

***FINAL REPORT***

**Winter 1998-99 Visitor Survey  
Yellowstone N.P., Grand Teton N.P.,  
and the Greater Yellowstone Area**

by

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## Executive Summary

This report describes the methodology, data collection procedures, and analysis associated with the Winter 1999 Visitor Survey for Yellowstone National Park, Grand Teton National Park and the Greater Yellowstone Area. This work was undertaken by Bioeconomics, Inc. of Missoula, Montana under a contract with the National Park Service. The survey was administered in February and March of 1999 with the assistance of National Park Service and National Forest Service personnel.

The winter visitor survey sampled two populations of winter recreationists in the Greater Yellowstone Area: national park visitors and national forest visitors. The sample of national park visitors was collected during three four-day sampling periods from February 2, 1999 to March 2, 1999. The national forest sample included, in addition to these three periods, a fourth sampling period from March 11-14, 1999. The park sampling rates and scheduling were based on December 1997 through March 1998 visitation to the parks (pers. comm. Yellowstone Visitor Services). A total of 1,930 survey packets were distributed at the park entrances. After a follow-up reminder postcard and additional mailing, 1,137 useable surveys were returned and entered into the final database. The overall response rate for the park visitor sample was 58.9%. For the sample of national forest visitors, 620 surveys were distributed and 257 returned. The response rate for the forest sample was 41.5%. Visitors who visit the area during the December 1998-January 1999 period may differ in some ways from visitors who were sampled in the February-March period. Accordingly, one should be cautious in extrapolating the results reported here to the entire winter visitor population. Additionally, the national forest sample was collected as a convenience sample rather than a probability sample (as was done in the parks). Therefore, the forest sample results are not necessarily representative of the entire forest visitor population and are not comparable to the winter park visitor sample.

The survey instrument was organized into four sections to gather information relevant to the survey objectives. The first section focused on the characteristics of respondents' trips including expenditures. The second and third sections asked for respondent views on winter management and wildlife management issues. The fourth section collected socioeconomic data on visitors. The report details the responses by sample population for each of the survey questions. In the following summary select question responses are highlighted from the full report results.

Respondents reported the expenditures made on their trip to YNP. Trip expenditures were calculated for two subgroups of visitors: residents of Montana, Idaho, or Wyoming and nonresidents. Nonresident visitors spent considerably more than regional residents on their trip to the Greater Yellowstone Area. On average, nonresidents in the park sample spent \$1,129 for the entire trip whereas resident park visitors spent an average of \$273 for their trip to the Greater Yellowstone Area. Expenditures by national forest visitors were similar to those of park visitors with nonresidents spending \$1,203 and residents spending an average of \$323 per trip.

Respondents to the winter visitor survey were asked how their plans to visit YNP would change

under four winter management scenarios. If the road to Old Faithful were plowed, 29.5% of the park sample and 24.2% of the forest sample said they would visit less frequently. (Nine percent of park respondents and 6.8% of forest respondents said they would visit more frequently.) If YNP was open only to snow coach, skiing and snowshoeing, but not snowmobiles, 42.2% of the park sample and 41.4% of the forest sample said they would visit less frequently. (A smaller share said they would visit more frequently--14.6% of park respondents and 13.8% of forest respondents.) For the third management option respondents were asked how they would change their visitation if the west-side roads between Old Faithful, West Yellowstone, and Mammoth were closed from Nov. 1 through April 30. For the park sample, 32% of respondents said they would visit less. This percentage was 26.8% for the forest sample. (A total of 5.1% of the park respondents and 10.9% of national forest respondents said they would visit more under this scenario.) The final management option asked about the effect of not plowing the road between Colter Bay and Yellowstone's South Entrance. Overall, 10.6% of the park sample and 9.4% of the forest sample said they would visit less under this scenario, and 6.5% of park visitors and 10.3% of forest visitors said they would visit more. Those respondents to the four management questions who did not say they would visit either less or more under the alternative management scenarios responded variously that they either would not change their visitation, they would shift their visits to other areas in the GYA, or they were not sure how their visitation would be affected. These responses are detailed in the report.

Table S.1 shows the estimated percentage reductions in winter visitation to the GYA based on responses to survey questions. Two measures of central tendency were used to calculate these estimated visitation changes: mean and median stated changes in the number of trips that would be taken. Two patterns are apparent from the survey responses shown in Table S.1. Estimated trip reductions from GYA residents are consistently lower than are reductions from visitors living outside the GYA. This result is consistent with the finding that a larger portion of GYA-resident survey respondents were cross-country skiers than were respondents from outside the area, and skiers were more likely to increase visitation under certain management options than were snowmobilers (Appendix C). A second result shown in Table S.1 is that the estimated trip reductions calculated using median stated trip changes were roughly half the size of reductions calculated using mean stated trip changes. Use of median trip changes rather than mean reduces the influence of any outlying observations on the estimated visitation changes.

It should be noted that the estimated visitation changes detailed in Table S.1 are only for current winter visitors. Estimates of prospective visitation changes under differing management options for those who do not currently visit the area in winter were not developed in this survey.



**Table S.1. Summary of estimated percentage reductions in winter visitation resulting from alternative management policies.**

<b>Statistic</b>	<b>Road plowing option (Q16)</b>	<b>Snowcoach, ski and snowshoe option (Q17)</b>	<b>West-side closure option (Q18)</b>	<b>Stop plowing Colter to South YNP option (Q19)</b>
(A) Changes in baseline trips to the GYA using <u>mean</u> stated trip changes by those who would take either more or fewer trips				
Non-GYA residents	-18.3%	-31.6%	-24.8%	-4.4%
GYA residents	-9.4%	-13.7%	-10.9%	-2.2%
(B) Changes in baseline trips to the GYA using <u>median</u> stated trip changes by those who would take either more or fewer trips				
Non-GYA residents	-8.0%	-12.7%	-10.3%	-9.9%
GYA residents	-4.2%	-2.2%	-4.2%	-4.9%

As a way of measuring general attitudes toward wildlife and wildlife management policies, respondents were presented with a set of statements and asked to indicate their level of agreement or disagreement with the statements. Looking at the park visitors' attitudes as a whole, there is a general pattern of supporting the well-being of wildlife: concern for wildlife habitat (97.2% agree), protection of rare plants (86.7% agree), concern for disturbance of Yellowstone wildlife in winter (61.2% agree), a willingness to donate to help animals (64.8% agree) and a view that wildlife species should be protected regardless of benefit to humans (69.4% disagree with the opposite view). A majority of winter park visitors (67.1%) also support mechanized winter access to the park. However, on some specific policy issues the public is generally quite divided in its opinions: livestock grazing on National Forest lands, killing bison at park boundaries, allowing bison to range onto public lands outside the park, and rounding up bison to test and slaughter or vaccinate. It appears that these are divisive issues on which there is little consensus. Responses for the national forest sample were generally quite similar to those of the park visitor sample.

Visitors were asked several related questions about winter road closure. In the context of winter management of access to Old Faithful, a plurality of both resident and nonresident park visitors favored the existing policy of grooming roads for snowmobile use. The next most favored policy for both resident and nonresident park visitors was allowing only snowcoach, ski and snowshoe travel. In the context of bison management, a question focuses on the possibility that if the roads throughout the park were not groomed, more bison might remain in the park. In response to this

question, a majority of park visitors favored the current access policy (52.1%), with the remaining respondents being closely divided between closing motorized access and not being sure which policy to prefer. Responses of forest visitors to this question were similar with slightly more favoring the current policy and fewer being undecided among the policies.

A final related question revisited the issue of possibly plowing the road from West Yellowstone to Old Faithful, but this time in the context of bison management. In this case again, a majority of both the park sample and the forest sample favored the existing access policy over the alternatives.

Contingent valuation is a method for estimating the amount an individual may be willing to pay for recreation or other experiences. Responses to a contingent valuation question on willingness to pay (WTP) to visit YNP in the winter, in the context of hypothetical increases in travel costs, indicate that a trip to Yellowstone is a highly valued winter recreational experience. As one would expect, the estimated median WTP for residents (\$30.33) is much lower than for nonresidents (\$144.66). Resident national forest visitors had an estimated WTP to visit the GYA in the winter of \$38.67.

Three additional contingent valuation questions were asked regarding various aspects of the respondents' trips to the GYA. Those respondents who had rented a snowmobile were estimated to have a median WTP to rent a "clean-quiet" machine of \$46.09 per day (\$35.89 for the forest sample). Park visitors were estimated to have a median WTP to plow the road from West Yellowstone to Old Faithful of \$6.14 (among forest visitors who had also visited the park on their trip this value was \$1.45). Those respondents who expected to participate in cross-country skiing during the 1998-99 winter were asked about their willingness to pay for an annual ski pass to support trail grooming and facilities in the park. It was estimated that park visitors from this group had a median WTP for the annual ski pass of \$46.31 (\$45.09 for park visitors).

A final contingent valuation question in the winter survey asked respondents about their willingness to support a program to acquire increased winter range for bison migrating out of Yellowstone National Park. WTP was measured in the context of a voluntary contribution to a trust fund. The overall valuation estimates are conservatively derived based on the difference between respondent WTP for winter range available next year versus having winter range available ten years from now. The statistical models associated with the winter range acquisition question fit the data well, with the exception of the national forest sample for the ten year WTP. In all cases the variables in the models are statistically significant with signs that are as would be expected based on economic theory. However, overall valuation estimates could not be derived from these models because the estimated one-year and ten-year WTP estimates were not significantly different.

## **1.0 Introduction and Scope of Study**

This report presents the methodology, data collection, and analysis associated with the Winter 1998-99 Visitor Survey for Yellowstone N.P., Grand Teton N.P., and the Greater Yellowstone Area. The design, implementation, and analysis of the winter visitor survey was completed by Bioeconomics, Inc. of Missoula, MT under a contract with the National Park Service. The survey was administered during February and March of 1999 with the assistance of National Park Service and National Forest Service personnel.

The Winter 1998-99 Visitor Survey is one of a group of three surveys designed to measure the experiences, perceptions, and attitudes of the public (both national park visitors and non-visitors) on the issues of winter park management, and wildlife management in the Greater Yellowstone Area. The full set of public surveys includes a winter visitor survey (discussed in the current report), a summer visitor survey, and a national random phone survey.

## **2.0 Theory and Methods**

### **2.1 Survey Design**

The survey instrument was organized into four sections. The first section gathers information on the characteristics of the respondent's trip, including travel group size and expenditures. The second and third sections query the respondent on her attitudes toward winter management and wildlife management policies. The fourth section collects information on respondent socioeconomic characteristics such as age and income. The complete text of the survey instrument is included in Appendix A.

### **2.2 Sample Design**

The GYA winter visitor survey was conducted using two samples: a national park sample and a sample collected on the Shoshone and Gallatin National Forests. All statistics and results presented in this report are presented for each of the distinct samples, park and forest. The national forest sample was in general a convenience sample, collected by staff of the Shoshone and Gallatin National Forests as was possible. The sampling within the national parks was a probability sample conducted on a strict schedule, and the sampling was designed based on the best information available regarding visitation levels and distribution of winter use within Yellowstone and Grand Teton National Parks.

The park sampling rates and scheduling were based on 1997-98 (December through March) data on visitation to the parks (pers. comm. Kristin Legg, YNP Planning Office, and Suzanne McDonald GT National Park, Supervisor's Office). Given the constraints of sampling budget and timing, it was decided to conduct the survey within the parks in three four-day sampling periods from February 2, 1999 to March 2, 1999. A pre-test of the winter instrument was implemented January 23-24. The sampling days and sampling periods were chosen so that the proportion of

sampling that was conducted during holiday weekends (President's Day), non-holiday weekends, and weekdays was in proportion to the percentages of winter visitation to the parks during these three categories of days within the entire December through March 1997-98 winter season. The final sampling periods for the park samples were February 2 -5, February 11-14, and February 27 through March 2. For the national forest sample, a fourth sampling period was added. Visitors to the Shoshone and Gallatin National Forests were sampled during the March 11 through 14 period. It should be noted that visitors who visited the area during the December 1998-January 1999 period may differ in some ways from visitors who were sampled in the February-March period. Accordingly, one should be cautious in extrapolating the results reported here to the entire winter visitor population. Additionally, the national forest sample was collected as a convenience sample rather than a probability sample (as was done in the parks). Therefore, the forest sample results are not strictly comparable to either the entire forest visitor population or the winter park visitor sample.

For the park sample, the total sample for the period was distributed among park entrance stations (YNP West, YNP East, YNP North, GT Moran, and GT Moose) in proportions equivalent to the distribution of total winter 1997-98 use among these stations. To the extent possible, sampling was also designed to be stratified by the primary mode of transportation (typically snowmobile, automobile, skier, and snowcoach).

The on-site surveys were administered at the sample sites by requesting that visitors provide names and addresses (for follow-up purposes) and by providing visitors with a mail-back survey. Repeat contacts were utilized (postcard reminder and an additional survey mailing to non-respondents) to achieve an increased response rate. One individual from each travel group was asked to complete the survey. That individual was selected randomly from within a group as the adult whose birthday was closest to the sample day's date. (See Appendix A for the complete text of the park survey agent instructions regarding administering the survey.)

In addition to the three sites in Yellowstone NP (East, North, and West entrances) and two sites in Grand Teton NP (Moose and the Moran Entrances), two national forests (the Gallatin and Shoshone) were sampled at visitor use locations such as trailheads, visitor contact facilities, or other sites. The exact sample locations for the forest samples were determined by forest staff.

The number of surveys distributed was 1,930 for the parks, 234 on the Shoshone, and 386 on the Gallatin NF.

### **2.3 Statistical Methodology and Measures of Central Tendency**

Many of the results and tables in this report present statistical descriptions of the responses to the survey questions. For these results, standard statistical measures such as frequency distributions and mean values were used. Sample sizes are provided along with the statistics in the following tables. Additionally, where only a subsample of the respondent population is represented by a statistical result, this is noted and the appropriate sample size is included in the result description.

As an on-site visitor survey, the possibility exists that more frequent visitors to the parks and forest were oversampled in this study. While statistical techniques exist for correcting for any such “avidity bias” these techniques could not be employed in the winter survey analysis without the use of assumptions regarding the frequency of park entry on a given trip. Any such assumption across all park sample respondents would potentially introduce additional undetected bias into the results. Therefore, no attempt was made to correct for any avidity bias in the survey responses. Any avidity bias that might exist in the survey results would apply to individual-level responses (such as number of trips made in to the area in a given winter season) and not to trip-level results (such as average trip expenditures).

## **2.4 Contingent Valuation Methodology**

The contingent valuation method (CVM) uses survey techniques to determine the values which people would place on traditionally nonmarket goods and services if markets did exist for these commodities. In this study, the value of a variety of commodities and services are measured through the use of contingent valuation (see Questions 9,12, 20, 22, and 32 of the survey instrument in Appendix A).

Well established markets for many public land activities do not exist. Therefore, the basic problem faced in determining the economic value of services such as a snowmobiling trip to Yellowstone N.P. is measuring the nonmarket values. Contingent valuation has been widely applied (Mitchell and Carson 1989) and is recognized by the U.S. Water Resources Council (1983) as an appropriate method. This approach has also been designated in federal guidelines (U.S. Department of Interior 1986, 1991) as a best available procedure for valuation of damages arising in superfund natural resource damage cases. The contingent valuation method has been employed numerous times to inform state and federal agency decision makers on resource issues. Examples of applications similar to the case at hand include Boyle and Bishop (1987), and Champ et al. (1997). Walsh, Johnson, and McKean (1992) provide a literature review of recreational demand studies, including contingent valuation. For example, in Montana, CVM has been used by the state fish and wildlife agency to value coldwater fishing on major fisheries in the state (Duffield and Patterson 1991) and to examine the relationship between stream flow and recreation values on the Bitterroot and Bighole Rivers (Duffield et al. 1992). Additionally, federal agencies have used CVM to inform decision makers in several large-scale Environmental Impact Statements on wildlife issues such as wolf reintroduction to Yellowstone National Park (U.S. Fish and Wildlife Service 1994), and reintroduction of grizzlies to central Idaho and western Montana (U.S. Fish and Wildlife Service 2000).

The essence of the CVM approach is to ask individuals their willingness to pay for a given service or commodity (WTP) contingent on their acceptance of a hypothetical but plausible and realistic market situation. The application of the CVM involves three elements: 1) a description of the

resource which is to be valued; 2) the “payment vehicle,” or method by which the respondent will pay for the resource; and, 3) the “question format” or specific method by which the value of the resource will be elicited. We will discuss how each of these elements is addressed in turn.

In the GYA Winter Visitor Survey, respondents were asked five specific contingent valuation questions. Table 2.1 shows the resource or service being valued in each of these questions as well as the payment vehicle used and the question format used.

<b>Table 2.1 Methodology used in winter visitor survey contingent valuation questions</b>			
<b>Question / Resource being Valued</b>	<b>Population that the question is applied to</b>	<b>Payment Vehicle</b>	<b>Question Format</b>
Q9 / Value of renting a cleaner, quieter snowmobile	Respondents who rented a snowmobile on trip to GYA	Increased rental cost	Dichotomous choice CV
Q12 / Value of trip to GYA	All respondents	Increased travel cost	Dichotomous choice CV
Q20 / Value of having a plowed road into Old Faithful	Respondents who visited Yellowstone NP on trip	Increased winter access fee	Dichotomous choice CV
Q22 / Value of having regular expanded ski grooming in park	Respondents who had cross country skied during past year	Special annual pass	Dichotomous choice CV
Q32 / Value of expanded bison range outside of park	All respondents	Contribution to trust fund	Dichotomous choice CV

The third feature of all CVM applications is the method by which the resource value is elicited from respondents. There are several basic genres of CVM elicitation techniques including open-ended CVM questions and dichotomous choice CVM questions. In the open-ended CVM respondents are asked to identify the maximum amount they would be willing to pay for a good or resource. In the dichotomous choice method, respondents are asked a simple “yes” or “no” question: whether they would pay a specified amount for the specified good or resource. This study utilized the dichotomous choice CVM. The dichotomous choice question format has the advantage of presenting respondents with a simple yes or no decision on whether the described “economic good” is worth the dollar amount asked. This type of decision making is similar to the decisions we make every day when we decide to buy, or not buy, goods and services based on the qualities of the goods and services and also upon their price. This study uses the dichotomous

choice question format. A detailed discussion of the calculation of welfare measures from dichotomous choice question responses is included in Appendix B.

### **3.0 Data Collection Methods**

This section presents the data collection methodology as well as sample sizes and response rates of the winter study in Yellowstone National Park

#### **3.1 Overall Data Collection Methods and Sample-Plan Design**

The visitation levels across the entrances to Yellowstone National Park vary dramatically. A sampling strategy was developed to vary the specific number of surveys given to each entrance in proportion to its visitation levels. The surveys were distributed at park entrances: North, West, East, and Grand Teton's Moran and Moose entrances. (Grand Teton's Moran Entrance includes YNP South Entrance visitors since the majority of Moran Station visitors eventually also pass through the YNP South Entrance.) The proportion of the target sample of 2,000 distributed surveys that were given out at each entrance station was based on the percent of visitors to the parks that passed through that particular entrance during the December through March 1997-98 winter season. The general goal was to sample visitors in proportion to use at each entrance station. The exception to this was in the case of the seldom-used East Entrance to Yellowstone N.P. For this very low use station, the sampling rate relative to the other entrances was doubled in order to achieve a minimum number of expected completed surveys from the East Entrance.

#### **3.2 Survey Implementation**

Visitors were surveyed in three different periods, or waves. Table 3.1 shows the dates of the survey waves as well as the dates of the follow-up postcard and survey mailings. The survey process followed a modified Dilman method (Dilman, 1982). When contacting visitors, the survey agents described the survey to the visitors and asked for their cooperation. If the visitor agreed, they were given a survey packet and asked for their name and home address. Once the name and addresses of the visitors were obtained from the personnel at the park, and two weeks after receiving the survey packet, the visitors were sent a reminder postcard thanking them for participating in the survey and reminding them to return the survey form. If the visitor had not returned the survey booklet within two weeks following the sending of the reminder postcard, they were sent a second survey packet with a letter explaining the importance of completing the survey.

<b>Table 3.1 Survey distribution schedule and follow up mailing</b>			
<b>Waves</b>	<b>Initial Distribution</b>	<b>Postcard Mail-out</b>	<b>Second Survey Mail-out</b>
<b>One</b>	2/2 to 2/5	2/19	3/5
<b>Two</b>	2/11 to 2/14	2/28	3/14
<b>Three</b>	2/27 to 3/2	3/15	3/29
<b>Four (Forest only)</b>	3/11 to 3/14	3/26	4/9

Table 3.2 shows the distribution of surveys according to entrances, as well as the overall number of surveys distributed in each wave. In wave 1, a total of 719 surveys were given to the park entrances and 162 to the Forest Service managers. In waves 2 and 3, 710 surveys and 612 surveys were given, respectively to the parks and 159 and 163 to the Forest Service. Finally, in wave 4, 136 surveys were sent to the Forest Service. A total of 2,036 survey packets were sent to the parks for distribution, and 620 were sent to the Shoshone and Gallatin Forests. Of these 2,656 surveys, there were 106 surveys that were not distributed to visitors by the park personnel (of these 106, 83 were from the Grand Teton stations, 21 from YNP East, and one each from YNP West and North). A total of 1,930 survey packets were distributed at the park entrances, and 620 were distributed in the Shoshone and Gallatin National Forests.

### **3.3 Sample Statistics and Response Rates**

Table 3.2 shows the sample distribution and response statistics of each park entrance, and the overall distribution. In total, 1,930 surveys were distributed at the five park entrances. Of these 1,137 unique surveys were returned and entered into the final database. The overall response rate for the entire park sample was 58.9%. A total of 34 duplicate surveys were identified from those respondents who belatedly completed both an initial survey and a follow up survey. In the case of the duplicate surveys, the initial survey was used. Complete statistics were not kept on the number of visitors refusing survey packets at the entrance stations. However, during the third sampling period those distributing the surveys were asked to keep track of refusals. Complete tracking was done at the West and North YNP entrances and on the Shoshone Forest. Six refusals out of 286 distributed surveys occurred at West, zero refusals out of 125 surveys at North, and zero out of 63 surveys on the Shoshone. To conclude, the rejection rate was very low.



<b>Table 3.2 Survey distribution and response rate statistics</b>					
<b>Wave 1</b>					
	<b>North</b>	<b>West</b>	<b>East</b>	<b>G. Teton</b>	<b>Total</b>
<b>Total distribution</b>	140	325	19	220	704
<b>Wave 2</b>					
	<b>North</b>	<b>West</b>	<b>East</b>	<b>G. Teton</b>	<b>Total</b>
<b>Total distribution</b>	139	325	24	134	622
<b>Wave 3</b>					
	<b>North</b>	<b>West</b>	<b>East</b>	<b>G. Teton</b>	<b>Total</b>
<b>Total distribution</b>	120	280	17	187	604
<b>Overall Results</b>					
	<b>North</b>	<b>West</b>	<b>East</b>	<b>G. Teton</b>	<b>Total</b>
<b>Total distribution</b>	399	930	60	541	1930
<b>Returned surveys</b>	254	537	31	315	1137
<b>Response rate</b>	63.7%	57.7%	51.7%	58.2%	58.9%

Table 3.3 shows the distribution statistics and response rates for the sample of surveys distributed by national forest personnel. The response rates for the forest sample, 41.5% is substantially lower because names and addresses for the follow up were not always obtained in a timely manner from forest service personnel.

<b>Table 3.3 Survey distribution and response rate statistics: forest service sample</b>			
<b>Wave 1</b>			
	<b>Gallatin N.F.</b>	<b>Shoshone N.F.</b>	<b>Total</b>
<b>Total distribution</b>	100	62	162
<b>Wave 2</b>			
	<b>Gallatin N.F.</b>	<b>Shoshone N.F.</b>	<b>Total</b>
<b>Total distribution</b>	100	59	159
<b>Wave 3</b>			
	<b>Gallatin N.F.</b>	<b>Shoshone N.F.</b>	<b>Total</b>
<b>Total distribution</b>	100	63	163
<b>Wave 4</b>			
	<b>Gallatin N.F.</b>	<b>Shoshone N.F.</b>	<b>Total</b>
<b>Total distribution</b>	86	50	136
<b>Overall Results</b>			
	<b>Gallatin N.F.</b>	<b>Shoshone N.F.</b>	<b>Total</b>
<b>Total distribution</b>	386	234	620
<b>Returned surveys</b>	156	101	257
<b>Response rate</b>	40.4%	43.2%	41.5%

## 4.0 Analysis and Results

The analysis of the data collected in the Greater Yellowstone Area winter visitor survey is presented in the following sections. The results are generally presented for the two samples: the national park visitor sample, and the national forest visitor sample. Further disaggregation of results is presented when differences among the responses of subsample populations are of interest.

The presentation of results in the following sections, 4.1 through 4.5, follow the structure of the survey instrument itself. The exception to this pattern is found in Section 4.4 where the results of all five of the contingent valuation questions are grouped and discussed.

### 4.1 Survey Trip Characteristics

Section A of the winter visitor survey along with the first three questions of Section B provided respondents with questions regarding their most recent trip to the Greater Yellowstone Area. The summary statistics associated with the responses to these questions are presented in Tables 4.1 through 4.14. As noted above, these tables present survey results separately for the visitors that were sampled in the national parks and those who were sampled on national forest lands outside of the parks.

The distribution of visitors to the Greater Yellowstone Area is shown in Table 4.1. Of the park visitors sampled, the majority, 84%, visited Yellowstone National Park. Approximately 30% visited Grand Teton National Park and another 35% visited national forest lands outside the two parks. Approximately 43% of national forest visitors visited Yellowstone National Park and another 15% visited Grand Teton National Park. Table 4.1 shows that 87% of national forest visitors stated they visited national forest lands outside the parks. Intuitively, this statistic should be 100% since the respondents were all sampled on national forest lands. This counterintuitive result might be due to incomplete question response, or an unclear understanding of the park/forest boundaries.

<b>Area Visited</b>	<b>Park Sample</b>	<b>Forest Sample</b>
Yellowstone National Park	83.8%	43.3%
Grand Teton NP or John D. Rockefeller, Jr., Memorial Pkwy.	30.9%	15.8%
National Forest lands outside the parks	35.7%	86.6%
Sample size	1146	247

Table 4.2 shows the main purpose for the trip by park and national forest visitors. The majority of park visitors sampled chose to visit Yellowstone National Park for recreation; similarly, national forest visitors named recreation in the national forests as the main purpose for their visit. For park visitors, recreating in national forests was the next most popular choice. Visiting other areas of Montana, Wyoming or Idaho was the third most popular choice for park visitors. For national forest visitors, visiting Yellowstone National Park for recreation was the second most preferred destination and other areas of Montana, Idaho, Wyoming was third. Recreating in Grand Teton National Park was the main purpose for approximately 23% of the park visitors sampled and for only 12% of the national forest visitors. Visiting friends or family was the main purpose of the trip for approximately 9% of park visitors and almost 14% of national forest visitors. Another 12% of park visitors listed ‘business’ or ‘other’ as their main purpose for the trip; approximately 9% of national forest visitors listed ‘business’ or ‘other’ as their main purpose.

<b>Table 4.2 Main purpose of the trip (Q2)</b>		
<b>Main Purpose</b>	<b>Park Sample</b>	<b>Forest Sample</b>
Visit National Forests for recreation	28.9%	69.9%
Visit Yellowstone N.P. for recreation	74.1%	34.9%
Visit Grand Teton N.P. for recreation	23.1%	12.0%
Visit other areas of WY, MT, or ID for recreation	24.2%	24.9%
Visit Family or Friends	9.3%	13.7%
Business	7.2%	2.8%
Other	5.1%	6.0%
Sample size	1147	249

Note: Multiple responses were allowed in this question, therefore, entries sum to more than 100%.

Table 4.3 shows that the majority, over 80%, of park and national forest visitors traveled with friends or family. Another 10.2% of park visitors traveled alone while 7.5% of national forest visitors traveled alone. Organized groups or tours accounted for 7.5% of park visitors and 2.4% of national forest visitors. For both park and national forest visitors, only 0.8% traveled under some other arrangement.

<b>Table 4.3 Group with which visitor traveled (Q3)</b>		
<b>Group type</b>	<b>Park Sample</b>	<b>Forest Sample</b>
Alone	10.2 %	7.2 %
Family or Friends	81.5 %	89.6 %
Organized group or tour	7.5 %	2.4 %
Other	0.8 %	0.8 %
Sample size	1147	250

Park and national forest visitors reported traveling in similar average-sized groups, as shown in Table 4.4. Park visitors reported an average group size of six people while national forest visitors reported an average group size of 5.7 people. On average, park visitors reported spending 4.8 nights away from home and national forest visitors reported 3.4 nights. The park visitors spent an average of 3.6 nights in the Greater Yellowstone Area while national forest visitors spent 2.7 nights.

<b>Table 4.4 Length of trip and number of people traveling together (Q4,Q5,Q6)</b>		
<b>Statistic</b>	<b>Park sample</b>	<b>Forest Sample</b>
Number of people traveling together	6.1 people	5.7 people
Sample size	1155	254
Total nights spent away from home	4.8 nights*	3.4 nights*
Sample size	1136	238
Nights spent in the Great Yellowstone Area	3.6 nights*	2.7 nights*
Sample size	1125	232

\* Excludes trips greater than 30 nights in length.

Table 4.5 presents the number of days park and national forest visitors spent at various winter recreational activities at any location during the most recent winter (December - March). In general, national forest visitors spent more days recreating than park visitors did. Park visitors on average spent the most days downhill skiing and snowmobiling. On average national forest visitors spent the most days cross-country skiing and snowmobiling.

<b>Table 4.5 Days of participation in activities at any location between December 1998 and March 1999 (Q7)</b>		
<b>Activities</b>	<b>Average number of days participating in the activity</b>	
	<b>Park Sample</b>	<b>Forest Sample</b>
Cross-country skiing	3.1	6.0
Downhill skiing or snowboarding	3.4	2.5
Snowmobiling	4.6	9.7
Snowshoeing	0.9	0.8
Telemark skiing	0.9	0.9
Other winter recreation	1.9	1.9
Sample size	1108	242

Note: Sample excludes those respondents who claimed they would recreate more than 90 days during the winter season. Missing entries in partially completed questionnaires were imputed to be zero values.

Table 4.6 shows the average number of hours and visitor participation in winter recreational activities for national forest visitors. Snowmobiling was the most popular activity with 66.8% of visitors participating. The average number of hours spent snowmobiling in the national parks was 14.3 and for national forests it was 61.1. Thirty-eight percent of respondents named wildlife viewing as one of their activities and spent an average of 8.9 and 15.5 hours in the park and national forest, respectively. Thirty percent of visitors cross-country skied for an average of 10 hours in the park and 19.9 hours in the national forests. More than ten percent of visitors downhill skied for an average of 15 hours in the park sample and 16.7 hours in the national forest sample. Approximately 14.2 percent of visitors listed viewing geysers as an activity in which they participated. Snowshoeing was engaged in by 6.7% of visitors who spent an average of 11 hours for the park sample and 15.4 in the national forest sample. Telemark skiing, snowboarding, and snow coach tours were all participated in by fewer than 5% of the visitors.

**Table 4.6 Participation in activities while visiting the Greater Yellowstone Area (visitors sample in the national forests) (Q8)**

<b>Activity</b>	<b>Percent of visitors participating</b>	<b>Average number of hours in National Parks</b>	<b>Average number of hours in National Forests and other areas</b>
Snowmobiling	66.8 (253)*	14.3 (92)	61.1 (143)
Cross country skiing	30.0 (253)	10.0 (39)	19.9 (61)
Snowshoeing	6.7 (253)	11.0 (10)	15.4 (15)
Telemark skiing	4.3 (253)	4.2 (5)	7.6 (11)
Downhill skiing	11.1 (253)	15.0 (10)	16.7 (20)
Snowboarding	2.8 (253)	13.5 (4)	3.3 (6)
Wildlife viewing	38.7 (253)	8.9 (59)	15.5 (58)
View Geysers	14.2 (253)	3.3 (35)	0.2 (6)
Snowcoach Tour	0.8 (253)	4.0 (4)	0.0 (2)
Other	11.5 (253)	26.0 (11)	27.4 (22)

Note: Average hours are provided for the subsample of the total sample population that engaged in each activity and provided estimates of hours engaged in the activity.

\* Sample sizes are indicated in parentheses.

Table 4.7 shows the percent of visitors by activity and entrance station to Yellowstone National Park. Snowmobiling was the most popular activity for visitors entering the park through the East and West entrances, 93.3% and 89.1%, respectively. Cross country skiing was the most popular activity for visitors to the north entrance of Yellowstone and to Grand Teton National Park. Downhill and telemark skiing were most popular for the Grand Teton National Park sample. Only 2-3% of visitors to all entrances snowboarded. Over 70% of North Entrance visitors listed wildlife viewing as an activity. Viewing geysers was most popular with West entrance visitors. Between 9-10% of visitors listed snowcoach tours as an activity. Table 4.7 also shows the average number of hours spent in the national parks and national forest at each activity. Only a total of 5.4% of visitors listed telemark skiing as an activity, in both the park and national forest. The greatest average hours were spent telemark skiing, 14.5 hours in the park and 23.6 hours in the forest.



**Table 4.7 Participation in activities while visiting the Greater Yellowstone Area (visitors sample in the park) (Q8)**

Activity	Percent of visitors per entrance & overall					Average # of hours in N. Park	Average # of hours in N. Forests and other areas
	North	West	East	G. Teton	Total		
Snowmobiling	31.0	89.1	93.3	33.4	61.1	13.3 (684)	19.0 (386)
Cross country skiing	38.0	8.7	13.3	41.7	24.2	16.2 (252)	19.9 (95)
Snowshoeing	13.9	4.5	6.7	19.2	10.8	9.6 (98)	9.8 (46)
Telemark skiing	5.3	2.4	0.0	11.6	5.4	14.5 (47)	23.6 (37)
Downhill skiing	9.4	14.5	16.7	24.2	15.6	13.0 (51)	22.7 (122)
Snowboarding	3.3	2.4	3.3	3.3	2.8	7.7 (16)	13.4 (28)
Wildlife viewing	71.8	61.4	46.7	56.0	62.1	10.6 (613)	14.5 (218)
View Geysers	26.9	58.0	40.0	27.8	42.2	4.5 (418)	9.1 (42)
Snowcoach Tour	9.4	10.5	0.0	9.9	10.1	8.9 (108)	10.3 (14)
Other	18.8	4.3	3.3	14.2	10.2	14.6 (91)	18.1 (50)
Sample size	245	531	15	302		--	

Note: Average hours are provided for the subsample of the total sample population that engaged in each activity and provided estimates of hours engaged in the activity.

\* Sample sizes are indicated in parentheses.

Table 4.8 shows the percent of visits to the Greater Yellowstone Area communities by entrance station. The numbers show consistent high visitation to the communities close to park entrance stations. For example, 84.7% of visitors through the West Entrance to the park visited West Yellowstone and 89.4% of those entering Grand Teton entrances reported a visit to Jackson. Overall, West Yellowstone was the most highly visited gateway community with 49% and Pinedale, Wyoming received the least visitation with 1.2% visitation

Table 4.9 shows the average number of nights stayed in each community in the GYA for all respondents. If a visitor did not visit a community, the number of nights for that community and that person equaled zero. For the overall park sample, West Yellowstone, Jackson, Bozeman, and Big Sky were the most frequently visited communities for overnight stays.

**Table 4.8 Percentage of visitors to the Greater Yellowstone Area communities by entrance stations of Yellowstone and Grand Teton National Parks (Q10)**

<b>Communities</b>	<b>North E.</b>	<b>G. Teton E.</b>	<b>West E.</b>	<b>East E.</b>	<b>N. Forest</b>	<b>Overall</b>
Ashton, ID	2.5	3.8	6.5	3.4	2.1	5.1
Driggs, ID	3.3	8.9	3.0	3.4	0.4	4.5
Idaho Falls, ID	2.9	5.0	8.3	6.8	2.1	6.4
Rexburg, ID	2.5	1.9	5.9	0.0	1.2	4.1
St. Anthony, ID	1.2	0.0	2.1	0.0	0.4	1.3
Big Sky, MT	9.7	1.9	2.5	3.4	14.9	15.6
Billings, MT	13.5	0.0	5.4	0.0	5.9	5.9
Bozeman, MT	39.8	2.7	3.0	3.4	21.7	25.4
Cooke City, MT	27.1	1.1	2.5	3.4	22.2	7.8
Ennis, MT	1.2	0.3	1.7	0.0	1.7	1.4
Gardiner, MT	64.4	1.5	2.9	0.0	10.6	16.6
Livingston, MT	29.2	0.0	2.3	0.0	5.9	7.7
Red Lodge, MT	2.9	0.0	1.7	3.4	3.8	1.5
West Yellowstone, MT	12.7	8.9	84.7	51.7	31.1	49.0
Cody, WY	1.6	1.5	3.0	62.0	5.5	3.1
Dubois, WY	1.2	12.4	1.7	3.4	24.7	4.3
Jackson, WY	3.8	89.4	8.7	34.4	13.2	28.1
Lander, WY	1.2	3.5	1.1	0.0	8.1	1.7
Pinedale, WY	0.4	2.7	9.6	0.0	1.7	1.2
Other	19.0	12.0	12.3	20.6	8.1	13.9
Sample size	236	257	517	29	234	1237

**Table 4.9. Overnight stays in the Greater Yellowstone Area communities by entrance stations of Yellowstone and Grand Teton National Parks (average number of nights) (Q10)**

<b>Communities</b>	<b>North E.</b>	<b>G. Teton E.</b>	<b>West E.</b>	<b>East E.</b>	<b>N. Forest</b>	<b>Overall</b>
Ashton, ID	0	0	0.02	0	0.02	0.01
Driggs, ID	0.02	0.07	0.03	0	0	0.04
Idaho Falls, ID	0.02	0.07	0.12	0.03	0.02	0.08
Rexburg, ID	0	0	0	0	0	0
St. Anthony, ID	0	0	0.01	0	0	0
Big Sky, MT	0.71	0.03	0.93	0.13	0.40	0.63
Billings, MT	0.08	0	0.06	0	0.06	0.05
Bozeman, MT	0.90	0.04	0.67	0.03	0.59	0.54
Cooke City, MT	0.28	0.01	0.07	0.06	0.64	0.10
Ennis, MT	0	0	0	0	0	0
Gardiner, MT	0.91	0.01	0	0	0.10	0.22
Livingston, MT	0.16	0	0	0	0.01	0.04
Red Lodge, MT	0.03	0	0.03	0	0.06	0.02
West Yellowstone, MT	0.58	0.15	2.74	1.03	0.63	1.58
Cody, WY	0.01	0.01	0.05	0.65	0.07	0.04
Dubois, WY	0	0.21	0.03	0.06	1.06	0.07
Jackson, WY	0.09	4.00	0.18	0.58	0.43	1.11
Lander, WY	0	0.03	0.01	0	0.10	0.01
Pinedale, WY	0	0	0	0	0.07	0
Other	0.35	0.49	0.46	0.31	0.35	0.43
Sample size	236	257	517	29	234	1237

Tables 4.10 through 4.13 show average trip expenditure levels for respondents to the winter visitor survey. Trip expenditures are presented for four subgroups of visitors: residents of Montana, Idaho, or Wyoming who were surveyed within the parks, residents of Montana, Idaho, or Wyoming who were surveyed on national forest lands, nonresidents who were surveyed within the parks, and nonresidents who were surveyed on national forest lands.

Question 11 of the survey asked respondents the following:

By the time this trip is over, how much money will you and the members of your group **with whom you shared expenses** have spent for lodging, travel, food, and other items? Please indicate the amount spent for the entire trip (both at home and while traveling), and then just the amount spent in the entire 3-state area and the amount spent just in the smaller Greater Yellowstone Area (GYA) (See map on back of cover letter).

The average reported group expenditures were divided by the average number of people covered by those expenditures (as reported by respondents in the last portion of Question 11) (Appendix A). Some respondents left portions of the expenditure table in Question 11 blank and, for example, only reported expenses for the entire trip and not also the portions attributable to the smaller 3-state and GYA areas. Theoretically, the average amount that nonresidents spent in the 3-state region should be larger than the average amount they spent in the GYA. Because of the missing entries, this is not always the case in the following four tables, however, the entries are in general in the same range. The number of respondents who completed any portion of each expense category are provided as the sample size entries in the tables. It should be noted that if the conservative assumption were made that missing entries represented zero expenditures, the total estimated expenditures would be lower than those reported in the tables. Because of the explicit directions in the survey to enter a zero for categories with zero expenditures, no imputation of missing values was done.

Overall, there is consistency between the park and national forest visitors in the amount they spent on their winter visit to the GYA. This consistency holds for both the 3-state resident samples and the nonresident samples. Nonresidents spent an average \$1,203 per trip for the national forest sample, and \$1,129 per trip for the national park sample. Three-state residents in the national forest sample spent an average of \$323 per trip. Residents in the national park sample spent an average of \$273 per trip. Because of the differing sampling techniques used in the national park and national forest samples, however, caution should be used in comparing the results from these two samples.

<b>Type of Expense</b>	<b>For Entire Trip</b>	<b>Amount spent in MT, ID, and WY</b>	<b>Amount spent just in GYA</b>	<b>Sample Size</b>
Lodging (motels, camping, etc.)	\$298.89	\$263.52	\$243.11	56
Food and drink (restaurants, groceries, etc.)	\$240.26	\$125.79	\$185.81	55
Travel (bus, plane fares, rental cars, gas & oil)	\$218.41	\$92.78	\$100.10	54
Retail Items (groceries, souvenirs, clothing, film, etc.)	\$88.94	\$65.42	\$59.14	46
Rental Equipment (snowmobiles, skis, etc.)	\$182.79	\$120.49	\$178.69	33
Snowcoach Tours	\$13.63	\$3.33	\$3.33	11
Commercial Guide Services	\$17.56	\$10.00	\$4.16	12
Fees (entrance fees, registration fees, ski area fees, etc.)	\$63.37	\$34.73	\$35.88	43
Equipment purchased specifically for this trip (snowmobiles, skis, etc.)	\$500.95	\$334.55	\$78.33	26
Other	\$55.59	\$69.48	\$69.48	5
Total expense*	\$1,203.13	\$598.86	\$637.34	--

\* Note: Because of item nonresponses, totals are not column totals but the average of individual total expenditures.

<b>Table 4.11 Expenses of residents (sample of visitors in national forest) (Q11)</b>			
<b>Type of Expense</b>	<b>For Entire Trip</b>	<b>Amount spent just in GYA</b>	<b>Sample Size</b>
Lodging (motels, camping, etc.)	\$88.29	\$102.48	90
Food and drink (restaurants, groceries, etc.)	\$49.32	\$55.36	129
Travel (bus, plane fares, rental cars, gas & oil etc.)	\$33.91	\$27.90	118
Retail Items (groceries, souvenirs, clothing, film etc.)	\$23.63	\$21.74	63
Rental Equipment (snowmobiles, skis, etc.)	\$38.82	\$48.28	45
Snowcoach Tours	\$1.51	\$2.77	33
Commercial Guide Services	\$2.34	\$4.41	32
Fees (entrance fees, registration fees, ski area fees, etc.)	\$12.24	\$11.76	91
Equipment purchased specifically for this trip (snowmobiles, skis, etc.)	\$471.43	\$458.01	49
Other	\$2.32	\$1.79	23
Total expense*	\$323.37	\$299.21	--

\* Note: Because of item nonresponses, totals are not column totals but the average of individual total expenditures.

<b>Table 4.12 Nonresident visitors' expense (sample of visitors in the park) (Q11)</b>				
<b>Type of Expense</b>	<b>For Entire Trip</b>	<b>Amount spent in MT, ID, and WY</b>	<b>Amount spent just in GYA</b>	<b>Sample Size</b>
Lodging (motels, camping, etc.)	\$352.34	\$256.16	\$261.90	570
Food and drink (restaurants, groceries, etc.)	\$171.76	\$125.04	\$125.87	594
Travel (bus, plane fares, rental cars, gas & oil, etc.)	\$281.02	\$162.18	\$129.21	580
Retail Items (groceries, souvenirs, clothing, film, etc.)	\$89.67	\$74.95	\$67.56	476
Rental Equipment (snowmobiles, skis, etc.)	\$168.72	\$218.41	\$166.03	391
Snowcoach Tours	\$65.38	\$50.81	\$68.93	121
Commercial Guide Services	\$67.14	\$69.23	\$93.44	97
Fees (entrance fees, registration fees, ski area fees, etc.)	\$48.53	\$56.29	\$34.35	479
Equipment purchased specifically for this trip (snowmobiles, skis, etc.)	\$373.90	\$266.92	\$120.07	200
Other	\$222.74	\$151.70	\$136.95	84
Total expense*	\$1,128.87	\$679.68	\$607.95	–

\* Note: Because of item nonresponses, totals are not column totals but the average of individual total expenditures.



<b>Table 4.13 Expenses of residents (sample of visitors in the park) (Q11)</b>			
<b>Type of Expense</b>	<b>For Entire Trip</b>	<b>Amount spent just in GYA</b>	<b>Sample Size</b>
Lodging (motels, camping, etc.)	\$109.71	\$95.08	227
Food and drink (restaurants, groceries, etc.)	\$64.41	\$56.08	301
Travel (bus, plane fares, rental cars, gas & oil, etc.)	\$35.51	\$23.62	289
Retail Items (groceries, souvenirs, clothing, film, etc.)	\$30.28	\$26.18	159
Rental Equipment (snowmobiles, skis, etc.)	\$69.42	\$57.88	108
Snowcoach Tours	\$26.59	\$42.91	40
Commercial Guide Services	\$5.47	\$7.74	29
Fees (entrance fees, registration fees, ski area fees, etc.)	\$26.56	\$19.64	202
Equipment purchased specifically for this trip (snowmobiles, skis, etc.)	\$255.90	\$396.55	60
Other	\$14.46	\$11.78	26
Total expense*	\$272.62	\$210.14	--

\* Note: Because of item nonresponses, totals are not column totals but the average of individual total expenditures.

Table 4.14 shows the summary responses to Questions 13 through 15 of the winter visitor survey. This table provides a breakout of the park sample by those visitors residing within and outside of the GYA. A significantly larger portion of non-GYA resident respondents from the national park sample were on their first visit to the GYA than were respondents contacted on national forest lands.

<b>Table 4.14 Visits to GYA, YNP and Grand Teton NP (Q13,Q14,Q15)</b>			
<b>Statistics</b>	<b>Park Sample</b>		<b>NF Sample</b>
	<b>Non-GYA residents</b>	<b>GYA residents</b>	
First visit to GYA in the winter (percent of visitors)	44.6%	7.0%	10.4%
Sample size	912	272	250
Average number of times the respondent expects to visit the GYA between December 1998 and March 1999	2.1	12.6	11.2 times
Sample size	810	235	241
Average number of times that the respondent who expects to visit GYA, will choose Yellowstone NP as their primary destination	1.05	3.5	2.2
Sample size	810	235	241
Average number of times that the respondent who expects to visit GYA, will choose Grand Teton NP as their primary destination	0.3	5.9	0.7
Sample size	810	235	241

Note: Partially incomplete responses to Question 15 were assumed to be zero.

## **4.2 Winter Use and Management within the GYA**

Tables 4.15 through 4.20 report the responses to a series of winter use survey questions asking respondents how they would alter their winter visitation patterns to the GYA under a series of alternative management actions. Table 4.15 shows the distribution of responses for survey questions 16 and 17. (The responses for the park sample are broken out for GYA residents and non-residents.) Under the Question 16 proposal to plow the road from West Yellowstone to Old Faithful for car and bus travel only, the largest proportion respondents in both the park sample and the forest sample said they would not change their number of visits to the GYA and Yellowstone N.P. The second largest group of respondents for this question were those who said they would visit less frequently under the change.

Question 17 of the winter visitor survey asked respondents how they would change their visitation under a policy that allowed only snowcoach, skiing, and snowshoe access to Yellowstone and Grand Teton National Parks. For this question, the largest response category for both the park and the forest sample was those respondents who said they would visit less frequently. The second largest category of responses for both samples was those who said the change would not cause them to change their visitation levels to the area.

**Table 4.15 Anticipated changes in winter visitation to the GYA under alternative options (Q16,Q17)**

Responses	If road from W. Yellowstone to Madison to Old Faithful was plowed and open for car/bus travel only. (Snowmobiles' trailer parking & rental available in Old Faithful)			If YNP and GT were open only to snow coach, skiing and snowshoeing, but not snowmobiles.		
	Park sample		N. Forest sample	Park sample		N. Forest sample
	Non-GYA	GYA		Non-GYA	GYA	
Percent of visitors that would not change their number of winter visits	37.4%	35.7%	45.8%	25.4%	27.4%	25.5%
Percent of visitors that would visit less frequently	31.0%	23.7%	24.2%	45.8%	31.2%	41.4%
Percent of visitors that would visit more frequently	6.3%	18.0%	6.8%	11.2%	26.7%	13.8%
Percent of visitors that would visit the same amount to the GYA, but would go to other destinations	8.4%	6.4%	12.3%	4.2%	3.8%	8.8%
Percent of visitors that are not sure how their visitation would change	16.9%	16.2%	11.0%	13.4%	10.9%	10.5%
Sample size	886	266	236	878	266	239

From the perspective of analyzing changes in regional expenditures, it is of interest to the 17-county GYA economy how visitors from outside the GYA would change their visitation under alternative policies. The average levels of change for these respondents who live outside of the GYA, and who said that plowing the road from West Yellowstone to Old Faithful would lead them to either increase or decrease the number of trips they would take to the GYA and Yellowstone N.P. are shown in Table 4.16. These average changes were calculated by

comparing the baseline expected number of trips to the GYA and Yellowstone N.P. from survey questions 14 and 15 with the expected number of trips under possible winter management changes from Question 16. (Changes associated with the GYA resident respondents is also presented for completeness.) Table 4.17 shows the expected changes in visitation levels associated with the Question 17 scenario of allowing only snowcoach, ski and snowshoe access to the parks in the winter months. Additionally, for those who said they would visit more often, a check was made to ensure that the anticipated number of trips times the length of their current trip in days was not greater than the total length of the YNP winter season (121 days). One respondent with a very high number of anticipated trips was excluded from further analysis based on this standard.

In calculating the estimated changes in visitation, responses were examined to ensure that those responses used in the calculations presented consistent information. (If the respondent said that they would decrease their number of trips to the GYA, for instance, the response data was checked to ensure that the numbers of trips they provided did not actually represent an increase.)

It should be noted that a number of the average reductions or increases in trips to the area calculated from the responses to Questions 16 through 19 are based on quite small sample sizes. Only responses for the park sample are presented because the combination of small sample sizes and informal sampling technique for the forest sample made it impossible to calculate the majority of trip changes for the forest sample with any degree of precision.

Table 4.16 shows that under the management option of plowing the West Yellowstone to Old Faithful road, park visitors from outside the GYA anticipate an 18.8% reduction in trips to the GYA and a 13% reduction to trips in the YNP. For GYA residents, these changes were an 8.0% decrease to the GYA and a 0.01% increase to YNP. In order to minimize the effect of outliers on these estimates of visitation changes, the median changes in visitation (rather than mean) were also used to estimate visitation impacts. These results, which are presented in Appendix D, generally show smaller estimated visitation decreases than those estimated using the mean responses.

Table 4.17 shows the estimated impacts on visitation of allowing only snowcoach, skiing and snowmobiling in Yellowstone National and Grand Teton National Parks. Under this management option, non-GYA park visitors would have an estimated 31.6% reduction in trips to the GYA and a 20.5% reduction to YNP. GYA residents are estimated to have a 12.7% and 0.04% reductions in trips to the GYA and YNP, respectively.

<b>Table 4.16 Estimated changes in visitation associated with changes in winter management (Q16)</b>		
<b>If the road from W. Yellowstone to Madison to Old Faithful were plowed and open for car/bus travel only (Snowmobile trailer parking &amp; rental available in Old Faithful)</b>		
<b>Statistic</b>	<b>Non-GYA</b>	<b>GYA</b>
<b>A. Change in visits to the GYA</b>		
Reduction in trips by those that would visit less	360 (199)	274 (42)
Increase in trips by those that would visit more	55 (43)	33 (28)
Net change in trips	-305	-241
Baseline trips to the GYA	1,667	3,016
Percentage change in baseline trips	-18.3%	-8.0%
<b>B. Change in visits to YNP</b>		
Reduction in trips by those that would visit less	186 (145)	80 (32)
Increase in trips by those that would visit more	63 (36)	89 (27)
Net change in trips	-123	9
Baseline trips to the YNP	943	932
Percentage change in baseline trips	-13.0%	.01%

Sample sizes are indicated in parentheses

Appendix C details how respondents engaged in different activities on their trips responded to survey Questions 16, 17, 18, 19. A general result of this analysis is that under alternatives which limit motorized access to the park, snowmobilers are more likely to decrease visitation and skiers are more likely to increase visitation.

**Table 4.17 Estimated changes in visitation associated with changes in winter management (Q17)**

**If YNP and GT were open only to snow coach, skiing and snowshoeing, but not snowmobiles**

<b>Statistic</b>	<b>Non-GYA residents</b>	<b>GYA residents</b>
<b>A. Change in visits to the GYA</b>		
Reduction in trips by those that would visit less	605 (291)	569 (68)
Increase in trips by those that would visit more	79 (63)	189 (43)
Net change in trips	-526	-380
Baseline trips to the GYA	1,663	3,002
Percentage change in baseline trips	-31.6%	-12.7%
<b>B. Change in visits to YNP</b>		
Reduction in trips by those that would visit less	291 (231)	164 (57)
Increase in trips by those that would visit more	100 (58)	127 (35)
Net change in trips	-191	-37
Baseline trips to the YNP	930	927
Percentage change in baseline trips	-20.5%	-0.04%

Sample sizes are indicated in parentheses

**Table 4.18 Anticipated changes in winter visitation to the GYA under alternative management options (Q18, Q19)**

Responses	If the roads from Mammoth and W. Yellowstone to Madison, and from Madison to Old Faithful were closed to all vehicular travel from Nov. 1 to April 30, and other roads groomed for snowmobiles.			If the road between Colter Bay and YNP's South entrance in Grand Teton NP was not plowed, and instead open a groomed for snowmobiles and snowcoaches.		
	Park sample		N. Forest sample	Park sample		N. Forest sample
	Non-GYA	GYA		Non-GYA	GYA	
Percent of visitors that would not change the number of winter visits	38.6%	47.5%	41.0%	48.8%	51.3%	53.4%
Percent of visitors that would visit less frequently	34.7%	23.6%	26.8%	8.3%	18.8%	9.4%
Percent of visitors that would visit more frequently	5.0%	5.3%	10.9%	7.1%	4.2%	10.3%
Percent of visitors that would visit the same amount to the GYA, but would visit other destinations in the GYA	4.3%	5.3%	6.7%	4.7%	5.4%	5.6%
Percent of visitors that are not sure how their visitation would change	17.5%	18.3%	14.6%	31.2%	20.3%	21.4%
Sample size	888	263	239	857	261	234

Table 4.18 shows the distribution of responses for survey questions 18 and 19. Under the Question 18 proposal to close the west-side roads in Yellowstone N.P. to all vehicular travel from November 1 through April 30, the largest proportion of respondents in both the park sample and the forest sample said they would not change their number of visits to the GYA and Yellowstone N.P. The second largest group of respondents for this question were those who said they would visit less frequently under the change.



Question 19 of the winter visitor survey asked respondents how they would change their visitation under a policy that entailed not plowing the road between Colter Bay and Yellowstone N.P.'s South Entrance, but instead grooming the route for snowmobiles and snowcoaches. For this question, the largest response category for both the park and the forest sample was those respondents who said they would not change their visitation. The second largest category of responses for both samples was those who said they were not sure how their visitation would change.

Tables 4.19 and 4.20 show the average reported changes in anticipated visitation to the GYA area under the changes described in survey questions 18 and 19 for visitors from outside the GYA.

Table 4.19 shows that under a West-side closure of roads within YNP there would be an estimated 24.8% reduction in trips by non-GYA residents to the GYA, and a 20.8% reduction in trips by this group to YNP. For GYA residents, there would be an estimated 10.3% reduction to the GYA and 6.8% reduction to YNP.

Table 4.20 shows the estimated impacts of stopping plowing the road from Colter Bay and YNP's South Entrance. Under this option, it is estimated that non-GYA residents would take 4.4% fewer trips to the GYA and 1.8% fewer trips to YNP. For GYA residents, the impacts would be a 9.9% decrease to the GYA and a 2.0% decrease to YNP.

**Table 4.19 Estimated changes in visitation associated with changes in winter management (Q18)**

**If the roads from Mammoth and W. Yellowstone to Madison, and from Madison to Old Faithful were closed to all vehicular travel from Nov. 1 to April 30, and other roads groomed for snowmobiles**

<b>Statistic</b>	<b>Non-GYA</b>	<b>GYA</b>
<b>A. Change in visits to the GYA</b>		
Reduction in trips by those that would visit less	460 (212)	353 (42)
Increase in trips by those that would visit more	32 (25)	47 (11)
Net change in trips	-428	-308
Baseline trips to the GYA	1,724	2,962
Percentage change in baseline trips	-24.8%	-10.3%
<b>B. Change in visits to YNP</b>		
Reduction in trips by those that would visit less	231 (156)	114 (33)
Increase in trips by those that would visit more	31 (21)	54 (12)
Net change in trips	-200	-60
Baseline trips to YNP	963	888
Percentage change in baseline trips	-20.8%	-6.8%

Sample sizes are indicated in parentheses

**Table 4.20 Estimated changes in visitation associated with changes in road plowing and vehicle access**

**If the road between Colter Bay and YNP's south entrance in Grand Teton NP was not plowed, and instead open a groomed trail for snowmobiles and snowcoaches**

<b>Statistic</b>	<b>Non-GYA</b>	<b>GYA</b>
<b>A. Change in visits to the GYA</b>		
Reduction in trips by those that would visit less	91 (37)	307 (29)
Increase in trips by those that would visit more	17 (42)	13 (10)
Net change in trips	-74	-294
Baseline trips to the GYA	1,692	2,974
Percentage change in baseline trips	-4.4%	-9.9%
<b>B. Change in visits to YNP</b>		
Reduction in trips by those that would visit less	33 (27)	27 (18)
Increase in trips by those that would visit more	16 (39)	9 (8)
Net change in trips	-17	-18
Baseline trips to YNP	932	886
Percentage change in baseline trips	-1.8%	-2.0%

Sample sizes are indicated in parentheses

<b>Table 4.21 Preferred policy for allowing winter access to Old Faithful (Q21)</b>				
<b>Policy</b>	<b>Park Sample (%)</b>		<b>Forest Sample (%)</b>	
	<b>Residents of MT, ID, and WY</b>	<b>Nonresidents</b>	<b>Residents of MT, ID, and WY</b>	<b>Nonresidents</b>
Existing policy of grooming roads for snowmobile use	45.3%	63.4%	61.6%	69.1%
To plow the road and groom a parallel route for snowmobile use	12.8%	13.0%	8.5%	14.7%
To plow the road but not groom a parallel route for snowmobile use	6.2%	3.0%	2.8%	0%
To not groom or plow, but allow ski or snowshoe use only	10.4%	3.9%	10.7%	10.3%
To allow snow coach, ski, and snowshoe travel only, not snowmobiles	25.3%	16.8%	16.4%	5.9%
Sample size	414	700	177	68

Table 4.21 shows the visitor response about their preferred winter management policy for allowing winter access to Old Faithful. The majority of visitors, both from the park and from the forest, chose the existing policy of grooming for snowmobile use. In the park sample, the response rate for residents is 45.3% and 63.4% for nonresidents, in favor of the current policy. In the forest sample, the response rate for residents is 61.6% and for nonresidents is 69.1%, in favor of the current policy. Nonresident visitors are more in favor of the existing policy than resident visitors, having the highest percent response, 63.4% in the park sample, and 69.1% in the forest sample.

In the park sample, for both residents and nonresidents, the second preferred policy was to allow snow coach, ski, and snowshoe travel only, not snowmobiles. In this case, the percent response of residents is 25.3%, and for nonresidents is 16.8%. The least preferred policy for all groups is to plow the road but not groom a parallel route for snowmobile use. In this case, the park sample has percent responses of 6.2% for residents, and 3.0% for nonresidents; while, the forest sample has a percent response of 2.8% for residents and 0% for nonresidents.

### 4.3 Wildlife Management

Wildlife viewing is often cited as a primary activity engaged in by both summer and winter visitors to Yellowstone N.P. In the current survey 62% of respondents in the park sample said they engaged in wildlife viewing activities on their visit to the GYA. Tables 4.22 to 4.24 present the responses of winter visitors on questions relating to what wildlife they saw on their visits, as well as to questions on the importance of specific wildlife species to their visitation decisions.

Table 4.22 summarizes the wildlife that park visitors saw and wildlife they would like to have seen. The most frequently seen wildlife included elk, seen by 93.5% of visitors, bison, seen by 90.4% and coyote, seen by 70.6%. The animals visitors most wanted to see were wolves, listed by 41.1% of visitors, the grizzly bear, listed by 36.0% and the mountain lion, listed by 31.9%. The animals that the fewest number of visitors wanted to see were the Canada goose, named by only 1.4% of visitors, the coyote and the fox, each garnering 2.5% of the visitors' choice. Only 24.2% of visitors reported seeing wolves, while just 0.6% reported seeing grizzlies. The most abundant species seen was elk, with an average of 348 viewed. The average number of bison seen was 120.

<b>Table 4.22. Wildlife species seen: park sample (Q23)</b>			
<b>Species</b>	<b>Percent of visitors that saw the animal</b>	<b>Average Number seen</b>	<b>Percent of visitors that chose this mammal as the one of the three species they would most like to see</b>
Antelope	19.0%	52	3.9%
Bald Eagle	57.6%	2	22.1%
Bighorn Sheep	22.4%	9	25.0%
Bison	90.4%	120	27.6%
Black Bear	0.7%	1	12.8%
Canada Goose	52.2%	33	1.4%
Coyote	70.6%	4	2.6%
Mountain Lion	0%	0	31.9%
Deer	37.5%	34	3.3%
Elk	93.5%	348	26.1%
Fox	15.4%	1	2.5%
Grizzly Bear	0.6%	3	36.0%
Moose	38.8%	7	31.2%
Trumpeter Swan	40.3%	7	6.3%
Wolf	24.2%	3	41.1%
Wolverine	0%	0	11.9%
Sample size	1127		

Note: The average number seen are for those who saw the species.

Table 4.23 summarizes the wildlife that the national forest visitor sample saw and the wildlife they would most like to see. National forest visitors ranked the moose, mountain lion and elk as those animals they would most like to see. The national forest visitors ranked the moose first, with 34.3%, the elk second with 32.6% and the mountain lion third with 32.2%. The most frequently seen animal was the elk, reported by 77.5% of visitors who saw an average of 711 elk. Sixty point one percent of visitors saw coyotes, and on average those who saw coyotes saw a total of six.

<b>Table 4.23. Wildlife species seen: forest sample (Q23)</b>			
<b>Species</b>	<b>Percent of visitors that saw the animal</b>	<b>Average Number seen</b>	<b>Percent of visitors that chose this mammal as the one of the three species they would most like to see</b>
Antelope	21.1%	38	2.0%
Bald Eagle	45.1%	3	18.4%
Bighorn Sheep	31.5%	17	26.5%
Bison	57.3%	79	19.6%
Black Bear	1.4%	1	11.8%
Canada Goose	32.4%	39	2.4%
Coyote	60.1%	6	3.3%
Mountain Lion	0%	0	32.2%
Deer	52.1%	42	10.6%
Elk	77.5%	711	32.6%
Fox	20.7%	2	3.3%
Grizzly Bear	0.5%	2	29.8%
Moose	49.8%	8	34.3%
Trumpeter Swan	19.2%	10	8.6%
Wolf	16.0%	3	31.0%
Wolverine	0%	0	15.1%
Sample size	213		

Table 4.24 shows how the presence of bison and wolves might affect the respondents' decision to visit the Greater Yellowstone Area. Of the park visitors, 53.9% said that the possibility of seeing bison affected their decision to visit the GYA. Among the national forest sample, 19.6% said that the possibility of seeing bison affected their decision to visit the GYA. With regard to wolves, 35.9% of park visitors and 19.0% of national forest visitors said that the possibility of seeing a wolf affected their decision. When asked if they would still visit the GYA if bison were not present, 67.2% of the park visitors and 81.0% of the national forest visitors said they would. For wolves, 76.1% of park visitors and 83.3% of national forest visitors would still visit the park without the presence of wolves.

<b>Table 4.24 Whether the possibility of seeing bison or wolves affected visitors' decision to visit GYA (Q25, Q26)</b>		
<b>Question / Response</b>	<b>Park sample</b>	<b>N. Forest sample</b>
Was seeing bison one of the reasons for your visiting the GYA on this trip?		
Yes	53.9%	19.6%
No	46.1%	80.4%
Sample size	1147	250
IF YES, would you still have chosen to take this trip even if bison were not present in the GYA?		
Yes	67.2%	81.0%
No	12.2%	6.0%
Not Sure	20.6%	13.1%
Sample size	726	84
Was seeing or hearing wolves one of the reasons for your visiting the GYA on this trip?		
Yes	35.9%	19.0%
No	64.1%	81.0%
Sample size	1143	248
IF YES, would you still have chosen to take this trip even if wolves were not present in the GYA?		
Yes	76.1%	83.3%
No	10.2%	8.3%
Not Sure	13.7%	8.3%
Sample size	551	72



Table 4.25 shows the visitors’ response about their knowledge of the current bison management policy. About 50% of resident visitors responded that they know a great deal about the situation (47.8% park, 53.9% forest). The most common response for nonresidents was that they know a fair amount about the situation (29.8% park, 35.2% forest). However, in the nonresident group, the second and third highest percent response corresponded to the choices of “have heard, but do not know much about it” and “never heard of the situation.” On the other hand, very few residents had not heard of the situation. To summarize, a large majority of residents report knowing a great deal or a fair amount about the situation; while nonresidents know a fair amount, not much, or never heard of it.

<b>Table 4.25. Respondent knowledge about current policy for management of bison infected with brucellosis, by residency (Q27)</b>				
<b>Responses</b>	<b>MT, ID, and WY residents</b>		<b>Nonresidents</b>	
	<b>Park sample</b>	<b>N. Forest sample</b>	<b>Park sample</b>	<b>N. Forest sample</b>
Never heard of the situation	3.3%	2.2%	26.5%	25.4%
Have heard, but do not know much about it	6.5%	4.4%	28.3%	25.4%
Know a fair amount about the situation	42.4%	39.4%	29.8%	35.2%
Know a great deal about the situation	47.8%	53.9%	15.4%	14.1%
Sample size	438	180	710	71

The visitors' opinions on different statements concerning bison and wildlife management are shown from Table 4.26 through Table 4.31. Table 4.26 shows the opinion of the nonresident group from the forest sample. Table 4.27 shows the response of the resident group from the forest sample. Tables 4.28 and 4.29 show the response of the nonresident and resident groups of the park sample, respectively. Table 4.30 and 4.31 show the overall response of the forest sample and the park sample, respectively.

There are striking similarities between all the groups, whether separated by residency or by sample group. The majority of visitors strongly agree that they have a great deal of concern for protecting wildlife habitat (59.2% forest, 72.9% park). The majority strongly disagree that wildlife species must be beneficial to humans to deserve protection (45.6% forest, 55.2% park). Between 40-50% of the forest sample as well as the park sample strongly agree that it is important to protect rare plants and animals to maintain genetic diversity. Most visitors strongly agree that they should have the opportunity to have mechanized winter access into YNP (51.6% forest, 39.6% park).

A plurality strongly agree that they would be willing to contribute to protecting wildlife habitat even if they never see or enjoy the animals (29.0% forest, 33.8% park). However, in both, the park sample and the forest sample, nonresidents "moderately agree" with this statement (35.2% forest, 32.3% park). Overall, about 32% of visitors strongly disagree that all bison in YNP should be rounded up and tested for disease then either slaughtered or vaccinated. In the forest sample, 24.7% strongly agree that bison should be allowed to range onto public lands outside YNP, though 24.3% strongly disagree with that statement. Most park visitors either strongly or moderately agree that bison should be allowed to range onto public lands outside the park (26.1% strongly agree, 23.3% moderately agree).

**Table 4.26 Visitors' opinions on different statements concerning bison and wildlife management: nonresident, forest (Q28)**

Statements	Strongly agree	Moderately agree	Neither agree or disagree	Moderately disagree	Strongly disagree	Do not know	Sample size
I have a great deal of concern for protecting wildlife habitat	60.6%	26.8%	7.0%	2.8%	1.4%	1.4%	71
Wildlife species must be beneficial to humans to deserve protection	12.7	12.7	15.5	15.5	40.8	2.8	71
It's important to protect rare plants and animals to maintain genetic diversity	35.7	31.4	25.7	2.9	2.9	1.4	70
Visitors should have the opportunity to have mechanized winter access into YNP	54.3	17.1	8.6	5.7	11.4	2.9	70
I am concerned about the possible disturbance of Yellowstone wildlife in the winter	26.4	16.7	18.1	18.1	16.7	4.2	72
Livestock grazing is an appropriate use on national forest lands around YNP	19.4	31.9	11.1	15.3	16.7	5.6	72
It is appropriate to kill bison at park boundaries as necessary to protect domestic livestock	23.9	19.7	16.9	11.3	22.5	5.6	71
I would be willing to contribute to protecting wildlife habitat even if I never see or enjoy the animals	26.8	35.2	19.7	4.2	8.5	5.6	71
Yellowstone bison should be allowed to range onto public lands outside YNP	12.7	28.2	22.5	12.7	19.7	4.2	71
All bison in YNP should be rounded up & tested for disease then either slaughtered or vaccinated	12.9	21.4	22.9	12.9	27.1	2.9	70

**Table 4.27 Visitors' opinions on different statements concerning bison and wildlife management: residents, forest (Q28)**

Statements	Strongly agree	Moderately agree	Neither agree or disagree	Moderately disagree	Strongly disagree	Do not know	Sample size
I have a great deal of concern for protecting wildlife habitat	58.7%	31.5%	4.9%	2.7%	2.2%	0%	184
Wildlife species must be beneficial to humans to deserve protection	8.8	6.6	19.9	16.6	47.5	0.6	181
It's important to protect rare plants and animals to maintain genetic diversity	41.8	28.8	13.6	9.2	4.9	1.6	184
Visitors should have the opportunity to have mechanized winter access into YNP	50.5	19.2	9.3	8.8	11.5	0.5	182
I am concerned about the possible disturbance of Yellowstone wildlife in the winter	22.4	20.2	13.7	15.3	28.4	0	183
Livestock grazing is an appropriate use on national forest lands around YNP	29.9	23.9	15.8	11.4	18.5	0.5	184
It is appropriate to kill bison at park boundaries as necessary to protect domestic livestock	33.0	22.0	8.8	7.7	28.6	0	182
I would be willing to contribute to protecting wildlife habitat even if I never see or enjoy the animals	29.9	26.6	22.3	3.3	12.5	5.4	184
Yellowstone bison should be allowed to range onto public lands outside YNP	29.3	16.3	13.6	12.0	26.1	2.7	184
All bison in YNP should be rounded up & tested for disease then either slaughtered or vaccinated	15.3	19.4	14.4	10.6	33.9	6.1	180

**Table 4.28 Visitors' opinions on different statements concerning bison and wildlife management: nonresident, park (Q28)**

Statements	Strongly agree	Moderately agree	Neither agree or disagree	Moderately disagree	Strongly disagree	Do not know	Sample size
I have a great deal of concern for protecting wildlife habitat	74.2%	24.4%	0.9%	0.3%	0.1%	0.1%	712
Wildlife species must be beneficial to humans to deserve protection	11.3	9.4	8.1	15.5	54.8	1.0	708
It's important to protect rare plants and animals to maintain genetic diversity	56.5	32.1	6.7	1.4	1.3	2.0	712
Visitors should have the opportunity to have mechanized winter access into YNP	43.6	29.5	9.0	8.4	7.2	2.2	713
I am concerned about the possible disturbance of Yellowstone wildlife in the winter	26.9	33.4	16.9	10.7	10.3	2.0	712
Livestock grazing is an appropriate use on national forest lands around YNP	16.7	23.7	17.2	14.2	19.4	8.8	708
It is appropriate to kill bison at park boundaries as necessary to protect domestic livestock	19.2	26.1	11.9	16.0	20.0	6.8	711
I would be willing to contribute to protecting wildlife habitat even if I never see or enjoy the animals	30.8	32.3	17.0	6.5	7.3	6.3	710
Yellowstone bison should be allowed to range onto public lands outside YNP	19.0	24.9	16.7	17.3	14.7	7.3	708
All bison in YNP should be rounded up & tested for disease then either slaughtered or vaccinated	12.1	18.2	20.6	13.8	24.6	10.8	708

**Table 4.29 Visitors' opinions on different statements concerning bison and wildlife management: resident, park (Q28)**

Statements	Strongly agree	Moderately agree	Neither agree or disagree	Moderately disagree	Strongly disagree	Do not know	Sample size
I have a great deal of concern for protecting wildlife habitat	71.0%	24.1%	3.4%	0.7%	0.5%	0.3%	436
Wildlife species must be beneficial to humans to deserve protection	10.0	10.7	10.6	12.2	55.8	0.7	430
It's important to protect rare plants and animals to maintain genetic diversity	57.4	26.1	9.3	3.0	2.9	1.4	437
Visitors should have the opportunity to have mechanized winter access into YNP	32.9	24.3	10.9	12.4	17.6	2.0	433
I am concerned about the possible disturbance of Yellowstone wildlife in the winter	36.9	25.9	12.9	12.1	11.6	0.6	437
Livestock grazing is an appropriate use on national forest lands around YNP	21.5	26.1	12.3	15.2	23.2	1.8	436
It is appropriate to kill bison at park boundaries as necessary to protect domestic livestock	19.7	18.9	8.8	13.2	37.9	1.5	437
I would be willing to contribute to protecting wildlife habitat even if I never see or enjoy the animals	38.7	28.9	17.8	4.3	6.5	3.7	438
Yellowstone bison should be allowed to range onto public lands outside YNP	37.8	20.8	12.3	14.1	12.1	3.0	436
All bison in YNP should be rounded up & tested for disease then either slaughtered or vaccinated	7.7	13.1	17.5	14.3	42.6	4.8	435

**Table 4.30. Visitors' opinions on different statements concerning bison and wildlife management: forest total(Q28)**

Statements	Strongly agree	Moderately agree	Neither agree or disagree	Moderately disagree	Strongly disagree	Do not know	Sample size
I have a great deal of concern for protecting wildlife habitat	59.2%	30.2%	5.5%	2.7%	2.0%	0.4%	255
Wildlife species must be beneficial to humans to deserve protection	9.9	8.3	18.7	16.3	45.6	1.2	252
It's important to protect rare plants and animals to maintain genetic diversity	40.2	29.5	16.9	7.5	4.3	1.6	254
Visitors should have the opportunity to have mechanized winter access into YNP	51.6	18.7	9.1	7.9	11.5	1.2	252
I am concerned about the possible disturbance of Yellowstone wildlife in the winter	23.5	19.2	14.9	16.1	25.1	1.2	255
Livestock grazing is an appropriate use on national forest lands around YNP	27.0	26.2	14.5	12.5	18.0	2.0	256
It is appropriate to kill bison at park boundaries as necessary to protect domestic livestock	30.4	21.3	11.1	8.7	26.9	1.6	253
I would be willing to contribute to protecting wildlife habitat even if I never see or enjoy the animals	29.0	29.0	21.6	3.5	11.4	5.5	255
Yellowstone bison should be allowed to range onto public lands outside YNP	24.7	19.6	16.1	12.2	24.3	3.1	255
All bison in YNP should be rounded up & tested for disease then either slaughtered or vaccinated	14.8	20.0	16.8	11.2	32.0	5.2	250

**Table 4.31 Visitors' opinions on different statements concerning bison and wildlife management: park total (Q28)**

Statements	Strongly agree	Moderately agree	Neither agree or disagree	Moderately disagree	Strongly disagree	Do not know	Sample
I have a great deal of concern for protecting wildlife habitat	72.9%	24.3%	1.9%	0.4%	0.3%	0.2%	1148
Wildlife species must be beneficial to humans to deserve protection	10.8	9.9	9.0	14.2	55.2	0.9	1138
It's important to protect rare plants and animals to maintain genetic diversity	56.9	29.8	7.7	2.0	1.9	1.7	1149
Visitors should have the opportunity to have mechanized winter access into YNP	39.6	27.5	9.7	9.9	11.1	2.1	1146
I am concerned about the possible disturbance of Yellowstone wildlife in the winter	30.7	30.5	15.4	11.2	10.8	1.4	1149
Livestock grazing is an appropriate use on national forest lands around YNP	18.5	24.6	15.3	14.6	20.8	6.1	1143
It is appropriate to kill bison at park boundaries as necessary to protect domestic livestock	19.4	23.4	10.7	14.9	26.8	4.8	1148
I would be willing to contribute to protecting wildlife habitat even if I never see or enjoy the animals	33.8	31.0	17.3	5.7	7.0	5.3	1148
Yellowstone bison should be allowed to range onto public lands outside YNP	26.1	23.3	15.0	16.1	13.7	5.7	1144
All bison in YNP should be rounded up & tested for disease then either slaughtered or vaccinated	10.4	16.2	19.4	14.0	31.4	8.5	1142



Table 4.32 shows the visitors' response concerning a possible approach to bison management: Because grooming the roads into Yellowstone N.P. from West Yellowstone and Mammoth for over-snow vehicles may provide an easier winter route out of the park for bison, if the roads were not groomed, more bison might remain in the park. Visitors from the park sample as well as visitors from the forest sample preferred the current policy that allows winter access. The park sample's response is 52.1% while for the forest sample is 59.6%, in favor of the current policy.

<b>Table 4.32 Bison management policies (1) (Q29)</b>		
Grooming the roads into YNP from West Yellowstone and Mammoth Hot Springs for over-snow vehicles provides an easier winter route out of the park for bison. If roads were not groomed, more bison might remain in the park.		
<b>Policy Choices</b>	<b>Park Sample</b>	<b>Forest Sample</b>
Keep the current policy that allows winter access	52.1%	59.6%
Close motorized winter access	23.4%	23.6%
Not sure which policy to prefer	24.6%	16.8%
Sample size	1134	250

Table 4.33 shows the visitors' response concerning another possible bison management policy: the park winter management policy could change to include plowing the road from West Yellowstone to Old Faithful. By plowing the road, it is possible that even more bison may need to be controlled at the park boundary because of the easier travel route that would create. Visitors from the park sample as well as visitors from the forest sample preferred the current policy that allows winter access (55.5% park, 61.0% forest). The second preferable choice for both groups was to close motorized winter access (23% park, 24.7% forest).

<b>Table 4.33 Bison management policies (2) (Q30)</b>		
<b>Policy Choices</b>	<b>Park Sample</b>	<b>Forest Sample</b>
Keep the current policy that allows winter access	55.5%	61.0%
Close motorized winter access	23.0%	24.7%
Plow the road from West Yellowstone to Old Faithful	4.5%	4.8%
Not sure which policy to prefer	17.1%	9.6%
Sample size	1140	251

#### 4.4 Nonmarket Valuation Question Analysis

The GYA winter visitor survey contained five questions designed to measure the value winter users would place on various current, or proposed, aspects of winter recreation in the GYA. The first of these contingent valuation questions asked the respondent’s willingness to pay for the opportunity to rent a cleaner and quieter snowmobile on their trip to the GYA. Table 4.34 shows the percentage of respondents in both the national park and the national forest samples who reported renting a snowmobile on their trip to the GYA. Overall, 42% of park visitors and 15.9% of forest visitors sampled had rented snowmobiles on their trip.

<b>Table 4.34 Visitors that rented snowmobiles in their trip to the GYA (Q9)</b>		
<b>Samples</b>	<b>Percent of visitors who rented a snowmobile</b>	
	<b>Park Sample</b>	<b>Forest Sample</b>
Percent renting a snowmobile	42.0%	15.9%
Sample size	1145	251

Those respondents who reported renting a snowmobile on their trip were asked about their willingness to pay a higher rental fee in order to rent a hypothetical clean/quiet machine. The exact wording of the question is as follows:

If you had the option of renting a snowmobile that would be as clean and quiet running as a typical new car, would you be willing to pay an additional \$\_\_\_\_\_ per day to rent such a machine?

The additional amount asked of respondents was randomly varied between \$10, \$25, \$50, and \$100. Table 4.35 shows the percentage of respondents asked each bid level who responded “yes” they would pay the additional amount. As would be expected, the percentage of respondents willing to pay each bid level decreased as the amount of the bid increased. This was true for both the park and the forest samples.

**Table 4.35 Percent of visitors who would be willing to pay an additional cost per day, for a cleaner and quieter snowmobile (Q9)**

Bid Level	Percent of respondents responding “yes” at alternative bid levels	
	Park sample	Forest sample
\$10	82.7% (107)	83.3% (12)
\$25	66.8% (91)	80.0% (10)
\$50	56.7% (78)	66.7% (3)
\$100	24.8% (104)	0.0% (10)

Sample sizes are indicated in parentheses.

The estimated logistic regression model associated with the bid responses shown in Table 4.35 is presented in Table 4.36. The estimated coefficients in Table 4.36 are all highly significant and the models themselves both fit a logistic distribution, although the fit for the forest sample barely passes the reported statistical test. The forest sample (35 observations) is quite small for this type of model.

The estimated median willingness to pay for renting a cleaner quieter snowmobile was similar for both the park sample and the forest sample (\$46.09 the park sample and \$35.89 for the forest sample).

<b>Regression Variables</b>	<b>Park Sample</b>	<b>Forest Sample</b>
Constant	4.3145 (8.17)	6.9709 (3.28)
Ln(BID)	-1.1263 (7.93)	-1.9468 (3.37)
N	388	35
$\chi^2$	4.12	5.74
d.f.	2	2
P	0.1274	0.0566
Estimated Median Willingness to Pay (standard error)	\$46.09 (4.88)	\$35.89 (8.53)

One of the contingent valuation questions included in the winter visitor survey asked respondents their willingness to pay an additional amount in travel expenses to have made their trip to the GYA. The wording of this question was as follows:

The costs of visiting and recreating in National Parks and National Forests change over time. For example, gas prices and other travel costs rise and fall. Would you have still made this trip if your share of total costs were \$\_\_\_\_\_ more than the amount you personally had to pay?

The bid amounts randomly entered in this question were chosen from the following set: \$25, \$50, \$100, \$500, and \$1,000. Table 4.37 shows the response proportions to the alternative bid levels for four subsamples, 3-state residents in the park and forest samples, and nonresidents in the park and forest samples. The response proportions generally show the expected declining percentage of “yes” responses as bid levels increased.

It is possible that some respondents viewed the bid amounts as an increase in their group (rather than individual) expenses. In order to be conservative and to identify an individual-based welfare measure, bid amounts were divided by the number of people who shared expenses on the trip. These “individual-based” bid levels were used in the estimation of the willingness-to-pay models.

<b>Bid Level</b>	<b>Park Sample</b>		<b>Forest Sample*</b>
	<b>Residents of MT, ID, and WY</b>	<b>Nonresidents</b>	<b>Residents of MT, ID, and WY</b>
\$25	77.5% (78)	92.0% (146)	75.0% (32)
\$50	61.8% (55)	87.5% (113)	76.1% (21)
\$100	49.1% (57)	88.1% (118)	52.0% (25)
\$500	15.3% (65)	41.9% (78)	23.0% (26)
\$1,000	11.4% (79)	16.8% (116)	5.8% (34)

\*Note: the nonresident forest sample was too small to reliably estimate a model.

\* Sample sizes are indicated in parentheses

Table 4.38 shows the estimated logistic regression models of willingness to pay additional travel expenses to have gone on the respondent's winter trip to the GYA. The t-statistics associated with the estimated coefficients in Table 4.38 show that all estimated coefficients are highly significant. With the exception of the nonresident park sample, the models presented in Table 4.38 fit the logistic distribution

The median willingness to pay was substantially higher for the nonresident sub-samples than for the 3-state resident samples. The park and forest resident samples have a median willingness to pay of \$30.33 and \$38.67 respectively. The nonresident median values for the park sample was \$144.66. The nonresident forest sample size was too small to estimate a reliable model.

**Table 4.38 Estimated logistic regression model of willingness to pay increased travel costs to visit the GYA in winter (Q12)**

Regression Variables	Park Sample		Forest Sample
	3-state residents	Nonresidents	3-state residents
Constant (t-stat)	2.6515 (6.53)	4.561 (12.14)	3.43 (5.12)
Ln(BID)	-0.7771 (7.62)	-0.9169 (11.09)	-0.9384 (5.60)
N	305	548	122
Hosmer-Lemeshow $\chi^2$	7.12	36.26	5.78
d.f.	6	8	6
P	0.3095	0.0001	0.4481
Estimated Median Willingness to Pay (standard error)	\$30.33 (5.40)	\$144.66 (19.32)	\$38.67 (9.34)

Table 4.39 shows aggregate responses to a contingent valuation question which asked respondents their willingness to pay to have the road from West Yellowstone to Old Faithful plowed in winter months. The wording of the question was:

One approach to winter management is for visitors to pay for the increased winter operations costs associated with plowing roads. Suppose the winter entrance fee to Yellowstone increased by \$\_\_\_\_\_ per visitor to pay for plowing the road from West Yellowstone into Old Faithful for car and bus travel. Would you still have chosen to make this trip to Yellowstone under these circumstances?

The park sample responses show a declining willingness to pay the fee as the fee level is increased. For the forest sample, there is a general, but not consistent, decline in the percentage of respondents willing to pay the increasing fee levels.

<b>Table 4.39 Visitors who would still pay entrance fee increases for plowing the road for car and bus travel (Q20)</b>		
<b>Bid Level</b>	<b>Percent of respondents who answered “yes” they would be willing to pay an additional amount</b>	
	<b>Park sample</b>	<b>Forest sample</b>
\$5	54.6% (228)	36.7% (30)
\$10	38.3% (180)	17.6% (17)
\$25	29.2% (181)	11.5% (26)
\$50	16.7% (231)	16.7% (18)

Sample sizes are indicated in parentheses

Table 4.40 shows the estimated logistic regression models of willingness to pay for the increased Yellowstone road plowing fee question responses. The model for the park sample shows both coefficients are highly significant and the model fits the theoretical distribution well. For the forest sample, the model fits the distribution well but the intercept coefficient is imprecisely estimated.

The estimated median willingness to pay for plowing the road from West Yellowstone into Old Faithful during the winter months is \$6.14 per person for the park sample respondents and \$1.57 for the forest sample.

**Table 4.40 Estimated logistic regression model of willingness to pay an additional fee to pay for plowing of the West Yellowstone to Old Faithful road (Q20)**

<b>Regression Variables</b>	<b>Park Sample</b>	<b>Forest Sample</b>
Constant	1.3316 (5.58)	0.2750 (0.34)
Ln(BID)	-0.7337 (8.38)	-0.6117 (1.97)
N	833	91
$\chi^2$	1.62	1.54
d.f.	2	2
P	0.4453	0.4619
Estimated Median Willingness to Pay (standard error)	\$6.14 (0.85)	\$1.57 (1.68)

Another contingent valuation question in the survey asked about respondents' willingness to pay for better ski trail grooming within Yellowstone NP. The contingent valuation responses of those respondents who said that they expected to participate in cross-country skiing between December 1998 to March 1999 were analyzed in order to estimate net willingness to pay for such improvements. The ski-trail question asked:

One of the winter management problems in the Greater Yellowstone Area is the lack of funding for facilities and regularly groomed trails for cross-country skiers. Currently 35 miles of cross-country trails are occasionally groomed in Yellowstone N.P. One possible solution is a cross-country ski pass program. Suppose the pass was used to support regular (nightly) grooming of these trails, to add restrooms at 10 trailheads, and to provide better signs and interpretive materials along the trails. Would you be willing to purchase a special annual pass (good for one year) for \$\_\_\_\_\_ to support these changes for cross-country skiing?

The alternative bid amounts used in the above question were \$5, \$10, \$25, \$50, and \$100. The response percentages to alternative bid levels shown in Table 4.41 show the expected declining probability of a "yes" response as the bid level is increased.



<b>Table 4.41 Percentage of skiers who would pay an additional amount for an annual pass to support ski trail grooming within the park (Q22)</b>		
<b>BID Level</b>	<b>Percent of respondents who answered “yes” would be willing to pay an additional amount for a ski pass</b>	
	<b>Park sample</b>	<b>Forest sample</b>
\$5	84.2% (76)	85.7% (14)
\$10	81.3% (65)	72.0% (25)
\$25	75.7% (66)	66.7% (15)
\$50	54.2% (71)	56.2% (16)
\$100	20.0% (60)	25.0% (12)

Sample sizes are indicated in parentheses

Table 4.42 shows the estimated logistic regression models of willingness to pay for the above ski-trail grooming contingent valuation question responses. All estimated coefficients in Table 4.42 are precisely estimated. The forest sample model fits the hypothesized distribution, however, the park sample model does not fit well.

The estimated median willingness to pay to support grooming of cross-country ski trails in Yellowstone N.P. was very similar for respondents from the park sample and those from the forest sample. The estimated median was \$46.31 for the park sample and \$45.09 for the forest sample.

<b>Table 4.42 Estimated logistic regression model of willingness to pay for annual ski pass to support cross-country trail grooming in the park (Q22)</b>		
<b>Regression Variables</b>	<b>Park Sample</b>	<b>Forest Sample</b>
Constant	3.7465 (8.11)	2.9582 (3.51)
Ln(BID)	-0.9768 (7.44)	-0.7767 (3.07)
N	339	82
$\chi^2$	11.47	1.44
d.f.	3	3
P	0.0094	0.6955
Estimated Median Willingness to Pay (standard error)	\$46.31 (6.62)	\$45.09 (16.90)

The final contingent valuation question in the GYA winter visitor survey asked respondents about their willingness to pay to support the acquisition of additional winter range for bison in the GYA.

This question asked:

For the area around Yellowstone National Park, a trust fund could be established to purchase land or easements on lands from willing sellers to provide more winter habitat for bison. This would allow bison to winter in certain areas outside the park and make it less likely that bison would need to be controlled at their winter range boundary in any given year. Suppose that such a program would add approximately 7,000 acres of bison winter range, and allow as many as 300 bison to winter outside of the park boundary. The land could be purchased and **available for use beginning 10 years from now** in the winter of 2009-2010. If you were contacted within the next month, would you be willing to make a one-time contribution of \$\_\_\_\_\_ to such a trust fund?

The random contribution amounts for this question were \$5, \$10, \$25, \$50, \$100, and \$200. Additionally, two versions of the question were asked varying the length of time that would pass before the winter range acquisition could be completed. One version used a 10 year time period, as is shown above, and the second specified that the winter range could be in place by next winter. (See Appendix A) It was anticipated that survey responses would show a greater willingness to pay for a program that would be completed in the near future than for one that would not be completed for 10 years. Responses to the questions, however, did not show such a difference.

Table 4.43 shows the percent “yes” responses at alternative bid levels for the “next year” version of the survey. The park sample shows a decreasing percentage of “yes” responses as bid levels increase. The forest sample is much smaller and responses are only generally declining.

<b>Table 4.43 Percent of visitors willing to donate to a trust fund to purchase land for bison habitat - land purchase next year scenario (Q32)</b>		
<b>Bid Level</b>	<b>Percent who would contribute to trust fund</b>	
	<b>Park sample</b>	<b>Forest sample</b>
\$5	76.8% (87)	53.8% (13)
\$10	76.3% (87)	72.2% (18)
\$25	60.4% (62)	64.2% (14)
\$50	46.7% (69)	35.2% (17)
\$100	39.5% (70)	33.3% (18)
\$200	28.3% (64)	40.0% (15)

Sample sizes are indicated in parentheses

Table 4.44 shows that the coefficients for the logistic regression models of willingness to pay to support a bison winter range trust fund for both the park and the forest samples are precisely estimated. Additionally, the p-values associated with chi-square statistic shows that both estimated models fit the theoretical logistic distribution.

The median willingness to pay estimates to support bison winter range purchases within the next year are \$47.06 for the park sample and \$32.58 for the forest sample.

<b>Table 4.44 Estimated logistic regression model of willingness to pay for purchasing bison winter range outside of YNP - land purchased next year scenario (Q32)</b>		
<b>Regression Variables</b>	<b>Park Sample</b>	<b>Forest Sample</b>
Constant	2.3779 (7.65)	1.3047 (2.01)
Ln(BID)	-0.6174 (7.32)	-0.3745 (2.16)
N	444	95
$\chi^2$	1.45	4.13
d.f.	4	4
P	0.8362	0.3887
Estimated Median Willingness to Pay (standard error)	\$47.06 (8.28)	\$32.58 (18.35)

Table 4.45 shows the percent “yes” responses at alternative bid levels for the “10 years from now” version of the survey. The park sample shows a generally decreasing percentage of “yes” responses as bid levels increase. The forest sample is much smaller and responses are more erratic.

**Table 4.45 Percent of visitors willing to donate to a trust fund to purchase land for bison habitat - land purchase in 10 years scenario (Q32)**

<b>BID Level</b>	<b>Percent who would contribute to trust fund</b>	
	<b>Park sample</b>	<b>Forest sample</b>
\$5	75.9% (90)	80.7% (26)
\$10	64.9% (57)	80.0% (15)
\$25	69.4% (79)	30.7% (13)
\$50	53.0% (66)	23.8% (21)
\$100	42.2% (71)	0.0% (8)
\$200	24.0% (50)	26.7% (15)

Sample sizes are indicated in parentheses

Table 4.46 shows that the estimated coefficients for the logistic regression models of willingness to pay to support a bison winter range trust fund for both the park and the forest samples are statistically significant. The p-value associated with chi-square statistic for the park sample shows that the estimated model fits the theoretical logistic distribution. The p-value of less than 0.05 for the forest sample indicates that the hypothesis that the model distribution fits the theoretical logistic distribution should be rejected at the 95% level of significance.

The median willingness to pay estimates to support bison winter range purchases within the next year are \$52.16 for the park sample and \$20.80 for the forest sample.

<b>Table 4.46 Estimated logistic regression model of willingness to pay for purchasing bison winter range outside of YNP - land purchased in 10 years scenario (Q32)</b>		
<b>Regression Variables</b>	<b>Park Sample</b>	<b>Forest Sample</b>
Constant	2.1623 (6.75)	2.9194 (4.24)
Ln(BID)	-0.5468 (6.27)	-0.9365 (4.68)
N	418	98
$\chi^2$	6.27	10.07
d.f.	4	4
P	0.1801	0.0536
Estimated Median Willingness to Pay (standard error)	\$52.16 (10.81)	\$20.80 (5.15)

Comparing the 10 year and “next year” scenario responses, the estimated WTPs for the park sample are quite similar. For the forest sample, the value attributed to the winter range by next year (at \$32.58) is, as one would expect, greater than the value of the winter range beginning in 10 years (\$20.80). However, overall valuation estimates could not be derived from these models because for both the park and forest samples the estimated one-year and ten-year WTP estimates were not significantly different.

#### 4.5 Visitor Characteristics

Tables 4.47 through 4.51 detail the demographic characteristics of the respondents to the two winter survey samples, park visitors and forest visitors. Table 4.47 shows the home states of respondents for the two samples. Not surprisingly, the states contributing the largest percentages of visitors to the GYA are those nearest to it (Montana, Wyoming, Utah, and Idaho for the park sample, and Montana and Wyoming for the forest sample).

State	Park Sample		Forest Sample	
	Number	Percentage	Number	Percentage
Alabama	14	1.3%	1	0.4%
Alaska	3	0.3%	--	--
Arizona	7	0.6%	1	0.4%
Arkansas	2	0.2%	1	0.4%
California	47	4.2%	6	2.4%
Colorado	26	2.3%	4	1.6%
Delaware	1	0.1%	--	--
Florida	27	2.4%	1	0.4%
Georgia	32	2.9%	1	0.4%
Idaho	84	7.6%	7	2.8%
Maryland	11	1.0%	1	0.4%
Massachusetts	24	2.2%	--	--
Michigan	18	1.7%	6	2.4%
Minnesota	52	4.7%	6	2.4%
Missouri	5	0.5%	2	0.8%
Montana	200	18.1%	107	43.1%
Nebraska	--	--	3	1.2%
Nevada	5	0.5%	--	--
New Jersey	9	0.8%	--	--

**Table 4.47 Number and percentage of visitors to national parks and national forests by state (Q33)**

	<b>Park Sample</b>		<b>Forest Sample</b>	
<b>State</b>	<b>Number</b>	<b>Percentage</b>	<b>Number</b>	<b>Percentage</b>
New Mexico	4	0.4%	--	--
New Hampshire	1	0.1%	--	--
New York	13	1.2%	--	--
North Carolina	10	0.9%	1	0.4%
North Dakota	6	0.5%	2	0.8%
Ohio	12	1.1%	2	0.8%
Oklahoma	1	0.1%	--	--
Oregon	14	1.3%	2	0.8%
Pennsylvania	21	1.9%	1	0.4%
Rhode Island	2	0.2%	--	--
South Carolina	4	0.4%	--	--
South Dakota	7	0.6%	1	0.4%
Tennessee	9	0.8%	1	0.4%
Texas	28	2.6%	1	0.4%
Utah	107	9.6%	10	4.0%
Vermont	--	--	1	0.4%
Washington	48	4.3%	4	1.6%
West Virginia	1	0.1%	1	0.4%
Wisconsin	15	1.4%	4	1.6%
Wyoming	155	14.0%	70	28.2%
Sample size	1110		248	



**Table 4.48 Number and percentage of visitors to Yellowstone national park by country: park sample\* (Q33)**

<b>Country</b>	<b>Number</b>	<b>Percentage</b>
Australia	2	10.8%
Canada	7	37.9%
Czech Republic	1	2.6%
Germany	4	21.6%
South Korea	1	5.4%
United Kingdom	4	21.7%
Sample size	19	

\* The National Forest Sample contained no foreign visitors

The demographic composition of visitors to the park and national forests is shown in Table 4.49. Interestingly, the percentage of male respondents is almost twice that of female respondents in both the park and the national forest. In the park, 66.5% of respondents were male and 33.5% were female. In the forest sample, 70.1% were male and only 29.9% were female. With regard to ethnicity, around 3% of the respondents were Hispanic or Latino and about 97% were not Hispanic or Latino. The great majority of respondents were white, 99.1% in the park and 99.6% in the national forest.

<b>Table 4.49 Demographic Composition of respondents (Q34, Q35, Q38)</b>		
<b>Variables &amp; Categories</b>	<b>Park Sample</b>	<b>Forest Sample</b>
Percent of respondents that were male	66.5%	70.1%
Percent of respondents that were female	33.5%	29.9%
Sample size	1135	
Average age of survey respondents	45.3 years	43.4 years
Sample size	1131	245
<b>Ethnicity</b>		<b>Percent</b>
Hispanic or Latino	3.0%	2.9%
Not Hispanic or Latino	97.0%	97.1%
Sample size	231	35
<b>Race</b>		<b>Percent</b>
American Indian or Alaska Native	0.4%	0.4
Asian	0.4%	-
Black or African American	-	-
Native Hawaiian or Other Pacific Islander	0.2%	-
White	99.1%	99.6%
Sample size	1098	247

Educational level of respondents is reported in Table 4.50. The majority of respondents have some college, a college degree or advanced degree. For the park, 52.8% of respondents have some college or a college degree and another 35.9% have some graduate school or a professional degree. For the national forest, 52.8% of respondents have some college or a college degree; another 23.2% have some graduate school or a professional degree. Less than 25% of park and national forest respondents have only a high school degree or less.

<b>Table 4.50 Reported educational level of respondents (Q37)</b>		
<b>Education Level</b>	<b>Percent</b>	
	<b>Park Sample</b>	<b>Forest Sample</b>
Ninth grade or less	0.4%	1.6%
High school grad. or GED	10.9%	22.4%
Some college	21.2%	24.4%
College graduate	31.6%	28.4%
Some Graduate School	9.7%	7.6%
MA, PhD, or professional degree	26.2%	15.6%
Sample size	1131	250

Reported household income is shown in Table 4.51. In the park sample, approximately 12% earned less than \$24,999 and for the national forest sample, this number was closer to 14%. Beginning at the \$75,000 - \$99,999 level, the park sample begins to show a higher percentage of respondents with higher household income than the national forest sample. Forty-six point one percent of park respondents reported a household income of \$75,000 a year or more as compared to the national forest respondents of which only 25.8% earned \$75,000 a year or more.

<b>Table 4.51 Reported annual household income level of respondents (Q36)</b>		
<b>Income range</b>	<b>Park sample</b>	<b>Forest sample</b>
Less than \$15,000	4.8%	5.2%
\$15,000 to \$24,999	6.7%	8.6%
\$25,000 to \$39,999	10.6%	19.3%
\$40,000 to \$59,999	18.6%	26.6%
\$60,000 to \$74,999	13.0%	14.6%
\$75,000 to \$99,999	16.1%	8.2%
\$100,000 to \$124,999	8.6%	5.2%
\$125,000 to \$149,999	5.5%	4.7%
\$150,000 or above	15.9%	7.7%
Sample size	1055	233

## Literature Cited

- Bishop, R.C. and T.A. Heberlein. 1992. The Contingent Valuation Method, in *Natural Resource Damages: Law and Economics*, by K. Ward and John Duffield. John Wiley. New York.
- Boyle, Kevin J. and Richard C. Bishop. 1987. Valuing Wildlife in Cost-Benefit Analysis: A Case Study Involving Endangered Species. *Water Resources Research* 23(5): 943-950.
- Bowker, J.M. and John R. Stoll. 1988. Use of Dichotomous Choice Methods to Value the Whooping Crane Resource. *American Journal of Agricultural Economics* 70: 372-381.
- Cameron, T.A. 1988. A New Paradigm for Valuing Non-Market Goods Using Referendum Data: Maximum Likelihood Estimation by Censored Logistic Regression. *Journal of Environmental Economics and Management* 15: 355-379.
- Champ, P., Bishop, R.C., Brown, T. C., and McCollum, D.W. 1997. Using Donation Mechanisms to Value Nonuse Benefits from Public Goods. *Journal of Environmental Economics and Management*. 33: 151 - 62.
- Dillman, Don. 1982. *Mail and Telephone Surveys*. John Wiley. New York.
- Duffield, John and Dave Patterson. 1991. Inference and Optimal Design for a Welfare Measure in Dichotomous Choice Contingent Valuation. *Land Economics*, 67(2): 225-39.
- Hanemann, W. M. 1984. Welfare Evaluation in Contingent Valuation Experiments with Discrete Responses. *American Journal of Agricultural Economics* 66: 332-341.
- Hanemann, W.M. 1989. Welfare Evaluation In Contingent Valuation with Discrete Response: Reply. *American Journal of Agricultural Economics*. 66:332-341.
- Mitchell, R.C., and R.T. Carson. 1989. *Using Surveys to Value Public Goods: the Contingent Valuation Method*. Resources for the Future, Washington, D.C. 463pp.
- Patterson, David and John Duffield. 1991. Cameron's Censored Logistic Regression Model: Comment and Extension. *Journal of Environmental Economics and Management* 20: 275-283.
- U.S. Department of the Interior. 1986. *Natural Resource Damage Assessment Rules and Regulations*. Federal Register 51(148):27725-27753(August 1).
- U.S. Department of the Interior. 1991. *Natural Resource Damage Assessments: Notice of Proposed Rulemaking*. Federal Register 56(82): 19752-19753 (April 29).
- U.S. Fish and Wildlife Service. 1994. *The Reintroduction of Gray Wolves to Yellowstone National Park and Central Idaho: Final Environmental Impact Statement*. Helena, MT.
- U.S. Fish and Wildlife Service. 2000. *Grizzly Bear Recovery in the Bitterroot Ecosystem: Final Environmental Impact Statement*.
- U.S. Water Resources Council. 1983. *Economic and Environmental Principles for Water and Related Land Resources Implementation Studies*. U.S. Government Printing Office, Washington, D.C. 137pp.
- Walsh, R.G., Johnson, D.M. and Mckean, J.R. 1992. Benefit Transfer of Outdoor Recreation Demand Studies, 1968 - 1988. *Water Resource Research*. 28: 703 - 13.

**APPENDIX A: Survey Instrument and Contact Letter**

## **APPENDIX B: The Dichotomous Choice Model and Methodology**

## Dichotomous Choice Contingent Valuation

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In dichotomous choice, individuals respond "yes" or "no" as to their willingness to pay a specific cash amount for a specified commodity or service. The advantages of this approach, as compared to open-ended or bidding game questions formats, have been discussed elsewhere (Boyle and Bishop 1988, Bowker and Stoll 1988). The disadvantage of this approach is that analysis and interpretation are relatively complex, since WTP is inferred rather than observed.

Hanemann (1984) has investigated the theoretical motivation for dichotomous choice models. He provides both a utility difference approach and an alternative derivation based on the relationship of the individual's unobserved true valuation compared to the offered threshold sum (see also Cameron 1988). In the latter, it is assumed that if each individual has a true willingness-to-pay (WTP), then the individual will respond positively to a given bid only if his WTP is greater than the bid. For example, suppose that an individual is confronted with an offered price ( $t$ ) for access to a given resource or recreational site. The probability of accepting this offer  $\pi(t)$ , given the individual's true (unobserved) valuation WTP is then:

$$\pi(t) = Pr(WTP > t) = 1 - F(t)$$

where  $F$  is a cumulative distribution function of the WTP values in the population. In the logit model  $F(\cdot)$  is the c.d.f. of a logistic variate and in the probit model  $F(\cdot)$  is the c.d.f. of a normal variate. The specification of this model can be briefly illustrated for the case where the WTP values are assumed to have a logistic distribution in the population of interest conditional on the value of covariates. A statistical model is developed that relates the probability of a "yes" response to explanatory variables such as the bid amount, preferences, income, and other standard

$$\pi(t; \tilde{x}) = [1 + \exp(-\alpha t - \tilde{\gamma}'\tilde{x})]^{-1}$$

demand shifter type variables. The specific model is:

where  $\pi(t; \tilde{x})$  is the probability that an individual with covariate vector  $\tilde{x}$  is willing to pay the bid amount  $t$ . The parameters to be estimated are  $\alpha$  and  $\tilde{\gamma}'$  (the constant term is included in  $\tilde{x}$ ). The equation to be estimated can be derived as:

$$L = \ln[ p/(1-p) ] = \alpha t + \tilde{\gamma}'\tilde{x}$$

where  $L$  is the "logit" or log of the odds of a "yes" and  $p$  are observed response proportions. In application, the logit and probit models are so similar that it is difficult to justify one over the other on the basis of goodness of fit. We choose to work with the logistic specification here because the probit model does not lead to closed-form derivatives. Maximum likelihood estimates of the parameters in equation 3 can be obtained with a conventional logistic regression program. We have utilized SAS (SAS Institute 1988).

Hanemann (1984) has shown that the linear specification in equation 3 is consistent with utility maximization based on his utility difference motivation. However Cameron (1988) argues that



from the standpoint of the threshold motivation, any of a variety of WTP distributions are theoretically plausible. This implies that the choice of functional form for  $F(\cdot)$  be based on empirical considerations. Some investigators (e.g., Boyle and Bishop 1988, Bowker and Stoll 1988) have found that WTP distributions are skewed to the right. In these cases, a better estimate may be obtained with a log-logistic model (replacing  $t$  in equation 3 with  $\log t$ ).

Because we estimate the distribution of WTP values with dichotomous choice contingent valuation, the question remains as to which parameter of the distribution to use. A variety of welfare measures for dichotomous choice models have been proposed in the literature including a truncated mean (Bishop and Heberlein 1992), the overall mean, and percentiles of the distribution, including the median (Hanemann 1984, 1989). In all cases the distribution of  $F$  is assumed to be continuous and nonnegative. For this application, we report the estimated median WTP.

The  $p^{\text{th}}$  quantile (100  $p^{\text{th}}$  percentile) of the distribution is given by  $F^{-1}(p)$ . For the log-logistic

$$\eta_p(\tilde{x}) = \exp(-\tilde{\gamma}\tilde{x}/\alpha)[p/(1-p)]^{-1/\alpha}$$

model, the  $p^{\text{th}}$  quantile is given by:

Of course, when  $p = 0.50$  equation 4 provides an estimate of the median. For the case where WTP values are skewed, as demonstrated in previous studies (e.g. Bowker and Stoll 1988), the median and the truncated mean may differ considerably. As Hanemann (1989) has discussed, choice of the welfare measure is a value judgement in that there is an implicit weighing of whose values are to count.

**APPENDIX C. Comparisons across respondents by activity and residency**

<b>Table C-1 Distribution of activities by residency within and outside the GYA</b>		
<b>Activity</b>	<b>Residency within the GYA</b>	<b>Residency outside the GYA</b>
Snowmobile	39.8%	68.2%
Cross-country skiers	54.4%	18.7%
Snowcoach	4.7%	11.4%
Other	1.1%	1.7%
Sample size	190	787

<b>Table C-2 Distribution of activities by residency within and outside the 3-state region</b>		
<b>Activity</b>	<b>Residency within the 3-state region</b>	<b>Residency outside the 3-state region</b>
Snowmobile	48.9%	69.5%
Cross-country skiers	44.0%	16.4%
Snowcoach	6.5%	12.1%
Other	0.6%	2.0%
Sample size	325	654

<b>Table C-3 Visitation response to changes in winter management</b>			
If the road from W. Yellowstone to Madison to Old Faithful were plowed and open for car/bus travel only (Snowmobile trailer parking & rental available in Old Faithful)			
	Snowmobile	Cross-country Skiers	Snowcoach
No change	31.4%	44.6%	32.0%
Would visit less frequently	41.3%	15.1%	28.9%
Would visit more frequently	2.0%	15.9%	8.2%
Would visit the same amount	7.7%	9.7%	10.3%
Not Sure	17.6%	14.7%	20.6%
Sample size	612	258	97

<b>Table C-4 Visitation response to changes in winter management</b>			
If YNP and GT were open only to snow coach, skiing and snowshoeing, but not snowmobiles			
	Snowmobile	Cross-country Skiers	Snowcoach
No change	15.4%	37.9%	43.8%
Would visit less frequently	66.1%	9.6%	11.5%
Would visit more frequently	2.6%	36.8%	27.1%
Would visit the same amount	3.5%	4.2%	5.2%
Not Sure	12.4%	11.5%	12.5%
Sample size	604	261	96

<b>Table C-5 Visitation response to changes in winter management</b>			
If the roads from Mammoth and W. Yellowstone to Madison, and from Madison to Old Faithful were closed to all vehicular travel from Nov. 1 to April 30, and other roads groomed for snowmobiles			
	Snowmobile	Cross-country Skiers	Snowcoach
No change	31.9%	49.4%	44.0%
Would visit less frequently	46.1%	11.7%	21.0%
Would visit more frequently	3.5%	9.3%	7.0%
Would visit the same amount	3.9%	7.0%	2.0%
Not Sure	14.6%	22.6%	26.0%
Sample size		257	100

<b>Table C-6 Visitation response to changes in winter management</b>			
If the road between Colter Bay and YNP's south entrance in Grand Teton NP was not plowed, and instead open a groomed trail for snowmobiles and snowcoaches			
	Snowmobile	Cross-country Skiers	Snowcoach
No change	47.0%	52.0%	48.0%
Would visit less frequently	7.5%	16.4%	6.1%
Would visit more frequently	9.8%	3.1%	4.1%
Would visit the same amount	4.6%	6.3%	2.0%
Not Sure	31.1%	22.3%	39.8%
Sample size	583	256	98

**APPENDIX D. Estimated trip changes using median values and distribution of stated trip changes under alternative management options.**

**Table D-1 Estimated changes in trips under alternative management options using median values**

**If the road from W. Yellowstone to Madison to Old Faithful were plowed and open for car/bus travel only (Snowmobile trailer parking & rental available in Old Faithful)**

<b>Statistic</b>	<b>Non-GYA</b>	<b>GYA</b>
<b>A. Change in visits to the GYA</b>		
Reduction in trips by those that would visit less	1 (199) <sup>a</sup>	3 (42)
Increase in trips by those that would visit more	1 (43)	0 (28)
Net change in trips	-156 <sup>b</sup>	-126
Baseline trips to the GYA	1,167	3,016
Percentage change in baseline trips	-9.4%	-4.2%
<b>B. Change in visits to YNP</b>		
Reduction in trips by those that would visit less	1 (145)	2 (32)
Increase in trips by those that would visit more	1 (35)	2 (27)
Baseline to the YNP	943	932
Net change in trips	-109	-10
Percentage change in baseline trips	-11.6%	-1.1%

<sup>a</sup> Sample sizes are indicated in parentheses

<sup>b</sup> Net changes are the net of the products of the median changes \* sample sizes, e.g., Section A non-GYA:  
 $(199*1) - (43*1) = -156$

**Table D-2 Estimated changes in trips under alternative management options using median values**

**If YNP and GT were open only to snow coach, skiing and snowshoeing, but not snowmobiles**

<b>Statistic</b>	<b>Non-GYA residents</b>	<b>GYA residents</b>
<b>A. Change in visits to the GYA</b>		
Reduction in trips by those that would visit less	1 (291) <sup>a</sup>	3.5 (68)
Increase in trips by those that would visit more	1 (63)	4 (43)
Net change in trips	-228 <sup>b</sup>	-66
Baseline trips to the GYA	1,163	3,002
Percentage change in baseline trips	-13.7%	-2.2%
<b>B. Change in visits to YNP</b>		
Reduction in trips by those that would visit less	1 (231)	1 (57)
Increase in trips by those that would visit more	1 (58)	2 (35)
Net change in trips	-173	+13
Baseline trips to the YNP	930	927
Percentage change in baseline trips	-18.6%	1.4%

<sup>a</sup> Sample sizes are indicated in parentheses

<sup>b</sup> Net changes are the net of the products of the median changes \* sample sizes, e.g., Section A non-GYA:  
(199\*1) - (43\*1) = -156



**Table D-3 Estimated changes in trips under alternative management options using median values**

**If the roads from Mammoth and W. Yellowstone to Madison, and from Madison to Old Faithful were closed to all vehicular travel from Nov. 1 to April 30, and other roads groomed for snowmobiles**

<b>Statistic</b>	<b>Non-GYA</b>	<b>GYA</b>
<b>A. Change in visits to the GYA</b>		
Reduction in trips by those that would visit less	1 (212) <sup>a</sup>	4 (42)
Increase in trips by those that would visit more	1 (25)	4 (11)
Net change in trips	-187 <sup>b</sup>	-124
Baseline trips to the GYA	1,742	2,962
Percentage change in baseline trips	-10.9%	-4.2%
<b>B. Change in visits to YNP</b>		
Reduction in trips by those that would visit less	1 (156)	1 (33)
Increase in trips by those that would visit more	1 (21)	2.5 (12)
Net change in trips	-135	
Baseline to the YNP	963	888
Percentage change in baseline trips	-14.0%	0.3%

<sup>a</sup> Sample sizes are indicated in parentheses

<sup>b</sup> Net changes are the net of the products of the median changes \* sample sizes, e.g., Section A non-GYA:  
 $(199*1) - (43*1) = -156$

**Table D-4 Estimated changes in trips under alternative management options using median values**

**If the road between Colter Bay and YNP's south entrance in Grand Teton NP was not plowed, and instead open a groomed trail for snowmobiles and snowcoaches**

<b>Statistic</b>	<b>Non-GYA</b>	<b>GYA</b>
<b>A. Change in visits to the GYA</b>		
Reduction in trips by those that would visit less	1 (37) <sup>a</sup>	5 (29)
Increase in trips by those that would visit more	0 (42)	0 (10)
Net change in trips	-37 <sup>b</sup>	-145
Baseline trips to the GYA	1,692	2,974
Percentage change in baseline trips	-2.2%	-4.9%
<b>B. Change in visits to YNP</b>		
Reduction in trips by those that would visit less	1 (27)	1 (18)
Increase in trips by those that would visit more	0 (39)	1 (8)
Net change in trips	-27	-10
Baseline trips to the YNP	932	886
Percentage change in baseline trips	-2.9%	-1.1%

<sup>a</sup> Sample sizes are indicated in parentheses

<sup>b</sup> Net changes are the net of the products of the median changes \* sample sizes, e.g., Section A non-GYA:  
 $(199*1) - (43*1) = -156$

Table D.5 shows a summary of three measures of central tendency for stated changes in visitation to the GYA under the management options outlined in Questions 16,17,18,and 19. The mean, median and mode responses are shown for both those who would increase and those who would decrease visitation under each alternative.

<b>Table D.5. Mean, median and mode measures of net changes in trips to the GYA under alternative management options.</b>				
<b>Question/sample</b>	<b>Mean change</b>	<b>Median change</b>	<b>Mode change</b>	<b>Sample size</b>
<b>(A) Non-GYA residents</b>				
Q16- road plowing / sample of those increasing trips	1.27	1	0 <sup>a</sup>	43
Q16- road plowing / sample of those decreasing trips	1.81	1	1	199
Q17- no snowmobiles / sample of those increasing trips	1.25	1	0	63
Q17- no snowmobiles / sample of those decreasing trips	2.07	1	1	291
Q18-westside closure / sample of those increasing trips	1.28	1	0	25
Q18-westside closure / sample of those decreasing trips	2.17	1	1	212
Q19-stop plowing Colter to South / those increasing trips	0.40	0	0	42
Q19-stop plowing Colter to South / those decreasing trips	2.46	1	1	37
<b>(B) GYA residents</b>				
Q16- road plowing / sample of those increasing trips	1.18	0	0	28
Q16- road plowing / sample of those decreasing trips	6.52	3	3	42
Q17- no snowmobiles / sample of those increasing trips	4.39	4	0	43
Q17- no snowmobiles / sample of those decreasing trips	8.37	4	1	68
Q18-westside closure / sample of those increasing trips	4.27	4	0	11
Q18-westside closure / sample of those decreasing trips	8.40	4	1	42
Q19-stop plowing Colter to South / those increasing trips	1.3	0	0	10
Q19-stop plowing Colter to South / those decreasing trips	10.59	5	2	29

<sup>a</sup> The net change estimates were calculated from the respondents' baseline expected trips to the GYA and their expected trips under the changed management policy. When a respondent, for instance, said that they would visit more under an option but supplied the same number of trips under the baseline and changed scenarios, the calculated increase in trips was 0.