Cook, The Trust for Public Land, Boston, Massachusetts
John Crompton, Texas A&M University, College Station, Texas
Dick Dadey, City Parks Alliance, New York, New York
Nancy Goldenberg, Philadelphia Center City Partners, Philadelphia, Pennsylvania
Peter Harnik, The Trust for Public Land, Washington, D.C.
Nancy Kafka, The Trust for Public Land, Boston, Massachusetts
Alastair McFarlane, U.S. Department of Housing and Urban Development, Washington, D.C.
Ken Meter, Crossroads Resource Center, Minneapolis, Minnesota
Sarah Nicholls, Michigan State Univerisity, East Lansing, Michigan
Joan Reilly, Pennsylvania Horticultural Society, Philadelphia, Pennsylvania
Dan Stynes, Michigan State Univerisity, East Lansing, Michigan
Patrice Todisco, Boston GreenSpace Alliance, Boston, Massachusetts
Susan Wachter, University of Pennsylvania, Philadelphia, Pennsylvania
Guijing Wang, Centers for Disease Control, Atlanta, Georgia
Richard Weisskoff, Everglades Economics Group, North Miami, Florida
Wayne Weston, Mecklenburg Parks and Recreation Department, Charlotte, North Carolina
Jennifer Wolch, University of Southern California, Los Angeles, California
Kathleen Wolf, University of Washington, Seattle, Washington
Matt Zieper, The Trust for Public Land, Boston, Massachusetts

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