Published in final edited form as:

J Park Recreat Admi. 2019 ; 37(2): . doi:10.18666/JPRA-2019-8968.

How Valuable are National Parks? Evidence from a Proposed National Park Expansion in Alaska

Lindsay Johnson, Michael Spanbauer, Patrick Button

Executive Summary

When balancing environmental preservation and economic development, it is critical to evaluate how taxpayers value national park land and for what they are valuing it. One key component of this evaluation is to calculate a “passive use value,” or the willingness to pay (WTP), for protection of land that may never directly be used, and to determine what benefits of land protection motivate this passive use value.

We estimated the WTP for a 5% expansion of Denali National Park in Alaska (an expansion of 325,340 acres) using a questionnaire and the contingent valuation method. The survey first educated respondents on Alaskan geography, the current status of protected land and wildlife in Alaska, and common arguments for and against National Park expansion. The survey then described a proposal to expand the Denali National Park and asked a series of questions designed to bound the respondents WTP. Finally, the survey asked respondents to answer questions about what motivated their support or disapproval for the program.

Multiple methodologies were used to estimate the national average WTP, resulting in a WTP range of a single payment of \$77 to \$409. This is estimated to be a total WTP of \$15.1 billion to \$79.3 billion for all individuals aged 18 to 64 in the United States, or \$363.1 million to \$1.91 billion per year in 2017 dollars. Respondents to the survey indicated that their support is driven primarily by increased protection from oil spills (85.8% deemed this very important or important), by increasing and protecting Alaska’s biodiversity (84.3%), and preserving Alaska’s beauty (84.2%).

These results can help inform recent, current, and future debates about land use. President Obama significantly expanded land protections, while President Trump is continuing to scale back land protections, including opening up untouched land in Alaska in the Arctic National Wildlife Refuge for oil drilling. These results suggest that there are significant passive use values that should be considered when deciding whether to expand or reduce protection of land. Given that passive use values are significant, this suggests that the economic benefits must be large to tip a cost-benefit analysis in favor of reduced land protections.

Keywords

National Parks; willingness-to-pay; nature conservation; contingent valuation; biodiversity; environmental policy; oil spills

Introduction

In 1980, the U.S. Congress passed the Alaska National Interest Lands Conservation Act, designating 104 million acres as either National Parks, forests, or preserves and also protecting 50 million more acres as wilderness. This legislation created Denali National Park, which encompassed 6 million acres. In Alaska today, the government and the National Park Service play a huge role in determining state land use because the federal government owns 60% of the state's land.

Alaska is outside the contiguous United States, and therefore does not have frequent visits from the majority of Americans. It does, however, possess a rich history of oil pipelines and oil exploration which primarily dates back to the construction of the Trans-Alaska Pipeline System in the mid-1970s. In the interest of balancing government spending and environmental preservation, it is critical to evaluate how taxpayers value National Park land and for what they are valuing it. Since 64.3% of National Park acreage is located in remote Alaskan terrain, a crucial component of this evaluation is estimating the value of National Parks for citizens who will never directly utilize it. Bateman & Langford (1997) describe this non-use value as being comprised of two categories: *bequest value*, or the value of passing the National Park to future generations, and *existence value*, or the value of preserving a wildlife habitat. Non-use value is also broadly referred to in the economics literature as *passive use value*.

The primary aim of this paper is to determine Americans' passive use value of Alaskan National Parks and what motivates their passive use value (e.g., the benefits of helping to prevent climate change via carbon sequestration, the desire to protect land, etc.). This study of National Park land in Alaska is important as there is little research that quantifies the passive use value of National Parks in Alaska or, more generally, in the United States or Canada. Alaska provides a useful case study, as a majority of National Park land is in Alaska (about 54 million acres out of 85 million acres, or 63.5% of all National Park land) (National Park Service, 2017, 2018b). This case study of Alaska is also a good way to better isolate passive use value, given that Alaska's National Parks are particularly remote.

To determine the passive use value of National Parks in Alaska, 753 people were surveyed. Survey results were then weighted to produce nationally-representative estimates of WTP. The survey respondents are first briefed on common arguments for and against National Park expansion. They are then asked if they would pay a one-time tax to the federal government, which would be added to their federal taxes in a single year, for the purpose of expanding Denali National Park by 325,340 acres, or roughly 5%. Following the contingent valuation method, respondents are randomly given a price (\$4, \$10, \$20, \$40, \$80, or \$120) and asked if they would be willing to pay for it. If they say "Yes", then they are asked if they would pay double this amount, or half if they say "No", thereby creating an upper and lower WTP bound for those that say (Yes, No) or (No, Yes). For those that indicate they would be willing to pay some amount (they answer "Yes" at least once), they were asked probative questions to learn what motivates their WTP. The WTP estimates and motivations from this study are useful in balancing environmental protection with economic development.

Literature Review

A review of the literature, focusing on studies that estimate a WTP for environmental protection, reveals that this study helps fill two gaps in the literature. First, no studies estimate the passive use value of National Parks in Alaska, despite National Parks in Alaska being the majority of National Park land, and despite Alaska being an excellent case study to estimate passive use values, given that few will visit Alaska.¹

Second, there are only a few studies that estimate the passive use values of National Parks in the United States in general. Out of the studies of National Parks, similar wilderness designations, or remote areas, only two studies quantifying passive use values for a National Park in the United States are available; Pope III & Jones (1990) focuses on the value of expanding protections of land in Utah, while Haefele & Loomis (2016) estimate the aggregate benefit, per household, for the entire National Park system.

Table 1² summarizes a number of studies that use similar methods to identify a consumer's WTP for environmental goods. These studies cover a diverse set of contexts and countries, ranging from quantifying the WTP for protecting National Parks, similar wilderness designations, or remote areas (e.g., Pope III & Jones, 1990; Carson et al., 1994; Bateman & Langford, 1997; Haefele & Loomis, 2016), the WTP for other areas (e.g., Seip & Strand, 1992), the WTP for protecting water resources (e.g., Carson et al., 1990; Carson et al., 2003; Schuhmann, 2013; Stefanski & Shimshack, 2016), the WTP for species preservation (e.g., Carson et al., 1990; Loomis & Larson, 1994), and the WTP for recreational opportunities (e.g., Schuhmann, 2013).

Through a summary across all studies, in Table 1 it can be seen that WTP values range from as little as \$0.33 per month in 2017 dollars (Hadker et al., 1997, preservation of a National Park in India) up to \$296.89 per year, in 2017 dollars (Seip & Strand, 1992, upper-bound estimate for membership in a Norwegian Ecology Club) or \$3,067.68, in 2017 dollars, per household in a one-time payment (Haefele & Loomis, 2016, value of the entire National Park system). This large range reflects both that the WTP values are higher in more developed economies, and the WTP values are higher when the areas protected are larger. The most similar study to ours, which studies National Park land in Utah (Pope III & Jones, 1990) found WTP values ranging from \$102 per year for protection of 5% of Utah land to be preserved as wilderness, to \$177 per year for 30% of Utah land to be preserved as wilderness, in 2017 dollars. Another similar study is Haefele & Loomis (2016), who find a large value of National Parks in general. The two other studies on Alaska include Carson et al. (2000) and Carson et al. (1990). The former quantified the costs of the Exxon Valdez oil spill and calculated the damages as between \$40 to \$80 per person (adjusted to 2017 USD) as a one-time payment, and the latter quantified the value for fisherman to raise catch limits to their desired amount for salmon in the Kenai river in Alaska at \$76.69 per year for fisherman (adjusted to 2017 USD).

¹There are two studies that do focus, on Alaska, but these focus on quantifying the value of specific items. Carson et al., (1990) measures the value of salmon from the Kenai River and Carson et al. (2003) quantifies damages from the Exxon Valdez oil spill in Alaska.

²In addition, the Online Appendix is available at <http://www.patrickbutton.com/research>.

Methods

Questionnaire Design

The questionnaire used in this study is designed around a realistic policy proposal which would increase the size of Denali National Park in Alaska by 5%, or 325,340 acres. Similar park expansions have occurred regularly since the establishment of the National Park Service. Furthermore, the land proposed to be included into the National Park System has been reserved by Alaska's Department of Natural Resources as an outdoor recreation area since 1970 (Alaska Department of Natural Resources, 2015).

The questionnaire was distributed through Qualtrics Research Core³ to 753 respondents from April to September 2016.⁴ The questionnaire first gauged the policy priorities of the respondents. The first question has respondents indicate, using a Likert scale, if more or less money should be spent on several societal problems (crime, environmental protection, public education, national debt, health care, foreign aid). The next question asks them to indicate, using a Likert scale, how important specific environmental goals are (reducing air pollution, protection of endangered species, safe recreational areas, reducing water pollution, clean rivers, lakes and beaches, public waters safe for drinking and swimming). Next, respondents were educated regarding Alaskan geography, the current status of protected land and wildlife in Alaska, common arguments for and against National Park expansion, and how expanding the existing park will affect human activities such as commercial development, fishing, and oil exploration and drilling. The survey then described a proposal to expand the Denali National Park in area by approximately 5%, incorporating uninhabited bordering land, rivers, and mountains into the existing protected area. This expansion is shown in Figure 1.

Respondents were told their household would be required to pay \$*X* to support the program:

At present, government officials estimate the program will cost your household a total of \$*X*. You would pay this in a special one-time charge in addition to your regular federal taxes. This money would be used only for the Denali National Park expansion program. If the program cost your household a total of \$*X*, would you vote for the program or against it?

If they agreed to pay \$*X* ("Yes"), they were asked if they would instead accept paying \$2*X*. If they refused to pay \$*X* ("No"), they were asked if they are willing to pay \$0.5*X*. This approach attempts to bound the respondents' WTP, as those who answer (Yes, No) or (No, Yes) have a WTP that is bounded between either (\$*X*, \$2*X*) or (\$0.5*X*, \$*X*), respectively. This bounding approach was chosen because, as discussed by Johnston et al. (2017), open-ended questions often lead to unrealistic responses.

Respondents were told the cost would be a one-time payment, rather than recurring, following Carson et al. (2003). This avoids over-estimating the WTP, which Carson et al. (2003) argues can happen with a recurring payment. A recurring payment also requires the

³Qualtrics Research Core is a leading survey company that allows researchers to create surveys using their software and distribute them to different samples and across different forms of media (e.g., email, SMS). For more information see <https://www.qualtrics.com/research-core/> (accessed February 4, 2019).

⁴The entire questionnaire is presented in Online Appendix B.

individuals to consider future costs, which often leads to significant error (O'Donoghue & Rabin, 1999). With a recurring payment, there is also the risk that surveyed individuals do not understand that it is recurring, an issue faced by Stefanski & Shimshack (2016). Stefanski & Shimshack (2016) used survey questions to remove those who may not have understood the payment mechanism from the sample (about 20%), although there is no guarantee that those who remained in the sample fully understood.

The questionnaire was administered in two phases. The first phase (April 6–7, 2016) had 226 respondents and had randomized initial program costs of \$4, \$10, \$20, \$40, and \$80, which were the initial program costs used by Stefanski & Shimshack (2016). In the second phase (August 26 to September 4, 2016) 527 respondents were surveyed. In the second phase the initial program cost of \$4 was replaced with \$120, as \$4 proved far too low given the high proportion of (Yes, Yes) responses in the first phase for this initial value (77.4%).

Those that indicated they would pay some amount for the program [(Yes, No), (No, Yes), (Yes, Yes)] were asked follow-up questions to determine what motivated their WTP.⁵ They were asked to indicate on a Likert scale how important certain components of environmental protection [see Figure 3 later in the article] were to their WTP. Those that did not indicate support (No, No) were asked follow-up questions to determine why they did not support the program, discussed later.

At the end of the survey, socio-economic and demographic information was collected, similar to in previous studies (Hadker et al., 1997), Bateman & Langford, 1997; White & Lovett, 1999; Stefanski & Shimshack, 2016). Information related to the respondent's connections to Alaska: current state of residence, state of upbringing, and how often the respondent has visited Alaska were also collected. Those with connections to Alaska may be more likely to visit the park, and thus their WTP could be more based on active use. Respondents were also asked about their attitudes toward increasing federal taxes to pay for National Park expansion.

Sample Composition

The sample was not selected to be nationally representative, requiring an additional step before estimating a nationally-representative average WTP. The data was raked following the procedures discussed by Kolenikov (2014), giving respondents from under-represented groups more weight and respondents from over-represented groups less weight so as to reflect the average socio-economic and demographic characteristics of the national population. Table 2, columns (1) and (3), show that the survey over-sampled women, individuals aged 18–44, college graduates, Democrats, and individuals in households with income less than \$150,000.

Three data sources were used to construct weights using raking so the resulting sample more closely matched the national population based on the variables in Table 2. Statistics on the national distribution of gender, Hispanic origin, race, and age are taken from July 2015

⁵We made an error in the first wave of the questionnaire and those that answered (Yes, No) were accidentally not asked these follow-up questions. This meant that these responses are not available for 6.7% of the individuals who were supposed to be asked these questions.

Census data (U.S. Census Bureau, 2016a) Statistics on educational attainment and household income were drawn from the 2015 American Community Survey (U.S. Census Bureau, 2016b) Political party affiliation was created by calculating the mean of bi-weekly Gallup Politics survey results, conducted from January 6, 2016, to October 9, 2016 (Gallup, 2016). Table 2 indicates that our raked sample closely matches the national averages of these socio-economic variables. Henceforth, all of our results are using the raked sample.⁶

Willingness to Pay

Several widely recognized methodologies to estimate the WTP were employed. These include interval regressions, probit and bivariate probit models, and also the Turnbull model (Turnbull, 1976). Each of these will be discussed in turn, but we begin our discussion with the standard interval regression model, borrowing some of our exposition from Stefanski & Shimshack (2016).

In all our analyses, outside of the Turnbull model, we model the unobserved WTP as a latent variable that is a function of covariates, x , such as socio-economic characteristics:

$$y_i^* = x_i'\beta + \varepsilon_i \quad [1]$$

and ε_i is the error term, which is assumed to be identically, independently, and normally distributed. This WTP value, y_i^* lies in one of four intervals depending on the yes/no answers to the first and second bid values. We observe a double-bounded interval for the WTP for those that answer (Yes, No), giving the interval $[\$X, \$2X]$, and for those that answer (No, Yes), giving the interval $[\$0.5X, \$X]$. For those that answer (No, No), the WTP is single-bounded on the right $(-\infty, \$0.5X]$, and for those that answer (Yes, Yes), the WTP is single-bounded on the left $[\$2X, \infty)$. This gives the following log-likelihood function:

$$\begin{aligned} \ln L = & \sum_{y_i^* \in (-\infty, \$0.5X]} \ln \Pr(y_i^* < \$0.5X) + \sum_{y_i^* \in [\$0.5X, \$X)} \ln \Pr(\$0.5X \leq y_i^* < \$X) \quad [2] \\ & + \sum_{y_i^* \in [\$X, \$2X)} \ln \Pr(\$X \leq y_i^* < \$2X) + \sum_{y_i^* \in [\$2X, \infty)} \ln \Pr(y_i^* \geq \$2X) \end{aligned}$$

We first perform double-bounded dichotomous choice interval regressions in levels (i.e., not transforming the data). Since the data exhibits a positive (rightward) skew, we then perform this regression in logs (i.e. $\ln(y_i^*)$). This transformation is commonly employed to adjust for the small number of relatively large values and the large number of relatively small values that are often found in WTP responses, as seen in Figure 2. The log transformation

⁶Results from the unraked sample are available in the Online Appendix and show a slightly lower WTP.

deemphasizes these infrequent, but large, values and allows the data to behave more like a normal distribution.

For both the levels and logs regressions, we estimate the WTP with and without covariates. First, we add socio-economic and demographic covariates to observe how these factors influence WTP. We then add covariates capturing region of residence and attachment to Alaska to see if WTP value are driven by actual use value rather than passive use value. Finally, we add preferences for environmental protection efforts and tax policies. Table 3 defines and summarizes each covariate used.

The analysis was then repeated using probit models instead of linear models, following the suggestion of Cameron & Quiggin (1994). Probit models impose fewer assumptions on the model: linear interval models assume that a respondent's unobserved valuation is identical during both the first and second bid, but this assumption is relaxed when using a probit model. Cameron & Quiggin (1994) found that their respondents' valuations did change between bids, therefore we exercise prudence and consider this possibility in our analysis, as well.

We estimate a double-bound dichotomous choice probit model, which is similar to the above except uses a probit regression rather than a linear regression. We then use a single-bound dichotomous choice probit model, which uses information on the first bid only. In this case, the unobservable WTP falls into two intervals. If the response to the first bid is "No", then the WTP lies in the range $(-\infty, \$X)$, and the response is "Yes", then the WTP lies in the range $[\$X, \infty)$. This gives a log-likelihood function of the form:

$$\ln L = \sum_{y_i^* \in (-\infty, \$X)} \ln Pr(y_i^* < \$X) + \sum_{y_i^* \in [\$X, \infty)} \ln Pr(y_i^* \geq \$X) \quad [3]$$

As discussed in Hanemann et al. (1991), the double-bounded approach is asymptotically more efficient than the single bounded approach for WTP calculations. The single-bound uses the initial program cost only, while the double-bound uses both the initial and follow-up program costs, which provides more information. This paper presents both single-bound and double-bound analysis because, although a double-bounded analysis is potentially more efficient, the initial questions regarding payment are easier for respondents to answer and therefore, potentially, more reliable (Hanemann et al. 1991).

We also consider another functional form for our estimation, following that of Turnbull (1976). One criticism of the previous parametric WTP models is the dependence of the mean WTP estimate on the dispersion of the data. The "distribution-free" Turnbull method addresses this concern by employing the survey responses to estimate the WTP distribution function non-parametrically rather than imposing a parametric distribution selected by the researcher. The method calculates the fraction of "No" response, F_j , at each initial bid level, j . Driven by the intuition that higher cost offerings should result in fewer positive responses, the method combines the responses for bid j with those for bid $j + 1$ (the next highest initial

bid value) whenever the fraction of “No” responses for bid $j + 1$, F_{j+1} , is less than the fraction of “No” responses for bid j , F_j (so $F_{j+1} < F_j$) (Haab & McConnell, 1997). The combined data is used to calculate a CDF of the WTP, and its corresponding PDF, permitting us to estimate WTP without requiring ad hoc distributional assumptions.⁷

Results

Table 4 and Figure 2 summarize the complete set of possible yes or no responses for the survey. Support for the program generally declines with the initial program cost. (Yes, Yes) is the most common response for all initial program costs, including the most expensive group (\$120). For the smallest initial program cost (\$4), 77.4% have a WTP of \$8 or more. This suggests the average WTP is significantly higher than \$4, and therefore this initial value does a poor job of bounding the WTP. We therefore replace this initial value with \$120 in our second phase of the questionnaire, which more successfully bounds WTP values.

Table 5 presents our interval regression estimates in both level and log form. For the levels regressions (columns 1–4), the WTP estimates range from \$111.10 to \$116.19. For the logs regressions (columns 5–8), the WTP estimate varies much more: between \$81.50 and \$225.46. The inclusion of covariates significantly affects the WTP estimate only in the logs regressions, but not in the level regressions. This magnitude appears partly driven by the raked data, as the range is somewhat smaller for the log regressions using unraked data (\$83.44 to \$186.77) (Online Appendix Table A1). The WTP estimates under levels are similar regardless of if the data is raked or not; unraked estimates range from \$110.43 to \$114.17.

Table 6 presents the probit model results.⁸ The levels WTP estimates in columns (1), (2), (5) and (6), ranging from \$143.59 to \$174.98, lie within the range of the interval regression results in Table 5. However, the log estimates in the remaining columns are larger in magnitude, ranging from \$161.68 to \$408.62. While the WTP estimates do not seem robust to this change in the functional form, they do suggest that our estimates in Table 5 are lower bounds. Combining the WTP estimates across all specifications results in an updated WTP range of \$81.50 to \$408.62.

Table 7 presents our Turnbull method results. We calculate a lower bound of \$77.88 and an upper bound of \$234.98, nearly identical to the range of estimates for the interval estimates in logs in Table 5. This lower bound of \$77.88 under Turnbull is our smallest estimated WTP across all specifications and robustness checks, while the upper bound fits within our earlier WTP range. Thus, across Tables 5, 6, and 7, our average WTP estimates range from \$77.88 to \$408.62. We conduct many robustness checks, discussed later, but the estimates fit within this range.

⁷For more information on the Turnbull method, see Bateman, et al. (2002).

⁸See Online Appendix Table A2 for estimates using the unraked sample.

Motivations Behind the Willingness-to-Pay

The coefficients in Table 5 allow us to see what factors affect WTP. The significant determinants in respondent's WTP are generally consistent across all specifications. Significant determinants decreasing an individual's WTP include spending the majority of childhood in Alaska and the opposition to increasing federal taxes to expand National Parks. While the latter is not unexpected, the fact that those who spent a majority of their childhood in Alaska have a lower WTP could be surprising. One might expect individuals who grew up in Alaska to have a stronger preference towards preserving its natural state. However, those who grew up in Alaska may also be more aware of the economic benefits of expanding the use of land for economic development. This effect could also be driven by outliers, as only seven individuals indicated that they spent a majority of their childhood in Alaska. The effect of gender is significant and negative in Table 5, columns (2) and (6), but this significance disappears as other covariates are included. This corroborates the findings of Stefanski & Shimshack (2016), who find gender to be unimportant independent of other covariates.

Significant determinants increasing an individual's WTP include preferences toward increased tax expenditures on National Parks and also attainment of a college education. Frequent visits to the state of Alaska also increases WTP, which is consistent with the existing literature (Stefanski & Shimshack, 2016). A significant relationship between age and WTP is not found, nor between environmental protection preferences and WTP.

Those who supported the park expansion proposal were asked why they supported the program. The results, shown in Figure 3, indicate that most respondents see a variety of benefits to National Parks. However, some goals were deemed relatively more important by respondents. The goal that was most often listed as either "very important" or "important" was to increase protection from oil spills (85.8% very important or important), followed by increasing and protecting Alaska's biodiversity (84.3%) and preserving Alaska's beauty (84.2%). While all goals receive large support, the least supported goals are recreational opportunities (77.1% very important or important, 5.8% not important at all), carbon sequestration (77.0%, 3.85%), and protecting Alaska Native populations (82.6%, 4.9%). The least supported (but still highly supported) goals are thus those linked more to active use of the park land rather than passive use, suggesting that passive use is relatively more valued.

Robustness

We investigate several possible issues that may affect our WTP estimates. In all cases, addressing these issues either leads to a WTP estimate within our range of primary estimates (\$77 to \$409) or leads to an even higher WTP estimate. This suggests that our reported WTP estimate range could be a lower bound, and the WTP could be even higher.

"Protest Nos"

The possibility of "protest no's" may bias WTP estimates towards zero. A "protest no" would be an answer of (No, No) such that the upper bound for their WTP estimate (\$0.5X) is lower than their true WTP. This means that the individual is indicating a lack of support

for the proposal for reasons other than their WTP, such as objecting to any taxes or to any government program. “Protest no’s” seem likely for some respondents, as 15.1% who were given an initial program cost of \$4 supposedly have a WTP of less than \$2, as judged by their (No, No) responses. Those who answer (No, No) were asked to give reasons why they do not support the program (see Table 8). These reasons were grouped into those that suggest a true “near zero” WTP⁹ and those that suggest a “protest no.” The “protest no’s” included the following reasons: “I am opposed to paying any new taxes” (raked percentage 22.2%), “I do not want to put a monetary value on protecting Alaskan wilderness” (11.1%), “I do not trust the institutions that will handle the money for this program” (11.7%), “I do not believe that paying will solve the problem” (3.0%), “It is not my responsibility to protect Alaskan wilderness” (5.2%). We re-estimate the main results in Table 5 without these respondents. These results are shown in Online Appendix Table A3 and are similar, ranging from \$110.76 to \$210.84.

Payment Frequency

The payment frequency (annual, monthly, one-time) could affect the WTP. In our case, the use of a one-time payment could provide a lower WTP, suggesting again that these estimates are lower bounds. This is for two reasons. First, confusion over the payment vehicle could affect the WTP estimates, as discussed by Johnston et al. (2017). If individuals thought the one-time charge was recurring, then they would have given a lower WTP. A debriefing question to assess if respondents thought that this was a one-time versus multiple-year charge, despite us mentioning that it was a one-time charge, was included. 49.04% indicated that they did not think this was a one-time charge. We re-estimate our main results with these respondents dropped, and the WTP estimates are similar (Online Appendix Table A4).

Second, individuals generally suffer from present bias (O’Donoghue & Rabin, 1999), where they discount the future more than they realistically should. Thus, a recurring payment does not seem as expensive, in present-value terms, compared to a one-time payment. Thus, our WTP estimates again could be lower bounds as individuals are less willing to pay as much up front.

Sensitivity to Scope

As discussed by Stefanski & Shimshack (2016), our WTP estimates could be sensitive to scope, or may depend on the amount of the public good offered in our proposal. A 5% expansion of Denali National Park is presented, and this is the only proposed expansion to the park. This is due to limited funding to disseminate our questionnaire, and a choice to focus on statistical power to provide a more precise estimate of the WTP. However, literature (e.g., Whitehead, Haab, & Huang, 1998; Haab et al., 2013) shows that it would have been ideal to have had multiple samples with different sized proposed expansions of the park (e.g., surveys proposing a 10% increase) to see if variations in the proposed expansion leads to significant variations in WTP.

⁹“I cannot afford to pay any amount at this time” (11.5% indicated this), “I live far from Alaska and do not see how the program is relevant to me” (14.4%), “Society has more important problems than protecting Alaskan wilderness” (3.6%), “I feel that the protection of Alaskan wilderness is unimportant” (2.5%).

Sensitivity to Media Coverage of Oil Spills and Pipelines

A factor that could have increased our WTP estimates was the increased coverage of pipeline spills that may have occurred at the time of the second phase of the survey. Figure 4 shows increased search activity for “pipelines” at the same time as the second phase. While individuals can search for “pipelines” for a variety of reasons, this increase was most likely driven by coverage of Native Americans protesting an oil pipeline being built in North Dakota on August 15th, 11 days before our survey was conducted, Dakota Access, LLC, filed a lawsuit against the Native American tribal leaders.¹⁰ On August 22nd, four days before our survey was conducted, media reports began circulating that 29 protestors were arrested near the work site.¹¹ This increased pipeline coverage may increase the WTP of individuals as they are more aware of the benefits of National Parks as a way to protect land from environmental disasters.

As can be seen in Figure 4, Phase 1 occurred during a low-interest period. This allows us to re-estimate our main results using Phase 1 and Phase 2 survey respondents separately. Online Appendix Table A5 presents these estimates, and it can be seen that WTP values are similar across phases.¹² This suggests that the increased focus on pipelines during Phase 2 did not influence our results.

Discussion

National Parks provide many important benefits, but the protected land could also be used for economic development. Determining the best use of land requires a full understanding of the costs and benefits of National Parks, as well as how taxpayers value the land in question. A key component of this is to estimate the “passive use” value that individuals attribute to protected National Park land that they may never directly utilize. This value is estimated using a questionnaire employing contingent valuation to determine WTP for expanding the size of Denali National Park by 5%.

Results indicated that respondents value National Parks significantly. We estimate that the national average WTP for a 5% expansion of Denali National is a single payment of \$77 to \$409, according to our primary specifications, but this WTP may be even higher under other plausible specifications. Moreover, from respondents’ answers to questions about what motivated their support for the program, we find that this WTP is largely driven by passive use value.

To compare our one-time payment WTP range to the studies that used an annual or monthly payment, we make a back-of-the-envelope conversion. We divide our WTP estimates by 41.7 years, which is the difference between the median age (38.1) and life expectancy (79.8) in the United States. This gives our WTP estimates a range of \$1.86 to \$9.80 per year. This range overlaps with five studies in the existing literature.

¹⁰Dakota Access, LLC, vs. Dave Archambault II, Jonathan Edwards, Dana Yellow Fat, Valerie Dawn Wolfnecklace, Clifton Verle Hollow, Donald Dennis Strickland, Aaron Gabriel Neyer, and John and Jane Does.

¹¹www.chicagotribune.com/news/nationworld/ct-dakota-access-pipeline-timeline-dapl-20161219-htmlstory.html Howard, Brandon (2017).

¹²We drop those with initial program costs of \$4 from phase one and those with initial program costs of \$120 from phase two so that both phases have the equivalent distribution of initial program values.

Our estimates are smaller than the remaining 18 studies in Table 1. This reflects several factors. First, we used a one-time payment mechanism to err on the side of more conservative WTP estimates. Comparing WTP ranges in Table 1 shows a clear trend where the studies using an annual or monthly payment tended to have larger WTP estimates, perhaps suggesting that the payment mechanism really matters. Second, we propose a 5% expansion of a National Park, rather than the protection of an entire park or multiple parks or protection of otherwise larger geographic areas. Third, we focus on remote land in Alaska to better estimate passive use value, while most other studies focus on less remote areas or focus on quantifying specific benefits. Fourth, our estimates could be lower bounds because of the nature of a one-time payment, rather than a recurring one, and because other functional form assumptions for our models suggest even higher WTP. In fact, our lower bound of \$77 comes from the lower bound of our Turnbull estimates, which are specifically designed to give a lower bound.

Overall, these estimates suggest that National Park land provides significant passive use values that should be considered in any assessment of whether to expand National Parks or to permit the economic development of protected land. If we multiply our WTP range for the one-time payment range (\$77 to \$409) by the population aged 15 to 64 (194.3 million, U.S. Census Bureau, 2018), this gives a back-of-the envelope estimate of the national WTP of \$15.1 to \$79.3 billion in 2017 dollars (or \$363.1 million to \$1.91 billion per year). For comparison, the expenditure of the National Park Service in 2017 was approximately \$2.4 billion (National Park Service, 2018a), and protecting an expanded Denali National Park would only be a small fraction of that amount. The key question, then, in determining if this land should be protected or not is if the benefits from economic development reach the magnitude of this significant passive use value.

This research on passive use values can be incorporated into contemporary and future debates about land use. There have been numerous changes to federal land use recently. President Obama created or expanded 34 national monuments, including creating Bears Ears National Monument and Gold Butte National Monument, which together are more than 1 million acres (Potenza, 2017). Since then President Trump has been reducing protections, such as shrinking the size of Bears Ears and Grand Staircase Escalante National Monuments (Nordhaus, 2018). President Trump also signed an executive order in March 2017 (Exec. Order No. 13,783) that instructed the Department of the Interior to revise rules pertaining to oil and gas extraction and the protection of surface water on federal land, including national park land. There are similar proposals to open up protected land in the Arctic National Wildlife Refuge for drilling (Mufson, 2018). Our research shows that there are large passive use values, and the most important driver of passive use value, according to our survey, is increased protection from oil spills (85.8% of survey respondents deemed this very important or important). These passive use values need to be considered in the broader cost and benefit analysis of whether or not to change land protections. The significant passive use values found here suggest that the economic benefits of reducing land protections would need to be large to justify recently-proposed changes.

Limitations of Contingent Valuation and Other Considerations

As discussed by Donaldson (2001), WTP calculations rely on the assumption that options are mutually exclusive, *ceteris paribus*, and the selected option is to be implemented for all. In our context, this is analogous to the assumption that each respondent believes their bid is binding for all taxpayers. Although this is not an unreasonable assumption given how the survey questions are structured and phrased, the existence of this assumption must be recognized. Furthermore, Brown et al. (1996) highlight that the format of the WTP questions influence the respondents' incentives for overstating or understating their true value. Open-ended questions avoid a possible incentive for the respondent to overstate their valuation, resulting in a more conservative WTP estimate. On the other hand, dichotomous choice questions avoid both the incentive to overstate and to understate WTP. The dichotomous choice methodology was chosen, since it is by far the standard in the literature; however, we acknowledge that other approaches, such as open-ended questioning, are possible.

Other potential limitations to the contingent valuation method have been accounted for in this analysis and in our survey design. For example, the sensitivity of WTP estimates to respondents' social stratum has been addressed through our raking methodology; results were calculated using both the raw survey data and raked data to present a nationally representative sample population. In addition to raking our sample to match the demography of the nation, we matched based on the national distribution of household income and education. We also control for household income and other socio-economic status variables in our analysis.

An additional concern is ensuring respondents have the proper contextual knowledge necessary to provide informed responses; our survey design accounted for this concern by providing respondents with background information on national parks, Alaska, economic development possibilities of this land, and the various environmental benefits of the land. We present balanced information both on these costs and benefits of expanding protection of land, following a similar approach in Stefanski & Shimshack (2016). This ensured that our WTP estimates reflected the actual costs and benefits discussed in debates about land use. The full survey text is included in the Online Appendix.

Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

References

- Alaska Department of Natural Resources. (2015). Denali State Park. Accessed July 5, 2017 from <http://dnr.alaska.gov/parks/units/denali1.htm>.
- Amigues JP, Boulato C, Desaignes B, Gauthier C & Keith J (2002). The benefits and costs of riparian analysis habitat preservation: a willingness to accept/willingness to pay contingent valuation approach. *Ecological Economics*, 43: 17–31.
- Baranzini A, Faust AK, & Huberman D (2010). Tropical forest conservation: Attitudes and preferences. *Forest policy and economics*, 12(5), 370–376.
- Bateman JJ (1996). An economic comparison of forest recreation, timber and carbon fixing values with agriculture in Wales: a geographical information systems approach (Doctoral dissertation, University of Nottingham).

- Bateman JJ, & Langford IH (1997). Non-users' Willingness to Pay for a National Park: An Application and Critique of the Contingent Valuation Method. *Regional Studies*, 31(6): 571–582.
- Berrens RP, Bohara AK, Silva CL, Brookshire D, & McKee M (2000). Contingent values for New Mexico instream flows: With tests of scope, group-size reminder and temporal reliability. *Journal of Environmental Management*, 58(1), 73–90.
- Bishop RC, Chapman DJ, Kanninen BJ, Krosnick JA, Leeworthy VR, & Meade NF (2011). Total economic value for protecting and restoring Hawaiian coral reef ecosystems final report.
- Brown TC, Champ PA, Bishop RC, & McCollum DW (1996). Which response format reveals the truth about donations to a public good? *Land Economics*, 152–166.
- Cameron TA, & Quiggin J (1994). Estimation using contingent valuation data from a “dichotomous choice with follow-up” questionnaire. *Journal of Environmental Economics and Management*, 27(3), 218–234.
- Carson R, Hanemann M, & Steinberg D. (1990). A discrete choice contingent valuation estimate of the value of Kenai King salmon. *Journal of Behavioral Economics*, 19(1):53–68. doi: 10.1016/0090-5720(90)90017-2
- Carson RT, Wilks L, and Imber D (1994). Valuing the preservation of Australia's Kakadu Conservation Zone, *Oxford Economic Papers*, 46, 727–749.
- Carson RT, Mitchell RC, Hanemann M, Kopp RJ, Presser S, and Ruud PA (2003) Contingent Valuation and Lost Passive Use: Damages from the Exxon Valdez Oil Spill. *Environmental and Resource Economics*, 25: 257–286.
- Donaldson C (2001). Eliciting patients' values by use of 'willingness to pay': letting the theory drive the method. *Health Expectations*, 4(3), 180–188. [PubMed: 11493324]
- Exec. Order No. 13,783, 3 C.F.R. 16093 (2017)
- Gallup (2016), Party Affiliation. Accessed December 2016 from www.gallup.com/poll/15370/party-affiliation.aspx.
- Giraud K, Turcin B, Loomis J, & Cooper J (2002). Economic benefit of the protection program for the Steller sea lion. *Marine Policy*, 26(6), 451–458.
- Haab T & McConnell K (1997). Referendum Models and Negative Willingness to Pay: Alternative Solutions. *Journal of Environmental Economics and Management*, 32(2), 251–270.
- Hadker N, Sharma S, David A, & Muraleedharan TR (1997). Willingness-to-pay for Borivli National Park: evidence from a contingent valuation. *Ecological Economics*, 21(2), 105–122.
- Haefele M, & Loomis JB (2016). Total Economic Valuation of the National Park Service Lands and Programs: Results of a Survey of the American Public. *SSRN Electronic Journal*. doi:10.2139/ssrn.2821124
- Hall DC, Hall JV, & Murray SN (2002). Contingent valuation of marine protected areas: Southern California Rocky intertidal ecosystems. *Natural Resource Modeling*, 15(3), 335–368.
- Hanemann M, Loomis J, & Kanninen B (1991). Statistical efficiency of double-bounded dichotomous choice contingent valuation. *American Journal of Agricultural Economics*, 73(4), 1255–1263.
- Hanley N, & Craig S (1991). Wilderness development decisions and the Krutilla-Fisher model: the case of Scotland's 'flow country'. *Ecological Economics*, 4(2), 145–164.
- Jakobsson KM, & Dragun AK (2001). The worth of a possum: valuing species with the contingent valuation method. *Environmental and Resource Economics*, 19(3), 211–227.
- Johnston RJ, et al. (2017). Contemporary guidance for stated preference studies. *Journal of the Association of Environmental and Resource Economists*, 4(2), 319–405.
- Kolenikov S (2014). Calibrating survey data using iterative proportional fitting (raking). *The Stata Journal*, 14(1), 22–59.
- Loomis J, & Larson D (1994). Total economic values of increasing gray whale populations: results from a contingent valuation survey of visitors and households. *Marine Resource Economics*, 9(3), 275–286.
- Loomis J, Kent P, Strange L, Fausch K, & Covich A (2000). Measuring the total economic value of restoring ecosystem services in an impaired river basin: results from a contingent valuation survey. *Ecological economics*, 33(1), 103–117.

- Lee CK, & Han SY (2002). Estimating the use and preservation values of national parks' tourism resources using a contingent valuation method. *Tourism management*, 23(5), 531–540.
- Mufson Steven. (2018, 12 20). Trump administration takes another step toward oil drilling in Arctic National Wildlife Refuge. *The Washington Post*. Retrieved from https://www.washingtonpost.com/national/health-science/trump-administration-takes-another-step-toward-oil-drilling-in-arctic-national-wildlife-refuge/2018/12/20/5fb93f40-0469-11e9-b5df-5d3874f1ac36_story.html?noredirect=on&utm_term=.1dc985f4b4ca.
- National Park Service. (2017). Alaska: Preserve and Protect. Retrieved January 20, 2019 from <https://www.nps.gov/locations/alaska/preserve-protect.htm>.
- National Park Service. (2018a). National Park Service, Fiscal Year 2019 Budget Justifications. Retrieved September 10, 2018 from <https://www.nps.gov/aboutus/upload/FY2019-NPS-Budget-Justification.pdf>.
- National Park Service. (2018b). About Us: Frequently Asked Questions. Retrieved January 20, 2019 from <https://www.nps.gov/aboutus/faqs.htm>.
- Nordhaus Hannah. (2018, 2 2). What Trump's Shrinking of National Monuments Actually Means. *National Geographic*. Retrieved from <https://news.nationalgeographic.com/2017/12/trump-shrinks-bears-ears-grand-staircase-escalante-national-monuments/>.
- O'Donoghue T, & Rabin M (1999). Doing it now or later. *American Economic Review*, 89(1), 103–124.
- Petrolia DR, Interis MG, & Hwang J (2014). America's wetland? A national survey of willingness to pay for restoration of Louisiana's coastal wetlands. *Marine Resource Economics*, 29(1), 17–37.
- Pope CA III, & Jones JW (1990). Value of wilderness designation in Utah. *Journal of Environmental Management*, 30(2), 157–174.
- Potenza Alessandra. (2017, 1 13). Obama's five new national monuments set a US record for land protection. *The Verge*. Retrieved from <https://www.theverge.com/2017/1/13/14263812/obama-national-monuments-legacy-land-protection-record/>.
- Ransom KP, & Mangi SC (2010). Valuing recreational benefits of coral reefs: the case of Mombasa Marine National Park and Reserve, Kenya. *Environmental management*, 45(1), 145–154. [PubMed: 19937021]
- Schuhmann PW, Casey JF, Horrocks JA, & Oxenford HA (2013). Recreational SCUBA divers' willingness to pay for marine biodiversity in Barbados. *Journal of environmental management*, 121, 29–36. [PubMed: 23523829]
- Seip K, & Strand J (1992). Willingness to pay for environmental goods in Norway: A contingent valuation study with real payment. *Environmental and Resource Economics*, 2(1), 91–106.
- Stefanski SF, & Shimshack JP (2016). Valuing Marine Biodiversity in the Gulf of Mexico: Evidence from the Proposed Boundary Expansion of the Flower Garden Banks National Marine Sanctuary. *Marine Resource Economics*, 31(2), 211–232.
- Togridou A, Hovardas T, & Pantis JD (2006). Determinants of visitors' willingness to pay for the National Marine Park of Zakynthos, Greece. *Ecological Economics*, 60(1), 308–319.
- Turnbull BW (1976). The empirical distribution function with arbitrarily grouped, censored and truncated data. *Journal of the Royal Statistical Society, Series B*, 38(3), 290–295. doi: 10.2307/2984980.
- U.S. Census Bureau. (2016a). Annual Estimates of the Resident Population for Selected Age Groups by Sex for the United States, States, Counties and Puerto Rico Commonwealth and Municipios: April 1, 2010 to July 1, 2015. Retrieved December, 2016.
- U.S. Census Bureau, (2016b) 2015 American Community Survey 1-Year Estimates. Retrieved December, 2016.
- U.S. Census Bureau. (2018). Annual Estimates of the Resident Population for Selected Age Groups by Sex for the United States, States, Counties and Puerto Rico Commonwealth and Municipios: April 1, 2010 to July 1, 2017. Retrieved September, 2018.
- Whitehead JC, Haab TC, & Huang JC (1998). Part-whole bias in contingent valuation: Will scope effects be detected with inexpensive survey methods?. *Southern Economic Journal*, 65(1), 160–168.

- White PCL, & Lovett JC (1999). Public preferences and willingness-to-pay for nature conservation in the North York Moors National Park, UK. *Journal of Environmental Management*, 55(1), 1–13.
- Willis KG, & Garrod GD (1993). Valuing landscape: a contingent valuation approach. *Journal of Environmental Management*, 37(1), 1–22.

Author Manuscript

Author Manuscript

Author Manuscript

Author Manuscript

(a) Denali National Park within Alaska

(b) Close-up of Denali National Park and the Proposed Expansion

Figure 1:
Map of the Proposed Expansion of Denali National Park

Figure 2:
Distribution-to-Pay (WTP) Estimates

Figure 3:
Respondents' Perspective of Goals, Motivations for Affirmative Vote

Figure 4:
Timing of Search Trends for Pipelines in America

Table 1 –

Previous Studies on the WTP, or Similar, for Environmental Preservation

Authors	Publication Year	WTP or Equivalent	Approximate WTP in 2017 Dollars	Payment Schedule	Notes
This Paper					Expansion of Denali National Park in Alaska by 5%
Stefanski & Shimshack	2016	\$77.88-\$408.62 \$28.07-\$107.50	\$77.88-\$408.62 \$28.07-\$107.50	One-time One-time	Expansion of Flower Garden Banks National Marine Sanctuary in the Gulf of Mexico
Haebele & Loomis	2016	\$1,445-\$2,967 (per household)	\$1,494.03-\$3,067.68	One-time	Value of all National Park programs and entire National Park system.
Petrolia et al.	2014	\$909	\$962	One-time	Louisiana coastal wetlands restoration
Schuhmann	2013	\$41-\$62	\$44.1-\$66.69	Pay for use	Scuba divers and marine biodiversity in Barbados
Bishop et al.	2011	\$249.74 or \$69.98	\$286.27 or \$80.22	Annually	Protecting and restoring Hawaiian coral
Baranzini et al.	2010	\$45 or \$60	\$51.71 and \$68.95	Annually	Amazon tropical forest conservation
Ransom & Mangi	2010	\$3.10 or \$15.00	\$3.65 or \$17.65	Admission Fee	Kenyan coral reefs for recreation
Togridou et al.	2006	€5	\$7	Open ended	Greek National Marine Park
Carson et al.	2003	\$30-\$60	\$41.68-\$111.15	One-time	Exxon Valdez oil spill in Alaska
Amigues et al.	2002	\$7.00-\$25.00	\$9.67-\$34.55	Annually	5-year program, preservation of Garonne River near Toulouse, France
Hall et al.	2002	\$6	\$8.36	Annually	California rocky intertidal ecosystems
Lee & Han	2002	\$5-\$14	\$6.96-\$19.50	Admission Fee	South Korean National Park
Giraud et al.	2002	\$61.13	\$85.15	Annually	Program for Stellar sea lion
Jakobsson & Dragun	2001	\$29 or \$118	\$41.36 or \$168.29	Annually	Conservation of possum and endangered flora and fauna in the state of Victoria, Australia
Loomis et al.	2000	\$21	\$30.56	Monthly	Restoring ecosystem services of Platte river basin in Nebraska area
Berrens et al.	2000	\$25 or \$55	\$36.38 or \$80.04	Annually	New Mexico instream flows
White & Lovett	1999	£119.05	\$252.48	Annually	Preservation of 11 National Parks in the UK
Bateman & Langford	1997	£23.29	\$53.50	Annually	Preservation of a National Park in the UK
Hadker et al.	1997	7.50	\$0.33	Monthly	Preservation of a National Park in India
Bateman et al.	1996	£9.94	\$22.83	Annually	Providing local recreation spaces in the UK
Carson et al.	1994	\$80	\$138.13	One-time	Conservation zone in National Park in Australia
Loomis & Larson	1994	\$16.18-\$18.14, \$25.00-\$29.73	\$28.90-\$32.40, \$44.65-\$53.10	Annually	Increasing Gray-Whale population
Carson & Mitchell	1993	\$106, \$80, or \$89	\$183.82, \$138.73, or \$154.34	Annually	Clean boating, fishing, swimming water in the United States
Willis & Garrod	1993	£24.56	\$68.31	Annually	Cleaning Yorkshire Dales in the UK

Authors	Publication Year	WTP or Equivalent	Approximate WTP in 2017 Dollars	Payment Schedule	Notes
Bateman et al.	1992	£76.74	\$194.37	Annually	Preservation of Norfolk Broads in the UK
Seip & Strand	1992	200kr–1000kr	\$59.37–\$296.89	Annually	Membership to Norwegian Ecology Club
Hanley & Craig	1991	£16.60	\$43.62	Annually	Preventing local deforestation in the UK
Pope III & Jones	1990	\$53, \$64, \$75, or \$92	\$101.62, \$122.71, \$143.80, or \$176.39	Annually	Value of Wilderness Designation for 5%, 10%, 15%, or 30% of the state of Utah.
Carson et al.	1990	\$40	\$76.69	Annually	Kenai King Salmon in Alaska

Notes: 2017 dollar values obtained by (1) calculating original currency inflation then (2) converting into dollar values using exchange rates as of 29 June 2017. Inflation calculations made using publication year, unless authors present their results in prior year's values; e.g., Bateman et al. (1992) express their results in 1990 values, therefore 1990 values are used for inflation calculation

Table 2:

Comparison of our Unraked and Raked Samples to the U.S. Population

Characteristic	Our Sample (%)	Raked Sample (%)	U.S. Population (%)
Gender: Female	61.27	51.26	51.32
Ethnicity: Hispanic or Latino	15.14	15.53	15.51
Race: White	79.05	78.35	78.39
Race: Black	11.95	12.75	12.71
Race: Asian	5.58	5.71	5.73
Age: 18–44	71.97	46.75	46.79
Age: 45 and older	28.03	53.25	53.20
Educ.: Bachelor's deg. or higher	37.18	26.69	26.65
Party: Identify as Democrat	41.64	30.41	30.42
HH Income: <\$25,000	25.77	23.11	23.05
HH Income: \$25,000–\$49,999	29.35	23.50	23.49
HH Income: \$50,000–\$74,999	18.99	17.80	17.81
HH Income: \$75,000–\$99,999	12.88	12.08	12.12
HH Income: \$100,000–\$149,999	10.09	13.15	13.13
HH Income: >\$150,000	2.92	10.36	10.39

Notes: N=753. U.S. population information obtained from the United States Census Bureau. Statistics on gender, origin, race, and age calculated using July 2015 Census data. Statistics on educational attainment and household income calculated using 2015 American Community Survey data. Political party affiliation obtained from Gallup Politics. Political party affiliation statistic created by calculating the mean of bi-weekly survey results from January 6, 2016 to October 9, 2016 by Gallup Politic

Table 3:

Summary Statistics and Definitions of Covariate Variables

Characteristic	Description	Mean	Raked Mean
WTP	Approximate WTP (using midpoint method)	66.89 (52.5)	75.30 (57.17)
White	Race: White, Not Hispanic or Latino	0.672 (0.47)	0.784 (0.41)
Young	Age: 18–34	0.471 (0.50)	0.305 (0.46)
Female	Gender: Female	0.614 (0.49)	0.512 (0.50)
College	Education: Bachelor's degree or higher	0.372 (0.48)	0.267 (0.44)
Low Income	Household Income: Less than \$20,000	0.195 (0.40)	0.182 (0.39)
Democrat	Party: Democrat	0.417 (0.49)	0.304 (0.46)
NPS Visitor	Experience: Has visited a National Park	0.699 (0.46)	0.721 (0.45)
AK Visit 1	Experience: Has visited Alaska 1 time	0.089 (0.28)	0.097 (0.29)
AK Visit 2	Experience: Has visited Alaska 2 times	0.070 (0.26)	0.058 (0.23)
AK Visit 3–5	Experience: Has visited Alaska 3–5 times	0.028 (0.16)	0.015 (0.12)
AK Visit >5	Experience: Has visited Alaska 5+ times	0.016 (0.13)	0.036 (0.19)
AK Birth	Experience: Born in Alaska	0.009 (0.10)	0.004 (0.06)
Env. Protect More	Attitude: “Strongly” or “Somewhat” agree nation should spend more on env.	0.628 (0.48)	0.565 (0.50)
Env. Protect Less	Attitude: “Strongly” or “Somewhat” agree nation should spend less on env.	0.096 (0.29)	0.144 (0.35)
Air	Attitude: Air pollution reduction is an important personal goal	0.495 (0.50)	0.457 (0.50)
Endangered	Attitude: Endangered species protection is an important personal goal	0.434 (0.50)	0.415 (0.49)
Water	Attitude: Water pollution reduction is an important personal goal	0.689 (0.46)	0.681 (0.47)
Support Tax	Attitude: Support increasing federal taxes to expand National Parks	0.514 (0.50)	0.499 (0.50)
Oppose Tax	Attitude: “Strongly” or “Somewhat” oppose increasing taxes for National Parks	0.276 (0.45)	0.278 (0.45)

Notes: N=753. Standard deviations are in parentheses.

Author Manuscript

Author Manuscript

Author Manuscript

Author Manuscript

Table 4:**Dichotomous Program Response by Questionnaire Version**

	Yes-Yes	Yes-No	No-Yes	No-No	N
Version	(%)	(%)	(%)	(%)	
A (\$4, \$8, \$2)	77.36	3.77	3.77	15.09	53
B (\$10, \$20, \$5)	71.24	13.07	5.23	10.46	153
C (\$20, \$40, \$10)	45.70	25.17	9.27	19.87	151
D (\$40, \$80, \$20)	47.71	18.30	16.99	16.99	153
E (\$80, \$160, \$40)	41.61	30.87	7.38	20.13	149
F (\$120, \$240, \$60)	39.36	22.34	13.83	24.47	94
Total	51.93	20.58	9.83	17.66	753

Notes: Summary of the complete set of possible response outcomes for the combined survey data. Yes-Yes represents respondents who voted in favor of the program for both the first and second (doubled) price. Yes-No represents respondents who voted in favor of the program for the first price and against the program when presented the second (doubled) price. No-Yes represents respondents who voted against the program when presented the first price and then voted for the program when presented the second (halved) price. No-No represents respondents who voted against the program for both the first and the second (halved) price. Versions A to E (B to F) were randomly given with equal probability in phase one (two).

Table 5:

WTP and Determinants of WTP Estimation: Interval Regressions, Raked Data

	Double-Bounded Dichotomous Choice Interval Estimation in Levels				Double-Bounded Dichotomous Choice Interval Estimation in Logs			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Constant	111.10 *** (11.77)	124.15 *** (22.79)	92.98 *** (23.51)	42.23 * (23.44)	4.40 *** (0.15)	4.59 *** (0.34)	4.04 *** (0.37)	3.13 *** (0.39)
White	...	-31.08 (19.45)	-24.96 (17.17)	-3.42 (16.82)	...	-0.47 (0.29)	-0.45 (0.28)	-0.08 (0.27)
Young	...	14.30 (14.63)	5.11 (13.03)	4.84 (12.66)	...	0.30 (0.24)	0.20 (0.23)	0.20 (0.21)
Female	...	-32.84 ** (15.21)	-20.63 (14.13)	-15.88 (12.34)	...	-0.52 ** (0.26)	-0.33 (0.25)	-0.25 (0.21)
College	...	38.60 ** (18.78)	15.72 (16.87)	16.67 (15.04)	...	0.57 * (0.30)	0.23 (0.30)	0.23 (0.26)
Low Income	...	-17.58 (17.22)	-6.68 (16.24)	-3.08 (14.70)	...	-0.25 (0.30)	-0.06 (0.29)	0.00 (0.25)
Democrat	...	48.60 *** (15.14)	44.15 *** (13.85)	29.55 ** (13.29)	...	0.75 *** (0.23)	0.71 *** (0.22)	0.48 ** (0.21)
NPS Visitor	...	...	22.50 (14.45)	16.06 (12.17)	...	...	0.50 ** (0.25)	0.40 * (0.21)
AK Visit 1	...	...	31.25 (25.75)	34.12 (22.39)	...	...	0.59 (0.43)	0.64 (0.40)
AK Visit 2	...	...	24.84 (29.35)	3.72 (36.64)	...	...	0.41 (0.43)	0.06 (0.56)
AK Visit 3–5	...	...	88.70 (60.76)	75.03 * (44.53)	...	...	1.40 (1.02)	1.19 (0.74)
AK Visit >5	...	...	296.07 *** (56.98)	232.11 *** (46.77)	...	...	4.29 *** (0.84)	3.08 *** (0.64)
AK Birth	...	...	-99.25 ** (48.07)	-89.80 *** (33.65)	...	...	-1.72 ** (0.79)	-1.55 *** (0.55)
Env. Protect More	...	...	...	20.12 (14.92)	...	...	...	0.32 (0.26)
Env. Protect Less	...	...	...	12.53 (17.98)	...	...	...	0.40 (0.32)
Air	...	...	...	11.39 (15.61)	...	...	...	0.25 (0.26)
Endangered	...	...	...	-3.17 (15.10)	...	...	...	0.02 (0.24)
Water	...	...	...	8.56	...	...	...	0.18

	Double-Bounded Dichotomous Choice Interval Estimation in Levels				Double-Bounded Dichotomous Choice Interval Estimation in Logs			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
				(14.83)				(0.27)
Support Tax	...	...	...	76.34 ***	...	...	...	1.23 ***
				(14.86)				(0.26)
Oppose Tax	...	...	...	-61.27 ***	...	...	...	-1.16 ***
				(14.51)				(0.26)
Log Likel.	-956.90	-918.22	-894.43	-796.46	-920.74	-887.56	-867.63	-765.09
Predicted WTP	\$111.10	\$121.04	\$115.82	\$116.19	\$81.50	\$123.60	\$142.07	\$225.46

Notes: N = 753.

*
p < 0.10,

**
p < 0.05,

p < 0.01. Robust standard errors in parentheses.

Table 6:

WTP Estimates: Probit and Bivariate Probit Raked Data

	Single-Bounded Dichotomous				Double-Bounded Dichotomous			
	Choice Probit				Constrained Bivariate Probit			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Constant	0.68*** (0.12)	0.27 (0.32)	1.19*** (0.27)	0.91** (0.37)	0.69*** (0.09)	0.31 (0.24)	1.36*** (0.25)	1.17*** (0.33)
Initial Cost	-0.00* (0.00)	-0.01*** (0.00)	...	...	-0.00*** (0.00)	-0.01*** (0.00)	...	...
ln (Initial Cost)	...	...	-0.20*** (0.08)	-0.29*** (0.08)	...	...	-0.27*** (0.07)	-0.37*** (0.06)
Full Covariates	No	Yes	No	Yes	No	Yes	No	Yes
Log Likel.	-463.16	-347.14	-459.48	-344.89	-895.20	-731.21	-900.92	-737.08
Predicted WTP	\$174.98	\$161.92	\$352.75	\$408.62	\$143.59	\$150.49	\$161.68	\$205.74

Notes: N=753. Set of full covariates includes all variables presented in Table 4.

*
p < 0.01,**
p < 0.05,***
p < 0.01. Robust standard errors are in parentheses.

Table 7:

Turnbull WTP Estimates; Initial Price

Bid	Number of Responses	Fraction of "No"s	Estimated Lower Bound	Lower Bound Variance	Estimated Upper Bound
\$0	–	0	\$0	–	\$0.66
\$4-\$10	34	0.165	\$0.51	0.01	\$2.53
\$20	44	0.291	\$0.33	0.35	\$0.66
\$40-\$80	93	0.308	\$3.00	0.28	\$9.00
\$120	36	0.383	\$74.04	16.09	\$222.13
\$360	–	1	–	–	–
Total	207		\$77.88	16.73	\$234.98

Notes: Results from Turnbull estimation methodology using survey responses to initial bid values ($j = \$4, \$10, \$20, \$40, \$80, \text{ or } \120). Upper (\$360) and lower (\$0) bounds are selected arbitrarily to conform to the monotonic convergence of F_j towards 1.

Table 8 –

Respondents' Reasons for Negative Vote (No, No)

Motivation	Count	Percent	Raked Count	Raked Percent
<i>"Near Zero" WTP</i>				
I cannot afford to pay any amount at this time	22	16.5	15.3	11.5
I live far from Alaska and do not see how the program is relevant to me	19	14.3	19.1	14.4
Society has more important problems than protecting Alaskan wilderness	8	6.0	4.8	3.6
I feel that the protection of Alaskan wilderness is unimportant	4	3.0	3.3	2.5
<i>"Protest No"</i>				
I am opposed to paying any new taxes	22	16.5	29.6	22.2
I do not want to put a monetary value on protecting Alaskan wilderness	14	10.5	14.7	11.1
I do not trust the institutions that will handle the money for this program	11	8.3	15.6	11.7
I do not believe that paying will solve the problem	7	5.3	4.0	3.0
It is not my responsibility to protect Alaskan wilderness	7	5.3	7.0	5.2
No answer	10	7.5	5.5	4.2
Other	9	6.8	14.0	10.5

Notes: This question was asked to respondents who responded "No" to both program costs (No, No). Of the 753 survey respondents, 133 were asked this question.