Benefit Estimation

Contents

Greenways, rivers, and trails provide many benefits which do not have established market values and are difficult to price and express in monetary terms. This section introduces techniques of economic analysis which attempt to quantify these non-market values to ensure a more complete measure of total benefits associated with rivers, trails, and greenways.

The first subsections present methods used to estimate the benefits of recreation. Also included, is a discussion of how people may value river, trail, and greenway resources, even when they may not visit these areas. Benefit-cost analysis is also introduced as an economic technique which may be helpful for some river and greenway projects.

Introduction to Benefit Estimation

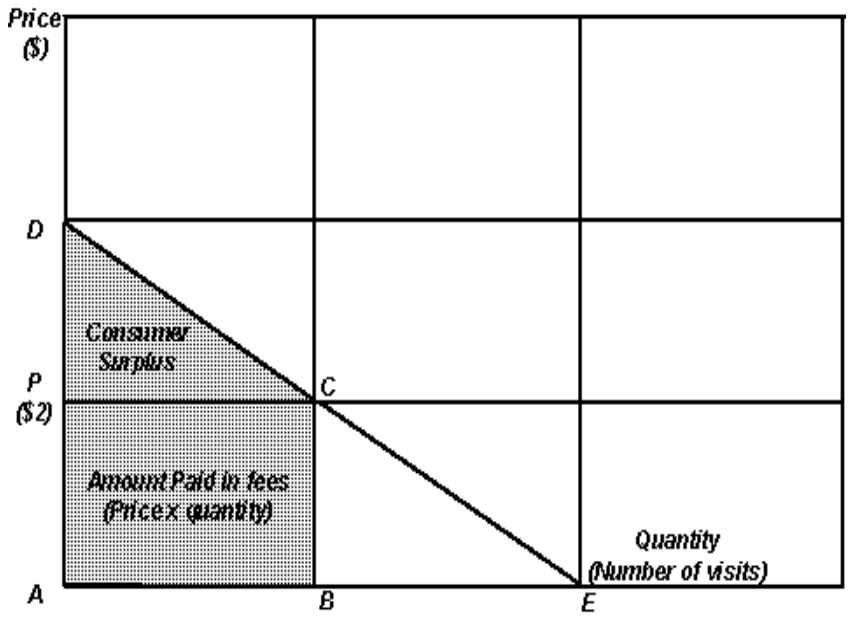
Total recreation benefits are defined as the sum of the maximum amount individuals are willing to pay to engage in a recreation activity, rather than forego it (Walsh, 1986). This concept is referred to as willingness-to-pay and is the method recommended by the Water Resources Council, a U.S. government interagency advisory committee, as an appropriate economic measure of the benefits of outdoor recreation.

The standard method of illustrating this concept is shown in Figure 9-1. The downward-sloping line represents the market demand curve (for total visits to a park, outings on a trail, canoe trips, etc.). The curve illustrates that, theoretically, the lower the cost of an activity, the more likely it is that people will engage in that activity. At a $2 fee, the greenway will receive 1000 visits. In this simplified example, the market value of the greenway is the annual number of visitors times the fee, or $2000, shown by the shaded rectangle APCB.

For some people, the $2 fee is the maximum they would be willing to pay to visit the greenway. They would choose other activities if the fee were raised. Many people, however, would be willing to pay more than the $2 fee. Therefore, these consumers would be receiving extra benefits for which they don't pay. This concept is referred to as consumer surplus, as shown by the triangle DPC in Figure 9-1. The total benefits associated with the greenway is illustrated by the entire shaded area. If no fee were charged, visitation would be expected to increase to E and total benefit would be the entire area under the curve.

Figure 9-1

Demand Curve and Total Benefit



Source: Spickard, 1978

Table 9-1

Average Willingness To Pay by Activity
(in 1987 dollars)

Activity	Average Value, per activity day	Number of studies evaluated
Camping	$ 19.05	14
Picnicking	18.26	6
Swimming	24.02	9
Hiking	28.49	6
Non-motorized boating	48.68	11
Cross-country skiing	16.76	2
Coldwater fishing	30.72	33
Anadromous fishing	51.52	8
Warm water fishing	29.25	13
Non-consumptive wildlife	20.06	3

Source: Walsh, et al, 1988

Many studies have been conducted which attempt to measure the willingness-to-pay for recreation activities. A composite table of various study results is provided below. These values are listed in 1987 dollars and are given to illustrate the range of willingness-to-pay, depending upon the activity. Willingness-to-pay may also vary depending upon the quality of the resource, or where the activity takes place.

Assessment Methods

Several methods can be used to estimate willingness-to-pay, or the benefits to users. Three methods are generally considered acceptable for measuring the benefits of recreation activities: the unit day value, the travel cost method, and contingent valuation. These methods are somewhat complex and will likely require the assistance of a specialist in recreation economics. This Resource Book provides an introduction to these methods. For further explanations, we suggest you review the texts listed under "Sources of Information" in this section.

The *unit day value* approach is considered appropriate for estimating the benefits from recreation activities at small sites. This approach relies on expert judgement to determine benefits to users, or the average user willingness-to-pay for the opportunity to recreate at a given site. Planners, managers, and economists have developed a wide variety of unit day value estimation methods. Methods have been established for unit day values by federal agencies. Three examples are described in this section: Bureau of Land Management (BLM), US Forest Service (USFS), and Water Resources Council.

The BLM example is the simplest method to understand (Table 9-2); the USFS method shows how unit day values vary by location (Table 9-3); and the Water Resources Council method shows how the unit day values vary depending upon the quality of the recreation experience (Table 9-4).

Using the BLM unit day values, and assuming an area received 25,000 user days of cross-country skiers and 25,000 user days of picnickers during the year, the economic benefits of recreation would be (25,000 x $14.20) + (25,000 x $13.98) = $704,500 annually.

Table 9-2

Bureau of Land Management Unit Day Values, 1986

Activity	
Camping and Picnicking	$14.20
Motorized Travel	6.70
Hiking and Horseback Riding	20.76
Water-Related Activities	20.27
Winter Sports	13.98

Source: Bureau of Land Management, 1987

Table 9-3 shown below, lists unit day values according to USFS administrative regions. USFS day values vary by activity and fluctuate region to region. To determine which Forest Service region your project is in, contact your local U. S. Forest Service office.

Using the USFS recreation values, or unit day values for camping, 10,000 visitor days of camping recreation in Region 2 would be 10,000 x $8.61 = $86,100 per year, whereas in Region 10, 10,000 visitor days of camping would be 10,000 x $4.23 = $42,300.

Table 9-3

U. S. Forest Service Recreation Values

Activity	U. S. Forest Service Regions								
	1	2	3	4	5	6	8	9	10
Camping, picnicking and swimming	4.97	8.61	8.81	5.60	7.68	7.16	8.06	12.36	4.23
Hiking, horseback riding, and water travel	5.28	5.59	5.52	5.20	6.00	5.56	6.99	8.23	5.01
Winter Sports	31.09	31.09	31.09	31.09	31.09	31.09	31.09	31.09	31.09
All other recreation activities	13.05	14.47	12.83	11.43	12.03	9.59	13.12	13.12	13.05
Fishing	31.96	34.78	40.42	31.96	38.54	46.06	40.42	42.30	31.00
Non-consumptive wildlife use	23.00	25.14	19.99	29.61	32.79	24.05	20.95	18.13	9.83

Source: U. S. Department of Agriculture, Forest Service, June 1989

Table 9-4

Guidelines for Rating Quality of Recreation Experience

Criteria	Quality of Experience, 100-point Scale				
Recreation Experience	Heavy use or crowding or other interference with use	Moderate use, other users evident and likely to interfere with use	Moderate use, some evidence of other users and occa-sional interference with use due to crowding	Usually little evidence of other users, rarely if ever crowded	Very low evidence of other users, never crowded
Total Points:	**30**				
Point Value:	0-4	5-10	11-16	17-23	24-30
Availability of Substitutes	Several within 1 hour travel time; a few within 30 minute travel time	Several within 1 hour travel time; none within 30 minute travel time	One or two within 1 hour travel time; none within 45 minute travel time	None within 1 hour travel time	None within 2 hour travel time
Total Points:	**18**				
Point Value:	0-3	4-6	7-10	11-14	15-18
Carrying Capacity	Minimum facility development for public health and safety	Basic facilities to conduct activity	Adequate facilities to conduct without deterioration of the resource or activity experience	Optimum facilities to conduct activities at site potential	Ultimate facilities to achieve intent of selected alternative
Total Points:	**14**				
Point Value:	0-2	3-5	6-8	9-11	12-14
Accessability	Limited access by any means to site or within site	Fair access, poor quality roads to site; Limited access within site	Fair access, fair road to site, fair access, good roads within site	Good access, good roads to site; fair access within site	Good access, high standard road to site; good access within site
Total Points:	**18**				
Point Value:	0-3	4-6	7-10	11-14	15-18
Environmental Quality	Low aesthetic factors exist that significantly lower quality	Average aesthetic quality; factors exist that lower quality to a minor degree	Above average aesthetic quality; any limiting factors can be reasonably rectified	High aesthetic quality; factors exist that lower quality	Outstanding aesthetic quality; no factors exist that lower quality
Total Points:	**20**				
Point Value:	0-2	3-6	7-10	11-15	16-20

Table 9-5

Water Resources Unit Day Values by Quality of Experience

Quality of Experience, 100-Point Scale

Recreation Activities	0	10	20	30	40	50	60	70	80	90	100
General recreation	$ 1.80	$ 2.16	$ 2.40	$ 2.76	$ 3.36	$ 3.84	$ 4.20	$ 4.44	$ 4.80	$ 5.16	$ 5.40
General fishing and hunting	2.64	2.88	3.12	3.48	3.84	4.20	4.86	4.80	5.16	5.28	5.40
Specialized recreation	7.32	7.80	8.40	9.00	9.60	10.80	12.00	14.40	16.80	19.20	21.50
Specialized fishing and hunting	12.60	12.95	13.20	12.55	13.90	15.25	16.55	17.65	18.95	20.30	21.50

Source: Walsh, 1986, (Updated to October 1987)

The other method of computing unit day values has been developed by the Water Resources Council, a U. S. government agency. In this method, the quality of the recreation opportunity is rated according to a specific set of criteria. Table 9-4, Guidelines for Rating Quality of Experience on a 100-Point scale, shows the ratings for various criteria. The individual scores for each criteria are totalled. The maximum score is 100. Table 9-5, allows you to estimate the unit day value based upon the quality of experience score.

For example, a greenway with these characteristics: moderate use and occasional crowding, no similar areas within 50 miles, good access and roads, and high aesthetic quality, would get a score of 70. Ratings from Table 9-4 which total 70 are: recreation experience (20); availability of substitutes (13); carrying capacity (11); accessibility (13); and environmental quality (13). If the most applicable category for this greenway is general recreation, the daily value of greenway use, from Table 9-5, would be $4.44 per visitor day. If you receive 25,000 visitors per year, the total annual recreation benefits using this approach would be $111,000, based on 1987 dollar values used in the table.

We now turn our discussion from the unit day value method to the *travel cost method.* The travel cost method is based upon assessing travel expenditures to and from a recreational resource as a measure of recreational benefit. The underlying assumption of this approach is the number of trips to a recreation site will decrease as the monetary and time costs of travel increase. This is an appropriate approach when trying to estimate the demand by the current population of users. This method involves creation of demand curves to estimate how many trips would be taken as one-way travel distance to the recreation destination increases. Walsh's text listed in the "Sources of Informa-

tion" subsection of this section, includes a detailed discussion of how to establish the demand curves and use this method.

As opposed to the travel cost method, the *contingent valuation method* uses a bidding approach to determine values of recreation resources via hypothetical market transactions. It can be used to evaluate the benefits of resources to the general population (users and non-users) and can also be used to evaluate the impacts from potential changes in resource availability, or quality.

- Daubert and Young (1981) performed one of the first evaluations of recreational values of instream flow in 1978 to 1979 on the Cache la Poudre River in Colorado. Respondents were asked to provide willingness-to-pay information corresponding to flow levels presented in a series of photographs. Photographs were supplemented by hydrologic and fish catch information for each of the flow levels pictured. Bid curves were then estimated corresponding to flow levels and socioeconomic characteristics. Results showed that average willingness-to-pay for fishing peaked at $30.35 per angler day at a flow level of 500 cfs. Lower or higher flows were significantly less valuable.

- Loomis, et al. (1986) used a combination of the travel cost method and contingent valuation method to evaluate the economic losses to recreational fisheries resulting from hydro development on Henry's Fork of the Snake River in Idaho. The estimate of net willingness-to-pay for current conditions on Henry's Fork was $2.86 million annually, which would be lost if a dam were to eliminate this river segment. A 50 percent reduction in fish catch would result in a loss of $920,000 in annual benefits and a 50 percent reduction in fish size would result in a loss in benefits of $1.07 million annually.

The unit day value, travel cost, and contingent valuation methods continue to be tested and refined. They provide alternatives to assess values of recreation resources via hypothetical market transactions. One study undertaken by the University of Wisconsin sought to validate these measures by including actual cash payment, in addition to the travel cost and contingent valuation methods. The focus of the case study was the value of goose hunting permits. In Wisconsin, goose hunting permits are issued by a lottery system. For this study,

travel cost and contigent valuation surveys were conducted to estimate permit winners' willingness-to-pay for hunting permits. In addition to asking people what they might pay, checks in varied amounts were sent to lottery winners which could be cashed if the winner's permit were returned. These checks were sent as a pragmatic test of what actual value the winners placed on the permit. The results were as follows:

Method	**Permit Value**
Actual cash value	$63
Contingent valuation method	$21
Travel cost method	$11-15

This study shows that people actually ranked the value of the permit higher than the estimation method revealed. This underscores the limitations and possible underestimation of hypothetical valuation methods.

Preservation Values

Analysis of economic benefits can also be used to determine the values which people place on resources, even if they do not use them. These non-users may value the resource for several reasons. The different types of preservation values and their definitions are as follows:

option value Knowing there is guaranteed opportunity for future access to the resource

existence value Knowing that a resource has been preserved in perpetuity, even if no recreational use is contemplated

bequest value Knowing that future generations will have the opportunity to enjoy the resource

Some studies have attempted to quantify these values.

■ Walsh, Sanders, and Loomis (1984) used contingent valuation to evaluate the optimal number of rivers in Colorado that should be protected under Federal Wild and Scenic designation. This study

was unique in that it incorporated both use and non-use values of rivers. The authors concluded that optimum benefits of river protection occurred at a level of protection for fourteen Colorado rivers. Use values were found to only account for approximately 20 percent of the total willingness-to-pay for river preservation, with the remaining 80 percent attributed to non-use (preservation) values.

■ Six percent of the American public uses wilderness areas, yet 60 to 95 percent are willing to be taxed to support preservation of wilderness areas (Driver, Nash, and Haas, 1986).

Benefit-Cost Analysis

Benefit-cost analysis is a systematic method of identifying and measuring the economic benefits and costs of a project (Hufschmidt, et al., 1983). The total benefits are then divided by total costs. If this ratio exceeds one, it may be assumed that the project will provide a good return, meaning the benefits are greater than the costs.

■ A study of four parks in Worcester, Massachusetts, found that if park visitors were willing to pay one dollar per visit, the value of this use would be almost $425,000 annually. This amount is substantially above the annual $125,000 it costs the city to maintain the parks' 219 acres and results in a benefit to cost ratio of 3.4 to 1 (More, Stevens, and Allen, 1982).

In the past few decades, there has been increasing interest by researchers to expand the application of benefit-cost analysis to include valuation of natural systems and environmental quality. Valuing the benefits of environmental quality and natural resources in economic terms may be helpful to your justification for conservation of a river, or establishment of a greenway. Performing a benefit-cost analysis for your project is likely to require assistance from either an economist, or staff and volunteers with an economics background. There are also aspects of environmental quality and natural resources which are important but still cannot be readily quantified. This may result in low benefit-cost ratios and underestimate the full benefits of your greenway.

Public Expression of Value

In these times of fiscal restraint, various non-profit funding initiatives, public interest organizations, and special interest legislation have emerged. This has resulted in fundraising drives and ballot initiatives which offer people the opportunity to contribute to special government funds for causes they value. Many of these involve resource conservation. The vehicles for these expenditures include donations, special licenses, fees, and tax rebate earmarked to support these causes.

- Proof of support for conservation programs has been evidenced in taxpayer donations. In Colorado, state income tax voluntary contributions to non-game wildlife programs generated revenues of $350,000, $500,000, and $650,000 during 1978, 1979, and 1980, respectively. However, in later years these amounts decreased considerably, particularly as taxpayers were given more competing choices for donations from tax refunds. Nonetheless, several states, including Oregon, Utah, Minnesota, and Kentucky, have adopted similar programs. (National Park Service, 1983).

- Surveys of California households reflected a willingness-to-pay between $42 and $94 annually (per household) to preserve water in Mono Lake. The cost to preserve the lake by providing replacement water and hydropower is only $2.64 per year, thus its value as a natural resource far outweighs the use value of the water (Loomis, 1987).

How to Use These Rationales in Your Community

Express the value of the resource. Total the willingness-to-pay for your resource and express this total as benefits gained through establishment of the greenway. You may wish to contact your local university to see if any students familiar with recreation economics can assist you in estimating willingness-to-pay. If assistance is unavailable, you may wish to use estimates for other recreation resources which are similar to your project. If your program is threatened by cutbacks, express existing benefits as net losses to the community.

Document public support for conservation. Cite examples of bond issues and tax measures passed by voters, funds, and contributions raised by local conservation groups, etc.

Sources of Information

Recreation Economic Decisions. This book by Dr. Richard G. Walsh is an excellent source text on recreation economics. It is available from Venture Publishing, 1640 Oxford Circle, State College, PA, 16801. Chapter 8 is especially applicable to benefit estimation.

The Review of Outdoor Recreation Economic Demand Studies with Non-Market Benefits, 1968-1988. This will allow you to determine whether specific demand studies are applicable to your region and resource. It is available from the Department of Agricultural and Resource Economics, CSU, Ft. Collins, CO, 80523.

The Water Resources Council's ***Economic and Environmental Principles and Guidelines for Water and Related Land Resources Implementation Studies*** is the third version (1983) of the WRC's "Principles and Standards." It is the most current version of this agency's recommendations for methods to assess the economic benefits of recreation. This publication is currently out of print, but may be available at your local university library.

A Review of Fisheries Economic Evaluation Methods. This report from the Sport Fishing Institute is a good review of economic valuation concepts and methods. It also contains an annotated bibliography of available fishery values calculated via travel cost, contingent valuation, and other methods. Contact the Sport Fishing Institute at 1010 Massachusetts Ave, N.W., Washington, D.C., 20001.

If you are specifically interested in literature related to how economics is used in promoting retention of instream flow, ***An Annotated Bibliography of Economic Literature on Instream Flow*** (Douglas, 1988) is available from the U.S. Fish and Wildlife Service, National Ecology Research Center, 2627 Redwing Road, Ft. Collins, CO, 80526-2899. Ask for Biological Report 88(39).

Amenity Resource Valuation. This 260-page collection of essays is a good source of indepth discussions of the philosophical and methodological issues associated with integrating economics and natural resources. The text is available from Venture Publishing, 1640 Oxford Circle, State College, PA, 16801.

Considerations in Using These Rationales

Numbers are not everything. Remember that estimates of economic impacts and benefits are only one tool available to conservation advocates. As mentioned earlier, many of the benefits of greenways may still not be quantified and numbers would underestimate the total value. Rivers, trails, and greenways should be promoted using the tools which are most effective. Focusing on the intrinsic values is most likely to be the most effective tool to begin building your constituency.

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