

Estimates of the Economic Benefits Accruing From an Expansion of Houston's Bayou Greenway Network

John L. Crompton

EXECUTIVE SUMMARY: The Houston Parks Board developed a Bayou Greenway Initiative. It proposed a comprehensive interconnected 310-mile trail system along the 10 largest bayous in the Houston area. More than 245 miles of shared-use trails would be added to the 55 miles of existing bayou trails. It was recognized that before taxpayers and elected officials would commit to the estimated \$480 million to complete the project, they would demand to know what return it would yield. This resulted in the economic analysis of incremental benefits that is described in this paper. The analysis estimates economic values for benefits associated with (a) the physical and mental health of residents (use value, health care cost savings), (b) environmental health (reduced vehicle use and air pollution abatement, runoff reduction, and ecosystem services), and (c) economic health (retiree retention and relocation, enhanced property tax base). Low, moderate, and high estimates were made for each metric, yielding annual economic benefits of \$104.5 million, \$117.1 million, and \$140.5 million, respectively. It is recognized that the embryonic nature of the available science means the best estimate of \$117.1 million is subject to a potentially substantial margin of error. Nevertheless, the magnitude of economic benefits is so great that changes in assumptions or methodological refinements are unlikely to affect the overall conclusion that investing in the Bayou Greenway Initiative offers impressive returns for the residents of the greater Houston area.

KEYWORDS: Economic benefits, greenway trails

AUTHOR: John L. Crompton is with the Department of Recreation, Park and Tourism Sciences, Texas A&M University, 2261 TAMU, College Station, TX 77843-2261; Phone 979-845-5320; jcrompton@tamu.edu

ACKNOWLEDGMENT: The author acknowledges with thanks, the contributions of Marsh Darcy Partners Inc. who did most of the analyses and Ms. Roksan Okan-Vick, Executive Director of the Houston Parks Board.

In the political arena, framing an issue in economic terms is almost always advantageous when presenting a case to taxpayers or a legislative body. This does not mean that parks and greenways should be justified by their economic contributions alone. That would ignore the social and environmental contribution they make for which at this point science has not offered a way to measure in economic terms. However, if no economic measure of their value is offered, then elected officials will likely assume that they have no economic value.

The merits of parks and natural areas will not be prominently prioritized and ranked against other measurable services if they are not measured in economic terms. The costs are relatively easy to calculate, and the absence of such a calculation of approximate economic benefit can mean there is an inherent unbalance in the information used by elected officials and taxpayers to make decisions. An awareness of the economic value of these benefits is likely to result in more of those decisions being positive.

This paper is a pioneering effort to apply and to adapt existing scientific tools to develop the economic case for making large investments into a comprehensive greenways system in a major city. The limitations of the techniques for measuring each of the benefits the system would generate are recognized. Some of them have been refined for use at the level of individual parks or greenways, but when they are implemented at the system-wide level, they are inevitably gross and global rather than nuanced and specific. Consequently, the economic values reported in this paper are tentative approximations rather than definitive amounts.

The Context

Arthur Comey was a student of Frederick Law Olmsted Jr. at Harvard. One of his early commissions after graduating with his degree in landscape architecture was to author the first master plan for the city of Houston. In it he observed, "Houston is far behind other progressive cities in certain respects, notably in its park system, and should act at once to remedy these conditions." He went on to state, "The backbone of a park system for Houston will naturally be its bayous or creek valleys...[which] furnish opportunities for parks of unusual value within a comprehensive short distance of most of the residential areas" (Comey, 1913, p. 9). Almost 100 years later, comparative metrics suggest that Comey's observations apply to contemporary Houston. The city has bolstered its park inventory by taking over operational responsibility for two large regional parks located in its periphery from a state agency and a federal agency. However, when these are discounted, the city remains behind most of its peers in acres per thousand population and in proportion of the city's geographical area occupied by parks (Center for City Park Excellence, 2011).

Remarkably, a century later the potential remains for Houston's bayous to emerge as the "backbone" of an outstanding park system. This recognition led the Houston Parks Board, an influential and effective nonprofit dedicated to parkland acquisition and capital improvements to Houston Parks, to launch its Bayou Greenway Initiative. The initiative contributes two assets to the physical landscape. First, it would add 4,830 acres to the effective parks inventory, where 1,900 of those acres are within the city of Houston's boundaries and the remaining 2,930 acres are in abutting areas of Harris County. Approximately 1,600 acres would be used for the linear trail system with the remainder being strategically located green space. Second, it would create 310 miles of off-street, all-weather trails along 10 of the city's major bayous, linking all areas of the city. More than 245 new miles of shared-use trails would be added to the 55 miles of existing bayou trails. It is extraordinary, and perhaps unique among major U.S. cities, that an opportunity of this magnitude remains 100 years after it was proposed in Houston's first city plan.

The initiative proposes the completion of a linear park system adjacent to 10 of the major bayous in Harris County. It includes the acquisition of property along at least one side of each of the bayous; the construction of at least one line of continuous, all-weather,

shared-use trail; and the addition of over 50 parcels of green space along the greenways, ranging in size from under 2 acres to over 350 acres. These properties would be designated for use as parkland and natural areas, but in most cases they could also be used for storm water detention and would result in water quality enhancement. This greenway trail system would connect 77 existing public parks and substantially enhance the small but heavily used bayou trails already in place.

The initial estimate for implementing the Bayou Greenway Initiative over its 20-year planning horizon is \$480 million. The Houston Parks Board believed that implementation of the Bayou Greenway Initiative would make a highly visible and tangible contribution to Houston's economic health and environmental health and to the physical and mental health of its residents. However, it was recognized that before the residents and leadership of Houston would commit to an investment of this magnitude, they would demand to know what return it would yield. This resulted in the economic analysis of the incremented benefits the initiative would deliver that are described in this paper.

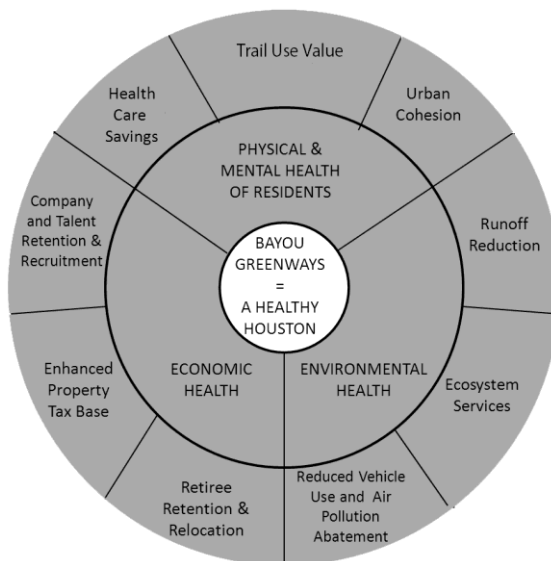


Figure 1. Prospectus for a Healthy Houston—
An Annual Value of \$117 million

The benefits associated with the initiative emanate from a wide variety of sources. The primary benefits in each of the three domains to which the initiative will contribute are shown in the outer ring of Figure 1. They constitute the key benefits Houston will receive from implementing the initiative and demonstrate why the initiative should be recognized as an investment in the city's future rather than a current cost.

Although categorizing the benefits into three domains shown in the inner ring facilitates discussion, they are not mutually exclusive. For example, all the environmental and physical and mental health benefits contribute to Houston's economic health. Similarly, if the city is economically and environmentally healthy, this contributes to residents' physical and mental health.

Contributions to the Physical and Mental Health of Residents

Trail Use Value

Because the bayou greenways are linear parkways with multiple access points, charging a fee to use them is impossible. Thus, a surrogate economic value measure was used for this purpose. A three-stage process was developed to ascertain this value. First, the number of residents residing within 1.5 miles of either side of each bayou was estimated. The model incorporated a decay factor, recognizing that as distance from the trails increased, trail use would likely decline. Second, estimates of number of uses among this population were made using data provided by the U.S. Census Bureau (2010), the National Cooperative Highway Research Program (2006), and the Texas A&M Transportation Institute (Shafer, Lee, Turner, & Hughart, 1999). These data suggested that 63% of the target adult population would likely commute regularly; that 0.38% of those commuters would use a bicycle for that purpose; that approximately 5% would use the trail for recreational biking (focused heavily on children); and that 0.72% non-biker trail users such as joggers, walkers, and skaters would be the target population. These calculations resulted in an estimate of 13.4 million annual uses of the trail system. Stage 3 was to attribute a surrogate value to these uses. The surrogate measure used was the per person value of \$4.70 per day, which is suggested by the U.S. Army Corps of Engineers (2011) in their "Unit Day Values for Recreation" that are published in the *Federal Register*. The resulting estimate of economic value for trail use was approximately **\$63 million**.

In addition to the trail use value, the greenways have an "availability value." Just as there are many residents who support the investment of tax revenues in schools but have no children in a local system, there are residents who likely have no desire to use the bayou greenways but still place an economic value on their availability. They may value having the option of using them in the future or, more altruistically, derive satisfaction from "doing the right thing" by making them available to others or providing opportunities for future generations. Because no empirical study measuring the availability value was found in the literature, a quantitative estimate for availability value was not offered.

Health Cost Savings

The landmark Surgeon General's report (U.S. Department of Health and Human Services, 1996) was unequivocal in concluding that the health of Americans "could be substantially improved by incorporating moderate amounts of physical activity in their daily lives" (p. 3). Specifically, a lack of physical activity is consistently shown in the scientific literature to contribute to cardiovascular disease, hypertension, type 2 diabetes, colon cancer, osteoporosis, osteoarthritis and rheumatoid arthritis, obesity, and depression and anxiety. Studies have demonstrated that costs associated with obesity and inactivity account for a large portion of health care costs.

Proximity to parks and trails has been consistently linked to increased physical activity (Centers for Disease Control and Prevention, 2002; Henderson, 2007; Lee & Moudon, 2004; Godbey & Mowdon; Sallis, Prodraska, & Taylor, 2000). It is reasonable to anticipate the extended access provided by the proposed Bayou Greenway Initiative will increase physical activity of residents in close proximity to the greenways.

The Trust for Public Land commissioned a review of the scientific literature reporting on the reduction in health care costs associated with physical exercise (Chenowith and Associates & Health Management Associates, 2004). This concluded that a value of \$351 was the average annual cost difference in 2010 dollars between those who exercised and those who did not. For persons 65 and older, this value doubled to \$702 because seniors typically incur two or more times the medical care costs of younger adults. When the values were multiplied by the number of projected users of the bayou greenways, the annual health benefits were estimated at approximately **\$13.9 million**.

Urban Cohesion

Houston is a mosaic of diverse neighborhoods, often divided by major thoroughfares, freeways, or railroad tracks. Although a reliable method for measuring this benefit is not available, studies indicate that parks and green space can serve as community gathering spaces, encouraging interaction between users, creating opportunities for shared experiences, and strengthening neighborhood ties (DeGraaf, Lankford, & Lankford, 2005; Glover & Parry, 2005; Shinew, Glover, & Parry, 2004; Skjaeveland, 2001). The continuous greenways adjacent to the bayous will form natural linkages under and around the streets, bridges, and highways that frequently divide neighbors and neighborhoods. The wide all-weather trails that are integral to the bayou greenway plan will make it easier to travel among the diverse communities along the greenways, enabling Houstonians and visitors to expand and enrich their community experiences.

Environmental Health

Reduced Vehicle Use and Air Pollution Abatement

In the later half of the 20th century, much of the city's leadership viewed the brownish haze that frequently embraced Houston as the inevitable consequence of, and an acceptable trade-off for, the city's booming business economy (Swartz, 2008). That perspective changed as the 21st century commenced. In 1999 *USA Today* ran a story with the headline "Houston (Cough, Cough) We Have a Problem, (Cough, Cough)" reporting that Houston had surpassed Los Angeles as the city with the worst air quality. An American Forests (2000) report concluded, "Houston's 16 percent decline in tree cover over the past three decades has cost the city \$38 million in annual air pollution removal services" (p. 2). Professor Stephen Kleinberg (as cited in Swartz, 2008) of Rice University, who has tracked the Houston economy for 30 years, observed, "Everyone began to realize Houston had no chance of making it in the new economy if the perception was that it was not just flat and hot, but also ugly and dangerously polluted" (p. 14).

Traffic's role in generating air pollution is well documented. For example, as much as 50% of ground level ozone pollution is a result of motor vehicle exhausts (Surface Transportation Policy Project [STPP], 2000). This triggers asthma attacks and causes asthma, which is the number one reason children visit an emergency room and miss school. Because the formation of ozone from volatile organic compounds and nitrogen dioxide is accelerated by sunlight and high temperatures, Houston is especially susceptible to air pollution. The stories in the national media were anathema to a city's leadership that was trying to recruit the high-end businesses of the new economy and the knowledge workers needed to nurture and service them.

The shift to improve the city's health in the past decade has been palpable. It has included building a large segment of Brays Greenway, refurbishing Hermann Park, committing to plant a million trees, converting half the city's light-duty automotive fleet to hybrid vehicles, defeating Texas Utilities' attempts to build eight new coal-fired power plants that could have had a devastating effect on the city's air quality, and petitioning the U.S. Environmental Protection Agency to strengthen emission standards for oil refineries and petrochemical factories.

The Bayou Greenway Initiative could be the definitive image of an environmentally transforming Houston. Houston has an opportunity to ameliorate its image as a sprawling, automobile-congested city by intentionally reinventing itself as a city with the most comprehensive off-street trail system in the nation—a potentially iconic position. A reduction in vehicle miles traveled will likely be a primary outcome of the Bayou Greenway Initiative, as a greater number of commuters shift to bicycles. The portion of the population commuting by bicycle is likely to increase annually as the bayou greenways develop, because trail access to desired destinations will expand and the option of commuting by bicycle will become more embedded in the public's consciousness.

Today, vehicles are equipped with high efficiency catalytic converters that eliminate 95% of the pollution produced during normal driving. Most pollution is now emitted in the first few minutes of driving, before the catalytic converter has warmed up. This means that the most effective strategy to reduce pollution from emissions of volatile organic compounds (VOC), nitrogen oxides (NO_x), sulfur dioxide, and carbon dioxide (CO₂) is to reduce the number of trips—especially short trips—taken by automobile (STPP, 2000). The benefits associated with a shift to bicycle commuting emanate not only from the reduction in air pollution per se, but also from vehicle operating cost savings and concomitantly from fewer vehicle crashes.

The number of commuters likely to use bicycles was calculated in the estimate of trail users described earlier in the paper. The impact of commuters using bicycles on the bayou greenways rather than automobiles has four dimensions. First, it reduces the vehicle operating costs of these commuters. Average trip and commute length was based on surveys undertaken by the Houston-Galveston Area Council (H-GAC). The reduction in vehicular miles was converted to a dollar amount by utilizing the IRS mileage reimbursement rate of \$0.51 per mile. The estimated annual aggregate benefit was \$3.8 million. A second dimension of using bicycles instead of cars for these trips was a reduction in the number of vehicle crashes. Based on the reduction in vehicle miles traveled, it was estimated that 13 fewer car crashes would occur per year based on the H-GAC vehicular crash rate per 100,000 miles, resulting in savings per car crash of \$21,464 and an aggregate saving of \$279,000.

The air quality benefits estimate the value of VOC, NO_x, and CO₂ emissions reductions as a result of fewer miles traveled by car. The value was the purchase price of emissions reduction credits (per ton) paid by the H-GAC of \$31.75 per pound. Also contributing to enhanced air quality is the carbon sequestration benefit resulting from the permanent conservation of almost 4,800 acres of green space along the bayou corridors. The calculation is based on an estimate of the amount of carbon an average acre of land takes up in a year and the floor value of \$10 per ton of carbon per the California Emissions Market. Using these metrics, we found the annual air quality benefit was \$141,000. Aggregation of reduced vehicle operating costs (\$3.8 million), reduced number of car crashes (\$279,000), and air quality benefit (\$141,000), resulted in an economic value of **\$4.2 million** for reduced vehicle use and air pollution abatement. Perhaps the largest economic savings accruing from the reduction in air pollution is medical costs. No estimate of dollar value is available for this fourth dimension of reduced vehicle use and air pollution abatement, but intuitively the amount is probably substantial.

Runoff Reduction

In recent decades, multiple instances of flooding have occurred in Houston during and after heavy rainfalls. This is testimony that the efficient and effective drainage system created by nature, to which the bayous are central, has been overburdened. The acquisition of 4,800 acres of additional green space proposed to complete the bayou greenways will contribute to preventing the occurrence of flooding. Developing the initiative will reduce flooding by maintaining and increasing absorptive vegetative ground cover on the new properties to be acquired for the greenways and making these lands available for joint parkland/water detention use.

If the acquired 4,800 acres were developed, an average of 47% of the land would be covered with impervious surface, based on data from H-GAC and the city of Houston. Removing the existing soil porosity and tree cover on this land would generate an additional 2 billion gallons of runoff per year. The city of Houston processes a combination of storm water and sewage at one of its three wet weather treatment facilities. When additional runoff is prevented as a result of new development, monies are saved that may otherwise be spent on storm water treatment. Valued at \$0.00065/gallon of reduced treatment cost, the total annual savings was calculated at **\$1.7 million**.

Ecosystem Services

Ecosystem services provided by the bayous and adjacent green spaces are a central part of Houston's "nature capital." These capital assets are underappreciated because residents do not pay for them, so their valuable roles are not part of the collective consciousness. However, they provide a stream of economic benefits such as local habitat preservation, detoxification, increased biodiversity, migratory habitat enhancement, increased aesthetics, increased cultural and scientific activities, and carbon sequestration. If these assets are degraded, the city will have to invest in expensive mechanical systems to perform the services that it currently gets at no cost. Alternatively, if these assets are improved and increased, the city will enjoy the benefits and commensurate value.

The 4,800 acres of additional green space in these watersheds will be made up of freshwater wetlands, riparian buffers, forested lands, and grassy open spaces. Values for each of these ecosystem types have been established, ranging from \$94 to \$10,708 per acre per year (Costanza et al., 1997). The value of ecosystem services supplied by this additional open space was estimated to be **\$16.6 million** per year.

Economic Health

Company and Talent Retention and Relocation

The strength of Houston's future economy will be determined primarily by the city's ability to expand the number of high-end jobs, especially in the high technology, research and development, company headquarters, and information and knowledge-based sectors. These are the engines that stimulate the creation of lower paid jobs and the housing and retail that follow these jobs. There is fierce competition among cities to nurture and attract these businesses. Essentially, they are information factories whose viability and vitality is dependent on their ability to attract and retain highly educated knowledge workers.

Knowledge workers are highly compensated, but of equal importance to them is the quality of life in a city. For many people, once they obtain a threshold of income, improvements in quality of lifestyle become more important than increases in salary. In a focus group with state business leaders that the author facilitated in 2007, a vice president of Dell Corporation in Austin, one of the country's largest computer manufacturers observed,

People working in high-tech companies are used to there being a high quality of life in the metropolitan areas in which they live. When we at Dell go and recruit in those areas, we have to be able to demonstrate to them that the quality of life in Austin is at least comparable or they won't come. It's about what's the community like where I'm going to live.

No matter how quality of life is defined, park and trail opportunities are a major component of it. The environment they provide is a key element in creating the quality of place that knowledge workers seek. Houston is disadvantaged when compared to many of its peer cities in quality of place. Implementation of the initiative could have a transformational impact on perceptions of Houston's quality of place among knowledge workers.

Retiree Retention and Relocation

There are Growing numbers of Retirees who are Active Monied People in Excellent Shape—GRAMPIES. Attracting and retaining affluent retirees is increasingly recognized as a new clean growth industry in America (Crompton, 2007). Retirees do not require the economic incentive packages that are invariably needed to lubricate business relocations. Furthermore, they are positive taxpayers in that they use fewer services than they pay for through taxes (e.g., they pay school taxes but do not send children there). They transfer significant assets into local investments and banking institutions, but do not compete in the job market.

After proximity to family and friends, proximity to amenities is the primary criterion GRAMPIES consider when deciding where they want to spend their retirement years. For the older elderly, the key amenities are the availability of health care and associated support services; for the younger elderly, the central role of recreational opportunities is consistently reiterated. This is exemplified in the growing number of specialized retirement settlements such as Sun City, Leisure World, and The Villages that emphasize the array of opportunities they provide for engaging in recreational activities.

An extensive off-street trail system meandering through riparian zones of rich habitat and convenient linear parks along the network of bayous in the greater Houston area would be a major attraction for GRAMPIES. The bayou greenways system would provide an appealing “hook” for promotional efforts targeting this group. The following illustrates the potential economic impact of GRAMPIES: For every 100 retired households that move to the greater Houston area in a year, each with an annual income of \$50,000, their impact is similar to that of a new business spending **\$5 million** annually in the city.

Enhanced Property Tax Base

The real estate market consistently demonstrates that many people are willing to pay a larger amount for property located close to a greenway with trails than for a home that does not offer this amenity. In effect, this represents a “capitalization” of the bayou greenways into increased property values of proximate landowners. The positive economic impact of parks on proximate property was a primary political rationale for cities investing tax revenue in them in the latter half of the 19th century—the formative years of urban parks in the United States (Crompton, 2004). *Ipsa facto* evidence of this impact in recent times is provided by the analogous investment of private developers in constructing approximately 1,000 golf courses in the past two decades for the explicit purpose of creating premiums for lot sales in their residential developments.

Table 1 shows the increase in per square foot of assessed valuations on adjacent properties in contemporary Houston that accompanied the development of Discovery Green, a new park in downtown Houston. The total cost was \$122 million. Land for it was acquired in 2004, and design commenced in 2005. Tax assessments increased by over 50% during the period from announcement to completion of Discovery Green.

Most of the proximate value is likely to occur within 600 feet (approximately three blocks) of a park or greenway. The magnitude of the premium varies widely for residential properties because it is influenced by factors such as the supply of parks in the area and ownership/rental status. As a result, the analysis used a conservative increase in residential property values for the 600-foot bandwidth at approximately 5%. Any increases in commercial property values were omitted since limited data exist on the influence of parks or greenways on commercial properties because rental prices tend to be proprietary.

Table 1

Changes in Assessed Property Values Adjacent to Discovery Green

Year	Mean Average Value	Change From Previous Year	Median	Change From Previous Year
2008	\$133.08	14%	\$125.23	24%
2007	\$116.77	14%	\$101.20	31%
2006	\$102.68	17%	\$77.28	106%
2005	\$87.87	N/A	\$37.53	N/A

When the 5% premium was applied to the Harris County Appraisal District valuations within the 600-foot bandwidth of the new additions to the bayou greenways system, the aggregate increase in property tax values to homeowners was estimated to be \$155,689,000. If annualized at 7% over 30 years, the annual value of this increase is **\$12.5 million**. Although the premium accrues to individual property owners, the city as a whole benefits because the tax rates levied on these premiums by the city, county, school districts, and other special districts result in these entities collecting more tax revenues. Based on the historical property tax rates in Houston of approximately 2% of property value, the annual residential property tax premium accruing to taxing entities is likely to increase by \$3.1 million.

Concluding Comments

The analysis estimated the annual dollar value of the benefits that were expected to accrue to the Houston region and individual users of the bayou greenways system once the entirety of the greenway is complete. Because the science is embryonic, it is acknowledged that estimates in this analysis are subject to a potentially substantial margin of error. Thus, the analysis developed a range of values from low to high in those dimensions of the analysis where it appeared viable to adopt this approach. The moderate value was used to support the text in this paper.

Table 2 suggests the best estimate is that annual total measurable economic benefits emanating from an investment of \$480 million in the Bayou Greenway Initiative amount to \$117.1 million. Despite the wide parameters, we can comfortably conclude that the magnitude of the values suggests a compelling case exists for investing in the Bayou Greenway Initiative. Two main points emerge from this analysis:

- Multiple benefits would emanate from the completion of the bayou greenways, and they would stem from a wide variety of different sources.

Table 2

Annual Benefits Summary

	Low	Moderate	High
Physical and Mental Health of Residents			
Use Value	\$52,800,000	\$63,200,000	\$82,500,000
Health Care Costs Savings	\$11,700,000	\$13,900,000	\$18,000,000
Subtotal	\$64,500,000	\$77,100,000	\$100,500,000
Environmental Health			
Reduced Vehicle Use and Air Pollution Abatement	\$4,200,000	\$4,200,000	\$4,200,000
Runoff Reduction	\$1,700,000	\$1,700,000	\$1,700,000
Ecosystem Services	\$16,600,000	\$16,600,000	\$16,600,000
Subtotal	\$22,500,000	\$22,500,000	\$22,500,000
Economic Health			
Enhanced Property Tax Base	\$12,500,000	\$12,500,000	\$12,500,000
Retiree Retention and Relocation	\$5,000,000	\$5,000,000	\$5,000,000
Subtotal	\$17,500,000	\$17,500,000	\$17,500,000
Total Measurable Benefits	\$104,500,000	\$117,100,000	\$140,500,000

- The magnitude of the benefits is so great that although substantial changes in the assumptions that undergird the illustrative estimates and/or future refinements in the methodologies may result in changes to them, they are unlikely to affect the overall conclusion that investing in the bayou greenways plan will leverage impressive returns for the residents of the greater Houston area. The key point is that whatever assumptions and values are negotiated, the magnitude of the annual economic value of a comprehensive greenway system as illustrated in the paper will be attention getting.

The utility of the analysis was validated first by the city of Houston's decision to include \$100 million for the bayou initiative in a bond referendum presented to Houston voters in November 2012, and second in the response of the voters who approved the bonds by a vote of 62% to 38%. The work in this area is embryonic and incomplete, and an urgent need exists for more sophistication and better nuanced tools. However, the field does not have the luxury of delaying the use of the tools and evidence that are available until they have been perfected. If the field's scientists and advocates fail to come forward with economic measuring tools that can be used in policy debates, the parks and recreation field will be substantially disadvantaged because the other services that compete for public funding are not hesitant to use such measures to support their case.

References

- American Forests. (2000). *Urban ecosystem analysis for the Houston Gulf Coast Region*. Washington, DC: Author.
- Center for City Park Excellence. (2011). *2011 city park facts report*. Washington, DC: Trust for Public Land.
- Centers for Disease Control and Prevention. (2002). *Guide to community preventative services: Creating or improving access to places for physical activity is strongly recommended to increase physical activity*. Retrieved from www.thecommunityguide.org/pa/default.htm
- Chenowith and Associates & Health Management Associates. (2004). *Developing a tool for quantifying the economic value of human health associated with city parks*. Washington D.C.: Trust for Public Land, Center for City Park Excellence.
- Costanza, R., D'Arge, R., De Groot, R., Farber, S., Grasso, M., Hannon, B., . . . Van Den Belt, M. (1997). The value of the world's ecosystem services and natural capital. *Nature*, 387(6630), 253–260.
- Comey, A. (1913). *Houston: Tentative plans for its development*. Houston, TX: City of Houston Planning Department.
- Crompton, J. L. (2004). *The proximate principle*. Ashburn, VA: National Recreation and Park Association.
- Crompton, J. L. (2007). Competitiveness: Parks and open space as factors shaping a location's success in attracting companies, labor supplies and retirees. In C. de Brun (Ed.), *The economic benefits of land conservation* (pp. 48–54). San Francisco, CA: Trust for Public Land.
- De Graaf, D., Lankford, J., & Lankford, S. (2005, August). A new perspective on urban spaces. *Parks and Recreation*, 40, 56–63.
- Glover, T. D., & Parry, D. C. (2005). Building relationships, accessing resources: Mobilizing social capital in community garden contexts. *Journal of Leisure Research*, 37(4), 450–474.
- Godbey, S., & Mowen, A. (2010). *The benefits of physical activity provided by park and recreation services: The scientific evidence*. Ashburn, Virginia: NRPA.
- Henderson, K. A. (2007). Urban parks and trails and physical activity. *Annals of Leisure Research*, 19(4), 201–213.
- Lee, C., & Moudon, A. V. (2004). Physical activity and environment: Research in the health field: Implications for urban and transportation planning practice and research. *Journal of Planning Literature*, 19(2), 147–181.

- National Cooperative Highway Research Program. (2006). *Guidelines for analysis of investments in bicycle facilities* (NCHRP Report #552). Washington, DC: Transportation Research Board.
- Sallis, J. F., Prodraska, J. J., & Taylor, W. C. (2000). A review of correlates of physical activity of children and adolescents. *Medicine and Science in Sports and Exercise*, 32, 963–975.
- Shafer, C. S., Lee, B., Turner, S., & Hughart, M. (1999). *Evaluation of bicycle pedestrian facilities: User satisfaction and perceptions of three shared use trails*. College Station: Texas A&M Transportation Institute.
- Retrieved from <http://tti.tamu.edu/publications/catalog/record/?id=15547>
- Shinew, K. J., Glover, T. D., & Parry, D. C. (2004). Leisure spaces as potential sites for interracial interaction: Community gardens in urban areas. *Journal of Leisure Research*, 36(3), 336–355.
- Skjaeveland, O. (2001). Effects of street parks on social interactions among neighbors: A place perspective. *Journal of Architecture and Planning Research*, 18(2), 131–147.
- Surface Transportation Policy Project. (2000). *Changing direction: Federal transportation spending in the 1990s*. Retrieved from www.transact.org
- Swartz, M. (2008, September). How green is my bayou. *Texas Monthly*, 12–16.
- U.S. Army Corps of Engineers. (2011). *Economic guidance memorandum, 11-03, unit day values for recreation for fiscal year 2011*. Retrieved from <http://www.usace.army.mil/CECW/PlanningCOP/Pages/egms.aspx>
- U.S. Census Bureau. (2010). 2000 census of population and housing, summary file 3, *Non-motorized Journey to Work by County*. Retrieved from <http://www.census.gov/prod/cen2000/doc/sf3.pdf>
- U. S. Department of Health and Human Services. (1996). *Physical activity and health: A report of the Surgeon General*. Atlanta, GA: Centers for Disease Control and Prevention.
- USA Today. (1999, October 7). Houston cough, cough. We have a problem, cough, cough. *USA Today*.