

Total Economic Value of US National Park Service Estimated to be \$92 Billion: Implications for Policy

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Introduction

AMERICA'S NATIONAL PARKS "ARE THE BEST IDEA WE EVER HAD." So said Pulitzer Prize-winning American author Wallace Stegner.¹ A new survey suggests Americans also consider the National Park Service (both the parks, and the associated programs of the agency which runs them) to be of the most valuable assets we ever had—worth some \$92 billion a year.

The present paper describes the results of the survey, which is the first-ever comprehensive estimate of the total economic value of the National Park Service (NPS). The valuation estimate covers NPS-administered lands, waters, and historic sites—the national park system. It also includes NPS programs, many of which extend far beyond the parks themselves, such as protection of natural landmarks and historic sites, partnerships with local communities, support of recreational activities, and educational programs. These two components of the NPS mission—managing the 400+ units of the national park system, and carrying out the 30+ external partnership programs—are the focus of our analysis. The remainder of this article describes the economic concepts, methodology, survey design, and results.

Economic concepts and methods

A number of studies conducted over the past 30 years have looked at the amount the public would willingly pay for *individual units* or *specific benefits* of the US national park system. Such studies utilize a range of attributes, values, and methodologies.² Other studies have focused on the direct economic impact (in terms of employment, tax revenue, and so forth) of visitor spending at national parks.³

The present study is different. It estimates the total economic value (TEV; Freeman, 2003) of the entire national park system and NPS programs, including recreation and other direct use values that derive from onsite use, as well as passive use values that are independent of onsite use. Passive use values include existence value (the benefit derived by consumers

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from simply knowing that national parks are protected), bequest value (the value of knowing that their continued protection today provides benefits for future generations), and option value (the benefit one gains from knowing that one may use national parks in the future). This application of TEV to national parks and NPS programs was proposed by Choi and Marlowe (2012).

Most of the economic value associated with the National Park Service derives from non-traded services for which there are no formal markets: recreation opportunities, clean air, wildlife habitat, and so forth. Economic values can be defined as the maximum amount that an individual consumer would pay for a particular good or service (“willingness to pay,” or WTP). An alternative measure is “willingness to accept,” or WTA, which is the minimum amount of money that an individual would require in order to relinquish a particular good or service. This measure is typically used by economists to estimate the value associated with taking away a resource that the public already “owns” or is entitled to (Freeman 2003).

In the current restrictive environment for public spending, we chose to look at program cuts rather than additions to NPS programs or services, which were viewed by survey pre-test respondents as politically unrealistic. This would normally point to the WTA method. However, research shows that WTA is often substantially larger than WTP, especially for non-market goods (Horowitz and McConnell 2002) when applied to the same public good. Willingness to pay can be applied to cases where one is taking away a public good if the scenario is described in terms of the need for additional funding to maintain a certain quantity of the public good. Therefore, in order to be conservative and to be consistent with the valuation methods used by other federal agencies, we selected WTP.⁴

Survey design

Because the magnitude of existence and bequest values are not reflected in market prices, economists rely on what people say they would pay in surveys that present respondents with a “simulated” market. In particular, the methodology used by academic and government economists to measure TEV involves presenting people with a trade-off between different quantities of publicly provided goods and specific costs, often in the form of increased taxes. This specificity is what distinguishes our TEV economic survey from the usual public opinion poll. The typical public opinion poll simply asks, “are you in favor or opposed?” with no cost mentioned, or asks if respondents would pay an unspecified increase in taxes for an unspecified amount of a public good.

The goal of our economic survey was to estimate the value of the entire national park system and NPS programs to American households, including those that are not visitors. We therefore surveyed a random sample of households and asked what they would pay to prevent the sale of some national park lands, waters, and historic sites, or cuts to some NPS programs.

Participants were asked whether they would pay specific increased annual federal income taxes in order to retain all the current national parks and NPS programs. We used income taxes as they are a recommended approach to obtaining a conservative measure of the amount of money a household would pay for a public good (Carson and Groves 2007). The

economic survey methodology used is consistent with the techniques employed by numerous federal agencies and academic economists for economic valuation of public programs (US Office of Management and Budget 1992; Arrow et al. 1993; US Environmental Protection Agency 2010).

To accomplish the goal of valuing the entire national park system and the NPS programs, the survey first clearly defines national park lands and waters (including historic sites such as battlefields, birthplaces of presidents, national monuments, and memorials) as well as NPS programs. It then specifies that without an increase in income taxes, a specific number of acres and historic sites would be sold. The amount sold ranged from 20–40% of the current total. We specified this range rather than sale of 100% of the national park system and NPS programs because we felt respondents would not treat such a scenario as realistic, even though the ultimate goal of the study was to value the entire NPS system and programs.

The respondent is then asked to choose from among three options: one which retains all parks and which has the highest tax increase; a “middle” option which has smaller cuts, but also a smaller cost to the household; and a third option with both the largest cuts and no cost to their household. By making a choice of their most preferred option, the respondents indicate whether their household would pay the specified tax increase to prevent the sale. The same approach is used for NPS programs such as the National Register of Historic Places, educational programs, and so forth. The specific increase in taxes and the size of the cuts are varied across 16 versions of the survey in order to estimate statistically the economic value.

The TEV survey was administered using a 12-page color questionnaire that was mailed to a random sample of all deliverable addresses in the United States. Two separate mailings totaling 4,200 (1,800 in 2013–2014 and 2,400 in 2015) were performed, with a total of 3,876 ultimately deliverable. The mailing included a postage-paid return envelope. A URL was also provided for those who wished to complete the survey online. Multiple follow-up contacts with non-respondents were made (by phone and mail), and included a second mailing of the survey and postage-paid return envelope.

Survey results

Despite our efforts to encourage responses, the final response rate was 18%—a low rate, but one which reflects a recent trend toward declining participation in similar surveys.⁵ Furthermore, the respondent demographics were different from those of the general population. To account for this we adopted a post-survey weighting procedure called “raking” (suggested by the National Research Council 2013) to reweight the sample observations to make the survey responses more representative of the general public.

Raking is a technique which uses known population proportions on specific characteristics and weights each sample observation so that the sample proportions reflect the population proportions. We used an algorithm in the Stata statistical package and performed several different weighting procedures—one using education level, age, income, race, and work status (retired or not); another using these characteristics along with national park visitation; and a third using only the visitation. Reducing the weight given sample observations to reflect visitation rates in the population resulted in the most statistically robust rank-ordered regres-

sion results and was chosen for the final valuation analysis. Since demographics are often determinants of national park visitation (Henrickson and Johnson 2013; Neher et al. 2013), weighting on visitation may implicitly adjust for demographics as well.

The survey results reflect rational economic behavior—the higher the cost (dollar amount) presented in the survey, the less likely a household would pay. This indicates that respondents were paying close attention to the payment amounts and gives us high confidence in our economic valuation.

Nearly half the sample indicated they would pay the highest income tax increase (by choosing the option which avoided all cuts to national park lands waters and historic sites as the preferred option).⁶ About one-third would pay the smaller income tax increase to reduce the size of the proposed cuts to national parks. The remainder would not pay at all and would allow the full cuts specified in the survey. The presence of a significant percentage of respondents who would not pay the full amount to avoid all cuts, and another significant percentage that would not pay anything, indicates that respondents were making economic trade-offs. In particular, 11% of the respondents who chose the full cut/no cost option indicated they could not afford to pay as much as was asked in their version of the survey and 2% indicated that national parks were not worth the cost to them. It should be noted that economists define “willingness to pay” to mean that a person is both willing and able to pay. Thus income and other expenses must enter into the determination of one’s willingness to pay. Table 1 shows the percentage of respondents’ selection of each option as their most preferred for parks and programs.

As noted, the survey asked respondents to indicate their most- and least-preferred options, which provides an implied ranking of the three choices. This enables us to use a rank-ordered logistic regression to estimate per-unit⁷ values for the national park system as well as for the NPS programs. Results from that analysis yielded a negative and statistically significant coefficient on the income tax cost of the option for both the parks and NPS programs. See Tables 2 and 3. This provides evidence of what economists call “internal validity”: that our valuation results are consistent with the law of demand—the higher the tax price,

Table 1. Responses to most preferred option.			
	Cost of option to household	Parks	NPS Programs
		<i>Percentage selecting as most preferred</i>	
Sale of some land in all parks; Cuts to all programs	\$0	12.71%	16.38%
Smaller lands sales in some or all parks; Smaller cuts to some or all programs	\$15–\$100	31.64%	45.48%
No sale of parks; No cuts to programs	\$115–600	49.44%	31.36%

Table 2. Results for national parks: Rank-ordered logit, weighted for national park visitation.

Dependent variable = Rank of the NPS park policy option

	Coefficient	Std. Error	Z	P> z
Annual cost of option (federal income tax)	-0.0017724	0.0002924	-6.06***	0.000
Nature-focused NPS (cuts avoided)	2.49E-08	6.99E-09	3.57***	0.000
History-focused NPS (cuts avoided)	0.0068598	0.0017039	4.03***	0.000
Water-focused NPS (cuts avoided)	3.60E-07	1.14E-07	3.14***	0.002
Number of observations = 1941 Number of groups = 647 (3 observations per groups)	Wald Chi-Sq(4) = 232.03 Prob > Chi-Sq = 0.0000		Log pseudo-likelihood = -1133.892	
*** significant at 99% confidence level				

Table 3. Results for NPS programs: Rank-ordered logit, weighted for national park visitation.

Dependent variable = Rank of the NPS program policy option

	Coefficient	Std. Error	Z	P> z
Annual cost of option (federal income tax)	-0.0041514	0.0003244	-12.8***	0.000
Historic sites and buildings protected each year (cuts avoided)	0.0006566	0.0002887	2.27**	0.023
Acres transferred to communities each year (cuts avoided)	0.0001513	0.0002011	0.75	0.452
Natural landmarks protected each year (cuts avoided)	0.012672	0.0051371	2.47**	0.014
School children served by NPS educational programs each year (cuts avoided)	6.91E-07	1.09E-07	6.33***	0.000
Number of observations = 1902 Number of groups = 634 (3 observations per groups)	Wald Chi-Sq(5) = 244.06 Prob > Chi-Sq = 0.0000		Log pseudo-likelihood = -1117.304	
*** significant at 99% confidence level, ** significant at 95% confidence level, * significant at 90% confidence level				

the lower the percentage of people that would “buy” the associated quantity of national parks and NPS programs.

Incremental (marginal) values for the attributes are calculated as the ratio of the attribute coefficient over the price coefficient (Holmes and Adamowicz 2003). From these marginal values we are then able to calculate per-household total values for each type of park and program output.

Using the marginal values, we estimated a per-household annual value for the average number of national park acres or sites spared from sale (the survey values ranged from 5% to 40%) of \$524.⁸ The estimated per-household annual value for NPS program outcomes spared from cuts is \$254.⁹ Both of these estimated per-household values are consistent with other national environmental surveys. Carson and Mitchell (1993) found the value of improving water quality of the nation’s water bodies to swimmable levels to be \$438 (adjusted for inflation) per household. A recent economic survey indicated that households would make a one-time payment of \$150 to avoid an oil spill comparable to the 2010 Deepwater Horizon incident in the Gulf of Mexico (Meade 2016). Walsh et al. (1984) found Colorado households would pay on average \$91.14 (in 2015 dollars) to protect 10 million acres of roadless land as wilderness.

To calculate the TEV of the entire national park system (lands, waters, and historic sites) and NPS programs we performed two calculations. First, we extended the values per unit (per acre, site, or program output) to the entire system and to the current total program outputs (Table 4). Second, we applied this value to 18% of US households (21 million).¹⁰ The result is a total value of \$62 billion for maintaining the entire national park system and an additional \$30 billion for maintaining all NPS programs. Hence the estimated total economic value of the National Park Service is \$92 billion.

Table 4. Per-household total economic value (TEV) for the national park system and NPS programs.	
National parks	Estimated value
Nature-focused national parks (79,096,632 acres)	\$1,113.24
History-focused national parks (226 sites)	\$874.71
Water-focused national parks (4,818,275 acres)	\$977.93
Per household value for all national park acres/sites	\$2,967.00
NPS programs	
Historic sites and buildings protected each year (2,000)	\$316.31
Acres transferred to communities each year (2,700)	\$98.41
Natural landmarks protected each year (114)	\$347.98
Schoolchildren served by NPS educational programs each year (4.1 million)	\$682.62
Per household value for all NPS programs	\$1,445.00

Comparison to other economic surveys

We can gain some perspective on this result by comparing our estimate with those of other studies. An analysis of national park visitors (using observed spending and travel behavior) by Neher et al. (2013) indicates the total *recreation* value of the national park system is \$28.5 billion.¹¹ Subtracting \$28.5 billion from our \$62 billion figure for the system indicates that existence and bequest value of national parks is \$33.5 billion. Put another way, slightly more than half of the TEV of the national park system is passive use value.

Our TEV values are also in line with estimates of total benefits from other nationwide contingent valuation method (CVM) surveys regarding environmental goods. Carson and Mitchell (1993: 2452) estimated a value of improving the water quality of America's rivers and lakes at \$69.5 billion (in 2015 dollars). This estimate is similar in magnitude to our estimate of the value of national parks (and would include bodies of water inside national parks). Schulze et al. (1983) estimated the value of maintaining air quality at three US national parks (Grand Canyon, Mesa Verde, and Zion) at \$17.8 billion in 2015 dollars. This suggests that our estimates for maintaining the entire national park system are conservative. Finally, according to a recent economic survey, the total WTP to avoid another oil spill like the 2010 Deepwater Horizon spill in the Gulf of Mexico is \$17 billion (Meade 2016).

Policy implications

Budget and maintenance backlog. There are at least three budgetary implications of our results. First is the great disparity between the monetary value the American public places on units of the national park system and NPS programs and the funding that they receive. In round numbers, federal funding for the National Park Service is \$3 billion annually, just one-thirtieth of the value Americans place on the asset. Americans value many government programs highly (e.g., federal highways, NASA, etc.). However we doubt that the gap between TEV and funding for these programs is as large as it is for the National Park Service.

Second, our results imply that there are substantial benefits to the American public from reducing and eventually eliminating the NPS maintenance backlog, which currently stands at \$12 billion. If Congress were to increase the NPS budget from \$3 billion to \$4.5 billion annually (still under 5% of the total value of the National Park Service), and all the additional increment were devoted to deferred maintenance, the \$12 billion backlog could be cleared in less than 10 years.

Third, given that slightly more than half of the value of the national park system and NPS programs is passive use value that does not arise from visitation, placing increasing emphasis on funding parks through user fees is inappropriate. The general public values these areas and programs regardless of whether or not they visit. Increased funding from general sources is therefore more appropriate.

Sagebrush Rebellion. Part of our survey specifically addressed the perennial push to turn over federal lands to states, counties, and private individuals (a tenet of the so-called "Sagebrush Rebellion"). Without mentioning the Sagebrush Rebellion, we noted in our survey that one of the possible outcomes of the sale of national park lands, waters, and historic sites would be that they "may be developed for houses, offices, resorts or other develop-

ments. They may also be used for timber harvesting, oil and gas development or mining.” These potential uses are consistent with the goals of Sagebrush Rebellion advocates. Our survey results indicate little support for this option. Not only do 93.8% of respondents *disagree* that “the U.S. should sell off some national parks,” 49% of respondents would pay at least \$115 a year in increased taxes to avoid any such sale of national parks.

Conclusion

In sum, national parks, monuments, memorials, seashores, lakeshores, battlefields, and historic sites are a valuable asset to a broad cross-section of the American public, not just to visitors. Current federal funding grossly undervalues the benefits that these assets provide. Moreover, slightly more than half the total economic value consists of non-use (existence, bequest, and option) values, which are received even by taxpayers who do not visit the facilities or benefit directly from the programs. For this reason, the National Park Service should be funded in a similar way to other federal programs that provide public goods—from broad-based taxes and not just user fees.

[Ed. note: The full report can be viewed at <http://webdoc.agsci.colostate.edu/DARE/PubLinks/NPSTotalEconValue.pdf>.]

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Endnotes

1. Wallace Stegner, quoted by National Park Service, “Famous quotes concerning the national parks.” Online at <https://www.nps.gov/parkhistory/hisnps/NPSThinking/famousquotes.htm> (accessed August 23, 2016).
2. See Schulze et al. 1983 and 1985, Welsh et al. 1997, Kerkvleit et al. 2002, Leggett et al. 2003, Douglas and Harpman 2004, Duffield 2006, Heberling and Templeton 2009, Neher et al. 2013, and Turner and Willmarth 2014 for examples.
3. See Cullinane Thomas et al. 2016 for the most recent national park visitor spending effects.
4. WTP is the approved measure of value used in cost-benefit analyses by many federal agencies, including the US Bureau of Reclamation (Welsh et al. 1997); US Water Resources Council (1983); US Office of Management and Budget (1992); National Oceanic and Atmospheric Administration (Arrow et al. 1993); and US Environmental Protection Agency (2010).
5. This result is consistent with the National Research Council’s (2013) findings and the authors’ own experience with other similar survey response rates dropping from 68% in the mid-1990s to 24% in 2015.

6. The tax increase ranged from \$115 to \$600 for the option with no cuts and from \$15 to \$100 for smaller cuts, depending on the survey version.
7. With respect to the national park system portion of the study, calculations were done in acres for larger types of parks and in the number of sites for smaller historical parks. With respect to the NPS program portion of the study, units also varied. Sites were used for historic preservation and for natural landmarks programs, acres for recreation lands programs, and the number of schoolchildren served by educational programs.
8. The 95% confidence interval is \$378 to \$670.
9. The 95% confidence interval is \$227 to \$281.
10. Since we had an 18% survey response rate we assumed a zero value for the other 82% of households.
11. This \$28.5 billion is in addition to the \$16.9 billion in visitor spending (Cullinane Thomas et al. 2016).

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