# Economic Values of Wilderness Recreation and Passive Use: What We Think We Know at the Beginning of the 21st Century

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**Abstract**—Two techniques are used to estimate the economic value of recreation and off-site passive use values of wilderness. Using an average value per recreation day ($39), the economic value of wilderness recreation is estimated to be $574 million annually. Generalizing the two Western passive use values studies we estimate values of Western wilderness in the lower 48 states to be $168 per acre, for a total value of $7 billion for the 42.7 million acres. Using the one study of Eastern wilderness we estimate a value of $103 per acre, for a total value of the 4.5 million acres to be $468 million.

## What Is Wilderness Economics?

Wilderness economics may seem as much an oxymoron as wilderness management may have when it was first proposed. When I attended a conference on public land management in 1978 and asked why the USDA Forest Service Research stations were not addressing the economic value of wilderness, I was told "Wilderness designation is a political issue." Well, true enough, but the political issue often revolves around the economic trade-offs of wilderness uses versus commodity uses. Information to make an informed trade-off might lead to less grandstanding by both sides.

The recognition that economic issues associated with wilderness should be objectively analyzed, coupled with advances in non-market valuation has lead to a steady increase in wilderness economics. The Proceedings of the 1985 National Wilderness Research Conference contained one page out of 370 that mentioned economic benefits (Driver and others 1987). In the Wilderness Benchmark 1988, one paper summarized what was known about the "non-traditional" economic values of Wilderness (Walsh and Loomis 1988). However, it was not until 1991 that sufficient research had accumulated on the economic value of wilderness to make it apparent that this line of inquiry could make useful contributions to debates over wilderness designation and even wilderness management. It was in 1991 that the Forest Service, USDI Bureau of Land Management and the Society of American Foresters held the first conference devoted specifically to the "Economic Value of Wilderness" (Payne and others 1992). The breadth of topics addressed at this conference was comprehensive, ranging from recreation economics to regional economic impact analyses. As presented below, there have been more than a dozen studies quantifying the economic value of wilderness recreation and the other economic benefits that wilderness provides society.

While economic factors should never be the driving force in wilderness designations or wilderness management, neither can they be overlooked. One side or the other in the contentious debates about wilderness designation and sometimes wilderness management, will raise economic issues. It is often done as a "smokescreen" to obscure the individual's or group's real motivation. Only by quantitative economic analysis can we evaluate whether economic factors really are critical in each specific case. Many wilderness designations preclude the managing agency from doing economically inefficient things like below-cost timber sales (Stewart and others 1992). In these cases, national economic efficiency is enhanced even if visitation is minimal. In other cases, wilderness designation of under-represented ecosystem types may carry large opportunity costs of efficient development foregone. As illustrated below for Colorado, wilderness economics can also help us answer the question of "how much wilderness is enough?" Few things in economics are all or nothing, and the same is true for Wilderness. In Colorado, 9.6 million acres out of 10 million roadless acres appeared to be the economic optimum in 1984 (Walsh and others 1984). Economics also provides another way to communicate the natural and social values of wilderness to the public officials who must ultimately decide whether an area is designated or not and, once designated, how it should be managed.

## Conceptual Basis for Economic Values of Wilderness

Wilderness preservation provides many direct, economic benefits to humans (Morton 1999). Wilderness protects watersheds, providing high quality waterflows to support fish, wildlife and consumptive uses of water. Wilderness is well-known for providing habitat to wildlife. In California, where only a small fraction of National Forest land is Wilderness, a large proportion of the deer hunting takes place in wilderness areas (Loomis 1993). Of course wilderness provides hiking, backpacking, horseback riding, mountain climbing, and primitive camping experiences as well as canoeing in some wilderness areas (for example the Boundary Waters).

Historically, federal agencies have not charged for access to wilderness areas. Nonetheless such recreation opportunities do have economic values since they meet two conditions: 1) wilderness recreation is scarce; 2) it provides enjoyment and satisfaction. What visitors would pay over and above

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their actual cost is the conceptually correct measure of the value of gains (Sassone and Schaeffer 1978; Stokey and Zeckhauser 1978) and the federally accepted measure of benefits as well (U.S. Water Resources Council 1983; U.S. Dept of Interior 1986, 1994). This net willingness to pay is sometimes called consumer surplus. We present below estimates of visitor willingness to pay (WTP) for wilderness recreation.

Only a portion of the economic value of wilderness relates to recreation. The general public's value from just knowing that self-regulating, intact ecosystems represented in wilderness areas exist and will be available for future generations has a sizeable economic value as well. The empirical literature on existence values and the current generation's bequest values to future generations from wilderness preservation is reviewed below.

# Methods for Estimating the Economic Values of Wilderness

## Travel Cost Method

This method uses variation in travel costs of visitors living at different distances from wilderness areas as prices and associated number of trips taken as a measure of quantities to statistically trace out a demand curve for recreation to a particular site. From the demand curve the consumer surplus or net WTP for wilderness recreation is calculated (Loomis and Walsh 1997). The travel cost method is quite capable of measuring the value of hunting, fishing, wildlife viewing, canoeing, backpacking, etc. This method has been extensively used to estimate the recreation benefits associated with wilderness but is not capable of estimating existence or bequest values.

## Contingent Valuation Method

The contingent value method (CVM) is a survey technique that constructs a hypothetical market to measure willingness to pay or accept compensation for different levels of nonmarketed natural and environmental resources. The method involves in-person or telephone interviews or a mail questionnaire. CVM is not only capable of measuring the value of outdoor recreation under alternative levels of wildlife/fish abundance, crowding, instream flow, etc., it is the only method currently available to measure ecosystem values, such as benefits the general public receive from the continued existence values of unique natural environments or species.

The basic notion of CVM is that a realistic but hypothetical market for "buying" use and/or preservation of a nonmarketed natural resource can be credibly communicated to an individual. Then the individual is told to use the market to express his or her valuation of the resource. Key features of the market include: (1) description of the resource being preserved; (2) means of payment (often called payment vehicle) and (3) type of willingness to pay question (such as open-ended or close-ended). For a more complete discussion of CVM see Loomis and Walsh 1997.

## Use of TCM and CVM by Federal and State Agencies

Both TCM and CVM are accepted by government agencies for valuing both recreation and other nonmarketed benefits of ecosystem services. TCM and CVM have been recommended twice by the U.S. Water Resources Council (1983) under two different Administrations as the two preferred methods for valuing outdoor recreation in federal benefit cost analyses. The U.S. Department of Interior (1986, 1994) endorsed both as methods for estimating the value of nonmarketed natural resources damaged by oil spills and other toxic events.

The U.S. Bureau of Reclamation and National Park Service (NPS) relied on CVM to value in dollar terms the recreational fishing and rafting effects of alternative hydropower water releases from Glen Canyon dam into the Grand Canyon. The Montana Department of Fish, Wildlife and Parks relied on a CVM survey of the benefits of viewing and hunting elk when justifying its purchase of additional elk winter range outside of Yellowstone National Park. State fish and game agencies in Arizona, California, Idaho, Maine, Missouri, Nevada and Oregon use TCM and CVM for valuing wildlife-related recreation.

Incorporating existence and bequest (passive use) values is becoming more frequent in Federal benefit-cost analyses. The U.S. Fish and Wildlife Service used CVM to value the passive use values of the wolf recovery program. The USDA Economic Research Service's economic analysis of salmon recovery efforts on the Snake River included rough estimates of passive use values drawn from the existing literature (Aillery and others 1996). The U.S. Bureau of Reclamation monetized passive use values from a more natural river flow regime from Glen Canyon dam above Grand Canyon National Park.

# Results on Recreation Value of Wilderness

## Recreation Use in USFS and NPS Wilderness

To estimate the recreation economic benefits from wilderness requires data on economic benefits to visitors and the number of visitors. Cole (1996) has compiled much of what we know about wilderness visitation. These data are the best available, consistently compiled for the U.S. Forest Service and National Park Service. However, wilderness use trends are difficult to measure accurately for several reasons. For example, methods for collecting visitor-use data at non-permit wilderness areas have sometimes changed from year to year. The quality of data collection efforts varies with funding and staffing devoted to the task. Further, the U.S. Forest Service and National Park Service use different units of measurement—the Recreation Visitor Day (RVD) and the Overnight Stay (OS), respectively. The Overnight Stay is considered to be a better indicator of intensity; although a factor of 2.5 is often employed to obtain equivalent RVDs (Cole 1996).

Generally speaking, the trend in recreation visits to Forest Service wilderness has paralleled designations of acreage. Use grew at more than 9.4 percent annually between 1965 and 1974. In the Pacific Coast region, use grew at a faster pace (nearly 17 percent annually) than designations. Between 1975 and 1985, the rate of growth in use increased to roughly 10 percent per year. Forest Service wilderness visits increased by about 4.5 million RVDs, led by a 298.4 percent gain (3.3 million recreation visitor days) in the Rocky Mountain region and a 700,000 RVD increase in the Pacific Coast region. Large increases in the South during that period closely followed substantial acreage additions. After 1985, as growth in supply leveled off, Forest Service wilderness use grew more slowly rising 8.4 percent by 1993. Recreation visitor days at Forest Service Wilderness for selected years between 1965 and 1993 are shown in table 1.

Use of National Park Service wilderness (table 2) generally follows large acreage designations, with a few exceptions or lags. The largest increase in National Park Service wilderness use occurred in 1984 with the addition of Yosemite and Sequoia-Kings Canyon in California to the National Wilderness Preservation System (NWPS).

## U.S. Fish and Wildlife Service Visitor Use

The U.S. Fish and Wildlife Service (FWS) does not maintain or report data on visits to wilderness areas within its National Wildlife Refuge System. It reports only total visits to each Refuge taken as a whole. To determine the visitor-days occurring in wilderness areas in National Wildlife Refuges we obtained information on the wilderness acres within each refuge and then individual refuges were contacted to determine the number of total visits that are attributable to the wilderness acres. While 63 Refuges have designated wilderness acreage, only the 14 with a substantial percentage of wilderness acres were contacted for two reasons. First, only on refuges where wilderness acreage represents a large percentage of the refuge or a large absolute amount of acreage would managers likely be able to provide accurate estimates of the proportion of Refuge visits attributable to Wilderness. Second, refuges with only a few hundred acres of wilderness would likely contribute such a small amount to total visits that it was not deemed worthwhile to contact the Refuge managers for such information. Thus, Refuge managers for each of the 14 Refuges were

**Table 1**—National Forest wilderness visitor use in 12-hour recreation visitor days for the U.S. and Regions for selected years.

| Year | U.S. total | North | South | Rocky Mountains | Pacific Coast |
|---|---|---|---|---|---|
| 1965 | 2,951,500 | 717,200 | 13,700 | 996,500 | 1,224,100 |
| 1970 | 4,646,000 | 1,171,500 | 15,300 | 1,054,500 | 2,404,700 |
| 1975 | 6,465,000 | 1,205,200 | 169,900 | 1,635,900 | 3,454,000 |
| 1980 | 9,079,360 | 1,421,300 | 422,600 | 3,751,460 | 3,484,000 |
| 1985 | 10,954,170 | 1,352,920 | 527,850 | 4,917,400 | 4,156,000 |
| 1990 | 11,569,821 | 1,821,800 | 519,783 | 5,136,700 | 4,091,538 |
| 1993 | 12,028,873 | 1,837,800 | 507,716 | 5,959,575 | 3,723,782 |

**Table 2**—National Park Service wilderness visitation statistics, U.S. total and Regions for selected years.

| | | Regions | | | |
|---|---|---|---|---|---|
| Year | U.S. | North | South | Rocky Mountains | Pacific Coast |
| **Overnight stays** | | | | | |
| 1965 | 0 | 0 | 0 | 0 | 0 |
| 1971 | 73 | | | 73 | |
| 1975 | 15,244 | | | 282 | 14,911 |
| 1980 | 179,763 | 28,043 | 89,101 | 15,801 | 46,684 |
| 1985 | 417,774 | 32,313 | 73,570 | 13,065 | 298,826 |
| 1990 | 559,093 | 37,489 | 81,459 | 11,631 | 428,504 |
| 1993 | 688,208 | 40,690 | 106,921 | 14,966 | 525,625 |
| 1994 | 738,434 | 43,673 | 109,174 | 17,976 | 567,611 |
| **Day use** | | | | | |
| 1965 | 0 | 0 | 0 | 0 | 0 |
| 1971 | 183 | | | 183 | |
| 1975 | 38,110 | | | 705 | 37,278 |
| 1980 | 449,408 | 70,108 | 222,753 | 39,503 | 116,710 |
| 1985 | 1,044,435 | 80,783 | 183,925 | 32,663 | 747,065 |
| 1990 | 1,397,733 | 93,723 | 203,648 | 29,078 | 1,071,260 |
| 1993 | 1,720,520 | 101,725 | 267,303 | 37,415 | 1,314,063 |
| 1994 | 1,846,085 | 109,183 | 272,935 | 44,940 | 1,419,028 |

**Table 3**—Total acreage and estimates of visitor use in National Wildlife Refuge Wilderness Areas, 1996.

| Region | Total wilderness acres | Acres surveyed | Estimated use |
|---|---|---|---|
| Alaska | 18,676,320 | None surveyed | — |
| Pacific | 1,475 | None surveyed | — |
| Rocky Mountain | 1,473,384 | 1,405,251 | 66,785 |
| Northeast | 63,528 | 25,150 | 2,170 |
| Southeast | 461,630 | 403,693 | 283,328 |
| Total | 20,676,340 | 1,834,094 | 352,283 |

contacted and asked about the percentage of activities which take place in the wilderness areas.

We surveyed most of the wilderness acreage in National Wildlife Refuges in the Rocky Mountain and Southeast Regions (Table 3). The areas in these Refuges account for nearly all of the Wildlife Refuge acreage in the Lower 48 States. Combining each Refuge Manager's estimates yields a total of about 350,000 visits to Wilderness Areas on refuges. About 80 percent of the visits occur in the South. More accurate assessment of wilderness use on National Wildlife Refuges will not be possible unless the FWS makes wilderness data collection a priority.

## Bureau of Land Management Visitor Use

The BLM recently developed a database system for recording recreation use at its wilderness areas. However, the system is not accessible to either BLM staff or the public on any centralized computer system. Not surprisingly, the visitor use data are incomplete and the lack of access provides little incentive for agency personnel to use or update the system.

The most detailed data available are for Arizona Wilderness Areas. Combining the data for Arizona, Colorado (only three areas reported), Montana and Utah (only one area each is reported) yields 63,000 visits in 1996 on 1.15 million acres. The Pacific Coast region reports 53,700 visits in 1996 on 735,200 acres, with the majority of the visits being in California.

The visitor use statistics in the BLM database are very likely substantial underestimates of use, as zero visitation is reported for thousands of acres of Wilderness Areas located in several BLM Districts in California. Wilderness visitation data are reported in the database for less than half the designated acreage. Given that much BLM wilderness is high desert, with spring and fall seasons of use that complement rather than substitute for Forest Service and Park Service alpine wilderness areas that receive primarily summer use, one would expect total visits to be in the millions, not 116,000 visits as reported for 1996. Knowing visitor use is part of the foundation of an agency's wilderness management program. Without knowing current use, it is difficult to assess trends for monitoring impacts and to objectively evaluate the merits of designations of additional areas.

## Other Sources of Visitor Use Data

Given the variable reliability of wilderness visitor use information, especially from the BLM and FWS, it is useful to have other independent estimates of visitation. One available estimate is provided by Cordell and Teasley (1997), who used data from the 1994-95 National Survey on Recreation and the Environment. Their approach employed a telephone survey of U.S. households, so it is based on the self-reported number of visits to areas the respondents perceived to be wilderness areas. Based on these responses, Cordell and Teasley estimated 40.4 million visits to wilderness areas in 1995. Since the sum of Forest Service and National Park Service RVD's is about 14 million, with about 100,000 visits from the BLM and 352,000 from the FWS, the combined agencies reported total is about 14.5 million visits. Thus, the agency-derived estimates appear to be conservative. Given the heated debates over Wilderness acreage recommendations, it would seem that agencies would want to have data on visitor use. This is particularly true for the BLM. This agency has more acres being debated for wilderness than any other agency, yet it knows the least about visitor use of its wilderness areas. This contributes to debates being based on emotion rather than data.

## Results on Recreation Values Per Day

There have been about two dozen empirical studies of the economic value of recreation in wilderness areas. These were originally compiled by Sorg and Loomis (1984), added to by Walsh and others (1992), and recently updated by

**Table 4**—Recreation values of wilderness (1996 dollars).

| Author | Year | Location | Method[a] | Value/day |
|---|---|---|---|---|
| Brown & Plummer | 1979 | WA & OR | TCM | $141 |
| Loomis | 1979 | UT | TCM | $30 |
| Smith & Kopp | 1980 | CA | TCM | $35 |
| Walsh and others | 1981 | CO | TCM | $25 |
| Walsh & Gilliam | 1982 | CO | CVM | $28 |
| Walsh and others | 1985 | CO | CVM | $33 |
| Walsh and others | 1985 | CO | TCM | $36 |
| Barrick | 1986 | WY | CVM | $15 |
| Peterson & Rosenthal | 1986 | MN | TCM | $24 |
| Rosenthal & Walsh | 1986 | CO | CVM | $17 |
| Leuschner and others | 1987 | NC | TCM | $13 |
| Prince | 1988 | VA | CVM | $17 |
| Peterson and others | 1988 | MN | TCM | $12 |
| Peterson and others | 1988 | MN | TCM | $36 |
| Hellerstein | 1991 | MN | TCM | $29 |
| Halstead and others | 1991 | NH | CVM | $2 |
| Englin & Shonkwiler | 1994 | WA | TCM | $22 |
| Englin & Shonkwiler | 1994 | WA | TCM | $34 |
| Casey and others | 1995 | NC | TCM | $218 |
| Baker | 1996 | CA | TCM | $25 |
| Overall average | | | | $39.61 |

[a]TCM is travel cost method; CVM is contingent valuation method.

Loomis and others (1998). Table 4 presents the summary of values per day. The average value of these studies is $39.61 per day in 1996 dollars. This means each visitor would pay nearly $40 more than his or her travel cost rather than lose a day visiting a wilderness area for recreation. When multiplied by the estimated 14.5 million days of wilderness recreation, the aggregate value is $574 million annually.

## Estimates of Passive Use Values of Wilderness

Undeveloped and pristine environments by their nature cannot be created, only destroyed. It was this fact that led Weisbrod (1964) to suggest they might be a source of option value, to maintain the opportunity to visit them in the future. To this, Krutilla (1967) added the categories of existence and bequest value. The Wilderness Act of 1964 emphasizes many societal benefits to wilderness preservation that go well beyond simply recreational use. Wilderness provides a storehouse of biodiversity and, even to non-visiting members of the general public represents the last vestiges of what North America was before Europeans arrived.

Walsh and others (1984) represent the first attempt to apply CVM to measure the option, existence, bequest as well as recreation value of wilderness. They conducted a mail survey of Colorado residents in 1980. In the survey booklet they asked households their annual willingness to pay (WTP) into a fund for continued preservation of the current (at the time of the study) 1.2 million acres of wilderness in Colorado, then WTP for 2.6 million acres, 5 million acres and finally for designating all roadless areas in Colorado (10 million acres) as wilderness. Following these questions, they asked what percent of WTP was for recreation use this year, maintaining the option to visit in the future, knowing that wilderness areas exist as a natural habitat for plants, fish and wildlife, and finally, knowing that future generations would have wilderness areas. The mail survey had a 41% response rate after two mailings.

The results are summarized in table 5 on both a per household basis as well as in the aggregate for Colorado households. This second calculation illustrates the public good nature of option, existence and bequest values: they are summed over the entire population. Given the sample was just Colorado households, the expansion is just to Colorado households, although clearly, households outside of Colorado receive existence and bequest values as well. To include an estimate of the value the rest of U.S. households receive from Wilderness, we use the rough approximation of Walsh and others (1982). This approximation is based on what Colorado residents would pay for wilderness protection in the rest of the U.S. This is probably a conservative estimate of what non-Colorado residents would pay for wilderness, as Colorado residents had more than a million acres of wilderness at the time of the survey. The majority of the U.S. population in the east and Midwest have little wilderness, so an additional acre of wilderness is probably worth more to them than to Colorado residents.

To calculate a land value comparable to a stumpage value for timber or the value of a mineral deposit the annual values of wilderness benefits are summed over time. Specifically, the annual benefits of wilderness in perpetuity are discounted back to the present using the interest rate. The resulting sum is referred to as the present value of this future stream of wilderness benefits.

Two other patterns are worth pointing out in this table. First, WTP per household and in the aggregate increases with the number of acres protected, but at a decreasing rate

**Table 5**—Recreation and passive use values of wilderness in Colorado and Utah.

| Study | 1st Acres | 2nd Acres | 3rd Acres | 4th Acres |
|---|---|---|---|---|
| **Colorado** | | | | |
| Walsh and others (1982) (millions of acres) | 1.2 | 2.6 | 5 | 10 |
| Total passive use per household | $13.92 | $18.75 | $25.30 | $31.83 |
| Total for CO (millions of 1980 dollars) | $15.3 | $20.6 | $27.8 | $35.0 |
| Recreation | $13.2 | $21.0 | $33.1 | $58.2 |
| Total economic value for Colorado (millions) | $28.5 | $41.6 | $60.9 | $93.2 |
| Percent passive use | 54% | 50% | 46% | 38% |
| Marginal present value per acre to Colorado and U.S. residents | $1,246 | $320 | $220 | $220 |
| **Utah** | | | | |
| Pope & Jones (millions of acres) | 2.7 | 5.4 | 8.1 | 16.2 |
| Total economic value per household | $52.72 | $64.30 | $75.15 | $92.21 |
| Total for Utah (millions of 1990 dollars) | $26.7 | $32.5 | $38.0 | $46.7 |
| Marginal present value per acre to Utah and U.S. residents | $402 | $245 | $190 | $117 |

as expected from diminishing marginal rate of substitution. Second, option, existence and bequest values represent about half the total economic value of wilderness. Walsh and others, also concluded that WTP exceeded the opportunity costs of designating 9 of the 10 million acres as wilderness. The present value per acre of wilderness to Colorado and rest of U.S. households ranged from a high of $1,246 per acre for 1.2 million acres to $220 per acre when 5-10 million acres was preserved.

The second study of the total economic value of wilderness preservation was performed by Pope and Jones (1990) in Utah. They conducted telephone interviews of Utah households regarding designation of alternative quantities of BLM land as wilderness. They obtained a 62% participation rate of households contacted. The results are presented in table 5 and illustrate a similar pattern of WTP rising at a decreasing rate for increased acreage designated.

The only study of total economic value of eastern U.S. wilderness was conducted by Gilbert and others (1992) to value the Lye Brook Wilderness Area and other wilderness areas in New England. Two versions of a mail questionnaire were mailed to separate samples of Vermont residents, which resulted in an overall response rate of 30% after two mailings. One version of the questionnaire asked respondents to value continued protection and management of the Lye Brook Wilderness area; the other to value protection of all wilderness areas east of the Mississippi River. Two separate samples composed of individuals who had visited an eastern wilderness area were apparently able to use this familiarity to distinguish between valuation of one area and all Eastern wilderness areas. Their annual total value was $9.71 for Lye Brook while a separate sample of people that had visited at least one Eastern wilderness area, had a total economic value for all Eastern wilderness areas of $14.28.

Table 6 presents the apportionment of total value into the individual use and passive use components and yields a pattern similar to that of Walsh and others—a majority of the value of wilderness is related to option, existence and bequest values. Table 6 also presents Gilbert and others' (1992) new category, related to altruism, protecting it for current use by others.

Barrick (1986) provides estimates for the option value of one wilderness area (Washakie in Wyoming). On-site users' option value for future visits was $46 in 1983, or $69 in 1996 dollars. For urban and rural non-visiting households living throughout the U.S., the option value for the Washakie Wilderness area was $9.70 and $8.40, respectively in 1983 dollars, or $14.60 and $12.70 in 1996 dollars.

As contingent valuation has spread internationally, it has been used to estimate the value of placing public forest lands off limits to logging in national parks. One such study was performed by Lockwood and others (1993) for preservation of wet and dry eucalyptus forests on the Errinundra Plateau in Victoria and New South Wales, Australia. A mail survey of households in the two states was sent out asking households their WTP to preserve roughly 100,000 hectares of old-growth forests. The survey had a response rate of 65%. Dichotomous choice CVM was used and the median WTP was $52 per household. As shown in table 6, the distribution of total economic value is dominated by existence and bequest values, again illustrating the importance of including these values in economic analyses of forest allocation decisions. Lockwood and others also performed a benefit-cost analysis that shows that the net present value of protecting these old growth forests in National Parks is positive for a wide range of assumptions about discount rates and assumptions about WTP of non-respondents.

Table 7 displays a rough estimate of the present value per acre of passive use value for wilderness in the West (using Walsh and others 1982 and the Pope and Jones 1990) and in the East using Gilbert and others (1992). As explained above, we used a conservative assumption of Walsh and others (1982) which uses what Colorado residents would pay for wilderness in the rest of the U.S. to estimate what U.S. households would pay for wilderness. The Utah value was estimated taking Utah resident value per acre divided by

**Table 6**—Distribution of total economic value per household.

| | Own recreation | Option value | Existence value | Bequest value | Altruistic value |
|---|---|---|---|---|---|
| **Walsh and others** | | | | | |
| Colorado | $14.00 | $5.44 | $6.56 | $6.75 | not asked |
| **Gilbert and others** | | | | | |
| Lye Brook | $1.27 | $1.64 | $1.95 | $2.87 | $1.97 |
| All Eastern wilderness | $2.26 | $2.41 | $3.03 | $4.14 | $2.44 |
| **Lockwood and others** | | | | | |
| S.E. Australia | $5.46 | $9.88 | $18.98 | $17.16 | not asked |

**Table 7**—Total passive use value.

| | Acres | $/Acre | Total value |
|---|---|---|---|
| | *Millions* | | *Millions* |
| Lower 48 Western | 42.7 | 168 | $7,173 |
| Eastern U.S. | 4.5 | 104 | $468 |

Walsh and others (1982) discount rate of 7.375%. Using this procedure the value per acre in the Western states outside of Alaska is estimated to be $168 per acre. When applied to the 42.7 million acres yields a present value of $7.17 billion. To estimate the economic value of Eastern wilderness, the Eastern value per household was multiplied times number of households in U.S. The present value of this Eastern wilderness is estimated at $468 million. Thus the total benefits in the lower 48 states is $7.5 billion. This is, of course, a very rough approximation that should be refined as additional passive use value of wilderness studies are performed.

### Passive Use Values for Canadian Wilderness Using CVM and Constructed Preferences

An alternative approach to estimating recreation and passive use values for wilderness adapts multiattribute theory to help individuals construct their preferences toward wilderness. In this approach, small groups of individuals are asked to first think through the trade-offs of wilderness preservation benefits versus costs of wilderness to society. This first step involves ranking and then weighting various benefit categories such as recreation, biodiversity, existence and bequest values. In McDaniels and Roessler's (1998) application in British Columbia, individuals in the group decide how much timber revenue the Provincial government should give up for the proposed doubling of Provincial wilderness acreage. They ask individuals to make this monetary determination twice, first for the benefits to the current generation and then for the benefits to future generations. This small sample (n=26) of students believes it would be appropriate for British Columbia government to sacrifice between $169 million and $338 million annually for a doubling of Provincial wilderness. The authors note the lower of these estimates is fairly close to the dichotomous choice CVM results of Reid and others (1995) for the same doubling of Provincial wilderness. Their CVM study estimated household WTP of $119 annually based on 1,571 surveys returned out of 3,000 mailed. The total Provincial benefits were calculated at $159 million annually. This yields an annual value of $28 per hectare of additional wilderness. Using the Provincial discount rate of 6%, this yields a present value of $466 per hectare, or $1,151 per acre. This value is equal to the upper range of the present values in Colorado.

## Conflicting Views on Costs of Wilderness Designation

### How Significant are the Opportunity Costs of Commodities Foregone?

While there is almost always a large perceived cost of wilderness designation, often held by local residents or industry, net economic benefits of development foregone are generally quite small or zero. As Irland (1979) points out, most roadless areas remained roadless because they were quite marginal for timber, especially when compared to the road construction costs. Outside of Oregon, Washington and northern California, most National Forests lose money on timber sales as the roading and restoration costs exceed the value of timber. In Montana, a U.S. Forest Service study by Stewart and others (1992) demonstrated that timber harvesting in three roadless areas on the Lolo National Forest would have a net present value loss of $2.14 million.

### Are There Non-Market Costs of Wilderness Designation?

Sometimes it is alleged that locals would pay not to have wilderness. Certainly, there are such individuals in the population. However, it is important to determine whether their motivation for being against wilderness is related to market costs that would already be counted in the cost side of a benefit-cost analysis. If there are net economic losses (producer surplus losses) to local logging and mining activity that are not off-set by production elsewhere, these costs are normally counted in benefit-cost analysis using market prices minus production costs. There is no need to elicit such costs from the public in a survey and doing so would double count these costs. Sometimes, there is local concern over lost jobs as well. However, these jobs are usually gained elsewhere, resulting in no net change in national employment. Hence they are not properly counted as a loss in benefit-cost analysis (U.S. Water Resources Council 1983; Sassone and Schaefer 1978). Occasionally, there may be non-market losses associated with wilderness designation. For example, the loss of ORV opportunities. It has even been alleged that there may be passive use values lost for wilderness designation (Keith and others 1986; Barrick 1986). Lockwood and others (1994) were the first to estimate whether there was a significant passive use value for logging of forests. The median WTP was zero, although 19% did indicate a positive WTP for logging. When asked to state the reasons, the majority indicated it was related to the economic activity generated or timber jobs. Since protection of old-growth forests will result in increased harvesting of timber elsewhere in order to meet demand, overall economic activity will likely not change, and logging jobs will increase elsewhere by the amount they fall in the wilderness area. Only 30% of the WTP of those 19% offering a positive WTP (6% of the sample) was related to the benefits derived from knowing the forests are logged. This amounts to $6 per year, for the 19% that would pay. While Keith and others (1986) found sizeable values for retaining multiple use instead of wilderness it is not clear, how much of this is a non-market value versus market effects on ranching, mining and logging, as the authors did not net these out. Thus, the potential for double counting of costs is evident in their study.

## Directions for Future Research

Several recommendations are in order for improving our knowledge of wilderness values. First and foremost is the need for agencies to put a high priority on collection of visitor use data in wilderness. As noted by Cole (1996), only 13% of Forest Service wilderness areas in 1989 had counts based on permits or counters. Much of the rest of the Forest Service wilderness area data are based on field personnel estimates. This adds unnecessary noise and variance to the estimates.

This lack of documented visitor use has brought criticism of Forest Service economic analysis of recreation use in the recent past (Schallau and others 1997) and will continue to do so until the agency recognizes the far reaching importance of the visitor estimates in many facets of its management.

While the Forest Service estimates are not as systematic as they could be, their coverage of their wilderness areas is far superior to the Bureau of Land Management and U.S. Fish and Wildlife Service. The FWS does not appear to maintain any central database on visitor use of its wilderness. The BLM has a database, but only one person in the entire agency knows how to access it. The numbers in the database are questionable as the database reports that visitation at many of BLM's wilderness areas in southern California is zero. It is hard to believe that large areas of public land next to more than 15 million people receive no use. Visitor use statistics are fundamental to monitoring of ecological impacts, social carrying capacity as well as economic analysis. Given the controversial nature of BLM wilderness recommendations, some simple visitor counts would add a great deal of light to rather emotional debates on this topic.

We also recommend that the U.S. Forest Service augment its current Resource Planning Act values, which currently reflect only multiple use outputs, to include the economic values of ecosystems. The need for such information is greatest with regards to wilderness. At present, the only economic value reflected in the RPA system for wilderness is a value per recreation visitor day. However, the Wilderness Act specifies that recreation is just one of many important reasons for the preservation of wilderness. It is often no wonder that Forest Service managers are hesitant to rely on the agency's economic analysis in making wilderness recommendations when the only representation of the economic value of wilderness is a value per visitor day. The existing literature (Walsh and others 1984) suggests that recreation is about 50% of the total value of wilderness. Augmenting the RPA accounts to include a value per acre for wilderness would better reflect its economic values. This would go along way toward demonstrating the relevance of economics to wilderness allocation and management issues.

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