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Measuring the total economic value of a park system to a community

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In the political arena, it is almost always advantageous to frame an issue in economic terms when seeking support from a legislative body. This paper describes, measures, and provides illustrative examples for estimating the economic value of 12 benefits associated with urban parks. Seven of these constitute a template for measuring the economic value of an urban parks system that has been developed and refined by empirical studies undertaken in 12 US urban areas by the Trust for Public Land. The remaining five are suggested measures that might be added to the template. The paper concludes by identifying five other park benefits for which no measure of economic value appears to exist at this point.

Keywords: urban parks, economic value

INTRODUCTION

Since parks are overwhelmingly public spaces, they are largely paid for by the public's taxes. This means that elected officials must evaluate support for park services against support for other public services. Elected officials, of course, are not required to fund programs; their mandate is to *invest* the public's resources to address issues of concern to a community's residents. The word "invest" is key because it suggests a measurable return on the resources allocated.

The challenge for park advocates is to make an effective case in these trade-off decisions. This is not easy: in some locales, they have not even been able to retain the historic level of park funding. A big part of the problem is elected officials' – and the public's – lack of understanding of the economic value of parks; because of this misperception, parks are sometimes referred to as "invisible assets" (Commission for Architecture and the Built Environment [CABE], 2009).

In the political arena, one good way to make an "invisible" issue visible is to frame it in economic terms. Most easily understood is the return-on-investment metric, which often serves as a common denominator to enable trade-offs among diverse programs. This does not mean that park services should be justified by their economic contributions alone. However, if no economic measure of their value is offered, they will often be discounted and misprioritized. After all, since the costs are easy to identify, the absence of estimated benefit badly skews any attempted calculation by elected officials and taxpayers.

In the UK, the Commission for Architecture and the Built Environment (CABE, 2009) provided a method for valuing the physical assets contained in a park. By applying this approach to each park and aggregating the results, the asset value of all the parks in a community can be established. While emphasizing that the purpose of the study "is not to place a financial value on the

multiplicity of positive and wide-ranging social, economic, and environmental values that parks and open spaces provide" (p. 13), the report's authors indicated that their intent was "to provide a starting point in quantifying the considerable financial value of the physical assets contained within our parks" (p. 8).

This paper is intended to complement the CABE approach by describing a starting point for valuing the many positive park outcomes to *all members* of a community – residents, neighbors, taxpayers, retailers, health service consumers, parents – whether they actually use the parks themselves or not.

In the USA, pioneering work in measuring the economic value of park systems has been undertaken by the Trust for Public Land's (TPL) Center for City Park Excellence (CCPE). TPL is a national non-profit conservation organization with 38 regional offices located in 27 states. CCPE has spearheaded TPL's research efforts in urban areas. CCPE's research program to measure the economic value of urban public parks was launched in 2003 when a small number of experts took part in a colloquium in Philadelphia to identify measurable sources of economic value. Subsequently, CCPE has undertaken empirical studies measuring the economic value of parks in nine cities (Washington, DC; San Diego; Boston; Sacramento; Philadelphia; Wilmington, Delaware; Virginia Beach, Virginia; Seattle; and Denver) and three counties (Mecklenburg County, North Carolina, home of Charlotte; and Nassau and Suffolk Counties, New York, outside New York City).

The intent of the research program is to develop measures that provide estimates to give taxpayers and elected officials a feel for the magnitude of a park system's economic value. The hope is that strong results may be sufficient to reposition the field in the eyes of elected officials from "nice to have if we can afford it", toward "a central economic role in our community".

The CCPE template quantified the economic value of seven dimensions of parks: economic impact from visitors, willingness to pay for direct use, property value premium, reduced stormwater costs, air pollution mitigation, community cohesion value and health value. CCPE recognized this as an incomplete set; however, the magnitude of the challenge was so great that it had to be made manageable. To cull it down to these seven dimensions, two criteria were used: did the factor make a substantial economic contribution? And, could it be measured? The literature is filled with statements like, "Parks are priceless", but in this case, the goal was to seek, as best possible, that very price.[1] And since methodology and procedures have been refined over time, much has been learned.

The purpose of this paper is to review what has been learned and to offer a framework to guide the future evolution of this work. Specifically, we will:

(1) Describe the seven elements in the CCPE template;
(2) Illustrate with empirical data how the value of each of these seven elements has been calculated;
(3) Suggest five additional elements that could be added to the template, and describe how their value could be measured; and
(4) Identify five other sources of economic value attributable either to ecosystem services or to social benefits, and describe what needs to be done to calculate the value of their contributions.

ELEMENTS IN THE CCPE TEMPLATE

Figure 1 shows that economic gains from the seven elements in the CCPE template may come either from direct spending by park users, or more indirectly from the services and values attributable to the presence of parks per se rather than from the users of them. The figure also shows to whom the

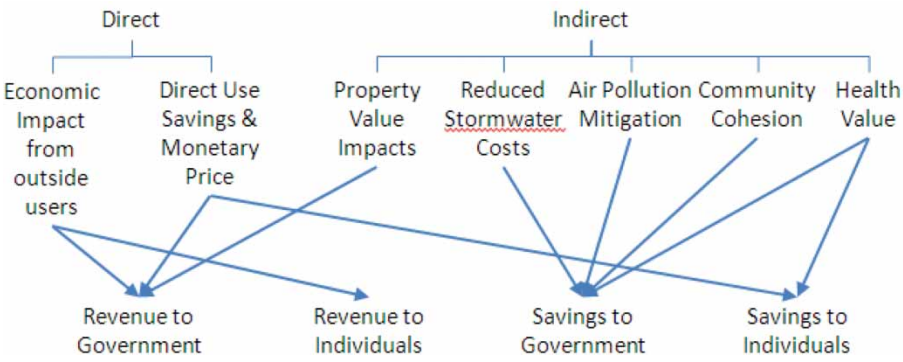

Fig. 1. Beneficiaries of the Seven Elements in the CCPE Template

economic gains accrue. There are four ways that a park system impacts a community's economy: by bringing in revenue to the government, bringing in revenue to certain individuals, providing savings to the government, and providing savings to certain individuals. Some of the benefits shown in Figure 1 generate income, others provide savings; some benefit the government at large, others profit only certain individuals; and some have multiple rewardees. It is not legitimate to simply "add up" these numbers, but each of them represents real benefit to a community.

Direct Spending by Park Users

Revenues accruing from direct spending by park users spring from two sources. The first is the economic impact of park visitors' incidental spending in the community on items such as gas, groceries, restaurant meals or hotel nights. The conceptual underpinning of visitors' economic impact is shown in Figure 2 (Crompton, 2006). It shows that residents and visitors in a community give funds to the city council in the form of taxes. The city council uses a proportion of these funds to subsidize tourism events, promotions, activities or facilities that attract out-of-town visitors who spend money in the local community. This new money from outside the community creates income and jobs for residents. Community residents, aided by visitors' bed and sales tax, are responsible for providing the initial funds, and residents receive a return on their investment in the form of new jobs and more household income.

Numerous such economic impact studies have been reported in the leisure literature (e.g. Burns, Hatch, & Mules, 1986; Crompton, 2010; Crompton & McKay, 1994). A common approach is to measure the economic impact from sports tournaments and special events that are organized by the park agency. An illustration from the city of Medlock, Oregon is given in Table 1. Economic impact delivers revenues to two constituencies: increased sales and accommodation taxes to governments; and to individuals, initially to the businesses who provide food, hotel, souvenirs, and other visitor services, but ultimately to a much wider spectrum of individuals who benefit as that influx of new money diffuses through a community. (Note, however, that establishing a multiplier effect from visitor spending through a community is difficult and may compound any existing computational errors; hence, it is recommended that multipliers not be included; Crompton, 2010.)

The second source of direct revenues is the price those using parks pay either for

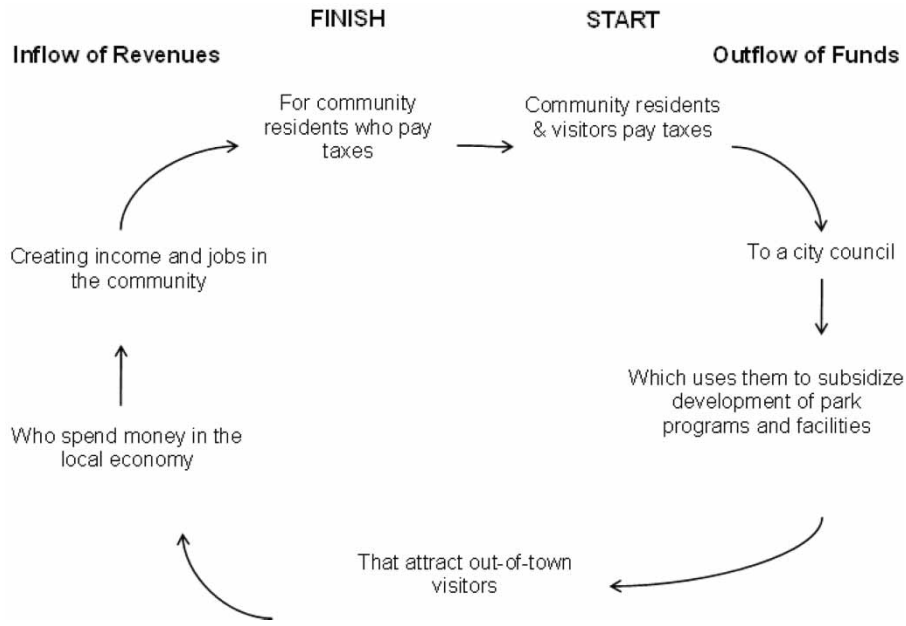

Fig. 2. The Conceptual Rationale for Undertaking Economic Impact Studies

admission, or to use the services inside the parks. This is the measure used by the private sector to measure economic value. However, revenues from this source are likely to be sparse in the context of urban parks, because either no fees are charged or they are heavily subsidized. Figure 1 suggests that while government may receive some revenues from this source, a majority of the economic value accrues to park users in the form of savings they derive from the public subsidy of these facilities (Table 2).[2]

Indirect Sources of Economic Value

The CCPE template incorporates five sources of indirect economic impact stemming from the existence of parks (Figure 1). The first is property value gain attributable to parks. The real estate market has consistently demonstrated that many people are willing to pay more for property located close to a park, than for a home that does not offer this amenity. The higher value of these residences means that their owners pay higher property taxes. In effect, this represents a "capitalization" of parkland into increased property values of proximate land owners. This process of capitalization has been termed the "proximate principle" (Crompton, 2004).

Most of the proximate value occurs within 500 feet of a park. The magnitude of the value varies widely according to such factors as the park's size, attractiveness, maintenance, amount of parkland in the community, level and types of use, noise, and level of lighting. A review of 30 empirical studies in the scientific literature led the reviewer to conclude: "A positive impact of 20 percent on property values abutting or fronting a passive park is a reasonable starting point guideline" (Crompton, 2004, p. 4). The author went on to recommend "point of departure" premiums of 10% for residential properties within 300-foot and 5% for those between 300- and 500-foot distances from the park.

Table 1. 2009 US Cellular Community Park Economic Impact Report

Date	Description	Event name	Teams	Games	Days	No. of local	No. of visiting	Local spending ($)	Visitor spending ($)	Visitor lodging ($)	Total spending ($)	Sales ($)
Jan 24–25	Adult softball	USSSA qualifier	8	20	2	6	2	$18,396	$5432	$4032	$27,860	$50,426
Feb 21–22	Adult softball	USSSA qualifier	8	20	2	4	4	$12,264	$10,864	$8064	$31,192	$56,457
Feb 25–28	Fastpitch	S. Oregon Univ. invitational	7	21	3	1	6	$4155	$19,728	$12,840	$36,723	$66,468
Mar	Fastpitch	High school softball games		3	0		2	$2500	$3300	$–	$5800	$10,498
Mar 7–8	Youth Baseball	Southern Oregon classic	10	20	2	6	4	$4302	$10,544	$8100	$22,946	$41,532
Mar 21–22	Adult Softball	USSSA national invitational tournament	24	61	2	10	14	$30,660	$38,024	$8224	$96,908	$175,403
Mar 23–24	Fastpitch	North Medford invitational	31	65	2	6	25	$5109	$156,625	$51,220	$212,954	$385,446
Apr	Fastpitch	High school softball games		13			8	$13,166	$14,300	$–	$27,466	$49,713
Apr 4–5	Youth baseball	April fools showdown	16	31	2	7	9	$5016	$24,525	$18,144	$47,685	$86,309
Apr 11–12	Adult softball	USSSA qualifier	14	33	2	10	4	$18,640	$10,864	$8064	$37,568	$67,998
Apr 18–19	Adult softball	Mixed classic	4	5	1	4	0	$2540	$–	$–	$2540	$4597
Apr 25–26	Adult softball	Bear creek lock and safe tournament	28	84	2	20	8	$61,320	$21,728	$16,128	$99,176	$179,508
May	Fastpitch	High school softball games		18			10	$17,410	$16,300	$–	$33,710	$61,015
May	Adult soccer	Fuego professional soccer games		2			2	$7500	$3050	$–	$10,550	$19,095
May 9–10	Adult softball	Senior travel league	20	100	4	4	16	$4805	$75,200	$32,256	$112,261	$203,192
May 16–17	Various	USCCP phase 3 grand opening events	62	35	2	53	9	$106,265	$28,845	$–	$135,110	$244,549
May 16–17	Adult softball	Tune-up tournament	20	62	2	17	3	$30,600	$7948	$5848	$44,396	$80,356
May 23–25	Youth soccer	Rogue Valley Cup	54	70	3	19	35	$39,550	$234,500	$99,655	$373,705	$676,406
May 23–25	Youth baseball	Memorial day showcase	37	103	3	9	28	$9675	$170,184	$79,724	$259,583	$469,845
June	Adult soccer	Fuego professional soccer games		2			2	$7500	$3050	$–	$10,550	$19,095
June 6–7	Adult soccer	ASA state qualifier	10	28	2	10	0	$6350	$–	$–	$6350	$11,493
June 13–14	Youth baseball	Summer sizzler	31	60	2	12	19	$8660	$96,988	$38,304	$143,952	$260,553
June 27–28	Adult softball	USSSA qualifier	13	39	2	10	3	$8140	$8148	$6048	$22,336	$40,428
July	Adult soccer	Fuego professional soccer games		2			2	$7500	$3500	$–	$11,000	$19,910
July 3–5	Youth baseball	July 4th showdown	18	72	3	5	11	$5375	$96,858	$42,176	$144,409	$261,380
July 20–12	Fastpitch	ASA U16 girls state championship	16	64	2	2	14	$4322	$95,092	$38,224	$137,638	$249,124
July 18–19	Adult softball	City league tournament of champions	13	32	2	13	0	$8255	$–	$–	$8255	$14,941

(*Continued*)

Table 1. Continued

Date	Description	Event name	Teams	Games	Days	No. of local	No. of visiting	Local spending ($)	Visitor spending ($)	Visitor lodging ($)	Total spending ($)	Sales ($)
July 23–26	Youth baseball	Cal ripken regional tournament	16	64	3	2	14	$4150	$149,540	$58,448	$212,138	$383,969
Aug 1–2	Youth baseball	West Coast nationals	15	39	3	5	10	$5025	$69,470	$45,240	$119,735	$216,720
Aug 8–9	Adult softball	USSSA state tournament	13	29	2	7	6	$21,175	$16,296	$12,096	$49,567	$89,716
Aug 22–23	Adult softball	Hot August hits	14	32	2	11	3	$25,875	$8148	$6048	$40,071	$72,528
Aug 29–30	Youth baseball	Hot August Hits	20	33	2	10	10	$30,250	$27,160	$20,160	$77,570	$140,293
Sept	Youth soccer	High school soccer games		7			7	$8166	$12,512	$1635	$22,313	$40,386
Sept	Football	High school football games		1			1	$500	$1100	$–	$1600	$2896
Sept	Youth soccer	Rogue Valley Soccer Club competitive games		4			4	$4665	$11,360	$4500	$20,525	$37,150
Sept 4–6	Youth soccer	Skyline conference jamboree	24	36	1	9	15	$2000	$21,750	$–	$23,750	$42,987
Sept 5–9	Youth soccer	Southwest conference jamboree	8	8	1	8	0	$1500	$–	$–	$1500	$2715
Sept 12–13	Adult softball	USSSA World “E” Tournament	13	28	2	6	7	$5358	$21,091	$14,112	$40,561	$73,415
Sept 17–20	Adult softball	Rogue Valley Senior Softball Fall Classic	44	110	4	6	38	$22,146	$231,040	$72,200	$325,386	$588,948
Sept 26–27	Youth baseball	Fall Brawl Tournament	6	9	2	4	2	$10,808	$5380	$2640	$19,128	$34,621
Oct	Youth soccer	High school soccer games		20			7	$23,331	$12,512	$–	$35,843	$64,875
Oct	Football	High School football games		5			3	$2500	$3300	$–	$5800	$10,498
Oct	Youth soccer	Rogue Valley Soccer Club competitive games		7			7	$8163	$19,880	$7875	$35,918	$65,011
Oct 10–11	Fastpitch	ASA fall showcase	13	52	2	5	8	$11,050	$21,728	$16,128	$48,906	$88,519
Oct 17–18	Youth baseball	City of Medford Tournament	10	14	2	5	5	$8190	$13,580	$10,080	$31,850	$57,648
Oct 31-Nov 1	Adult softball	USSSA Halloween Scream	11	36	2	8	3	$12,650	$12,805	$6048	$31,503	$57,020
Nov	Youth soccer	High school soccer games		6			6	$6990	$10,725	$6540	$24,255	$43,901
Nov	Football	High School football games		1			1	$500	$1100	$–	$1600	$2896
Nov	Youth soccer	Rogue Valley Soccer Club competitive games		7			7	$8163	$19,880	$7875	$35,918	$65,011
Nov 7–8	Adult softball	USSSA Fall Championships	16	38	2	6	10	$9487	$30,130	$20,160	$59,777	$108,196
Nov 14–15	Youth baseball	Turkey Bash	4	7	2	2	2	$3276	$5432	$4032	$12,740	$23,059
Nov 21–22	Youth soccer	Fred Meyer President’s Cup	36	27	2	4	32	$8326	$141,504	$60,134	$209,964	$380,034
Totals			707	1685	81	326	448	$694,219	$2,023,020	$873,002	$3,590,541	$6,498,749

Table 2. Acceptance of Price by Program Participants at Three Levels?

		Low (50% of cost)		Medium (break even)		High (going rate)	
Activity	**Existing price ($)**	**Yes (%)**	**$**	**Yes (%)**	**$**	**Yes (%)**	**$**
Swim lessons	$8.00	100	10	92	12	76	15
Youth swim	$0.50	94	.50	84	.75	77	1
Aerobic fitness	$12.00	78	14	59	23	38	32
Weight conditioning	$16.00	55	16	52	22	33	30
Youth baseball	$10.00	69	20	72	28	44	35
Tennis lessons	$8.00	76	13	86	15	62	20
Preschool classes	$34.00/mo.	74	36	34	50	9	100
Photography classes	$13.00	52	25	53	32	54	40
Adult specialty crafts	$15.00	50	33	36	43	42	50
Youth dance classes	$12.00	68	14	67	20	64	25
Cross country ski	$15.00	44	24	53	34	30	45
Resident camping	$70.00	47	97	53	121	28	125
Whitewater raft trips	$18.00	60	23	22	32	25	35

Notes: Consumer surplus at an Oregon Park and Recreation Agency (see footnote 2): The presence of consumer surplus was demonstrated by an Oregon Park and Recreation Agency. The agency's cost of providing each program was estimated and three alternate pricing options were developed. The low price option recovered 50% of costs; the medium price option was break-even point, recovering all cost; the high price was the highest price used by a competitor supplier (public or private) in the market area. A sample of participants in each of 15 program areas was surveyed. Each respondent received either the low-, medium-, or high-price scenario.

Among the 15 recreation programs whose users were surveyed, a remarkably high level of consumer surplus emerged (see Table 2). For example, among those paying for summer swim lessons, 100% and 76% reported a willingness to accept a 25% (from $8 to $10) and 90% (from $8 to $15) increase in price, respectively. Clearly, the full economic value to participants in the activities was not being captured by the existing price structure.

Source: Howard and Selin (1987).

Parks and natural areas are sometimes referred to as "natural capital" because they enable nature to perform environmental services that otherwise would have to be provided by costly investments in infrastructure and technology. Investing in parks' environmental services can provide a stream of economic benefits just as any other good investment does. Two factors in particular stand out: reducing stormwater costs and reducing air pollution costs. They are the second and third indirect sources of economic value in the CCPE template.

Stormwater is best dealt with through absorption rather than rapid flushing, and natural areas act like a huge sponge, soaking up water as rainfalls and snow melts. These areas then release the water slowly over time. When development occurs, the natural sponge is removed and has to be replaced with a substantial built infrastructure to accommodate stormwater runoff, which is both more expensive and less effective than the natural mechanism. The stormwater has to be collected by curbs and gutters, pipes and channels. Without the absorption role of natural areas, drainage systems must be designed for peak runoff conditions, which is even more expensive. Furthermore, "hard"

engineering solutions in one location frequently create problems downstream.

Natural park areas make two specific contributions to controlling stormwater runoff. First, the roots of trees and other vegetation hold the soil in place, which reduces soil erosion and, in turn, enhances the flow-control function of the area. Second, the vegetation intercepts and holds rainfall with its foliage, slowing the rate at which it reaches the ground and allowing some of it to evaporate.

Air pollution is a significant and expensive urban problem, injuring health and damaging structures. The human cardiovascular and respiratory systems are affected, and there are broad consequences for health-care costs and productivity. In addition, acid deposition, smog, and ozone increase the need to clean and repair buildings and other costly infrastructure. Trees, other vegetation, and soils enhance air quality by removing from the atmosphere: ozone and other gaseous pollutants and toxic chemicals, such as nitrogen dioxide; particulate pollutants; and carbon dioxide. Soils have considerable capacity to remove gases from the atmosphere and to transform them through microbial, physical, and chemical processes. Vegetation can aid the process by effectively cleaning the soil in its root zones of many toxic man-made chemicals.

A fourth source of indirect economic value is associated with the all-pervasive issue of health. The USA spends 16% of its gross national product on health care, which is 5 percentage points higher than any other nation (OECD, 2008). The recent "epidemic" of obesity, with its associated illnesses, suggests that these costs will continue to escalate. Physical inactivity is a primary contributor to obesity. There is emerging scientific evidence that indicates levels of physical activity increase when people have easy access to parks, trails, and walkable areas (Kaczynski & Henderson, 2007; Li et al., 2006; Mowen & Godbey, 2010; Roemmich, Epstein, & Roja, 2006).

Finally, there is the economic value of the social benefits provided by parks. Along with schools, churches, and other social gathering places, parks can be key sources of community bonding. The institutions that make up this web of human relationships can make a neighborhood stronger, safer, and more successful. This human web, for which the term "social capital" was coined by Jacobs (1961, p. 138), is strengthened in some communities by parks. From playgrounds to sports fields to park benches, to interpretation programs to flower gardens, parks offer opportunities for people of all ages to communicate, compete, interact, learn, and grow.

HOW CCPE MAKES ITS CALCULATIONS

The CCPE created, and has subsequently refined, a method to formally calculate the values of each of the seven economic contributions shown in Figure 1. These are described in this section.

Park Tourism Value

Table 3 reports how tourism was calculated in CCPE's San Diego study. First, the number of park tourists was estimated. They were separated into overnight (who spend more) and day visitors (who spend less). These numbers were reduced to an estimate of park tourists who came *because* of the parks. Finally, these numbers were multiplied by the average spending per tourist per day and then by the jurisdiction's tax rate (for a tax revenue total) and by an average profit margin of 35% (for a profit rate for individual entrepreneurs). The number of overnight and park specific visitors, and spending amounts were derived from secondary survey data provided by the San Diego Convention and Visitors Bureau.

Table 3. Spending by Visitors Who Went to San Diego Because of Parks

Overnight visitors	
Overnight visitors to San Diego	16,050,000
Overnight visitors who visited parks (20%)[a]	3,210,000
Estimated 26%[a] who visited *because of* parks	834,600
Spending per overnight visitor per day	$107
Spending of overnight visitors because of parks	$87,302,200
Day visitors	
Visitors to San Diego	11,874,000
Visitors who visited parks (20%)	2,374,800
Estimated 22% who visited because of parks	522,456
Spending per day per visitor	$48
Spending of day visitors because of parks	$25,077,088
Total spending (overnight and day visitors)	$114,380,088
Sales, meal, and hotel taxes (7.5% average) on park tourist spending	$8,578,507
Net profit (35% of tourist spending)	$40,033,031

Notes: According to data from the San Diego Convention and Visitors Bureau (CVB), the California Travel and Tourism Commission, and a telephone survey by the Morey Group, an estimated 20% of tourists visited a park while in San Diego. The phone survey further revealed that 22% of San Diego park visitors came *because* of the parks. (Using this methodology assures that the count did not include the many tourists who came to San Diego for other reasons and happened to visit a park without planning to do so.) The conclusion was that just under 5% of San Diego tourism in 2007 was due to the city's parks – 835,000 overnighters and 522,000 day visitors.

Knowing the average daily spending level of those tourists – $107 per overnight visitor and $48 per day visitor meant that total park – derived tourist spending in 2007 came to $114.3 million. With an average tax rate on tourist expenditures of 7.5%, tax revenue to the city was *$8,579,000*. In addition, since economists consider that an average of 35% of every tourist dollar is profit to the local economy (the rest is the pass-through cost of doing business), the citizenry's collective increase in wealth from park-based tourism was *$40,033,000*.

[a]San Diego Convention and Visitors Bureau and California Travel and Tourism Commission, 2006.

Source: CCPE The Economic Benefits of San Diego's Park and Recreation System.

Direct Use Savings

To determine the amount of money that residents save by not paying fees either for admission or to use services in urban parks, CCPE uses surrogate unit day values. The unit day value establishes an average value per unit of use for different recreation activities and facilities. Total value provided by a park system is obtained by multiplying the average value per visit by the number of visits (Table 4).

Table 5 shows the approximations for economic value used by the East Bay Regional Park District whose 100,000-acre park system blankets the east side of the San Francisco Bay area. These values were based on willingness to pay surveys, either commissioned by the District or undertaken by other park agencies. Thus in lieu of surveying people to elicit their willingness to pay, values that have been elicited by others can be used. Dozens of valuation studies have been reported for activities such as hunting, fishing, boating, and picnicking in regional, state, and national park areas. However, the East Bay data provided the only source of values relevant to urban parks. Thus, they were used as a point of

Table 4. The Economic Value of East Bay Regional Park District Facilities to Its Users

Activity	Parks visitors	Per visit user utility ($)[a]	Parks user utility ($)[a]
Walking, hiking, running, etc.	2,795,000	$4.50	$12,577,500
Bicycle riding	785,000	$4.50	$3,532,500
Dog walking	1,525,000	$2.50	$3,812,500
Other	1,410,000	$2.50	$3,525,000
Picnicking	1,320,000	$5.00	$6,600,000
Fishing	490,000	$4.50	$2,205,000
Swimming	450,000	$4.50	$2,025,000
Equestrian	290,000	$40.00	$11,600,000
Environmental education	290,000	$25.00	$7,250,000
Meadows	250,000	$4.50	$1,125,000
Camping	240,000	$7.50	$1,800,000
Golfing	190,000	$42.00	$7,980,000
Boating/windsurfing	100,000	$20.00	$2,000,000
Rental Facilities	80,000	$7.50	$600,000
Special recreation	30,000	$5.50	$165,000
Total	10,245,000	$6.52[b]	$66,797,500

Notes: The East Bay Regional Park District is the largest regional park system in the USA. It is responsible for managing 100,000 acres of open space and trails in Alemeda and Contra Costa counties close to the San Francisco–Oakland metropolitan area. The wide arrays of recreational uses which occur on these lands are listed in the above table.

The agency commissioned a study to identify the economic value to users of this set of activities. For some of the activities (e.g. swimming, equestrian, golf, boating/windsurfing, camping, fishing), the Park District or its concessioners charged a monetary price. For those activities that were free to users (e.g. hiking, biking, environmental education) results from willingness to pay type studies done elsewhere were adopted as approximations for economic value at East Bay.

The annual economic value to direct users of the Park District's offerings was $66.7 million (N.B.: This is a minimal estimate of economic value of the activities because it does not measure the economic impact expenditure from visitors to the two county area, and it includes no estimate of indirect value.).

[a]User utility is defined as the value an individual user places on a visit to a park.

[b]A weighted average, total parks user utility divided by total parks visitors

Source: Adapted from Economic & Planning Systems Inc. (2000).

departure for developing the values shown in Table 5.

Table 5 shows, for example, that playing in a playground is worth $3.50 each time to each user. Running, walking, or rollerblading on a park trail is worth $4.00, as is playing a game of tennis on a city court. For activities for which a fee is charged, like golf or ice skating, only the "extra value" (if any) is assigned; i.e. if a round of golf costs $20 on a public course and $80 on a private course, the direct use value of the park course would be $60. Based on a belief that the second and third repetitions of a park used in a given period are slightly less valuable than the first use (i.e. the value to a child of visiting a playground the seventh time in a week is somewhat lower than the first), this model was further modified by building in an estimated sliding scale of diminishing returns for heavy park users. Thus, for example, playground value diminished from $3.50 for the first time to $1.93 for the seventh time in a week. Finally, for

Table 5. Urban Park Unit Day Use Values

Facility/activity	Value unit of use
General park uses	*Value per person visit* ($)
Playgrounds	$3.50
Picnic areas	$3.00
Trail uses	$4.00
Gardens	$3.50
Other passive uses of parks	$2.50
Outdoor sports facilities – individual use	*Value per person visit* ($)
Tennis	$4.00
Basketball	$3.00
Other fields/courts	$3.00
Facilities/field rentals[a]	*Rental value* ($)
Picnic shelters	$100.00
Baseball/softball – league	$100.00
Baseball/softball – community	$100.00
Outdoor performing areas	$500.00
Special uses/fee areas	*Per unit value* ($)
Golf courses	$20.00
Nature centers	$10.00
Zoo/arboreta	$10.00

[a]Per visit value for facility/field rentals is based on 25 users per rental.

the few activities where a fee is charged – such as golf, ice skating, and the use of fields for team sports – the per-person fee is subtracted from the imputed value.

The number of park visits and activities engaged in are determined by a probability telephone survey of residents (with an accuracy level of plus or minus 4%). The results for San Diego showed a value of $1226 million.

Property Value

There are several good examples in the scientific literature of studies that have measured the impact of an individual park, or a sub-set of parks, on proximate property values. However, to do this for every park in a system is likely to be cost prohibitive. The cost-efficient methodology used by the CCPE to obtain a gross measure is to identify all residences within 500 feet of a park using a city's geographic information system maps, and to assign a conservative value of 5% as the amount that parkland adds to the value of all dwellings within that distance. Table 6 shows the CCPE estimate for Washington, DC. The value of all residential properties (apartments, condominiums, terraced houses, duplexes, and detached homes) within 500 feet was almost $24 billion. The 5% park premium suggests that parks increased property value by almost $1.2 billion. This represents the additional asset value property owners receive because of the presence of parks. Using the city's tax rate of 0.58%, the analysis estimates that the city treasury of Washington, DC, gained an additional $6.95 million in property tax revenue because of the parks.

Table 6. The Property Value Premium from Parks in Washington, DC

Value of properties within 500 feet of parks[a]	$23,977,160,000
Assumed average value of a park	5%
Value of properties attributed to parks	$1,198,858,025
Effective annual residential tax rate	0.58%
Annual property tax capture from value of property due to parks	$6,953,377

[a]Property values were obtained from the District of Columbia.

Stormwater Runoff Retention

CCPE uses a model developed by the US Forest Service to estimate the value of retained stormwater runoff attributable to green space in parks. First, land cover data are obtained through the analysis of aerial photographs. This reveals forested as well as open grassy areas and water surface; in addition, it reveals impervious surfaces in parks – roadways, trails, parking lots,

buildings, and hard courts. Second, the same photographs are then analyzed for the amount of perviousness in the *rest* of a city – in other words, the city excluding parkland and surface water. (Pervious land in the city can consist of residential front and back yards as well as private natural areas such as cemeteries and corporate campuses.) Third, the amount and characteristics of rainfall are calculated from US weather data. The model uses hourly annual precipitation data to estimate annual runoff. By comparing the modeled runoff (with parks), and the runoff that would occur from a city with the same size and level of development (i.e. with streets, rooftops, parking lots, etc.) but without any parks, the reduction in runoff due to parks can be calculated. The final step involves finding what it costs to manage each gallon of stormwater using traditional methods (i.e. "hard infrastructure" such as concrete pipes and holding tanks rather than parkland). By knowing this number and the amount of water held back by the park system, an economic value can be assigned to the parks' water pollution reduction.

Table 7 shows the CCPE estimate of savings in stormwater costs in Philadelphia because of the city's parklands. Approximately 12% of the city's area is parkland and 81.3% of the parkland is pervious. The rest of the city is 34.9% pervious. Philadelphia receives an average of 43.29 inches of rain per year. The model shows that Philadelphia's parks reduced runoff by almost 496 million cubic feet compared with a scenario in which the city had no parks. It is estimated that Philadelphia stormwater management cost is 1.2 cents ($0.012) per cubic foot. Thus, the park system provided an annual stormwater retention value of $5.949 million.

Table 7. The Savings in Stormwater Runoff Costs Attributable to Parks in Philadelphia

Stormwater costs in Philadelphia per cubic foot	
1. Rainfall on impervious surface	8,667,269,456 cu. ft.
2. Annual expenditure on water treatment	$100,000,000
Cost per cubic foot (line 2/line 1)	$0.012
Cost savings due to runoff reduction: Philadelphia's parks	
Results for Typical Year – 43.29 inches of rainfall	Cubic feet
1. Annual rainfall over entire city of Philadelphia	1,623,928,386
2. Amount of actual runoff from parks (81.3% perviousness)	168,480,901
3. Runoff if parks did not exist and if that acreage were of the same permeability as rest of city (34.9% perviousness)	664,198,620
4. Reduction in runoff due to Parkland's perviousness (line 3−line 2)	495,717,719
5. Estimated stormwater costs per cubic foot	$0.012
Total savings due to park runoff reduction	$5,948,613

Air Quality

CCPE uses an air pollution calculator based on the urban forest effects model of the US Forest Service. It is location specific, taking into account the air pollution characteristics of a given city. Table 8 reports the estimate of the calculator provided for Mecklenburg County's parks. First, land cover information was obtained. The county's tree canopy was analyzed using computerized mapping based on a digitized assessment of aerial photography. While Mecklenburg County has many trees on streets and private property, this study measured only the economic value of trees on public parkland and parkways. It was found that 14,280 acres, or 77.9% of the county's 18,340 acres of parks, are covered with trees. Then, the pollutant flow through the area within a given time period ("pollutant flux") was considered, taking into account the concentration and the velocity

Table 8. The Economic Value of Reduced Air Pollution Costs Attributable to Mecklenburg County's Park System

	Pounds removed	Dollars saved per ton removed ($)[a]	Pollutant removal value ($)
Carbon dioxide	24,340.9	$870	$10,588
Nitrogen dioxide	143,159.6	$6127	$438,569
Ozone	821,552.9	$6127	$2,516,827
Particulate matter	413,457.7	$4091	$845,728
Sulfur dioxide	103,172.3	$1500	$77,379
Total			$3,889,092

[a]2000 pounds = 1 ton.

of deposition. (The calculator uses Environmental Protection Agency hourly pollution concentration data.) The resistance of the tree canopy to the air, the behavior of different types of trees and other vegetation, and seasonal leaf variation are taken into account by the calculator. The total pollutant flux is multiplied by tree-canopy coverage to estimate total pollutant removal. Finally, the monetary value of pollution removal by trees is estimated using the median US externality values for each pollutant. (Externality value refers to the amount it would otherwise cost to prevent a unit of that pollutant from entering the atmosphere.) The annual savings in air pollution costs attributable to Mecklenburg County's park system is approximately $3.9 million.

Health Benefits

CCPE's Health Benefits Calculator measures the collective economic savings realized by the use of parks. The calculator was created by identifying the common types of medical problems that are inversely related to physical activity, such as heart disease and diabetes (Chenoweth & Associates Inc./Health Management Associates, 2004). Based on empirical studies conducted in seven states that estimated the impact of physical inactivity on various medical conditions, a value of $250 was estimated in 2004 as the annual cost difference in current dollars between those who exercise regularly and those who do not. For persons over the age of 65 that value was doubled to $500 because seniors typically incur two or more times the medical care costs of younger adults. When these data were updated to 2011 dollars based on Bureau of Labor Statistics year-to-year inflation rates, the values were $351 and $702, respectively. These values are reasonably consistent with those suggested by the Department of the Arts, Sport, Environment, Tourism, and Territories in Australia which "estimated the value to the community in terms of health and productivity benefits of a person becoming physically active was approximately US$600 per annum at today's prices and exchange rates" (cited in Veal, Toohey, & Frawley, 2012, p. 117).

The key datum input for determining medical cost savings is the number of park users engaging in a sufficient amount of physical activity to make a difference. This is defined by the Centers for Disease Control as at least 150 minutes of moderate activity, or at least 75 minutes of vigorous activity, per week. The telephone survey described earlier in the discussion of direct use value identifies activities in which residents participate and the frequency of their participation. Low heart-rate activities such as picnicking, sitting, strolling, and bird watching are omitted, as are those engaging

Table 9. Health-Care Savings Attributable to Physically Active Users of Sacramento Parks

Cost description	Residents physically active in parks[a]	Average medical cost difference between active and inactive persons ($)	Amount
Adult users under 65 years of age	71,563	$350	$25,047,050
Adult users 65 years of age and older	6054	$700	$4,237,800
Subtotals combined	77,617		$29,311,830
Regional cost multiplier (based on statewide medical costs)			0.95
Total Value			$27,846,257

[a]People engaging in moderate, vigorous, or strenuous activity at least half an hour, three days per week.

in "strenuous" activities for fewer than 75 minutes a week, because they fail to meet the CDC exercise guidelines. Table 9 shows the annual health-care swings attributed to physically active users of Sacramento's parks. The number of active park users was estimated at 77,617, of whom 71,563 were under 65 and 6054 were 65 or older. The combined annual health savings were almost $28 million.

Social Capital

As a proxy for social capital, CCPE identifies the number of individuals and the amount of time and money they invest either in coproducing services or volunteering with the parks department. Such roles may involve using city facilities, belonging to friends of the parks groups, serving as docents, etc. The number of volunteer hours is multiplied by the hourly value assigned to volunteers by the Points of Light Foundation. In Mecklenburg County, for example, 122,213 volunteer hours were identified, each valued at $20.25, giving a total value of $2.47 million. In addition, $42,000 was received in voluntary financial contributions, so the county's cohesion value was approximately $2.49 million.

Table 10 aggregates the economic values we have used for illustrative purposes. Thus, these composite values are for a hypothetical park system.

COULD MORE IMPACTS BE COUNTED?

CCPE, which has pioneered the effort to measure the economic value of a park system, recognizes that the work is

Table 10. Seven Elements in the CCPE Templates Applied to Estimating the Annual Economic Value of a Hypothetical Composite Park System

Revenues produced for government	
Tax receipts from increased property value (Table 6)	$6,953,377
Tax receipts from increased tourism value (Table 3)	$8,578,507
Cost savings to government	
Stormwater runoff retention value (Table 7)	$5,948,613
Air pollution mitigation value (Table 8)	$3,889,092
Community cohesion value (narrative)	$2,490,000
Economic value to park users	
Direct use savings (narrative)	$1,226,000,000
Health value (Table 9)	$27,846,257
Wealth increases to citizens	
Net economic impact from tourism (Table 3)	$40,033,031

embryonic. Research over the years, combined with the creative input of many thoughtful observers, now suggests that there may be countable measures for an additional five sources of economic value from a park system: availability value, business relocation, retiree relocation, reduced energy costs, and alleviation of deviant behavior among youth.

Availability Value

Availability Value recognizes that some people are willing to pay for the capital and operating costs of a park, even though they may not currently use it. Three reasons may explain this phenomenon: "recognizing the existence;" "maintaining the option;" and "bequesting the future".

"Recognizing the existence" derives from the satisfaction of merely knowing that a park exists. Some people may have no children or grandchildren and yet derive great pleasure (which has an economic value) from parks being available for other people's children or for their role in preserving wildlife habitat. "Maintaining the option" is self-directed in that it retains the possibility of future service. For example, early in life some persons may not use golf courses; nevertheless, they may have aspirations to play golf in the future and may perceive such facilities to have an economic value to them. "Bequest value" is the pleasure and satisfaction associated with providing for future generations' well-being.

CCPE does not currently include a measure of availability value in its studies. However, it could do this by adding survey questions to its telephone survey. Those who do not visit parks could be asked to consider the three availability options and to value them by the use of a contingent valuation format. Contingent valuation questions may be framed in different ways. They may be presented with an open-ended question: "How much are you willing to pay for . . . ?" Alternatively, a dichotomous choice (take it or leave it) format may be used which asks, "Would you be prepared to pay $5?" A variation of this is to ask that question and if the answer is yes, then the amount would be increased to $6, $7, and so on, until the answer is no. Another variation is to give people a set of potential prices – $3, $4, $5, $6, $7, – and ask them to check the amount they would be willing to pay. The various dichotomous formats are more market-like and easier for people to answer than the open question format.

An alternative approach would be to ask the question of non-park users: "Would you like to see the level of tax support for parks changed? If so, by how much? Reduced by 20%, 10% or 5%; Remain the same; or increased by 5%, 10%, or 20%." This approach was used in Alberta, Canada (Johnston, Whitehead, Mason, & Walker, 2007). The hypothetical scenario said that the Alberta government was considering proposals to expand amateur sport and recreation programs, funded by increases in the provincial income tax. Respondents were told that the rise in income taxes would be $10, $25, or $50 per year. (Each person was quoted just one figure.) Respondents were asked whether they would vote for such a referendum. Results showed Albertans were willing to pay C$18.32 per household per year.[3]

Communitywide Economic Growth

Economic development is widely viewed as central to economic prosperity because it can enhance the tax base and create jobs. Parks can be a contributor to economic development by influencing the relocations of both businesses and retirees.

The viability of businesses in the highly recruited high-technology, research-and-development, company headquarters, and services sectors is dependent on their ability to attract and retain highly educated professional employees. The deciding

factor of where these individuals choose to live is often based on the quality of life (Florida, 2002). No matter how quality of life is defined, public parks are a component of it. The value of this contribution is measurable, as reported by Crompton, Love, and More (1997). Respondents – who were the key decision-makers from 174 businesses that had relocated, expanded, or been launched in Colorado within the previous five years – were asked to allocate 100 points among six elements on each of two constant sum scales designed to identify the relative importance of general elements and the relative importance of quality-of-life elements on influencing location decisions.

Table 11(a) and 11(b) shows the mean average scores reported by the 38 small (10 or fewer employees) companies in the sample. If a similar survey of new small businesses in a community revealed these data and the aggregated taxable value of these businesses was (say) $20 million, then the estimate of tax revenue attributable to parks and recreation shown in Table 11(c) could be made. The income from new businesses accruing to residents is new since it was not part of the economy before the businesses opened.[4]

If this survey is administered to each new business that opens in a community, the aggregate value of new business income entering the local economy and annual tax revenues attributable to parks can be calculated. Presumably, these income and tax revenues would be cumulative. That is, their impacts would remain as long as the businesses were operating. As new

Table 11. The Relative Importance of (a) General Elements in Location Decisions among Small Companies and (b) Quality of Life Elements in Location Decisions among Small Companies, (c) Economic Return from Business Relocations

Elements	Small company means (n = 38)
(a) General elements in location decisions among small companies	
Government incentives	3.9
Quality-of-life	33.3
Labor	10.3
Proximity to customers	28.4
Operating costs	17.2
Transportation	6.7
(b) Quality of life elements in location decisions among small companies	
Primary/secondary education	19.4
Recreation/parks/open spaces	26.4
Cost of living/housing	23.0
Personal safety/crime rate	12.9
Cultural opportunities	10.6
Health/medical services	7.1
(c) Economic return from business relocations	
Taxable value of businesses	$20,000,000
Quality of life value (Table 11(a), 33% of general elements)	$6,800,000
Recreation and parks value (Table 11(b), 26% of quality of life)	$1,718,000
Annual revenue given a tax rate at 2% of market value (city, county, school district)	$34,300
Businesses' payroll (new income to residents)	$15,000,000
Quality of life value 33% (Table 11(a))	$5,000,000
Recreation and parks values at 26% of quality of life (Table 11(b))	$1,300,000

businesses entered the economy, their impacts would be added to these base numbers each year.

As for the impact of retirees, it has been observed that "there is a new clean growth industry in America today – the industry is retirement migration" (Longino, 1995, p. 7). If 100 retired households come to a community in a year, each with a retirement income of $40,000, their impact is equivalent to a new business spending $4 million annually. Members of this cohort have been termed GRAMPIES – the *G*rowing number of *R*etirees who are *A*ctive, *M*onied *P*eople *I*n *E*xcellent *S*hape (Van der Merwe, 1987).

Extensive empirical evidence reveals the propensity of younger, affluent retirees to initiate a lifestyle change to a more recreation-oriented way of life and to migrate to areas rich in amenities – and parks are prominent among the amenities sought. These sentiments are exemplified by such retirement settlements as Sun City and Leisure World, communities which invariably emphasize the array of opportunities they provide for recreation.

To measure the economic value of parks' contribution to GRAMPIES' economic impact on a community, a similar approach to that described in the previous section for business relocations could be adopted, as shown in Table 12. Obviously, some modifications to the set of amenities listed in Table 11(b) would be needed, e.g. proximity to family, climate, etc. If each new GRAMPIES household spends an average of $40,000 of their pension resources in the community, then the added annual income from 100 such households would be $4 million. Like the taxes and income generated by new businesses in a community, this would be cumulative and additive.

Table 12. Economic Return from Retiree Relocation (100 GRAMPIES Buy Homes at $100,000 Each)

Added value to the tax base is	$20,000,000
Parks (assuming an allocation of 25% of the 100 pts, cf. Table 11(b))	$5,000,000
Annual tax revenue (assuming taxes paid are 2% of market value of the property)	$100,000

Two nuances of the economic contributions of GRAMPIES suggest that this measurement approach will underestimate their impact. First, in addition to their role in attracting affluent retirees to a community, it has been demonstrated that the caliber of leisure services influences decisions on whether GRAMPIES remain in a community or decide to leave it (Haigood & Crompton, 1998). Thus, failure to provide such amenities is likely to result in some of these valuable households leaving a community. Second, while this paper is limited to considering gross economic contributions and does not address the cost of servicing retirees, businesses, tourists, etc. , it is worth noting that unlike almost all other types of residential households, retirees are likely to be positive tax payers. That is, they characteristically use fewer public services than they pay for through taxes (Crompton, 2001).

Stimulation of Recreation Equipment Sales

The economic viability of equipment retailers in a community is significantly dependent on the availability of park and recreational facilities at which the equipment can be used. The annual sales of outdoor sporting goods in (for example) Texas amount to approximately $1.3 billion (National Sporting Goods Association, 2011). The state's population is 26 million which suggests a per capita expenditure of approximately $50 per head. Thus in a community of 100,000, annual expenditures on sporting goods are estimated to be $5 million. Assuming an average retail mark-up of 35%, the gain to retailers in the community

(netting out the cost of the goods) is approximately $1.75 million.

A remaining challenge in quantifying this economic measure is how to subtract-out the proportionate use of equipment that is not used on local parkland. At this point, no research has been reported in the literature that has addressed this question. There is a need for survey or time diary studies which offer broad guidelines on the locations where various types of equipment are used. In their absence, we suggest 50% may be accepted as a reasonable arbitrary point of departure, which would result in $875,000 of the gain to retailers (in our hypothetical Texas city) being attributable to local parks.

Alleviating Deviant Behavior among Youth

The activity patterns of youth reveal that the peak hours for juvenile crime and experimentation with drugs, alcohol, cigarettes, and sex are between the hours of 3 and 6 pm. Prevention efforts have two dimensions: (i) occupying youth in activities so time and opportunity are not available to engage in negative behavior; and (ii) using the activities as a medium through which to teach the skills necessary to avoid the negative behavior. Park agencies are positioned to be a primary community resource for addressing these issues for at least three reasons. First, park areas (where many gangs and deviant youth congregate) are distributed widely across communities and, thus, can be used as service centers for addressing gang- and youth-related problems. Second, an agency's personnel are experienced in establishing empathetic relationships with young people. Third, recreational activities are inherently appealing to large segments of youth in general, including at-risk youth and, thus, offer a vehicle for assessing and positively influencing social behavior.

An estimate of the costs imposed upon society (in 2001 dollars) over the lifetime of the average career criminal, the average heavy drug user, and the average high school dropout ranges from about a quarter-million to more than one-and-a-half million dollars (see Table 13). From society's perspective, any park intervention program that can reduce such behavior is likely to be cost effective. In fact, a comprehensive analysis of the costs and benefits for the California after School Education and Safety Program[5] (Table 14) revealed that:

Table 13. The Monetary Value of Saving a High-Risk Youth

	Low estimate ($)	High estimate ($)
Career criminal	$1,434,455	$1,655,140
Career drug abuser	$408,268	$1,070,324
High school dropout	$268,133	$428,130

Note: Estimates adjusted to reflect 2001 dollar values.
Source: Cohen (1997).

Table 14. Estimated Costs and Benefits Associated with After-School Programs

Estimated effects	Total benefits Lower estimates ($)	Higher estimates ($)
1. Reduced child care costs	$889	$1777
2. Increased schooling costs	−$989	−$742
3. Improved school performance	$447	$809
4. Increased compensation	$29,415	$38,284
5. Reduced crime costs	$59,425	$88,835
6. Reduced welfare costs	$335	$502
Total	$89,522	$129,465
Cost of program	$10,038	$10,038
Net benefit	$79,484	$119,427

> Each dollar invested in an at-risk child brings a return of $8.92 to $12.90. Much of this remarkable benefit is derived from diverting a relatively small portion of at-risk youngsters from a future path of crime. An at-risk child who becomes a career criminal costs society anywhere from $1.4 million to $1.7 million over his or her lifetime. Therefore diverting even less than one percent of participating at-risk youth from a life of crime save several times the cost of the program. (Brown, Frates, Rudge, & Tradewell, 2002, executive summary, n.p.)

These data suggest that if a California city has 2000 children enrolled in the program and the average benefit per child is $100,000 (somewhere between the low and the high estimates in Table 14), then the benefits to the community would be $200 million over the nine-year period or $22.2 million per year.

Reducing Energy Costs

Trees contribute to reducing energy costs not only at the individual home level, but also at the community level by mitigating the "urban heat island" effect. Through their evapotranspiration process, trees act as natural "evaporative coolers", thus lowering the ambient temperature (McPherson & Simpson, 2001). A single large tree can transpire up to 100 gallons of water a day, producing a cooling effect similar to that of five average air conditioners running for 20 hours (Akbari, Davis, Dorsano, Huang, & Winnett, 1992).

On average, developed areas of cities are 5–9°F warmer than the rural areas surrounding them. This differential increases with city size and can commonly reach 18°F for the largest cities at the peak time after sundown (Nowak & Heisler, 2010). The asphalt, brick, concrete, and steel attract the heat, while pollution from automobiles, factories, and air conditioners traps it. A review of empirical findings relating to the heat island effect concluded: "Large parks or residential neighborhoods with extensive vegetation can produce air temperature reductions as great as 10°F compared to nearby areas with little vegetation" (McPherson & Simpson, 1995, p. 12), and these areas have been termed "park cool islands" (Nowak & Heisler, 2010, p. 19).

Numerous studies have reported the magnitude of savings associated with tree cover. For example, in Houston, residents spent approximately $714 per home on air-conditioning, but the existing tree canopy in the city saved an average homeowner $72 per year. Thus, the aggregate annual savings to the city's homeowners was approximately $26 million per year (American Forests, 2000). Parklands account for only a portion of this because street trees and trees planted on private lands are likely to be major contributors. To identify the proportion of this economic value attributable to parklands a similar procedure to that used to estimate parks' impact on air quality could be used, that is, through the use of computerized mapping based on a digital assessment of aerial photography.

ADDITIONAL CONCEPTUAL MEASURES

This paper has identified 12 economic benefits that have been or could be quantitatively measured. This final section points out five other benefits that may accrue from parks which future research and analysis might eventually be able to quantify (see Figure 3).

Communitywide Ecosystems Economic Value

Parks' ecosystem services include protection of water, animal species and plants, and their pollinators, even though these factors are difficult to quantify.

The economic value of parkland in *protecting drinking water* has long been recognized. For example, when legislation was passed by New York State in 1885 declaring the Adirondack Forest Preserve be "kept forever as

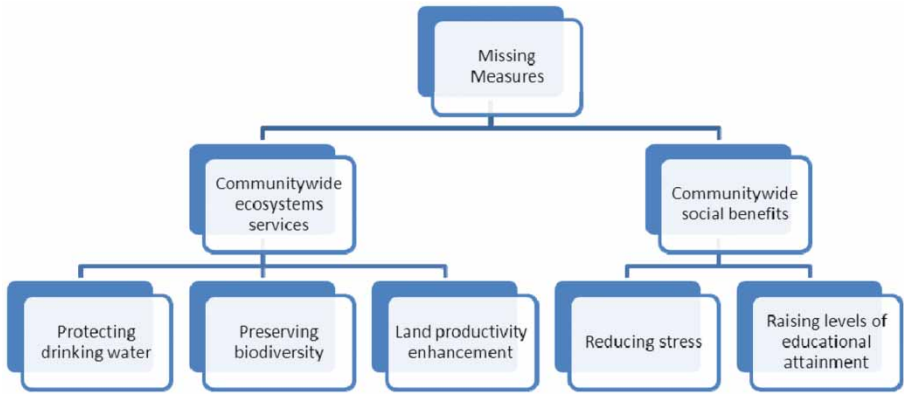

Fig. 3. Benefits for Which a Methodology of Approximating Economic Values Is Needed

wild forest lands", the primary driving force was to insure "a regulated water supply for New York's rivers and canals" (Nash, 1973, p. 108). There is widespread recognition that natural lands such as forests, parks, and wetlands can help slow and filter water before it gets to rivers, reservoirs, or aquifers, keeping those drinking water sources cleaner and making treatment cheaper. Similarly, Fairmount Park in Philadelphia was officially formed in 1855 which makes it one of the oldest urban parks in the USA. The rationale for acquiring the land was to safeguard the city's water supply on the Schuylkill River. Its subsequent use as a park was merely a secondary beneficial outcome.

A host of case studies documenting the key role of park and conservation lands in protecting drinking water have been published by conservation organizations in the past decade (e.g. Ernst, 2004). Increasingly, there is a willingness to acquire land or easements protecting water courses because the cost of doing so is lower than paying for treatment plans to filter polluted water. Indeed, some communities have created dedicated funds for this purpose. For example, Dade County, Florida, imposes a 3% surcharge on water bills; in Spokane, Washington, residents pay $15 a year specifically for aquifer protection; Providence, Rhode Island, collects a 1 cent/100 gallon water usage tax specifically to fund watershed acquisitions (Heal, 2000).

For the most part, while parks have a positive impact on water quality, the economic value attributable to a city's parks is not likely to be of sufficient magnitude to be meaningful. For this reason, this economic value is probably best estimated at the watershed scale which incorporates all elements of green infrastructure, rather than only urban parks.

Two decades ago, the word "biodiversity" did not exist. Today, *preserving biodiversity* appears prominently on national and international agendas. This extraordinary rise to prominence stems from a realization that species extinction is now occurring at an unprecedented rate, resulting in decreasing levels of diversity. The natural diversity of living things has great economic value in providing food, clothing, shelter, industrial products, and medicine. One in four medicines and pharmaceuticals has its origin in the tissues of plants, and another one in four is derived from animals and microorganisms. Thus, the extinction or genetic impoverishment of species forecloses the options and associated economic benefits of future generations.

Parks contribute to preserving biodiversity in two ways. First, by creating habitat to sustain diversity. Second, by preserving

conservation corridors to link these areas and facilitate the biologically effective movement of animals between them. This enables fresh individuals to access a site and enhances the diversity of a gene pool. The larger the area, the more likely it is to sustain biological diversity. Thus, the most effective sites, and most of the economic values emanating from diversity, are likely to be the responsibility of regional, state, and federal agencies. Local park agencies can contribute, but on a much smaller scale. Often the relatively small park sites they operate are too fragmented and isolated to sustain biodiversity over the long term.

Land productivity enhancement recognizes the role of healthy ecosystems in the pollination of crops and natural vegetation, integrated pest management, and dispersal of seeds and translocation of nutrients. Again, large regional parks operated by state and federal agencies rather than local jurisdictions are likely to be the major contributors to this outcome.

Communitywide Social Benefits

Stress is a condition experienced daily by many. It may involve both psychological emotions, such as frustration, anger, fear, and coping responses that use energy and contribute to fatigue. Its detrimental impact to health and well-being may be manifested in characteristics such as headaches, tension, short temper, aggressive behavior, low morale, and an increase in number of sick days away from work. Surroundings influence individuals' outlooks on life, their sense of well-being, and ultimately their attitude and behavior toward others. Different environments can have quite different influences on inflicting or ameliorating stress, and parks and natural vegetation have long been known to have a restorative effect by fostering *stress reduction* and psychological well-being.

Kuo (2010) reviewed an impressive and substantive body of scientific literature that supports the contention that exposure to nature enhances social behavior, psychological health, and physical health. These findings consistently reaffirmed the therapeutic value of natural settings. This conclusion was derived not only from psychological studies, but also from physiological measurements of cardiovascular activity, including heart rate; skin conductance, which the autonomic nervous system controls; muscle tension, which the central nervous system controls; and pulse transit time (a measure that correlates highly with systolic blood pressure).

The cost of stress in terms of work days lost and medical care required is likely to be substantially greater than the cost of providing and maintaining parks. However, to this point, the development of a quantitative method for capturing economic value of the savings emanating from these services has not been forthcoming.

In the past decade, there has been a movement to increase the amount of time that children are involved in educational activities beyond regular school hours in order to *enhance levels of educational achievement*. The intent is to compensate for the lack of support for education in the homes of many youth. Recreation has proved to be an effective "hook" for persuading many to participate in these after-school programs. They are permitted to engage in the activities only after they have completed the "enrichment" part of the program, which may consist of completing their homework with or without assistance; receiving tutoring in academic and/or life skills; or engaging in activities designed to achieve developmental outcomes.

Findings in the scientific literature evaluating the success of these programs are encouraging. A meta-analysis of 56 studies found that such programs had positive effects on the achievement of at-risk

students in reading and mathematics; that the time frames at which these programs are held (i.e. after school or summer) do not influence their level of effectiveness; and that these programs need not focus solely on academic activities to have positive effects on student achievement (Mid-Continent, 2004). Another review of 35 studies reported that the test scores of low-income, at-risk youth improved significantly in both reading and mathematics following their participation in after-school programs (Lauer et al., 2006).

The research literature demonstrates that improvements in academic performance are likely to be associated with three factors: (i) the quality and quantity of the academic elements in the program; (ii) the capacity of the recreational components in the after-school program to improve students' attendance in regular school hours; and (iii) gains in personal and social skills, and in self-esteem, which encourage students to recognize the importance of good academic performance. Given that students' potential earning power is enhanced by improvements in educational performance, these programs clearly have economic value. However, no method for measuring it in a parks context has yet been forthcoming.

CONCLUDING COMMENTS

The only primary data that the CCPE study template requires relate to activity participation in parks. These are collected through a telephone survey of a probability sample of residents. Thus, a major strength of the economic valuation measures discussed in this paper is that they do not require expensive primary research. Rather, they use research previously reported in the literature, and adapt it to the context of a specific city. Developing the initial adaptation methodology requires significant expertise and effort, but once it is established, the methodology becomes a replicable template that can be implemented efficiently to measure these economic benefits in any urban park system.

It is recognized that this paper is merely a starting point to developing a composite economic measure of the value of a community's park system. Some of the economic measures that have been described are supported by a substantial literature. Others are rather tenuous and fragile – crude approximations based on assumptions that some may challenge. There is an urgent need for more sophistication and better nuanced tools, but the field does not have the luxury of delaying the use of tools and evidence until they have been perfected. If scientists, economists, and advocates fail to come forward with measuring tools for the policy debate, then the parks field will be substantially disadvantaged since other competing services are not hesitant to use such measures to support their cases.

NOTES

1. There is always a trade-off in research between resources and accuracy. An enhanced level of accuracy invariably requires more time and money. It is recognized that each of the measures described in this paper could be refined to enhance accuracy. Indeed, in some cases, more refined versions of a measure can readily be found in the scientific literature where the unit of analysis is an individual project, facility or event. To accomplish that at the level of a complete park system would be prohibitively costly for most park agencies. However, the CCPE work has shown that agencies can commit sufficient resources to produce gross estimates of economic value using methods that are viewed as reasonable.
2. The technical term used to describe the difference between what participants actually pay for a service and the highest amount they would be prepared to pay is *consumer surplus*. An individual may pay $3 for admission to a park but would have been willing to pay $5; a swimmer may pay $2 but would have been content to pay $4. In these cases, the consumer

surplus would be $2. By adding up these surpluses from all participants, an estimate of the total can be made. Consumer surplus can be measured by asking participants, "What increase in price over the current price would have caused you not to participate?" The consumer surplus in Table 2 shows the full potential value contained in one particular park system.

3. A challenge with using a questionnaire to elicit willingness to pay is persuading respondents to answer truthfully. Some may "strategically bid" by answering in ways they anticipate will shift the payment burden to others. If they believe there is a real likelihood of increased fees, they may understate their real willingness to pay. In contrast, if they believe there is little likelihood of a higher fee, they may deliberately overstate their willingness to pay – on the theory that officials may be impressed enough to allocate greater tax support for the service.
4. This assumes that the contributions of the new businesses are additive and have not merely displaced existing businesses. For this reason, new retail businesses should be excluded since they often do result in displacement.
5. Under the act, the state invested $433 million per year in after school programs servicing 485,000 students in grades K through 9. With the local 50 percent match, the cost per student was $1350 per year and the costs were projected out over nine years for which students were eligible (costs and benefits were calculated in present values using a discount rate of 4%). The net societal benefit for each participant was found to be between $79,484 and $119,427 over the nine year period.

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