Chapter 9
The Net Economic Value of Wilderness

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The purpose of this chapter is to inventory and assess what is currently known about the economic or "dollar" values accruing to Americans from the National Wilderness Preservation System. This chapter identifies the benefits of Wilderness and the economic value of these benefits through an extensive review of published conceptual and empirical literature. It uses the definition of Wilderness provided by the Wilderness Act of 1964, which encompasses both the objective and subjective aspects of Wilderness (see Chapters 3 and 4). When this chapter refers to "Wilderness," the authors mean statutory or official Wilderness as defined by the Wilderness Act of 1964. The question that this chapter addresses is: "How much are the on-site recreation and passive use benefits of Wilderness worth to Americans?"

To assess the net economic value of Wilderness, this chapter presents an analysis of published research that has focused on the on-site recreation use benefits of Wilderness, and also research that has focused on the passive use benefits of Wilderness. From these analyses the authors estimate the total or aggregate net economic value of the recreation and passive use benefits of Wilderness.

A Taxonomy of Benefits and Values

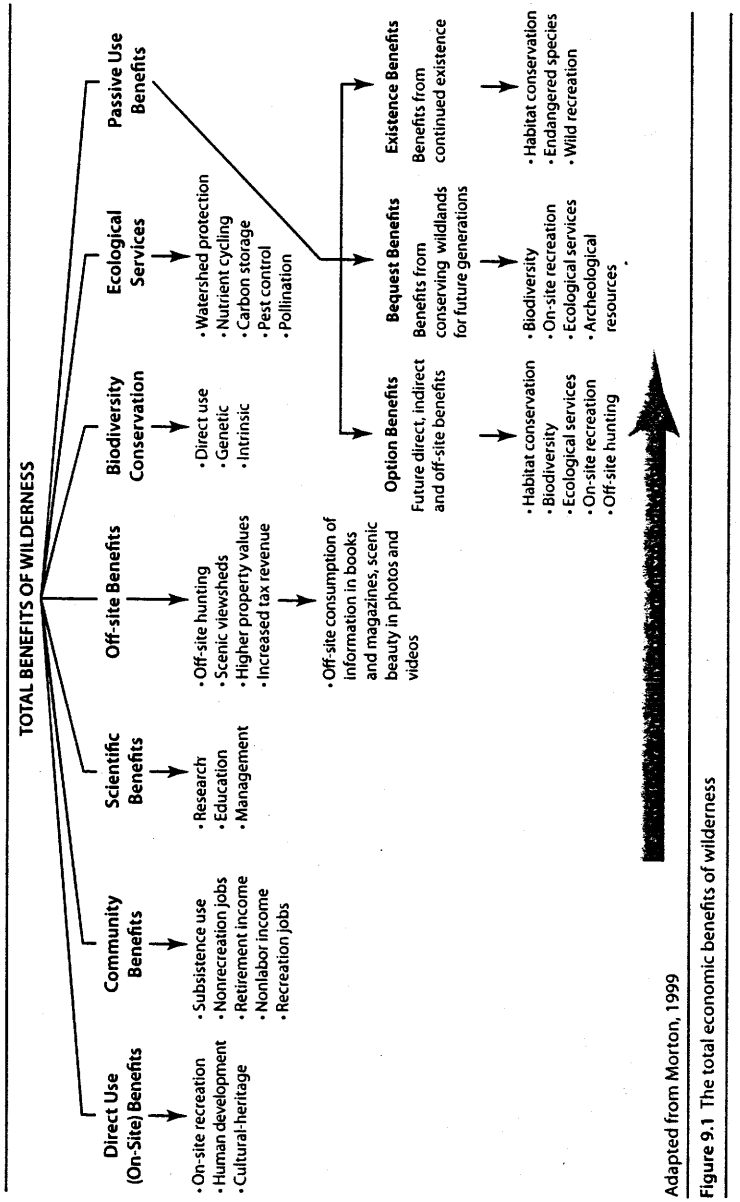
Morton (1999) identified seven categories of benefits for defining the total economic value of Wilderness: on-site recreation, community, scientific, off-site, biodiversity conservation, ecological services, and passive use benefits (Figure 9.1). This section focuses on the on-site recreation and passive use benefits.

On-Site Recreation Benefits

On-site recreation benefits derive from consumptive and nonconsumptive activities in a Wilderness area. Among the types of activities in Wilderness from which people obtain these benefits are fishing, hunting, birdwatching, rafting, backpacking, hiking, and camping. Motorized activities are not permitted in Wilderness. Morton (1999) refers to on-site recreation or *in situ* Wilderness benefits as direct use benefits.

Passive Use Benefits

Passive use benefits, also called nonuse benefits (Freeman 1994, p. 145), are less tangible than the physical presence of a person being on-site and participating in a recreational activity (Figure 9.1). Krutilla (1967) is considered the originator of the concept of nonuse benefits of natural resources in general. However, his concept is easily adapted to Wilderness as a protected natural resource. For example, passive use benefits reflect the utility gained from knowing Wilderness is preserved, even if an individual does not visit or ever



Adapted from Morton, 1999

Figure 9.1 The total economic benefits of wilderness

plan to visit the area. Hence, passive use benefits could be considered a form of off-site benefits. Passive use benefits for Wilderness consist of at least three components: (a) option benefits, (b) bequest benefits, and (c) existence benefits. Option benefits are received from current preservation, ensuring the opportunity to visit Wilderness areas in the future. Bequest benefits are gained from knowing that Wilderness will be available for use by one's heirs or future generations. Existence benefits derive from simply knowing Wilderness exists.

While there is some debate among economists over the precise definitions for the various components of passive use benefits, and perhaps even more debate as to the empirical measurement of the resulting economic values, most natural resource economists would agree with the concept of passive use benefits (Freeman, 1994, p. 141).

Other Benefits of Wilderness

Morton identifies five other benefits of Wilderness in addition to on-site recreation and passive use. They include community, scientific, off-site, biodiversity conservation, and ecological service benefits.

Community benefits include jobs and income created and supported through local spending by people who visit Wilderness for recreation. As well, there are other direct and indirect benefits realized by communities near Wilderness. For example, subsistence use of Wilderness lands for food, clothing, and shelter can be included as a community benefit (Morton, 1999). Rosenberger and English address the state of knowledge of community economic impacts of Wilderness recreation in Chapter 10. Tarrant and Schuster also address the idea of community benefits, but as a social value of Wilderness in noneconomic terms (see Chapter 7).

Morton identified three types of scientific benefits—research, education, and management (Morton, 1999). These benefits are also discussed from a social values perspective in Chapter 7. As a scientific benefit, Wilderness is recognized as a living laboratory and as a benchmark for evaluating the impacts of development elsewhere (Loomis & Richardson, 2000). These benefits from research are reflected in a sizeable number of scientific journal articles that use Wilderness as the research observation site. Educational benefits include development of Wilderness skills and clearing the mind for visualization and creative thinking (Morton, 1999). Wilderness areas can also act as templates for understanding and restoring natural forest ecosystems elsewhere. Thus, Wilderness provides examples of natural systems that can be observed in order to specify the makeup and functioning of various ecosystems when they are in pristine condition.

Wilderness provides habitat for fish, wildlife, and a wide variety of other wild species. However, the species depending on this habitat do not necessarily have to be enjoyed by visiting a Wilderness area. A golden eagle soaring beyond

the boundary becomes an important off-site benefit for those lucky enough to see it. In many different ways, wildlife that depends on habitats within protected Wilderness may be viewed and enjoyed outside of its boundaries. Similarly, off-site benefits of Wilderness can include its contribution as natural and scenic views for the casual sightseer, as well as a backdrop for burgeoning resort and second home communities (McCloskey, 1990). "In both time and space, Wilderness benefits are not limited to visitors actually setting foot in Wilderness" (Morton, 1999).

Policymakers and scientists are becoming increasingly aware of the importance of conserving biodiversity. Biodiversity conservation is a growing consideration in Wilderness legislation and management in that it means helping preserve representations of ecosystems, species, and genetic diversity (Loomis & Richardson, 2000). Wilderness also plays a role in sustaining the ecological processes comprising our global life support system. Some ecological systems fostered in Wilderness include watershed protection, carbon storage, and natural pest control (Morton, 1999). Cordell, Murphy, Riitters and Harvard address the ecological values of Wilderness in more detail in Chapter 11. Gudmundsen and Loomis address the concept of intrinsic values that are separate from the economic and social values that humans place on Wilderness in Chapter 12.

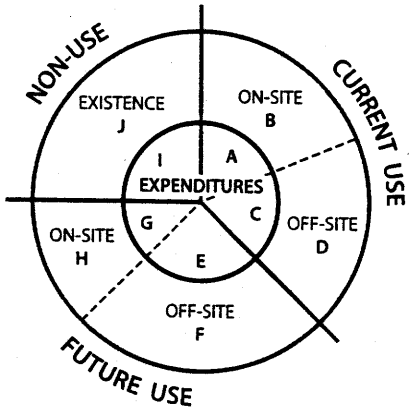
Benefits-to-Value Linkage

The many benefits of Wilderness summarized here contribute to an individual's value for Wilderness attributes (e.g., wildness, geography), functions (e.g., preservation of wild places, recreational setting), and services (e.g., animal and plant habitat, cultural preservation; see Chapter 4). As with other goods and services, monetary measures pertaining to these benefits can be partitioned into two components: expenditures and consumer surplus. Expenditures are what an individual is required to pay to obtain a Wilderness benefit (Figure 9.2, Areas A, C, E, G and I, p. 166). Expenditures encompass things like travel expenses, gasoline used to visit a Wilderness, food, lodging, and public-use fees. Consumer surplus, or net economic value, is a measure of the value an individual receives from the same Wilderness benefit, above and beyond expenditures. In Figure 9.2, consumer surplus is represented by the amount of remaining area of the entire circle after the inner circle is subtracted (Areas B, D, F, H and J). Measured empirically, it may be more or less than actual expenditures.

Consider an example, adapted from Loomis (1993), of expenditures and consumer surplus for on-site recreation (Figure 9.3, p. 167). Assume an individual lives in Denver, Colorado. She enjoys visiting Indian Peaks Wilderness each summer and the expenditures for a one-day trip to Indian Peaks total $20. Also assume that for the first trip of the year to Indian Peaks, she would be

willing to pay $30. This willingness to pay is her value for the trip to Indian Peaks. Having been there once, she values the second trip slightly less at $25. Subsequent trips provide less satisfaction, so she values the third trip at $20 and the fourth at $15. For the first two trips, she is willing to pay more than the trip costs. This difference is called consumer surplus, or net economic value. The value of the third trip equals its cost. Should she take the third trip, she would receive no additional consumer surplus. The fourth trip would cost more than the individual would receive in benefits, thus, she would likely take no more than three trips to Indian Peaks in a given year. Gross economic value, the sum of expenditures and consumer surplus, is $75 ($30+$25+$20). Expenditures for recreation at Indian Peaks equal $60 ($20+$20+$20). The net economic value received from either two ($10+$5) or three ($10+$5+$0) visits is $15.

Passive use economic value can also be demonstrated. Consider the case where an individual knows about the Okefenokee Wilderness in southeastern Georgia. He enjoys envisioning the Okefenokee and its wild features, but does not intend to visit it in the future. Nevertheless, he derives personal pleasure from knowing that this Wilderness exists and will be protected. While he pays $25 annually to a fund supporting this Wilderness area, he would be willing to pay more, say $75, if he had to. As such, the net economic benefit this individual receives from knowing that the Okefenokee exists is $50 per year ($75 less $25).



Adapted from Bergstrom, Stoll, Titre, and Wright, 1990

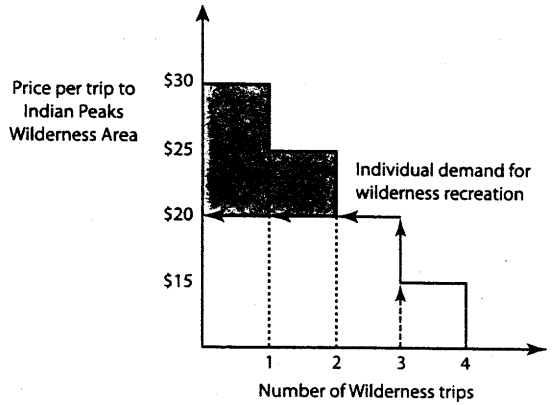
Figure 9.2 The total economic value of wilderness-based recreation

Review of Net Economic Value Research

As earlier stated, this chapter is based on a synthesis of a number of published studies of the economic value of on-site recreation and passive use benefits from Wilderness. Other benefits identified by Morton (1999) and briefly discussed, such as biodiversity conservation, also have positive benefits to people, but they are much more difficult to measure in monetary terms. Hence, few empirical studies have examined the economic value of these Wilderness benefits. The end result sought from this synthesis is an estimate of the nationwide economic value of the recreation and passive use benefits from the National Wilderness Preservation System.

On-Site Recreation Value Estimates

We identified fourteen published studies that estimated individual consumer surplus for on-site Wilderness recreation. All of these studies used either the travel cost method or contingent valuation method to estimate consumer surplus; that is, net economic value. The travel cost method estimates recreational visits to Wilderness based on actual travel behavior and associated actual expenditures. The contingent valuation method uses survey instruments to elicit an individual's stated willingness to pay for a recreation trip to a Wilderness area (Loomis & Walsh 1997).



The shaded area represents consumer surplus. Arrows indicate the number of trips taken at $20 per trip.

Adapted from Loomis, 1993

Figure 9.3 Example of consumer surplus (or net economic value)

The fourteen studies yielded 31 estimates of net economic value. Of these 31 estimates, 27 are from Wilderness areas west of the Mississippi River. Thirteen of these 27 western area estimates are from California, Oregon, or Washington. One of the 31 estimates is from Alaska. The USDA Forest Service manages a majority of the Wilderness areas on which these studies focused. Sixty-nine of the 76 Wilderness areas (91%) in the literature are managed by the USDA Forest Service.[1]

Each observation represents the dollar value to an individual (i.e., net economic value or consumer surplus) for either a single-day or multiple-day trip to a given Wilderness (Table 9.1). All dollar values are base-year 2002, that is, deflated to equal the real purchasing power of a dollar in 2002 using the Consumer Price Index. The consumer surplus values per person per Wilderness trip range from $4.64 to $287.22, with the median being $24.45. The consumer surplus per person per trip averaged across all studies done in the United States equals $61.47. With an average duration of 3.5 days per trip, average consumer surplus per person per day is $17.56. It should be noted that we excluded estimates from Brown and Plummer (1981) in our calculations. Their estimates were greater by two standard deviations from the average for all the reported studies (Table 9.1). Nothing was noted in their study to account for this large difference and therefore it was treated as an outlier.

Table 9.1 Wilderness on-site recreation use empirical literature: Individual consumer surplus for single-day use and multiday use (2002 dollars)

Author	Year	State(s)	Single-Day Use Consumer Surplus	Multiday Use Consumer Surplus
Brown and Plummer	1981	OR & WA		4 estimates between $415 and $560
Smith and Kopp	1980	CA		$64
Walsh and Gilliam	1982	CO	$31	$185
Walsh et al.	1984	CO		$94
Leuschner et al.	1987	NC	$12	$16
Prince and Ahmed	1988	VA	$14	
Walsh et al.	1989	MN		$61
Barrick and Beazley	1990	WY		$16
Halstead et al.	1991	NH		$7
McCollum et al.	1990	9 USDA Forest Service regions	$22	8 estimates between $12 and $287
Hellerstein	1991	MN		$33
Englin and Shonkwiler	1995	WA		$27
Baker	1996	CA		6 estimates between $63 and $1,907
Richer and Christensen	1999	CA		$5

[1] Walsh, Loomis, and Gillman (1984) used "all" Wilderness in Colorado as the research setting. There are 41 Wilderness areas in Colorado, of which 36 are managed solely by the USDA Forest Service. Four other areas are managed in conjunction with the National Park Service, the U.S. Bureau of Land Management, or the U.S. Fish and Wildlife Service.

Grouping the studies according to region, the average consumer surplus per person per trip for states west of the Mississippi River is $71.95, with a range of $4.64 to $287.22 and a median of $33.43. On a per-day basis, average consumer surplus per person per trip for western states is $20.56. For states east of the Mississippi, average consumer surplus per person per trip is $13.28. The values for the eastern United States range from $6.99 to $17.97, with the median being $13.87. On a per-day basis, average consumer surplus per person per trip for eastern states is $3.79. Only one study provided estimates for Alaskan Wilderness visits. McCollum, Peterson, Arnold, Markstrom, and Hellerstein (1990) estimated consumer surplus equal to $287.22 per person per trip. However, the average trip length was over 18 days, which equates to a per-day value of $15.38.

Grouping the studies according to trip length (single-day v. multiple-day trips), the average consumer surplus per person per trip for single-day use is $19.50. Consumer surplus values for single-day use range from $11.50 to $30.50, with the median at $17.99. Average consumer surplus per person per trip for multiday use equals $68.47. Multiday consumer surplus ranges from $4.64 to $287.22, with the median at $30.11.

Passive Use Value Estimates

Eight published studies which provided estimates of passive use values of Wilderness were identified (Table 9.2, p. 170). These studies used contingent valuation (Loomis & Walsh, 1997) to obtain either individual or household annual willingness to pay to protect Wilderness from various forms of development. The estimated values pertained to keeping the land managed as Wilderness, rather than letting it be developed. With the exception of one study on eastern Wilderness (Gilbert, Glass & More,1992), the body of empirical work has focused on western states and subsets of the National Wilderness Preservation System (NWPS) in those states. No studies pertaining to passive use values of Wilderness in Alaska were found.

It is difficult to compare results from studies of household willingness to pay (i.e., consumer surplus) for passive use of Wilderness. Each used a different sampling frame and base population. None that we could find attempted to measure the monetary value of passive use for the entire NWPS. Moreover,

each study presented somewhat different development scenarios as alternatives to preservation of one or more particular Wilderness areas. Several studies presented multiple passive use values because more than one Wilderness area in different portions or combinations were presented to the survey respondents. In addition, some of the studies were more focused on methodological issues in the measurement of passive use value and thus did not provide actual estimates of the passive use economic value in such a way that they could defensibly be extrapolated for the whole country.

Although there is incongruence across the published literature, the authors opted to use an average across studies of the reported passive use value estimates as an initial approximation of household annual willingness to pay for Wilderness' protection. Because each reported study focused on a subset of NWPS areas, it seems reasonable to assume that each study represents a conservative estimated household passive use value for the whole NWPS. That is, if a household would pay $41 annually for passive use benefits of just the designated Wilderness areas in Colorado (Walsh, Loomis & Gillman, 1984), then it seems reasonable they would pay at least that much for the entire NWPS. This is especially defensible given that Wilderness area access is not an issue in order for passive use benefits to exist.

Estimates of annual household values of passive use benefits from the studies reported in Table 9.2 range from $20 to $861. All but the Keith, Fawson, and Johnson (1996) study in Utah reported annual household values of less than $100. Thus, that study was considered to be an outlier and was excluded. Averaging results of the remaining studies in Table 9.2 yielded a per household estimate of annual willingness to pay for passive use benefits from the NWPS of approximately $67 per year.

Table 9.2 Empirical literature, year, state, and annual household willingness to pay from study for passive use (2002 dollars)

Study	Year	State(s)	Annual Household Willingness to Pay (Consumer Surplus)
Walsh et al.	1984	CO	$72
Aiken	1985	CO	$98
Barrick and Beazley	1990	WY	$76 and $87
Pope and Jones	1990	UT	$80
Gilbert et al.	1992	Eastern U.S.	$19 and $21
Diamond et al.	1993	CO, ID, MT & WY	$38, $47, and $64
McFadden	1994	CO, ID, MT & WY	$61 and $96
Keith et al.	1996	UT	$861.03

Other Value Estimates

Although this chapter focuses only on the economic value of on-site recreation and passive use benefits, a brief summary of estimates of other Wilderness values as identified in Figure 9.1 is provided here. For example, the scientific values of Wilderness and roadless areas were studied by Loomis and Richardson (2000). They estimated that 422 journal articles had been based primarily on studies done in Wilderness. They used an estimate from Black (1996) to calculate the monetary value of the scientific contribution of these journal articles. Black estimated the economic value of one journal article to society as $12,000 per year. Using Black's approach, the 422 journal articles generate a potential value to society of $5.1 million annually (Loomis & Richardson, 2000).

We were unable to locate many quantitative indicators of Wilderness being the main focus of any educational programs. However, there are national organizations that foster educational benefits to people and use Wilderness as a backdrop for Wilderness Experience Programs (Friese, Hendee & Kinziger, 1998). These schools facilitate effective adaptation skills, problem solving, emotional development, and a greater awareness of and concern for Wilderness (see Chapter 7).

Very few researchers have attempted to estimate the economic value of Wilderness education programs to society. However, Russell, Hendee, and Cooke (1998) examined the economic benefits and costs of the Wilderness Discovery program designed for at-risk youth in the Federal Jobs Corps. They found statistical evidence suggesting a reduction in early terminations of Job Corps Center at-risk youth and a consequent increase in employability for students who participated in Wilderness Discovery. Their findings translated to a return in social benefits per student of $931 (inflated to 2002 dollars) for each $446 in program costs.

Wilderness (or proximity to Wilderness) may be considered a valuable amenity. Hedonic procedures exist allowing economists to estimate the contribution of amenities or other attributes to the overall value of a good or service (Freeman, 1994, p. 121). This procedure has been applied in real estate markets to value property attributes like air quality or proximity to amenities. Using an hedonic model, Phillips (2000) estimated that parcels of land in a town near Wilderness in the Green Mountain area of Vermont sold at prices 13 percent higher than comparable land in the area not proximal to Wilderness.

We found no literature addressing the economic value of ecological services or biodiversity conservation in Wilderness. However, we can draw some conclusions with roadless and other wild areas serving as a proxy for Wilderness. Costanza and colleagues (1997) estimated the benefits from temperate forests for climate regulation to be $35 per acre per year. Costanza and colleagues also estimated benefits from waste treatment services of $35 per acre per year from these same forests. Loomis and Richardson (2000), using Costanza

and associates' values, estimated that these benefits from 42 million roadless acres are $980 million annually, or $23 per acre. Applying the per acre estimate to the 106 million acres of Wilderness, they calculated the ecological value of Wilderness in the United States to be $2.5 billion annually. Cordell, Murphy, Riitters, and Harvard address the ecological value of Wilderness from an overall ecosystem health and life-support perspective (see Chapter 11).

Aggregate Net Economic Value of Wilderness

Monetary estimates of the value of some of the benefits identified in Figure 9.1, including scientific, off-site, biodiversity, and ecological services, are still quite controversial and present considerable measurement challenges. Therefore, the chapter takes a conservative approach and includes only on-site recreation and passive use benefits in its calculations of the aggregate net economic value of the National Wilderness Preservation System (NWPS).

Net Economic Value for On-site Recreation

Calculation of the annual aggregate net economic value of on-site Wilderness recreation requires two key components: the average net economic value per person per trip and an estimate of the number of Wilderness trips.

In light of the very dispersed nature of Wilderness recreation, accurate estimation of on-site use is extremely costly. Of the four major federal land management agencies—USDA Forest Service, National Park Service, Bureau of Land Management, and Fish and Wildlife Service—the only visitation numbers consistently estimated are those maintained by the Forest Service for Wilderness areas within National Forests (Cole, 1996). A 1989 study of all Wilderness areas in the country identified that only 13 percent of Forest Service Wilderness areas had use estimates based on systematic counts at that time (McClaran & Cole, 1993).

Using a variety of on-site sources, Cole (1996) reported 16,988,000 recreation visitor days (RVDs) to all NWPS Wilderness in 1994. Loomis (1999), using Cole's data, estimated National Forest Wilderness visitation equal to 12,028,873 RVDs in 1993. Loomis (1999) estimated National Forest and National Park Wilderness visitation to equal 13,749,393 RVDs in 1993.

Cordell and Teasley (1998) use origin-based sampling to provide a different approach to Wilderness visitation estimation using the 1994–95 National Survey on Recreation and the Environment (NSRE). A household sample of persons across the United States was asked about their annual recreational trips consistent with Wilderness recreation. Depending on assumptions, the procedure they used led to an estimate of between 15.7 and 34.7 million trips per year to areas of the National Wilderness Preservation System. The authors indicated

the most likely amount of trips to Wilderness was believed to lie somewhere between these lower- and upper-bound estimates.

Loomis and Richardson (2000) took a different approach. Their estimate of annual trips to Wilderness was based on an inventory of activities throughout the U.S. National Forest system, including roadless and backcountry areas. Using the ratio (106 million acres to 54 million acres) of Wilderness to "near Wilderness" lands in national forests (Loomis & Richardson, 2000), this equates to approximately 26.7 million visits per year—a likely upper bound for annual recreation use.

A more promising alternative and perhaps more scientifically based estimate of Wilderness visitation relies on the Forest Service's National Visitor Use Monitoring (NVUM) system. NVUM is a system designed to provide statistically reliable estimates of recreation visitation on national forests and national grasslands. Following a four-year cycle, recreational use on every national forest is surveyed. Wilderness is one of five strata in the sampling plan (English, Kocis, Zarnoch & Arnold, 2002). Wilderness visitation is estimated as recreation site visits for the entire National Forest System (Figure 9.4). A recreation visit is defined as "...one person entering and exiting a national

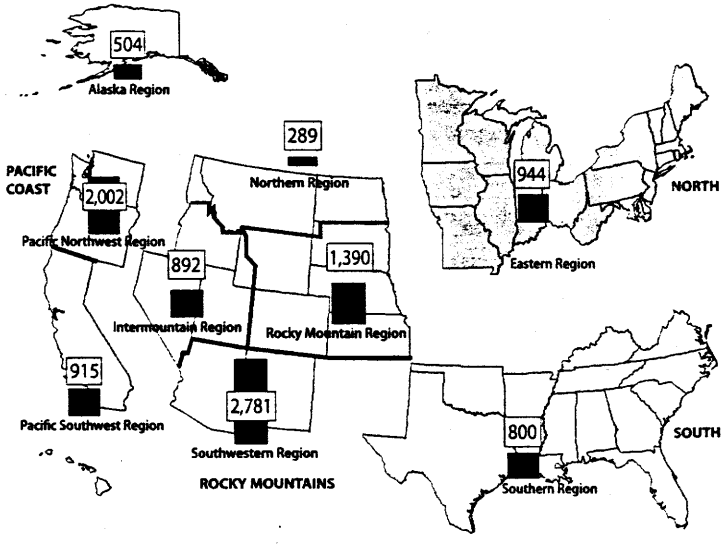


Figure 9.4 The distribution of Wilderness site visits in the National Forest System for the year 2001 (in thousands of visits)

forest, national grassland, or designated Wilderness area for the purpose of recreation" (English, Kocis, Zarnoch & Arnold, 2002). A site visit may be 10 minutes or 10 days. Annual visitation in 2001 to all National Forest Wilderness was estimated to be 10.5 million visits. Of these, 73 percent were single-day visits and 27 percent were multiple-day visits (Table 9.3). This ratio of day use to overnight use differs considerably from Cole's (1996) estimates for National Park Wilderness. He found that 26 percent of the visits were for single-day use and 74 percent for multiple-day use.

D.N. Cole (personal communication, 2003) estimated each agency's share of Wilderness visitation. He calculated that 82 percent of all Wilderness visitation is on National Forest lands, 15 percent on National Parks, 2.6 percent on U.S. Fish and Wildlife Service (FWS) lands, with the remaining 0.4 percent on areas managed by the U.S. Bureau of Land Management (BLM). Applying Cole's share estimates to National Park Wilderness and assuming that FWS and BLM ratios are similar to Forest Service NVUM estimates, the authors estimate that on-site recreation use for all NWPS areas is approximately 12.8 million visits per year (Table 9.4). This includes approximately 8.5 million single-day visits and 4.4 million multiple-day visits. Based on a sample average of trip length in days for multiple-day visits of just over 4 days, an estimated 18.2 million days were spent in Wilderness during multiple-day trips. Combining estimates of total days spent during single-day and multiple-day trips

Table 9.3 Percentages of single-day wilderness visits by Forest Service region

Forest Service Region	Percentage single-day visits (Forest Service only)
R1 Northern Rocky Mountain	55.8
R2 Rocky Mountain	85.9
R3 Rocky Mountain—Southwest	93.6
R4 Intermountain	84.0
R5 Pacific—Southwest	77.5
R6 Pacific—Northwest	62.6
R8 South	70.8
R9 North	29.8[1]
R10 Alaska	98.1[2]
Average	73.1

[1] Boundary Waters Canoe Area (BWCA) in Minnesota was one of the surveyed Forest Service sites for Region 9. BWCA is a remote wilderness requiring long travel times to reach, thus it is more likely that trip times will be long. This would explain why 30% of visitation in R9 is single-day use. As there are only two years of data, it remains to be seen if the BWCA will have a disproportionate effect on the visitation from R9. However, the two years of data is the best available.

[2] Most trips to Alaska are for a long duration. However, visitors have the opportunity to stay off-site and visit multiple sites during a multiday trip. Thus, there is a high percentage of single-day use.

leads to a total estimate of 26.6 million days of Wilderness use annually across all NWPS lands.

Combining the estimates of average per-person-per-trip consumer surplus reported in the studies summarized earlier and estimates of the total number of single-day trips to Wilderness, it is calculated that the annual net economic value of Wilderness single-day trips to be $163.8 million ($19.50 x 8.4 million). Following the same procedure for multiple-day trips to Wilderness, an estimate for annual net economic value of $301.3 million ($68.47 x 4.4 million) can be obtained. Taken together, the net economic value all recreation trips to the NWPS is estimated to be $465.1 million annually. For perspective, the product of annual trips and value per trip ($465.1 million) can be scaled by the number of acres in the NWPS (106 million) to obtain an estimate of annual per-acre average net value of recreation trips to Wilderness of $4.39 across the NWPS.

Net Economic Value for Passive Use

When estimating the aggregate annual passive use value for the NWPS, it is particularly important to identify the relevant population because the aggregate estimate is directly influenced by the size of the population selected. The passive use value studies reported earlier (Table 9.2, p. 170) are primarily based on household sampling. Therefore, one approach to estimating total passive use value is to aggregate across U.S. households. A conservative approach was chosen by following the average response rates for these studies which was approximately 50 percent. Thus, the authors aggregate passive use value across only 54.5 million households, one-half of the 109 million total households in the United States (U.S. Census Bureau, 2003). This conserva-

Table 9.4 Total site visits by agency and by single-day and multiday lengths of visit

Total National Wilderness Preservation System site visits	**12,825,610**
Forest Service (FS)	10,517,000
National Park Service (NPS)	1,923,841
Fish & Wildlife Service (FWS)	333,466
Bureau of Land Management (BLM)	51,302
Total single-day visits	8,458,490
Total multiday visits	4,367,120
Total FS, FWS and BLM visits	10,901,768
FS, FWS, and BLM single-day visits (73%)	7,958,291
FS, FWS, and BLM multiday visits (27%)	2,943,477
Total NPS site visits	1,923,841
NPS single-day visits (26%)	500,199
NPS multiday visits (74%)	1,423,643

Note: Any discrepancies in appropriate summation are due to rounding error.

tive procedure assumes that nonrespondent households from the studies reported earlier express no passive use value for Wilderness.

Aggregating the estimated average annual passive use value of $67 per household across 54.5 million households yields an aggregate estimate of passive use value for the entire NWPS of $3.7 billion per year. This is approximately $34.50 per acre annually. This calculated estimate demonstrates that the economic value derived from passive use exceeds the economic value derived from on-site recreation use by a ratio of nearly eight to one. These quantitative results indicating the relatively high value of passive use values compared to direct use values are consistent with the qualitative opinion survey results reported in Chapter 7.

Conclusion

Today's social and political climate increasingly leads to debates of whether certain publicly provided goods and services are "worth it" to taxpayers. The NWPS provides a multitude of benefits to the American population, some of which are indirect. These benefits lead to conceptually valid, albeit empirically elusive, estimates of the net economic value of Wilderness. While some people choose to visit Wilderness and obtain the direct benefits derived from on-site recreation, the majority do not. Nevertheless, numerous studies, including results discussed in this chapter and in Chapter 7, have shown that even for those with no intention of ever visiting the NWPS, benefits derived from off-site passive use are nontrivial and, in fact, considerably outweigh the value of recreation benefits.

Based on published literature, annual average individual consumer surplus for on-site Wilderness recreation is estimated to be $19.50 for day use and $68.47 for multiple-day trips. For passive use, annual average per-household consumer surplus is estimated to be $67. Combining these consumer surplus values and appropriately aggregating over the relevant populations yields an estimated annual net economic value for the NWPS of nearly $4.2 billion, or about $39 per acre per year. If one adds the per acre value of $23 for ecological services (Loomis & Richardson, 2000) another $2.4 billion of benefits could be considered.

For yet another perspective, annual flows of estimated economic values are often discounted to the present. This calculation of present value allows direct comparison of assets or projects with different annual flows of economic returns and possibly different project time horizons (Penson & Lins, 1980). Conservatively assuming a discount rate of 4 percent (as currently used by the USDA Forest Service federal agencies), assuming a constant population of on-site users and households deriving passive use benefits, and assuming

constant nominal net economic values per household and per person per trip, the net present value of the NWPS across a 60-year time horizon is about $95 billion or, on average, about $900 per acre. Including the estimated value of ecological services would increase the estimated present value of the NWPS to almost $150 billion, or about $1,400 per acre.

Currently, there are millions of acres in the United States that are still wild or roadless, and do not yet have Wilderness designation. If more acres are added to the NWPS in the future, the aggregate net economic value to Americans of Wilderness in the system should be expected to grow. However, as demonstrated in a number of studies including Walsh, Loomis, and Gillman (1984) and Pope and Jones (1990), the value of additions to the System, while non-negative, are likely less at the margin than the average values reported above. The Campaign for America's Wilderness (2003) estimates almost 319 million acres of remaining wild lands are unprotected by official Wilderness designation. Loomis and Richardson (2000) estimate that there are 42 million acres of roadless National Forest lands that could potentially qualify as designated Wilderness. According to their estimates, adding these roadless areas to the Wilderness roll could increase the aggregate net economic value of the NWPS by another $1.5 billion annually.

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Chapter 10
Impacts of Wilderness on Local Economic Development

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