July 2005

Winter 2002–2003 Visitor Survey: Yellowstone and Grand Teton National Parks

Revised Final Report

Prepared for

National Park Service
Environmental Quality Division
Dr. Bruce Peacock
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Fort Collins, CO 80525

Prepared by

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BBL Sciences
Long Beach, CA 90802

RTI International
Health, Social, and Economics Research
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*RTI International is a trade name of Research Triangle Institute.

Explanation of Revision

This document is a revision of the October 2003 report detailing the winter 2002-2003 visitor survey conducted at Yellowstone and Grand Teton National Parks. Subsequent to the production of the earlier report, an error was discovered in the data coding that was used to estimate the economic values of various user groups potentially affected by regulations proposed in 2003. Correcting this error resulted in changes of the willingness to pay (WTP) estimates of snowmobile riders, as reflected in Table 6-9. In particular, the estimated reduction in WTP for snowmobile riders who visited during high crowding conditions in the baseline, but decided not to visit the parks under the proposed regulations changed from $32 in the October 2003 report to $191 in this report. The WTP estimates for nonsnowmobilers did not change.

Acknowledgments

The report was authored by Dr. Carol Mansfield, Dr. F. Reed Johnson, and Dr. Roy Whitmore of RTI International and Dr. Daniel Phaneuf of North Carolina State University. We would like to acknowledge the contributions of a number of individuals who helped with this project. The design of the survey benefited greatly from discussions with Dr. John Loomis and Dr. V. Kerry Smith. Chris Bastian provided assistance identifying snowmobile trails in Wyoming. We also want to thank the staff at Yellowstone and Grand Teton National Parks for their help in designing the survey and assisting with the administration of the survey. In particular, we would like to thank John Sacklin, Chief of Planning and Compliance at Yellowstone National Park, and Steven Iobst, Assistant Superintendent at Grand Teton National Park, as well as Marin Moore and Terry Roper from Grand Teton National Park and the following staff from Yellowstone National Park: Jennifer Conrad, Kevin Schneider, Rick Mossman, Dave Phillips, Bob Seibert, Tammy Wert, Linda Miller, Rose Zugel, Rich McAdams, and Jesse Farias. Finally, we want to thank Dr. John Loomis and Dr. Joffre Swait for very helpful review comments and suggestions.

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Executive Summary

During the 2002–2003 winter season, RTI International, under contract with MACTEC Engineering and Consulting, Inc., BBL Sciences, and the National Park Service (NPS), conducted the Winter Visitor Survey for Yellowstone and Grand Teton National Parks. The survey was designed to provide information about

- ➤ current recreational winter use of the parks;
- ➤ expenditures and trip characteristics of current winter visitors;
- ➤ seasonal trips by snowmobile riders and other winter recreators to the parks and other sites in the region;
- ➤ the change in visitor welfare (consumer surplus) for day trips to the parks under different conditions, where the attributes of the trips are designed to capture the important effects of alternative winter management plans on winter visitor experience; and
- ➤ changes in visitation in response to alternative management plans.

The basis for the alternative winter management plans was the Final Supplemental Environmental Impact Statement (FSEIS) for winter use in Yellowstone and Grand Teton National Parks, published by NPS in February 2003. The document contained five alternative winter use plans for the parks.

Visitors to Yellowstone National Park (YNP) were sampled through out the season at all four entrances open during the winter (East, West, North and South). A sampling plan was constructed to create a probability-based sample of winter visitors that could be weighted to reflect the true population of winter visitors to the park. Winter

visitors to Grand Teton National Park (GTNP) were sampled at the Taggart Lake parking lot according to a random sampling plan.[1] Taggart Lake parking lot is primarily used by cross-country skiers to access trails in GTNP.

The survey was designed using standard methods including data from previous surveys, focus groups, and cognitive interviews. In addition, staff from YNP and GTNP, as well as expert survey consultants and the NPS Social Science Program provided input.

In total, 80 percent of the surveys mailed to YNP visitors and 83 percent of the surveys mailed to GTNP visitors were returned.

Visitors were intercepted in the parks according to the sampling plan and asked for their participation. Overall, 92 percent of visitors approached in YNP and 96 percent of visitors approached in GTNP at Taggart Lake agreed to participate in the survey. The visitors answered 2 or 3 short questions and provided their name and address. Visitors who provided their name and address were mailed the survey. In total, 80 percent of the surveys mailed to YNP visitors and 83 percent of the surveys mailed to GTNP visitors were returned.[2]

In terms of demographics, winter visitors to the two parks are relatively more educated and wealthy than the general population. The majority of visitors to both parks are from Western states. Forty-six percent of the Taggart Lake sample lived in Wyoming. The majority of visitors were employed and married, and the average age of visitors is in the mid-40s. In YNP[3], 55 percent of visitors indicated that the primary activity on their trip was riding a snowmobile without a guide. Downhill skiing outside the parks was the next most popular primary activity (17 percent of visitors). In GTNP, 62 percent of those sampled chose cross-country skiing as their primary activity. Again, downhill skiing was the next most popular primary activity (14 percent of visitors). Fifteen percent of the visitors in YNP are on day-trips compared to 40 percent in the GTNP sample. Visitors on multi-day trips to both parks spent more time outside the parks than inside the parks on their trips.

[1] Visitors were also intercepted at the Moran entrance to GTNP. The data from this entrance was not analyzed in this report because of the limited sampling hours and a low response rate.

[2] Excluding visitors who did not supply a valid address.

[3] Survey responses for YNP were weighted to reflect the total population of winter visitors. Survey responses for GTNP were not weighted and reflect the responses of the sample who returned surveys.

Finally, the survey asked visitors for one thing they would change about their trip. In YNP, 40 percent said they would not change anything about their trip. Twenty percent of nonsnowmobile riders said they would have liked fewer snowmobiles in the park, while fourteen percent of snowmobile riders wanted smoother snow on the roads. At Taggart Lake, 60 percent of visitors would not change anything about their trip.

To assess changes in visitation, the survey presented the respondent with one of three management plans and asked if they would visit more, the same number of times, less or not at all if the management plan was implemented.

The survey contained several questions to address the impact of alternative management plans on winter use and to calculate the welfare impacts on visitors of changing conditions in the parks. To assess changes in visitation, the survey presented the respondent with one of three management plans and asked if they would visit more, the same number of times, less or not at all if the management plan was implemented. The three management plans were banning snowmobiles, capping the number of snowmobiles allowed in each day and requiring all snowmobiles to be on a guided tour, and simply capping the number of snowmobiles each day. For all types of visitors, the ban elicited the largest change in behavior with a majority of snowmobile riders saying they would not visit. The majority of other visitors indicated they would not change or would increase the number of trips they took if snowmobiles were banned. The policy of capping the number of snowmobiles allowed in the park each day (but not requiring guided tours) resulted in the smallest change in behavior with 71 percent of visitors to YNP and 74 percent of visitors to GTNP answering that they would not change the number of times they visited during the season under this policy.

Welfare changes to visitors were calculated using both the travel cost method and a stated preference conjoint experiment. The travel cost model was based on information about snowmobile trips in the 2000-2001 winter season to Wyoming, Montana, and Idaho. A random utility model estimated that snowmobile riders would lose on average about $70 per trip or $32 per day if YNP and GTNP were closed to snowmobiles.

In general, policies that reduce crowding, noise and emissions and improve road conditions result in welfare gains of between $110 and $360 per day for both snowmobile riders and nonsnowmobile visitors.

The stated preference conjoint experiment was designed to look at how visitors trade-off different attributes of their trip including activity, crowding, cost and other park conditions such as road condition, noise and exhaust fumes. Respondents were presented with a series of choices between two hypothetical trips or the option of not visiting the parks. The trips were described by nine attributes covering the features mentioned above. The results allow calculation of changes in welfare from changes in park conditions. The data were estimated using conditional and mixed-logits. The results of the mixed logit models were used to calculate welfare changes for sample management scenarios. In general, policies that reduce crowding, noise and emissions and improve road conditions result in welfare gains of between $110 and $360 per day for both snowmobile riders and nonsnowmobile visitors. However, policies that require snowmobiles to be on guided tours result in welfare losses from a baseline of moderate crowding. Banning snowmobiles in the parks resulted in a per day welfare loss of $191 for snowmobile riders in one model, while nonsnowmobile riders had welfare gains of $430 per day.

1 Introduction and Study Goals

This report describes the design and implementation of the 2002–2003 Winter Visitor Survey for Yellowstone and Grand Teton National Parks and the analysis of survey results.

The 2002–2003 Winter Visitor Survey for Yellowstone and Grand Teton National Parks was conducted over the entire winter 2002–2003 season from December 18, 2002, to March 3, 2003. RTI International (RTI), under contract with MACTEC Engineering and Consulting, Inc., BBL Sciences, and the National Park Service (NPS), designed and implemented the survey and analyzed the survey results.

1.1 BACKGROUND

NPS has been assessing winter use issues within the parks located in the Greater Yellowstone Area (GYA) (Yellowstone National Park [YNP], Grand Teton National Park [GTNP], and the John D. Rockefeller, Jr., Memorial Parkway [the Parkway]) for several decades. This assessment has resulted in intensive study and public involvement, and in 1990 a Winter Use Plan (NPS, 1990) was completed for GYA. In 1997, the Fund for Animals filed suit against NPS alleging that NPS had failed to conduct adequate analysis under the National Environmental Policy Act (NEPA) when developing its winter use plan for the areas, failed to consult with the U.S. Fish and Wildlife Service on the effects of winter use on threatened and endangered species, and failed to evaluate the effects of trail grooming on wildlife and other park resources. In 1997, the Department of the Interior (DOI) and the plaintiffs reached a settlement agreement in which NPS agreed to produce an environmental impact statement (EIS). The final environmental impact statement (FEIS) was published and the record of decision (ROD) was subsequently signed on November 22, 2000. The new rule was published in the Code of Federal Regulations (CFR) on

January 22, 2001 (36 CFR Part 7).[1] The regulation eliminated recreational snowmobile and snowplane use from the parks by the winter of 2003–2004.

On December 6, 2000, a lawsuit filed by the International Snowmobile Manufacturers Association asked for the pending decision, reflected in the ROD and final rule, to be set aside on the basis of NEPA process infractions. The Office of the Secretary of the Interior negotiated a procedural settlement that became final on June 29, 2001. As provided in that settlement agreement, NPS is acting as lead agency to prepare a supplemental environmental impact statement (SEIS) and added the State of Wyoming as a cooperating agency.[2] In accordance with the settlement, the SEIS would incorporate new or additional information and data, as provided by the affected public and cooperating agencies, including information regarding new snowmobile technologies, submitted with respect to a winter use plan for the parks. A Notice of Intent to prepare an SEIS was published in the *Federal Register* on July 27, 2001 (66FR39197).

To allow sufficient time to complete the SEIS and prepare a new ROD, NPS negotiated a rule that allows for a 1-year delay (the "delay rule") in implementing the existing snowmobile regulations in YNP, GTNP, and the Parkway. The "delay rule" was proposed in March 2002 and finalized in November 2002.

The 2002–2003 Winter Visitor Survey was designed in part to provide information for a benefit-cost analysis of the five alternatives considered in the FSEIS.

The final SEIS (FSEIS) was released in February 2003. The report presents the expected impacts from five alternatives. Alternative 1a is the original ban from January 2001. The baseline alternative is Alternative 1b, the delay rule, which delays implementation of the ban by one year. In addition, three other alternatives allow snowmobile access under different conditions. Table 1-1 summarizes the main features of the five alternatives. The 2002–2003 Winter Visitor Survey was designed in part to provide information for a benefit-cost analysis of the five alternatives considered in the FSEIS.

[1]The rule became effective February 21, 2001.

[2]Subsequent to the settlement, all agencies (other than the State of Wyoming) that signed cooperating agency agreements during the earlier EIS process agreed to be cooperating agencies for the SEIS and include the U.S. Forest Service, the States of Montana and Idaho, Fremont County in Idaho, Gallatin and Park Counties in Montana, and Park and Teton Counties in Wyoming. In addition, the Environmental Protection Agency (EPA) was added as a new cooperating agency.

Table 1-1. Comparison of Selected Major Features of FSEIS Snowmobile Management Alternatives

	Alt 1b—Delay Rule	Alt 1a—Ban	Alt 2	Alt 3	Alt 4—ROD
Snowmobile Maximum Daily Limits					
YNP North Entrance	2003–2004: 60 2004–2005 onward: ban	2003–2004 onward: ban	2003–2004 onward: 25	2003–2004 onward: 100	2003–2004 onward: 50
YNP West Entrance	2003–2004: 278 2004–2005: ban	2003–2004 onward: ban	2003–2004: 825 2004–2005: 725 2005–2006 onward: 600	2003–2004 onward: 330	2003–2004 onward: 550
YNP East Entrance	2003–2004: 65 2004–2005: ban	2003–2004 onward: ban	2003–2004 onward: 100	2003–2004 onward: 100	2003–2004 onward: 100
YNP South Entrance	2003–2004: 90 2004–2005: ban	2003–2004 onward: ban	2003–2004 onward: 225	2003–2004 onward: 400	2003–2004 onward: 250
The Parkway—Grassy Lake Road	2003–2004: 60 2004–2005: ban	2003–2004 onward: ban	2003–2004 onward: no limit	2003–2004 onward: 100	2003–2004 onward: 75
GTNP and the Parkway—CDST from East Entrance to Northern Park Boundary (Alt 1b) or Flagg Ranch (Alts 2–4)	2003–2004: 60 2004–2005: ban	2003–2004 onward: ban	2003–2004 onward: 75	2003–2004 onward: 100	2003–2004 onward: 75
GTNP—Jackson Lake	2003–2004 onward: ban	2002–2003 onward: ban	For fishing only, with biofuel	None permitted	2003–2004 onward: For fishing only, with air and sound emissions requirements: 40

(continued)

Table 1-1. Comparison of Selected Major Features of FSEIS Snowmobile Management Alternatives (continued)

	Alt 1b—Delay Rule	Alt 1a—Ban	Alt 2	Alt 3	Alt 4—ROD
Emission Requirements	None	NA	Rentals, 2003–2004 onward: below 200 g/kW-hr for carbon monoxide and 75 g/kW-hr for hydrocarbons Private, 2003–2006: any four-stroke and any two-stroke using biofuels and lubes Private, 2006–2007 onward: below 200 g/kW-hr for carbon monoxide and 75 g/kW-hr for hydrocarbons	All snowmobiles, 2003–2004 onward: below 120 g/kW-hr for carbon monoxide and 15 g/kW-hr for hydrocarbons	Commercially guided, 2003–2004 onward: below 120 g/kW-hr for carbon monoxide and 15 g/kW-hr for hydrocarbons Noncommercially guided, 2003–2004: none Noncommercially guided, 2004–2005 onward: below 120 g/kW-hr for carbon monoxide and 15 g/kW-hr for hydrocarbons
Sound Requirements	All snowmobiles: 78 db(A) or less	NA	Rentals: 75 dB(A) or less Private: 78 dB(A) or less	All snowmobiles: 73 db(A) or less	All snowmobiles: 73 db(A) or less with same phase in as above
Guided Tour Requirement	2003–2004: in YNP only	NA	No	Yes, in all parks	In YNP only, although 20 percent can be "noncommercial"
Adaptive Management Requirement	No	NA	Yes	Yes	Yes

1.2 WINTER VISITOR SURVEY GOALS

The survey will provide data to characterize

- ➤ current recreational winter use of the parks;
- ➤ expenditures and trip characteristics of current winter visitors;
- ➤ seasonal trips by snowmobile riders and other winter recreators to the parks and other sites in the region;
- ➤ the change in visitor welfare (consumer surplus) for day trips to the parks under different conditions, where the attributes of the trips are designed to capture the important effects of alternative winter management plans in the FSEIS (NPS, 2003) on winter visitor experience; and
- ➤ changes in visitation in response to alternative management plans in the FSEIS.

The survey is designed to provide multiple methods of calculating the visitor-day values and changes in consumer surplus needed to conduct the benefit-cost analysis, specifically the impact of the proposed alternatives on snowmobile riders and other winter visitors. Each type of data provides a different perspective on winter visitors.

The data from this survey will be used in part to conduct a benefit-cost analysis and a small business impact analysis under the Regulatory Flexibility Act (RFA) of 1980 for the alternatives in the FSEIS including the preferred alternative chosen by NPS for the final rulemaking in 2003.

The survey is designed to provide multiple methods of calculating the visitor-day values and changes in consumer surplus needed to conduct the benefit-cost analysis, specifically the impact of the proposed alternatives on snowmobile riders and other winter visitors. Each type of data provides a different perspective on winter visitors.

It is important to note that this survey reflects the views of current visitors to YNP and GTNP. It does not reflect the views of potential visitors who do not currently visit YNP or GTNP because of the snowmobiles. Nonsnowmobile visitors who currently visit the parks may have more tolerant attitudes towards snowmobiles. Furthermore, the survey is not intended to capture nonuse values for the park held by current visitors or the general public.

1.3 REPORT ORGANIZATION

The report is organized as follows. Section 2 presents the design of the samples in YNP and GTNP, while Section 3 discusses the design of the survey instrument. The data collection procedures are described in Section 4. Section 5 provides summaries of the data and Section 6 contains the results of the consumer surplus analysis.

In addition, Appendix A contains the initial Winter Visitor Contact Form, Appendix B contains a copy of the survey instrument, and Appendix C contains the formulas used to calculate weighted survey results and adjust for nonresponse.

2 Sample Design

2.1 YELLOWSTONE SAMPLE DESIGN

This section describes the procedures used to sample winter visitors in YNP and GTNP.

In YNP, the goal was to create a probability-based sample that could be weighted to reflect the true population of winter visitors to the park. We designed a sampling plan based on daily entrance records from the 2001–2002 winter season to intercept every "Nth" visitor at the four entrances open in the winter: the West, North, South, and East Entrances to YNP. In YNP, we designed the sampling strategy to yield a sample that was 60 percent snowmobile riders and 40 percent other visitors, as well as 50 percent entering from the West Entrance and 50 percent from the other three entrances combined.[1] Nonsnowmobile visitors and visitors from entrances other than the West Entrance were oversampled to facilitate comparisons among the visitor groups. Based on differences in predicted versus actual visitation in the park, we updated the sampling rates during the season to achieve the desired number of respondents.

We selected a stratified random sample of days to represent the visitors during the 2002–2003 winter season, which ran from December 18 through March 3. To ensure adequate sample representation by entrance and type of day, the sample of days was stratified by entrance and type of day, as shown in Table 2-1. Although the park was scheduled to open to oversnow vehicles on December 18, 2002, poor snow conditions prevented snowmobile

[1] In the 2001–2002 winter season, approximately 62 percent of winter visitors entered through the West Entrance and 74 percent of snowmobile passengers.

Table 2-1. Sample Days by Yellowstone National Park Sampling Stratum

Entrance	Weekday		Weekend		Holiday		All	
	Snow-mobile	Nonsnow-mobile	Snow-mobile	Nonsnow-mobile	Snow-mobile	Nonsnow-mobile	Snow-mobile	Nonsnow-mobile
North	NA	10	NA	9	NA	3	NA	22
South	7	4	5	4	2	2	14	10
East	5	NA	3	NA	3	NA	11	NA
West	19	3	9	4	5	3	33	10
Total	31	17	17	17	10	8	58	42

NA = not applicable.

We established a separate (1-in-n) sampling rate for each stratum defined by entrance, type of day, and snowmobile versus nonsnowmobile to ensure adequate nonsnowmobile sample sizes.

access from the West, North, and East Entrances until later in the season. Sampling began on December 23 at the South Entrance as planned, on December 29 at the East and West Entrances, and on January 8 at the North Entrance. Sampling continued through March 3, 2003, when the roads at the North Entrance were closed to snowmobiles so that the park could begin clearing the snow.

To be eligible to participate in the survey, visitors had to meet the following criteria:

- 18 years of age or older,
- had not already provided contact information earlier in their trip or on a previous trip, and
- not a park employee or an employee of a park concessionaire.

Eligible individuals were sampled using stratified systematic sampling. We established a separate (1-in-n) sampling rate for each stratum defined by entrance, type of day, and snowmobile versus nonsnowmobile to ensure adequate nonsnowmobile sample sizes. We adjusted the sampling rates, as necessary, to achieve adequate sample sizes. The stratum sample sizes and numbers of respondents are summarized in Tables 2-2 and 2-3.

2.2 GRAND TETON SAMPLE DESIGN

The sample collected at GTNP was not designed to be a probability-based sample representative of all winter visitors to GTNP. Instead, the sample was designed to provide information about a specific set of visitors. The sampling plan for GTNP involved intercepting visitors at the Moran Entrance and the Taggart Lake parking lot in GTNP.

Table 2-2. Sample Persons by Yellowstone National Park Sampling Stratum

Entrance	Weekday		Weekend		Holiday		All	
	Snow-mobile	Nonsnow-mobile	Snow-mobile	Nonsnow-mobile	Snow-mobile	Nonsnow-mobile	Snow-mobile	Nonsnow-mobile
North	NA	118	NA	162	NA	69	NA	349
South	124	32	95	28	43	10	262	70
East	21	NA	33	NA	40	NA	94	NA
West	470	61	208	98	137	79	815	238
Total	615	211	336	288	220	158	1,171	657

NA = not applicable.

Table 2-3. Respondents by Yellowstone National Park Sampling Stratum

Entrance	Weekday		Weekend		Holiday		All	
	Snow-mobile	Nonsnow-mobile	Snow-mobile	Nonsnow-mobile	Snow-mobile	Nonsnow-mobile	Snow-mobile	Nonsnow-mobile
North	NA	89	NA	123	NA	51	NA	263
South	84	26	64	21	35	6	183	53
East	14	NA	19	NA	21	NA	54	NA
West	321	49	138	62	77	49	536	160
Total	419	164	221	206	133	106	773	476

NA = not applicable.

Sampling days were randomly selected between December 18, 2002, and March 1, 2003.

Visitor statistics are not kept for the Taggart Lake parking lot, so the sampling rate could not be calculated based on statistics for the previous year. We set an initial sampling rate based on advice from staff at GTNP and adjusted it during the season to yield a sample of approximately 200 visitors. Visitors were intercepted according to the sampling rate.

At the Moran Entrance, we conducted sampling between 11 am and 1 pm on randomly selected days. A majority of the visitors using the Moran Entrance travel to the South Entrance to YNP. Visitors entering at Moran on their way to YNP were sampled at the South Entrance to YNP. Visitors who were only visiting GTNP were eligible to be sampled at Moran. Although visitor statistics exist for this entrance,

the statistics were not kept by the hour, and they did not distinguish between visitors staying in GTNP and those traveling on to YNP. We set the sampling rates based on assumptions about the fraction of visitors staying in GTNP and entering between 11 am and 1 pm.

To be eligible for the survey, visitors had to meet the same criteria that visitors in YNP had to meet.

3 Survey Design

This section briefly summarizes the primary steps involved in designing the 2002–2003 Winter Visitor Survey.

We designed the survey to provide information for the regulatory process, balancing the need for detailed information against the burden to the respondent. Prior to designing a draft survey instrument, we conducted two formal focus groups with individuals who engaged in winter recreation, including people who had been to YNP and GTNP in the winter for both snowmobiling and skiing. Additional information came from discussions with staff at YNP and GTNP; interviews were conducted over the last two winter seasons with local business owners in the GYA; academic consultants Dr. V. Kerry Smith, and Dr. John Loomis; and past winter visitor surveys conducted in YNP.

Based on these discussions, we created an initial draft of the survey. This version was tested through cognitive interviews with individuals at RTI. The draft was revised and tested again through nine cognitive interviews with residents of the GYA who participated in both snowmobiling and skiing. In addition, we held an on-site meeting with staff from YNP and GTNP, other NPS employees, and Dr. John Loomis in October 2002 in YNP. Based on feedback from these pretests, we created a revised draft, which we tested on a focus group conducted by Dr. Loomis in Denver, Colorado, with members of an outdoor recreation club that makes a yearly trip to YNP.

The Office of Management and Budget (OMB) reviewed the survey and provided comments on the sampling plan and survey questions. OMB officially approved the survey (OMB Approval #1024-0224 (NPS #03-004) Expiration Date: 09/30/2003).

The final version of the survey consists of two parts. First, a short survey administered in the parks asks for the visitor's name and mailing address along with two or three additional questions about his trip. Appendix A contains the questions for the contact in the park.

Following the initial contact, we mailed survey respondents the main questionnaire (Section 4 provides details on data collection).

The main questionnaire contains four sets of questions:

- questions about the visitor's trip including activities, the areas she visited, and expenditures;
- questions about the visitor's winter recreation last season (2001–2002);
- stated preference conjoint questions and a stated behavior question; and
- demographics.

Four versions of the main survey were created for local, experienced snowmobile riders; nonlocal, experienced snowmobile riders; local "all others"; and nonlocal "all others."

Respondents were sorted into groups based on their responses to the initial questions asked in the park. Four versions of the main survey were created for local, experienced snowmobile riders; nonlocal, experienced snowmobile riders; local "all others"; and nonlocal "all others" according to the following definitions:

- Local: on a day trip
- Nonlocal: on an overnight trip
- Experienced snowmobile rider: a person riding a snowmobile in the park the day he was intercepted and not his first time on a snowmobile
- All others: people not riding a snowmobile in the park the day they were intercepted or first-time snowmobile riders

The local version of the main survey grouped the expenditure questions that would apply to overnight visitors on a page that would be easy to skip if the respondent was on a day trip.[1] Experienced snowmobile riders were asked questions about the snowmobile trips they took last winter season (2001–2002), while all others were asked about winter trips for cross-country skiing, snowshoeing, hiking, and camping in winter 2001–2002. Appendix B contains the survey questions.

[1]For the first survey mailing, the local survey contained expenditure questions relevant only to day trips. However, concerns about accuracy of the answers to the screening questions led to the inclusion of expenditure questions relevant to overnight trips on one page of the local survey.

Section 6 contains more details about the stated behavior question, the question about snowmobile trips during the 2000–2001 season, and the stated preference conjoint questions.

4 Data Collection Methods

4.1 YELLOWSTONE NATIONAL PARK: COLLECTING CONTACT INFORMATION

In this section, information is provided on the data collection methodology and the survey response rates achieved.

In YNP, most visitors were sampled at the entrance gates as they entered the park according to the sample design. The exceptions were snowcoach passengers from the West Entrance, who were sampled at Madison Junction to avoid traffic flow problems at the West Entrance, and snowcoach passengers from the South Entrance, who were sampled as they exited the park. Although some of the field survey staff in YNP were off-duty park employees, all the staff recruiting survey respondents were hired and paid as temporary employees of RTI.

Survey field staff responsible for recruiting the sample counted visitors until they reached the "Nth" visitor according to the sampling plan. The staff approached this visitor to determine eligibility for the survey. The staff asked eligible visitors for their participation in the survey according to a script. Eligible visitors who provided their contact information were then asked the questions listed in Appendix A and given a scenic postcard of YNP that provided a brief description of the survey and a toll free number and email address where the respondent could get more information.

If the visitor was ineligible, the field staff marked the reason for ineligibility on their sampling sheet. If the visitor refused to stop or when stopped refused to provide contact information, the field staff noted their mode of transportation. Modes of transportation

included snowmobile, snowcoach, auto/RV/bus/van, skis, and other.

4.2 GRAND TETON NATIONAL PARK: COLLECTING CONTACT INFORMATION

In GTNP, visitors were sampled at two points as they entered the park according to the sample design. Survey field staff hired by RTI intercepted visitors at the Taggart Lake parking lot as they arrived in their cars, and on-duty park staff in the entrance booth at the Moran Entrance intercepted the visitors as they entered the park. Otherwise the procedures were the same as in YNP.

4.3 SURVEY FOLLOW-UP

All visitors who provided contact information received a package in the mail containing

- a cover letter on Department of the Interior letterhead signed by John Sacklin, the Chief of Planning at YNP, that included a toll-free number and survey email address for additional information;
- a copy of the survey;
- a postage-paid business return envelope; and
- a $5 bill as an incentive to answer the survey.

After approximately 2 weeks, visitors who had not returned their surveys were sent a scenic reminder postcard with the toll-free number and survey email address.

Visitors who had not returned their surveys after approximately one month were mailed a second package sent priority mail that included

- a cover letter on RTI letterhead signed by Carol Mansfield, the RTI project manager, and Dr. Daniel Phaneuf, a survey consultant from North Carolina State University, that included a toll-free number and survey email address for additional information;
- a copy of the survey; and
- a postage-paid business return envelope.

4.4 RESPONSE RATES

Table 4-1 provides the response rates by entrance and mode of transportation for the YNP and GTNP Taggart Lake samples.

Table 4-1. Percentage and Number of Visitors Who Agreed to Participate and Provided Contact Information by Entrance and Mode of Transportation

	Mode of Transportation				
	Snowmobile	**Snowcoach**	**Auto or Bus**	**Cross-Country Ski**	**Overall**
YNP North			98% (N = 341)		98% (N = 341)
YNP South	98% (N = 256)	96% (N = 65)		100% (N = 2)	97% (N = 323)
YNP West	90% (N = 733)	86% (N = 200)		100% (N = 5)	89% (N = 938)
YNP East	94% (N = 88)				94% (N = 88)
All YNP Entrances	**92% (N = 1077)**	**88% (N = 265)**	**98% (N = 341)**	**100% (N = 7)**	**92% (N = 1,690)**
GTNP Taggart Lake			96% (N = 266)		96% (N = 266)

Overall, 92 percent of the visitors approached in YNP provided contact information. The North Entrance is the only entrance where visitors entered by car or bus, and at this entrance all visitors enter by car or bus. At the other entrances, the majority of visitors entered the park on snowmobiles. At the East Entrance, all visitors identified as eligible for the survey entered by snowmobile. Snowcoaches only operate out of the West and South Entrances. In YNP, 55 percent of the contacts were made at the West Entrance, and visitors riding snowmobiles accounted for 64 percent of the total YNP contacts.

As of June 24, 2003, 1,567 surveys had been returned, or approximately 80 percent of the surveys.

A total of 2,032 individuals provided contact information in the two parks. Out of these, 72 provided invalid addresses, so a total of 1,960 surveys were mailed out. As of June 24, 2003, 1,567 surveys had been returned, or approximately 80 percent of the surveys. Table 4-2 provides the response rate by entrance and overall.

Although visitors were recruited at the Moran entrance to GTNP, the data from these surveys were not analyzed as part of this report. At the Moran entrance, only 43 percent of the visitors intercepted at the entrance provided their name and address, and only 76 percent of these people completed the survey. This yielded a sample of 76 people. The poor response rate and limited sampling period

Table 4-2. Percentage of Mail Surveys Returned as of June 24, 2003

Entrance	Response Rate
YNP East	68%
YNP North	82%
YNP West	81%
YNP South	77%
All YNP Entrances	**80%**
GTNP Taggart Lake	83%

(visitors were only intercepted between 11 am and 1 pm) produced a sample that would not be sufficiently representative of the population of visitors using the entrance to access GTNP.

The survey design and administration procedures yielded a very high response rate, both in the parks and to the mail survey. The high response rate should provide the basis for a sample that is representative of winter visitors to YNP and the Taggart Lake entrance to GTNP.

5 Analysis and Results

5.1 SAMPLE STATISTICS AND WEIGHTS FOR YELLOWSTONE NATIONAL PARK SAMPLE

In this section, we provide summary statistics for the YNP and GTNP survey responses.

We designed the YNP sample as a probability-based sample that could be weighted to reflect the total population of winter visitors to YNP in 2002–2003. As described in Section 2.1, the sample was stratified along three dimensions:

- four entrances (West, North, East, and South),
- two activities (snowmobile and nonsnowmobile), and
- three types of days (weekdays, weekends, and holidays).

The resulting sample has 18 strata that were used to weight the survey results.[1] Based on the sampling plan and the results of the survey we calculated two sets of analysis weights—person-day weights and person-level weights. The sample person-day weight for each person in the sample was calculated as the reciprocal of his probability of selection given the date and entrance where he was intercepted, whether he was on a snowmobile, and the type of day. After adjusting for survey nonresponse these weights can be used to estimate the total number of person-days spent in the park by people who met the eligibility criteria for the study.

Many visitors entered the park multiple times during the season, and they had a positive probability of being selected each time they

[1] Everyone at the North Entrance entered the park in a wheeled vehicle and was considered a nonsnowmobile visitor for the purposes of the sampling plan. At the East Entrance, the sampling plan allowed for sampling both snowmobile riders and nonsnowmobile riders; however, on the randomly selected sampling days only snowmobile riders came through the entrance.

entered the park. To create person-level weights, which could be used to estimate the number of unique people who entered the park during the winter season, we adjusted the person-day weights using data from the survey about the number of days each person had spent in the park so far during the season and the number of days each person anticipated spending in the park over the rest of the season. Finally, both the person-day and person-level weights were adjusted for nonresponse (where nonresponse refers to visitors who did not supply their name and address or did not return their surveys). Appendix C contains the formulas used to calculate the weights and the nonresponse adjustments.

The nonresponse-adjusted weights were calibrated (post-stratified) using the official YNP estimates of visitor-days (person-days) during the 2002–2003 winter season broken down by snowmobile and nonsnowmobile riders to match our strata.

The nonresponse-adjusted weights were calibrated (post-stratified) using the official YNP estimates of visitor-days (person-days) during the 2002–2003 winter season broken down by snowmobile and nonsnowmobile riders to match our strata. The person-day and person-level weights were adjusted to match the park visitor-day estimates. Appendix C describes the post-stratification adjustment in more detail. The official park estimate of person-days in the park is not identical to our estimate for the following reasons:

- Our sample included only visitors 18 years of age or older, while the park statistics count all visitors.
- At the North Entrance, YNP counts are based on the number of cars multiplied by a constant number of visitors per car (2.5 in December 2002 and 2.74 for January through March 2003), while our counts are based on the actual number of people in the car.
- Random variations in visitation across days due to weather or other factors will affect how closely our projections, based on the days we sampled in the park, match actual park visitation.

Table 5-1 presents the predicted total number of unique park visitors (using person-level weights) and person-days (using person-day weights) for the winter 2002–2003 season to each entrance by snowmobile and nonsnowmobile riders using both the nonresponse-adjusted weights and the post-stratified weights.[2] As expected, the nonresponse-adjusted weights result in lower total numbers of unique visitors and person-days in the park compared to

[2]All results presented in this section reflect all survey responses except three that were dropped because the respondents were not recreating on their trips. One was going to Mammoth for breakfast, one went to church in Mammoth every Sunday, and the third was assessing impacts of snowmobiles.

Table 5-1. Estimated Park Visitor and Visitor-Day Totals

	Total Visitors[a]	Total Visitor Days[b]	Total Visitors Post-Stratified[c]	Total Visitor Days, Post-Stratified[d]	Ratio of Visitors[e]	Ratio of Visitor Days[f]
North Entrance (nonsnowmobile)	3,381	8,457	4,261	9,374	1.26	1.11
East Entrance (snowmobile)	563	1,357	1,357	2,741	2.41	2.02
West Entrance (nonsnowmobile)	2,092	3,674	3,332	5,494	1.59	1.50
West Entrance (snowmobile)	16,250	29,535	25,273	40,022	1.56	1.36
South Entrance (nonsnowmobile)	1,797	1,991	2,637	2,861	1.47	1.44
South Entrance (snowmobile)	5,944	8,353	10,000	12,956	1.68	1.55

a = Person-level, nonresponse-adjusted weight total (number of unique visitors)
b = Person-day level, nonresponse-adjusted weight total (number of visitor-days)
c = Post-stratified, person-level weight total (number of unique visitors calibrated to YNP visitor counts)
d = Post-stratified, person-day-level weight total (identical to YNP visitor counts for the six weighting classes)
e = Ratio of total visitors, post stratified and total visitors
f = Ratio of total visitor days, post stratified and total visitor days

the post-stratified weights. The last two columns contain the ratio of the predictions based on the post-stratified weights to the predictions based on the nonresponse-adjusted weights. The ratio is highest for the East Entrance (a higher ratio indicates a larger difference between the estimates). The East Entrance receives the least amount of traffic of all four entrances, so the sampling plan allocated the fewest sampling days to this entrance. Projections based on fewer days are less precise.

Section 5.2 presents the results of the survey weighted by the nonresponse-adjusted weights. The weights used for individual questions were further adjusted for item nonresponse (i.e., the number of people who returned a survey but did not answer a particular question).

5.2 VISITOR AND TRIP CHARACTERISTICS

In this section, we summarize the variables from the survey concerning visitor and trip characteristics for the YNP and GTNP Taggart Lake samples.

5.2.1 Yellowstone National Park Sample

Demographics

Visitors to YNP in the winter come from all over the U.S., although a majority live in western states. In Table 5-2, column 1 lists each state, and column 2 gives the unweighted percentage of visitors from that state in the sample. Column 3 presents the weighted percentages using the person-level nonresponse-adjusted weights (see Section 5.1). The weighted percentages indicate the estimated percentage of the total population of winter visitors to YNP from each state based on the results of the survey. Montana supplied the most visitors to YNP, and a majority of visitors live west of the Mississippi River.

Overall, visitors to YNP in the winter are well educated and have a higher income compared to the general U.S. population. Compared to snowmobile riders, nonsnowmobile visitors are somewhat more educated, more of them are retired, and they earn on average somewhat less income.

Table 5-3 contains demographic information about the sample intercepted in YNP. The weighted percentages are provided for the sample as a whole and for snowmobile riders and nonsnowmobile visitors separately. Overall, visitors to YNP in the winter are well educated and have a higher income compared to the general U.S. population. Compared to snowmobile riders, nonsnowmobile visitors are somewhat more educated, more of them are retired, and they earn on average somewhat less income. Visitors are generally married with an average age between 40 and 50 years. Males compose a larger fraction of the snowmobile riders, compared to the nonsnowmobile visitors.

More than one quarter of the snowmobile riders own a snowmobile, and about 30 percent own snowmobiles that employ fuel-injected two-stroke engines or four-stroke engines. On average, snowmobile riders have been riding for 12 years. Although nonsnowmobile visitors are more likely to own cross-country skis and snowshoes, a significant percentage of snowmobile riders own other winter recreation equipment as well. In terms of club memberships, about a third of nonsnowmobile visitors belong to an environmental organization compared to 10 percent of snowmobile riders.

Activities and Trip Characteristics

Respondents were asked to indicate all the activities they participated in on their most recent trip and the location of the activity. People on day trips were given the choice of YNP and GTNP as locations. People on overnight trips were also given the

Table 5-2. Yellowstone National Park Visitation by State—All Entrances

State	Unweighted Share of Total	Weighted Share of Total[a]
AL	0.55%	0.36% (0.16%)
AR	0.39%	0.57% (0.29%)
AZ	0.70%	0.75% (0.34%)
CA	4.52%	5.97% (1.01%)
CO	2.57%	2.58% (0.67%)
CT	0.55%	0.42% (0.21%)
DC	0.23%	0.19% (0.18%)
FL	4.91%	5.99% (1.15%)
GA	3.66%	4.26% (0.82%)
IA	0.94%	0.72% (0.29%)
ID	5.77%	5.96% (0.85%)
IL	2.03%	2.08% (0.48%)
IN	1.48%	1.70% (0.51%)
KS	0.23%	0.13% (0.12%)
KY	0.39%	0.39% (0.21%)
LA	0.78%	1.18% (0.47%)
MA	0.55%	0.48% (0.21%)
MD	0.62%	0.55% (0.25%)
ME	0.31%	0.50% (0.34%)
MI	2.73%	3.02% (0.74%)
MN	4.21%	5.11% (1.33%)

(continued)

Table 5-2. Yellowstone National Park Visitation by State—All Entrances (continued)

State	Unweighted Share of Total	Weighted Share of Total[a]
MO	0.55%	0.57% (0.27%)
MS	0.23%	0.23% (0.14%)
MT	20.27%	13.75% (1.33%)
NC	1.33%	1.56% (0.41%)
ND	0.55%	0.66% (0.35%)
NE	0.39%	0.35% (0.19%)
NH	0.39%	0.21% (0.15%)
NJ	1.33%	1.72% (0.43%)
NM	0.23%	0.24% (0.15%)
NV	0.94%	1.05% (0.55%)
NY	3.04%	3.35% (0.71%)
OH	2.03%	2.07% (0.52%)
OK	0.94%	0.52% (0.26%)
OR	0.55%	0.50% (0.23%)
PA	2.10%	1.69% (0.41%)
RI	0.16%	0.18% (0.14%)
SC	0.62%	0.71% (0.25%)
SD	0.62%	0.51% (0.24%)
TN	1.71%	2.01% (0.54%)
TX	3.51%	4.43% (0.80%)
UT	5.61%	7.05% (1.52%)

(continued)

Table 5-2. Yellowstone National Park Visitation by State—All Entrances (continued)

State	Unweighted Share of Total	Weighted Share of Total[a]
VA	0.62%	0.60% (0.36%)
VT	0.62%	0.69% (0.28%)
WA	3.66%	3.98% (0.74%)
WI	2.65%	2.58% (0.56%)
WV	0.16%	0.10% (0.07%)
WY	5.53%	4.94% (1.12%)
Canada	0.55%	
Other countries	1.01%	
Other		0.85% (0.30%)

[a]Weighted estimates calculated using nonresponse-adjusted person-level weights. Numbers in parentheses are standard errors on weighted percentage calculations.

choice of recreating in the GYA outside the parks. Table 5-4 presents the percentage of visitors who indicated each activity for each location. After indicating all the activities they participated in, respondents were asked to select one activity as their primary activity for the trip. The last column of Table 5-4 lists the percentage of visitors who indicated that a particular activity was their primary activity.

A majority of winter visitors in YNP rode a snowmobile without a guide, and 55 percent indicated riding a snowmobile without a guide was the primary activity on their most recent trip. Many visitors also indicated that they rode a snowmobile outside the parks on their trip. Downhill skiing was the next most popular primary activity, indicating that many visitors to YNP come to the area to recreate outside the parks.[3] Thirteen percent of visitors indicated that they took a snowcoach tour of YNP; however, slightly less than 5 percent listed snowcoach tour as the primary activity for their most recent trip.

[3]Several respondents indicated that they went downhill skiing in YNP or GTNP, although there is no downhill skiing in the parks. It is possible these visitors did some other kind of skiing in the parks.

Table 5-3. Sample Demographics for Yellowstone National Park Sample, Weighted Estimates[a]

	Total	Snowmobilers	Nonsnowmobilers
Education			
Some high school or high school graduate	11.51% (1.09%)	12.27% (1.25%)	8.69% (1.91%)
Some college or college graduate	58.25% (1.72%)	60.91% (1.91%)	48.33% (3.71%)
Some graduate school or graduate degree	30.24% (1.58%)	26.83% (1.55%)	42.985 (4.50%)
Employment status			
Employed full-time	69.75% (1.73%)	73.60% (1.93%)	55.40% (3.03%)
Employed part-time	7.95% (0.96%)	6.91% (1.09%)	11.83% (2.08%)
Retired	12.65% (1.06%)	9.97% (1.14%)	22.64% (2.33%)
Student	1.84% (0.53%)	1.49% (0.54%)	3.12% (1.46%)
Homemaker	3.79% (0.82%)	3.84% (1.01%)	3.63% (0.93%)
Unemployed	1.36% (0.39%)	1.29% (0.43%)	1.60% (0.89%)
Other	2.67% (0.50%)	2.90% (0.57%)	1.78% (1.05%)
Married	79.84% (1.39%)	79.96% (1.65%)	79.42% (2.43%)
Age[b]	45.62 (0.53)	44.57 (0.55)	49.54 (1.27)
Number of children at home under age 18[b]	0.60 (0.04)	0.68 (0.05)	0.31 (0.04)
Male	65.39% (2.05%)	70.17% (2.01%)	47.48% (5.58%)
Total household annual income before taxes (2002)			
Less than $25,000	6.44% (1.03%)	5.38% (0.93%)	10.36% (3.35%)
$25,000 to $59,999	22.33% (1.50%)	20.40% (1.67%)	29.74% (3.28%)
$60,000 to $124,999	40.85% (2.02%)	42.12% (2.42%)	36.16% (3.32%)
More than $125,000	30.37% (1.84%)	32.09% (2.20%)	24.00% (3.01%)

(continued)

Table 5-3. Sample Demographics for Yellowstone National Park Sample, Weighted Estimates[a] (continued)

	Total	Snowmobilers	Nonsnowmobilers
Own a snowmobile	24.24% (1.98%)	29.58% (2.43%)	4.25% (1.74%)
Type of snowmobile owned			
Two-stroke engine snowmobile		67.10% (3.74%)	
Fuel-injected two-stroke engine snowmobile		23.12% (3.49%)	
Four-stroke engine snowmobile		6.13% (1.81%)	
Don't know		3.65% (1.52%)	
Own cross-country skis	21.91% (1.74%)	18.63% (1.93%)	34.18% (3.66%)
Own downhill skis	39.55% (1.82%)	40.30% (2.19%)	36.74% (2.68%)
Own snowshoes	17.29% (1.37%)	16.01% (1.57%)	22.09% (2.79%)
Years riding a snowmobile[a]		12.04 (0.46)	
Years riding a snowmobile (median)		9.08	
Belong to snowmobile club	9.03% (0.88%)	11.40% (1.15%)	0.14% (0.11%)
Belong to cross-country ski club	1.90% (0.56%)	0.66% (0.30%)	6.56% (2.22%)
Belong to environmental organization	14.06% (1.17%)	10.15% (0.99%)	28.68% (4.02%)

[a]Weighted estimates calculated using nonresponse-adjusted person-level weights. Numbers in parentheses are standard errors on weighted calculations. Definitions for "snowmobilers" and "nonsnowmobilers" based on general primary activity in the parks, summary contained in Table 5-5.

[b]Mean and standard error on mean.

Table 5-4. Trip Activities for Yellowstone National Park Sample, Weighted Estimates[a]

Activity	YNP	GTNP	Outside the Parks in the GYA	Percentage Indicating this Was His/Her Primary Activity
Snowmobiling without commercial tour guide	67.00% (2.30%)	4.85% (0.88%)	31.49% (2.61%)	55.06% (2.26%)
Snowmobiling with commercial tour guide	10.95% (1.50%)	1.85% (0.57%)	4.54% (0.79%)	7.61% (0.92%)
Cross-country skiing without tour guide	5.72% (0.85%)	1.23% (0.42%)	4.77% (1.10%)	4.54% (0.86%)
Cross-country skiing with commercial tour guide	0.15% (0.14%)		.	0.09% (0.06%)
Cross-country skiing with NPS guide	0.44% (0.24%)			
Snowshoeing	2.39% (0.49%)	1.05% (0.35%)	2.11% (0.61%)	0.50% (0.16%)
Snowcoach tour of park sights	13.28% (1.49%)	1.49% (0.59%)	0.26% (0.15%)	4.59% (0.86%)
Driving tour of park sights	9.51% (0.93%)	3.91% (0.56%)	5.26% (0.67%)	4.17% (0.57%)
Bus tour of park sights	0.72% (0.31%)	0.28% (0.26%)	0.39% (0.32%)	1.21% (0.42%)
Educational tours led by NPS guide	1.30% (0.38%)	0.75% (0.36%)	0.78% (0.38%)	0.51% (0.28%)
Winter camping	0.30% (0.12%)	0.13% (0.10%)	0.39% (0.19%)	0.34% (0.16%)
Downhill skiing	1.43% (0.41%)	3.25% (0.73%)	22.61% (1.99%)	16.90% (1.68%)
Other activity	4.18% (0.65%)	1.09% (0.37%)	8.95% (1.23%)	4.48% (0.69%)

[a]Weighted estimates calculated using nonresponse-adjusted person-level weights. Numbers in parentheses are standard errors on weighted calculations.

We assigned all visitors to one of four general activity categories based on the four major classes of activities that people do in YNP.

Using Table 5-4 and answers to other survey questions, we assigned all visitors to one of four general activity categories based on the four major classes of activities that people do in YNP. Table 5-5 contains the results for the whole sample and broken down by whether the respondents were intercepted at the West Entrance or one of the other three entrances. For visitors who did not indicate their primary activity, a primary activity was assigned according to the activity indicated for their "typical" trip on the survey (see Appendix B, page B-13 Question 20). If the respondent indicated their typical activity was "drive car to sightsee, ski, or snowshoe," we assigned a primary activity according to their answers to the questions in Table 5-4. For respondents who provided no useful information in the activity list, a primary activity was assigned based on their activity when they were intercepted in the park and the entrance where they were intercepted.

Table 5-5. Primary Activity in Yellowstone or Grand Teton National Park for Yellowstone National Park Sample, Weighted Estimates[a]

	Total	West	North/South/East
Snowmobiling	73.51% (2.05%)	87.32% (2.05%)	51.84% (2.96%)
Cross-country skiing or snowshoeing	5.85% (1.02%)	3.66% (1.24%)	9.29% (1.69%)
Snowcoach tour	8.79% (1.43%)	8.00% (1.27%)	10.02% (3.04%)
Car or bus tour	11.85% (1.24%)	1.03% (0.38%)	28.84% (2.68%)

[a]Weighted estimates calculated using nonresponse-adjusted person-level weights. Numbers in parentheses are standard errors on weighted calculations. "West" and "North/South/East" refer to the entrance where the visitor was intercepted for this survey.

Almost 75 percent of current winter visitors to YNP were classified as snowmobile riders for their primary activity. At the West Entrance, almost 90 percent of visitors were assigned snowmobile riding as their primary activity. Taking a car or bus tour was the next most popular category, and about equal numbers of visitors were classified as snowcoach tour riders or cross-country skiers/snowshoers.

According to the survey, 41 percent of visitors would not change anything about their trip. At least 5 percent of visitors identified smoother road surface, level of exhaust emissions, cost, and number of other snowmobiles as the one thing they would change.

Table 5-6 describes additional details of the individuals' trips. According to the results, about 15 percent of visitors were on day trips. The average length of an overnight trip was almost 5 days, with 1.5 days spent in YNP on average. About 65 percent of the visitors rented a snowmobile. Comparing people on day trips with people on overnight trips, just over 50 percent of day-trip visitors rented a snowmobile, while almost 70 percent of overnight visitors rented a snowmobile. The survey asked respondents what one thing about their trip would they change. According to the survey, 41 percent of visitors would not change anything about their trip. At least 5 percent of visitors identified smoother road surface, level of exhaust emissions, cost, and number of other snowmobiles as the one thing they would change.

Figure 5-1 shows the percentage of respondents who visited the GYA for different reasons. Although "Visit YNP" was the most popular reason, over one-third of the sample came to the area primarily to recreate outside the parks.

Finally Table 5-7 presents information about expenditures on the individual's trip, including the number of nights spent in different communities near the park. The cover of the survey instrument in Appendix B shows a map of the GYA including the towns listed in the table. West Yellowstone, Montana, was the most popular destination, although compared to nonsnowmobile visitors the town is much more popular with snowmobile riders. Nonsnowmobile visitors were more likely to have stayed in Gardiner, Montana, or Jackson, Wyoming. Winter visitors to YNP mostly traveled in groups with friends or family.

With respect to expenditures, 32 percent of the visitors purchased some kind of package tour. The per-day per-person expenditures presented at the end of Table 5-7 are for items not included in package tours for overnight visitors. Snowmobile riders spent more than nonsnowmobile visitors in all categories except tour and activity fees.

Table 5-6. Trip Characteristics for Yellowstone National Park Sample, Weighted Estimates[a]

	Total	Snowmobilers	Nonsnowmobilers
Percentage visitors on day trip	15.38% (1.82%)	13.68% (2.17%)	21.72% (3.24%)
Multiday trip visitors			
Number of days on trip			
Mean	4.76 (0.14)	4.76 (0.17)	4.78 (0.18)
Median	3.79	3.78	3.81
Number of days in YNP			
Mean	1.58 (0.04)	1.58 (0.04)	1.57 (0.14)
Median	0.81	0.82	0.75
Number of days in GTNP			
Mean	0.55 (0.06)	0.55 (0.07)	0.57 (0.12)
Median	0	0	0
Number of days outside the parks in GYA			
Mean	3.85 (0.35)	3.73 (0.38)	4.43 (0.75)
Median	2.31	2.23	2.64
Rented a snowmobile on trip	65.80% (2.10%)		
For day-trip visitors, percentage renting a snowmobile	52.69% (6.08%)		
Rented two-stroke	43.04% (8.42%)		
Rented four-stroke	31.71% (5.82%)		
Don’t know	25.25% (6.21%)		
For overnight visitors, percentage renting a snowmobile	68.18% (2.06%)		
Rented two-stroke	51.81% (3.07%)		
Rented four-stroke	33.37% (2.33%)		
Don’t know	14.82% (2.24%)		

(continued)

Table 5-6. Trip Characteristics for Yellowstone National Park Sample, Weighted Estimates[a] (continued)

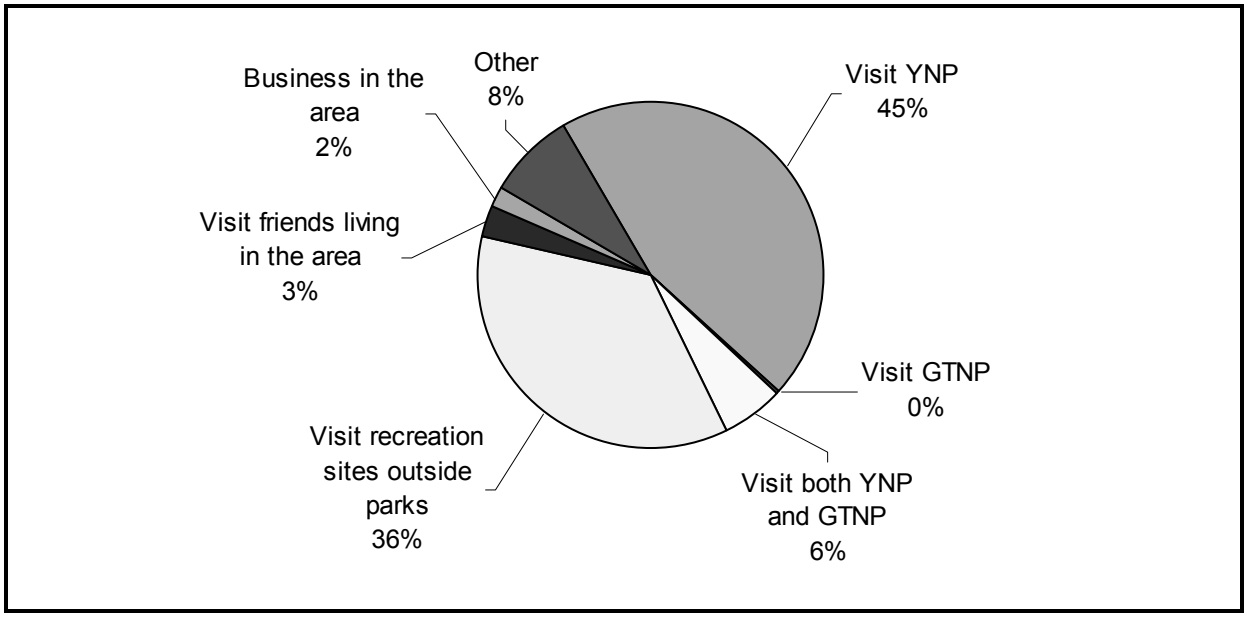
	Total	Snowmobilers	Nonsnowmobilers
Number of days in YNP so far this season and anticipated[b]			
Mean	1.57 (0.04)	1.54 (0.04)	1.66 (0.11)
Median	0.73	0.74	0.69
Number of days in GTNP so far this season and anticipated[b]			
Mean	0.57 (0.07)	0.59 (0.08)	0.48 (0.08)
What one thing about your trip would you change?			
Number of other visitors	0.75% (0.30%)	1.18%[c]	0.75%[c]
Number of other snowmobiles	5.33% (0.94%)	2.36%[c]	19.55%[c]
Number of other cars	0.26% (0.15%)	0.35%[c]	0.75%[c]
Noise level	3.07% (0.62%)	2.72%[c]	4.51%[c]
Smoother road surface	14.66% (1.56%)	14.42%[c]	7.27%[c]
Level of exhaust emissions	7.47% (1.05%)	6.50%[c]	5.26%[c]
Cost	6.83% (0.97%)	8.04%[c]	3.26%[c]
Other	20.39% (1.67%)	19.62%[c]	17.54%[c]
Wouldn't change anything	41.24% (2.48%)	44.80%[c]	41.10%[c]

[a]Weighted estimates calculated using nonresponse-adjusted person-level weights. Numbers in parentheses are standard errors on weighted calculations. Definitions for "snowmobilers" and "nonsnowmobilers" based on primary activity in the parks, summary contained in Table 5-5.

[b]Number of days so far this season and anticipated is the sum of Questions 16 to 18 (page B-9) from the survey instrument in Appendix B.

[c]Unweighted percentages.

Figure 5-1. Primary Purpose for Visit, Yellowstone National Park Sample



5.2.2 Grand Teton Taggart Lake Parking Area

Demographics

As with the YNP visitors, the people in the GTNP survey sample are well educated and have a high income. Compared to the YNP sample, they are more like the nonsnowmobile visitors than the snowmobile visitors in terms of demographics (and, as reported in later tables, in terms of activities).

We start with some basic demographics of the GTNP survey population. In Table 5-8, column 2 gives the percentage of the sample from each state. Over 45 percent of the visitors sampled at this location live in Wyoming.

Table 5-9 contains demographic information about the sample intercepted in GTNP at the Taggart Lake parking area. As with the YNP visitors, the people in the GTNP survey sample are well educated and have a high income. Compared to the YNP sample, they are more like the nonsnowmobile visitors than the snowmobile visitors in terms of demographics (and, as reported in later tables, in terms of activities). A large percentage of the sample owns cross-county skis, downhill skis, and snowshoes, while less than 5 percent own a snowmobile.

Activities

Respondents were asked to indicate all the activities they participated in on their most recent trip and the location of the activity. People on day trips were given the choice of YNP and GTNP as locations. People on overnight trips were also given

Table 5-7. Trip Characteristics and Expenditure for Yellowstone National Park Sample, Weighted Estimates[a]

	Total	Snow-mobilers	Nonsnow-mobilers	Number of Nights Spent[b]
Percentage who stayed and number of nights spent in[c]				
West Yellowstone, Montana	48.62%	60.34%	19.75%	3.44 (0.15)
Gardiner, Montana	13.38%	7.15%	28.66%	1.98 (0.11)
Jackson, Wyoming	20.11%	22.24%	14.97%	4.36 (0.25)
Pahaska Tepee, Wyoming	4.52%	6.37%	0.00%	1.33 (0.14)
Cody, Wyoming	2.40%	3.12%	0.64%	3.02 (0.44)
Old Faithful Snowlodge, YNP	8.12%	4.81%	16.24%	1.92 (0.16)
Mammoth Hot Springs, YNP	3.41%	1.95%	7.01%	1.49 (0.16)
Bozeman, Montana	9.04%	7.15%	13.69%	2.73 (0.51)
Big Sky, Montana	10.79%	9.62%	13.69%	5.72 (0.41)
Other	13.93%	13.00%	16.24%	3.28 (0.31)
What kind of group were you with on your recent trip?				
Alone	1.91% (0.48%)	1.56% (0.52%)	3.21% (1.12%)	
With family	56.59% (1.97%)	55.64% (2.25%)	60.13% (4.35%)	
With friends	44.87% (2.23%)	47.40% (2.41%)	35.45% (5.53%)	
With a club or other organized group	8.13% (1.28%)	8.32% (1.54%)	7.40% (1.68%)	
Other	2.72% (0.54%)	2.62% (0.61%)	3.11% (1.18%)	
Percentage purchasing a package tour	31.68% (2.19%)	34.77% (2.55%)	20.13% (3.60%)	
Expenditure for items not included in package tours for overnight visitors, per day per person[d]				
Lodging during stay in GYA				
Mean	$46.22 (2.42)	$50.80 (3.03)	$30.52 (3.06)	
Median	$33.13	$37.42	$18.17	

(continued)

Table 5-7. Trip Characteristics and Expenditure for Yellowstone National Park Sample, Weighted Estimates[a] (continued)

	Total	Snowmobilers	Nonsnow-mobilers
Food/drink at restaurants/bars in GYA			
Mean	$35.52 (1.45)	$38.55 (1.60)	$25.13 (3.43)
Median	$24.31	$27.84	$14.90
Food/drink from grocery/convenience stores in GYA			
Mean	$7.82 (0.60)	$8.39 (0.72)	$5.88 (0.95)
Median	$3.75	$4.41	$2.33
Transportation in GYA			
Mean	$19.08 (1.25)	$20.00 (1.39)	$15.88 (2.98)
Median	$4.94	$7.11	$1.10
Tour/activity fees			
Mean	$12.19 (1.99)	$11.11 (2.37)	$15.92 (3.50)
Median	$0.00	$0.00	$0.00
Equipment rental			
Mean	$27.52 (2.58)	$34.16 (3.22)	$4.79 (0.68)
Median	$0.00	$8.31	$0.00
Expenditure for items not included in package tours for overnight visitors, total for trip			
Transportation to GYA			
Mean	$249.53 (24.14)	$253.75 (28.67)	$233.78 (40.40)
Median	$97.33	$116.02	$43.82
Souvenirs/gifts			
Mean	$71.21 (7.50)	$78.63 (9.43)	$43.46 (6.84)
Median	$23.32	$29.54	$8.81

[a]Weighted estimates calculated using nonresponse-adjusted person-level weights except where noted. Numbers in parentheses are standard errors on weighted calculations. Definitions for "snowmobilers" and "nonsnowmobilers" based on general primary activity in the parks, summary contained in Table 5-5.

[b]Means and (standard errors) for visitors who spent at least one night in the city.

[c] Unweighted percentages because small sample size from East Entrance made weighting of Pahaska Teepee results difficult.

[d]Weighted using person-day nonresponse-adjusted weights.

Table 5-8. Grand Teton National Park Taggart Lake Sample Visitation by State

State	Share of Total
AL	0.91%
AR	0.45%
AZ	0.45%
CA	3.64%
CO	4.55%
CT	1.36%
DC	0.91%
FL	1.36%
GA	0.91%
ID	5.45%
IL	4.09%
IN	0.45%
LA	0.45%
MA	0.45%
MD	0.45%
ME	0.45%
MI	0.91%
MN	1.36%
MO	1.36%
MT	1.82%
NC	1.82%
NH	0.45%
NM	0.45%
NY	2.73%
OH	1.82%
OR	1.36%
PA	1.36%
RI	0.45%
TN	0.45%
TX	1.82%
UT	3.64%
VA	2.73%
VT	0.45%
WA	1.36%
WI	0.45%
WY	46.36%
Canada	0.45%

Table 5-9. Sample Demographics for Grand Teton National Park Taggart Lake Sample

	Total	**n[a]**
Education		216
Some high school or high school graduate	1.85%	
Some college or college graduate	49.54%	
Some graduate school or graduate degree	48.61%	
Employment status		215
Employed full-time	64.19%	
Employed part-time	9.30%	
Retired	11.63%	
Student	5.12%	
Homemaker	4.65%	
Unemployed	2.79%	
Other	2.33%	
Married	70.70%	215
Age[b]	44.7	213
Number of children at home under age 18[b]	0.3	204
Male	53.20%	203
Total household annual income before taxes (2002)		206
Less than $25,000	13.11%	
$25,000 to $59,999	23.30%	
$60,000 to $124,999	40.29%	
More than $125,000	23.30%	
Own a snowmobile	4.23%	213
Own cross-country skis	71.69%	219
Own downhill skis	60.09%	218
Own snowshoes	53.70%	216
Belong to snowmobile club	0.00%	212
Belong to cross-country ski club	11.79%	212
Belong to environmental organization	31.78%	214

[a]n is the number of people who answered each question; the total sample size is 220.

[b]Mean.

In contrast to the YNP sample, very few visitors rode a snowmobile. The majority of visitors cross-country skied in GTNP, while a third went snowshoeing and 20 percent went downhill skiing outside the parks.

the choice of recreating in the GYA outside the parks. Table 5-10 presents the percentage of visitors who indicated each activity for each location. In contrast to the YNP sample, very few visitors rode a snowmobile. The majority of visitors cross-country skied in GTNP, while a third went snowshoeing and 20 percent went downhill skiing outside the parks. The Taggart Lake parking lot serves as the entrance to numerous cross-country ski trails in GTNP, and the activity choices are consistent with the location. It is interesting to note how few of the visitors recreated in YNP on their trip.

After indicating all the activities they participated in, respondents were asked to select one activity as their primary activity for the trip. The last column of Table 5-10 lists the percentage of visitors who indicated that a particular activity was their primary activity. As with YNP, respondents were then assigned a primary activity inside the parks. Table 5-11 indicates the percentage of the sample for each of the four primary activities. Approximately 80 percent of the visitors said cross-country skiing or snowshoeing was their primary activity. For visitors who did not indicate their primary activity, we assigned a primary activity according to the activity indicated for their "typical" trip (see Appendix B, page B-13 Question 20). Where the activity was drive car to sightsee, ski, or snowshoe, we assigned an activity based on the activities they did during their trip as reported in Table 5-10. For respondents who did not answer this question, we designated people intercepted at Taggart Lake as cross-country skiers.

Table 5-12 describes additional details of the individuals' trips. Compared to the YNP sample, 40 percent of the GTNP visitors were on a day trip. Of those visitors on multiday trips, the average trip was 7 days long with most of that time spent in either GTNP or outside the parks. Consistent with the activities reported in Table 5-10, less than 8 percent of overnight visitors and no day-trip visitors rented snowmobiles. In terms of satisfaction with their trip, almost 60 percent reported that they would not change anything about their trip.

Table 5-10. Trip Activities for Grand Teton National Park Taggart Lake Sample

Activity	YNP	GTNP	Outside the Parks in the GYA	Percentage Indicating this Was their Primary Activity
Snowmobiling without commercial tour guide	3.21%	0.46%	1.38%	0.49%
Snowmobiling with commercial tour guide	0.46%	0.46%	1.38%	0.49%
Cross-country skiing without tour guide	8.72%	74.31%	17.89%	62.62%
Cross-country skiing with tour guide	0.46%	1.38%	0.46%	0.49%
Cross-country skiing with NPS guide	0.00%	0.92%	0.00%	0.49%
Snowshoeing	5.05%	35.78%	11.01%	10.68%
Snowcoach tour of park sights	4.13%	0.00%	0.00%	
Driving tour of park sights	3.21%	22.02%	8.26%	1.46%
Bus tour of park sights	0.00%	0.00%	0.00%	0.49%
Educational tours led by NPS guide	1.38%	0.92%	0.00%	
Winter camping	0.92%	2.75%	0.92%	0.97%
Downhill skiing	1.38%	10.09%	20.18%	14.56%
Other activity	2.29%	9.17%	7.80%	7.28%
n[a]	218	218	218	206

[a]n is the number of people who answered each question; the total sample size is 220.

Table 5-11. Primary Activity in Yellowstone or Grand Teton National Park for Grand Teton National Park Taggart Lake Sample

Activity	Percentage
Snowmobiling	2.27%
Skiing/snowshoeing	82.27%
Snowcoach tour	0.45%
Car/bus	15.00%

Table 5-12. Trip Characteristics for Grand Teton National Park Taggart Lake Sample

	Percent	Mean (Median)	n[a]
Percentage visitors on day trip	40.45%		220
Multiday trip visitors			
Number of days on trip		7.1 (6.0)	115
Number of days in YNP		0.7 (0.0)	106
Number of days in GTNP		4.0 (3.0)	113
Number of days outside the parks in GYA		4.5 (3.0)	111
Rented snowmobile			
For day trips[b]	0.00%		
For overnight trips[c]	8.40%		
Rented two-stroke	63.64%		
Rented four-stroke	18.18%		
Don't know	18.18%		
Number of days in YNP so far this season and anticipated		1.4 (0)	194
Number of days in GTNP so far this season and anticipated		9.5 (5)	215
What one thing about your trip would you change?			212
Number of other visitors	1.89%		
Number of other snowmobiles	8.96%		
Number of other cars	0.94%		
Noise level	3.77%		
Smoother road surface	3.30%		
Level of exhaust emissions	2.36%		
Cost	1.42%		
Other	17.45%		
Wouldn't change anything	59.91%		

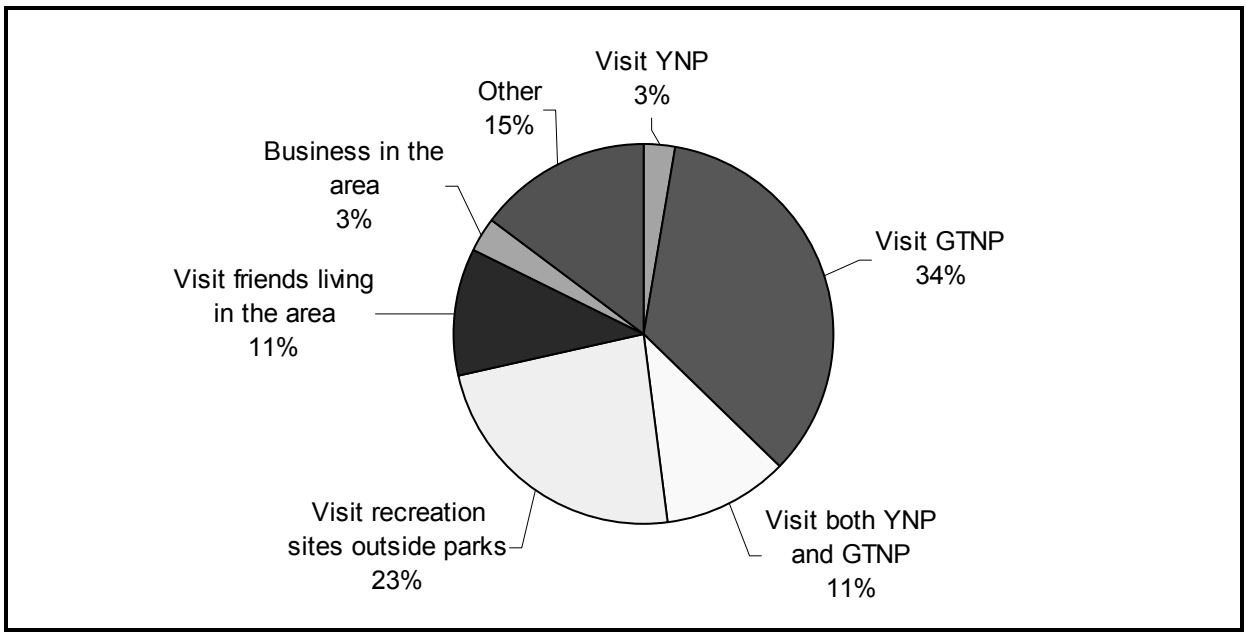
[a]n is the number of people who answered each question; the total sample size is 220, except where noted.

[b]Total sample size = 89, no one rented a snowmobile.

[c]Total sample size = 131, 11 people rented a snowmobile.

Figure 5-2 shows the percentage of respondents who visited the GYA for different reasons. The majority visited primarily to recreate in GTNP or outside the parks.

Figure 5-2. Primary Purpose for Visit, Grand Teton National Park Taggart Lake Sample



Finally, Table 5-13 presents information about expenditures on the individual's trip, including the number of nights spent in different communities near the park. Most visitors stayed in Jackson, Wyoming. Compared to YNP, a slightly larger percentage were on their trip alone, which is understandable given the large percentage of visitors on day trips. Per-day per-person expenditures were slightly higher than those for YNP nonsnowmobile visitors for lodging, food and drink in restaurants, and food and drink in grocery stores but lower for transportation in the GYA, tour fees, and equipment rental. The GTNP sample spent slightly more on transportation to the GYA and significantly more on gifts than the average visitor to YNP.

Table 5-13. Trip Characteristics and Expenditures for Grand Teton National Park Taggart Lake Sample

	Percentage	Average Nights (Median)	n[a]
Number of nights spent in[b]			
West Yellowstone	6.11%	3.9 (1)	
Gardiner	1.53%	5.5 (5.5)	
Jackson	81.68%	9.8 (5)	
Pahaska Tepee	0.00%	0.0 (0)	
Cody	2.29%	3.7 (2)	
Old Faithful Snowlodge	9.16%	2.6 (3)	
Mammoth Hot Springs	0.76%	2.0 (2)	
Bozeman	6.11%	2.6 (2)	
Big Sky	0.76%	3.0 (3)	
Other	15.27%	5.1 (5)	
What kind of group were you with on your recent trip?			220
Alone	13.18%		
With family	49.09		
With friends	41.36		
With a club or other organized group	2.27		
Other	1.36		
Percentage purchasing a package tour	8.78%		205

(continued)

Table 5-13. Trip Characteristics and Expenditures for Grand Teton National Park Taggart Lake Sample (continued)

	Percentage	Average Nights (Median)	n[a]
		Mean (Median)	
Expenditure for items not included in package tours for overnight visitors, per day per person[b]			
Lodging during stay in GYA		$41.62 ($31.25)	79
Food/drink at restaurants/bars in GYA		$27.28 ($20.00)	79
Food/drink from grocery/convenience stores in GYA		$7.81 ($4.00)	79
Transportation in GYA		$10.52 ($2.22)	79
Tour/activity fees		$7.38 ($0.00)	79
Equipment rental		$3.56 ($0.00)	79
Expenditure for items not included in package tours for overnight visitors, total for trip[b]			
Souvenirs/gifts		$148.16	79
Transportation to GYA		$252.11	79

[a]n is the number of respondents who answered the question; total sample size is 220 except where noted.

[b]Sample size = 131, overnight visitors.

6 Management and Valuation Questions

This section describes the analysis of survey results using stated behavior, revealed preference, and stated preference techniques.

A primary objective of the survey was to collect information that could be used to estimate behavioral changes in response to alternative winter management plans and willingness to pay (WTP) by park visitors for changes in key environmental variables in the parks. Because some visitors have strong opinions about the plans for alternative winter management in the parks, we attempted to design questions that would separate their opinions about management plans from their preferences for conditions in the park when they visit to limit strategic behavior in the valuation questions. To assess visitor reactions to the major alternatives for winter management proposed in the FSEIS (NPS 2003), each respondent was asked a stated behavior question that focused on how the visitor might change her travel plans in response to one of three proposed management plans. We designed three management plans to correspond with three of the management plans presented in the FSEIS (NPS, 2003).

In addition to the stated behavior question, we asked about snowmobile trips in the previous season to sites in Wyoming, Montana, and Idaho. The data from this question can be used to derive one measure of the welfare loss, or WTP, associated with banning snowmobiles from the parks. To estimate WTP for changes in key environmental and trip-related variables in the park that might change as a result of implementing alternative management plans, we also asked each respondent a series of stated preference conjoint questions. The conjoint questions asked respondents to choose between hypothetical trips, where the trips were described by variables related to activity; conditions in the park such as crowding, noise, and exhaust fumes; and cost. The data from these questions allow us to estimate the rate at which individuals make

trade-offs between activity, park conditions, and cost. These questions provide data for an estimate of welfare change resulting from changes in park conditions due to the different management plans.

The stated behavior and stated preference conjoint questions were designed to focus on simplified versions of three of the alternatives presented in Table 1-1. The three alternatives modeled were

- a ban on snowmobiles,
- a cap on the number of snowmobiles allowed in each day and a requirement that snowmobiles be on a guided tour, and
- a cap on the number of snowmobiles allowed in each day but no requirement for guided tours.

The ban represents the policy that will be enacted if no further action is taken (Alternative 1b in the FSEIS). The cap on numbers and a requirement for guided tours represents the preferred alternative in the FSEIS (Alternative 4). Finally, the cap on numbers with no guided tour requirement represents the basic structure of Alternative 2 from the FSEIS.

Below we discuss the results from the stated behavior questions, a travel cost model estimated using data about past snowmobile trips, and the stated preference conjoint experiment.

6.1 VISITATION UNDER DIFFERENT MANAGEMENT SCENARIOS

The stated behavior questions provide one estimate of how individuals would change their visits to YNP and GTNP if winter management in the parks were changed.

The stated behavior questions provide one estimate of how individuals would change their visits to YNP and GTNP if winter management in the parks were changed. The questions were intended to help estimate changes in visitation under alternative management proposals. Each respondent was presented with a single management proposal and asked about the impact of this proposal on her current trip and on trips over the entire season. Appendix B, Section B.3, contains the text of the management plan descriptions for the three management proposals.

The attributes of the management plans were designed to correspond to the major winter management alternatives outlined in the FSEIS and to the stated preference conjoint questions discussed in Section 6.3. Describing the management plans, we balanced the

length of the descriptions against the need to capture the most relevant features of the plans. For example, we chose to describe the caps as applying to all entrances but binding at the West and South Entrances to YNP rather than trying to present information on the proposed caps at all the entrances and current visitation. To facilitate comparisons, the two alternatives representing the cap on numbers of snowmobiles with and without a guided tour requirement are identical except for the guided tour requirement. The guided tour requirement corresponds to Alternative 4 in which a certain number of permits would be distributed to "noncommercial guides."

After the description of the management plan, the respondent was asked the following:

If this plan had been in effect this winter season how would your decision to make your *recent trip* to Yellowstone or Grand Teton National Park have been affected? Please check only one.

- ☐ My visit would not have been different.
- ☐ I would have stayed *fewer* days. → How many fewer days? _____
- ☐ I would have stayed *more* days. → How many more days? _____
- ☐ I would not have visited the park.

If this plan were in effect this winter season how would your *total visits* to Yellowstone and Grand Teton National Parks be affected? Please check only one.

- ☐ No change in total visits.
- ☐ I would visit *less* often. → I would take _____fewer annual trips
- ☐ I would visit *more* often. → I would take _____more annual trips
- ☐ I would not visit Yellowstone and Grand Teton National Parks.

Tables 6-1 and 6-2 present the results for these questions for the three management plans for the YNP and GTNP samples, respectively. Overall, in YNP the ban elicited the biggest changes in behavior in terms of people visiting more and visiting less. Table 6-3 contains the results for the YNP sample by primary activity in the park (see Table 5-5 for a breakdown of primary

Table 6-1. Stated Behavior Questions, Results for Yellowstone National Park Sample, Weighted Estimates[a]

	Ban on Snowmobiles	Cap on Number of Snowmobiles and Guided Tours Required	Cap on Number of Snowmobiles
Current Visit			
Increase days	5.90% (1.40%)	4.19% (1.78%)	3.40% (1.37%)
Average increase in days[b]	3.9	2.7	2.4
Visit unchanged	28.20% (2.45%)	54.21% (2.83%)	75.31% (3.35%)
Decrease days	2.92% (1.21%)	2.87% (1.12%)	0.87% (0.39%)
Average decrease in days[b]	3.8	1.9	1.5
Not visit	62.97% (2.58%)	38.73% (2.62%)	20.42% (3.04%)
Total visits this season			
Increase trips	6.35% (1.34%)	3.74% (1.16%)	5.06% (1.34%)
Average increase in trips[b]	4.0	1.8	1.9
Trips unchanged	30.22% (2.28%)	51.10% (2.67%)	70.65% (3.59%)
Decrease trips	10.49% (2.08%)	7.34% (1.48%)	3.75% (1.32%)
Average decrease in trips[b]	1.5	1.4	1.3
Not visit	52.94% (3.02%)	37.82% (3.07%)	20.53% (2.99%)

[a]Each respondent answered the questions about current visits and total visits for only one of the three management proposals. Weighted estimates calculated using nonresponse-adjusted person-level weights. Numbers in parentheses are standard errors on weighted calculations.

[b]Means of changes in number of days and trips are unweighted due to small sample size.

activities in the parks). As Table 6-3 shows, as expected, a large percentage of snowmobile riders say they would not visit the parks under the ban, while a large percentage of other visitors indicated they would visit more often. Among snowmobile riders, the policy of capping the number of snowmobiles but not requiring guided tours resulted in the smallest change in total visits compared to the current situation (68 percent would not change their total visits for the season) and the smallest number who answered that they would not visit (25 percent). The sample of snowmobiles is the largest of

Table 6-2. Stated Behavior Questions, Results for Grand Teton National Park Taggart Lake Sample[a]

	Ban on Snowmobiles	Cap on Number of Snowmobiles and Guided Tours Required	Cap on Number of Snowmobiles
Current Visit (n = 214)[b]			
Increase days	27%	9%	5%
Average increase in days	5.6	3.3	2
Visit unchanged	63%	80%	93%
Decrease days	0%	2%	0%
Average decrease in days	—	7	—
Not visit	10%	9%	2%
Total visits this season (n = 214)[b]			
Increase trips	35%	18%	24%
Average increase in trips	3.0	3.4	1.6
Trips unchanged	53%	68%	74%
Decrease trips	8%	5%	2%
Average decrease in trips	3.3	5.0	2.0
Not visit	5%	9%	0%

[a]Each respondent answered the questions about current visits and total visits this season for only one of the three management proposals.

[b]n is the number of people who answered the question.

the four primary activities, and the responses are estimated with the greatest precision.

Cross-country skiers and snowshoers represent a small group of respondents, and many of the weighted percentages have large standard errors. Overall the ban on snowmobiles elicited the largest increase in trips for these respondents, followed closely by the cap/guide policy. However, large standard errors on the percentages make firm conclusions difficult. Over 80 percent of visitors who indicated a snowcoach tour was their primary activity would not change the number of trips they took in a season under any of the proposed policies. Finally, visitors on auto/sightseeing tours in YNP, which would occur in the northern part of the park mostly, present a slightly more mixed response. Fifty percent or more would leave their trips per season unchanged in response to any of the policies. However, under a ban over 30 percent would reduce the number of

Table 6-3. Stated Behavior Questions, Results for Yellowstone National Park Sample by Primary Activity, Weighted Estimates[a]

	Snowmobile Rider			Cross-country Skier/Snowshoer			Snowcoach Tour			Auto-tour/Sightsee		
	Ban	Caps/ Guides	Caps	Ban	Caps/ Guides	Caps	Ban	Caps/ Guides	Caps	Ban	Caps/ Guides	Caps
Current visit												
Increase days	1.75% (1.18%)	1.45% (0.73%)	2.49% (1.75%)	19.75% (9.10%)	18.81% (12.46%)	12.49% (8.03%)	7.03% (4.16%)	34.12% (18.00%)	1.30% (0.74%)	16.74% (5.56%)	2.50% (1.56%)	7.07% (5.62%)
Average increase in days[b]	2.3	2	2.8	3.9	3.8	2.3	2.6	2.4	2.5	5	2	2
Visit unchanged	12.64% (2.12%)	47.83% (3.21%)	69.82% (4.17%)	62.97% (8.83%)	69.89% (13.21%)	76.85% (6.43%)	79.36% (8.43%)	62.47% (17.08%)	95.63% (2.57%)	48.47% (8.61%)	91.76% (3.67%)	89.75% (6.33%)
Decrease days	3.55% (1.72%)	3.61% (1.45%)	1.06% (0.52%)	0.73% (0.75%)			0.33% (0.32%)		0.84% (0.87%)	2.85% (1.94%)		
Average decrease in days[b]	5	1.9	1.7	1					1	1		
Not visit	82.06% (1.93%)	47.11% (2.87%)	26.63% (3.84%)	16.55% (7.88%)	11.30% (7.10%)	10.66% (5.62%)	13.28% (5.94%)	3.40% (2.33%)	2.23% (2.04%)	31.95% (7.18%)	5.74% (3.36%)	3.18% (3.19%)
Total visits this season												
Increase trips	2.09% (1.21%)	1.66% (0.73%)	2.62% (1.32%)	27.18% (9.51%)	26.98% (12.23%)	15.33% (9.15%)	6.07% (3.20%)	15.27% (9.54%)	7.26% (3.55%)	14.36% (4.89%)	4.59% (3.65%)	14.49% (7.66%)
Average increase in trips[b]	1.5	1.3	1.8	4	2	2.6	1.3	1.3	1.5	5.1	2.3	1.5
Trips unchanged	15.87% (2.22%)	43.86% (2.84%)	67.96% (4.42%)	55.61% (9.08%)	61.44% (12.69%)	74.73% (6.31%)	80.58% (7.26%)	82.16% (8.93%)	86.98% (4.28%)	49.73% (8.22%)	83.31% (6.01%)	68.67% (10.22%)
Decrease trips	12.98% (2.82%)	8.00% (1.89%)	4.69% (1.75%)	1.40% (1.05%)	2.94% (3.00%)		6.89% (4.82%)		1.41% (0.90%)	6.46% (3.24%)	8.15% (4.55%)	1.86% (1.57%)
Average decrease in trips[b]	1.5	1.3	1.2	3	2		0		1	1.3	1.7	1.5
Not visit	69.05% (3.56%)	46.48% (3.36%)	24.73% (3.66%)	15.81% (7.82%)	8.64% (6.40%)	9.94% (5.82%)	6.46% (2.81%)	2.57% (2.21%)	4.36% (3.54%)	29.44% (7.68%)	3.96% (3.28%)	14.98% (8.43%)

[a]Weighted estimates were calculated using nonresponse-adjusted person-level weights. Numbers in parentheses are standard errors on weighted calculations.

[b]Means in changes in days and trips are unweighted because of the small sample size.

trips or not visit at all, compared to 14 percent who would increase their trips.

However, the people who would increase their trips indicated they would increase their trips by more than any other group of visitors (an average increase of five trips per season).

In the GTNP Taggart Lake sample, most visitors are cross-country skiers. As Table 6-2 shows, most people would increase or not change the number of visits they make in a season under the three proposed management plans. Similar to the YNP sample, the ban would prompt the largest changes, although in GTNP on average people would be visiting more rather than less. The results for the other two policies, the cap with the guided tour requirements and the cap on numbers, are generally similar. However, more visitors indicated they would not visit under the cap with guided tours than under the cap alone.

Many visitors to YNP and GTNP have strong feelings about winter management in the parks and snowmobile access in particular. It is possible that the answers to these questions may contain an element of strategic behavior. For example, it is not completely clear why 25 percent of snowmobile riders in YNP who answered the question about visits under a plan that capped the number of snowmobiles allowed in the park daily said they would not visit under such a policy. However, the description of the policy capping the number of snowmobiles included a requirement that all snowmobiles must have a four-stroke engine. Snowmobile riders, especially those who currently ride their own two-stroke engine machines in the park, may not want to visit because of the technology constraint.

Because of the potential for strategic behavior by survey respondents, the survey was designed to separate respondents' feelings about the management proposals from their preferences for conditions in the park when they visited. The stated behavior questions focused on the management plans and we recognize there may be some strategic bias in the results. Responses to stated behavior questions will be the primary basis for estimating how many visitors will come to the park under different management scenarios, while the revealed preference and stated preference results will be used to estimate the welfare changes associated with changes in visitation and park conditions. However, the revealed

preference and stated preference model results will also be used to check the reasonableness of the visitation changes implied by the stated behavior questions.

6.2 MULTIPLE SITE RANDOM UTILITY MODEL

This section describes the standard travel cost model we used to estimate the value of a snowmobile trip to YNP and GTNP. Travel cost models are one type of revealed preference model, so named because they are based on observed behavior. We collected data to allow application of a random utility maximization (RUM) model. The RUM model is a travel cost model designed to analyze a person's visitation decision on a choice occasion from a set of available recreation sites. The sites are differentiated by their implicit price of getting to the site (the travel cost) and the attributes of the individual sites. When choosing a site, the potential visitor compares prices and attributes of the available sites to arrive at a decision. The strength of the RUM model is its ability to characterize the substitutability of the available sites by modeling this decision process. Using the estimated RUM model we are able to assess the value of a trip to a given site, given the availability of alternative sites that may (or may not) provide similar recreation opportunities.

6.2.1 Model Development

The premise of the RUM model is that, on a given choice occasion, the person will visit the site that provides the highest level of utility.

The premise of the RUM model is that, on a given choice occasion, the person will visit the site that provides the highest level of utility. We define the utility a person receives for a visit to site j by

$$u_j = v_j + \varepsilon_j \, , \; j = 1, \ldots, J, \tag{6.1}$$

where v_j is the observable component of utility that depends on the travel cost of reaching the site and other site characteristics. The term ε_j is a random error representing the component of utility that is unobservable from the perspective of the analyst but known to the individual. The goal of the model is to estimate the utility function up to the unobserved error term and use this estimate to assess the value of the recreation site.

Under the assumption of utility maximization the person will choose to visit site j on a given choice occasion if $u_j \geq u_k \; \forall k \neq j$. Because total utility is unobserved by the analyst, this choice is

random from the perspective of the model, and we can only state the probability that a site will be chosen. In general terms this probability is given by

$$\begin{aligned} pr(u_j \geq u_k) &= pr(v_j + \varepsilon_j \geq v_k + \varepsilon_k) \\ &= pr(\varepsilon_k - \varepsilon_j \leq v_j - v_k) \end{aligned} . \qquad (6.2)$$

Estimation of the model proceeds using assumptions for the form of the deterministic component of utility and the error distribution.

In the most common version of the model, the deterministic component of utility is given by $v_j = \beta p_j + \delta q_j$, where p_j is the travel cost of reaching the site, q_j is a vector of site attributes, and β and δ are parameters to be estimated. If it is assumed that the error terms are distributed independent Type I extreme value, the specific form of the probability that site *j* is visited is given by

$$pr(u_j \geq u_k) = \frac{\exp(v_j)}{\sum_{k=1}^{J} \exp(v_k)} . \qquad (6.3)$$

Given a sample of observed choices, maximum likelihood is used to recover estimates of the utility function parameters.

The estimated parameters provide a characterization of the utility function that allows calculation of the WTP (consumer surplus) for changing site attributes or maintaining the availability of particular sites. For example, under the assumptions of the model the per-trip consumer surplus for a trip to the first site is given by

$$cs = \frac{1}{\hat{\beta}} \left(\ln \left[\sum_{j=1}^{J} \exp(\hat{v}_j) \right] - \ln \left[\sum_{j=2}^{J} \exp(\hat{v}_j) \right] \right), \qquad (6.4)$$

where $\hat{v}_j = \hat{\beta} p_j + \hat{\delta} q_j$, and $\hat{\beta}$ and $\hat{\delta}$ are the coefficient estimates.

Implementation of this model requires data on trips made by people over the course of a recreation season to sites included in a researcher-defined choice set and prices for each of the sites for each person in the sample. The following section describes how the survey was designed to provide this information.

6.2.2 Choice Set Definition and Survey Design

Because the parks sit at the intersection of Wyoming, Montana, and Idaho we decided these three states would form the basis for the choice set.

The RUM model requires defining the set of available sites from which individuals choose on a given recreation occasion. In our case the objective was to gauge the importance of YNP and GTNP as a snowmobile destination. Thus, our aim was to construct a choice set that would adequately represent the set of alternatives that would be available to potential YNP and GTNP visitors. Because the parks sit at the intersection of Wyoming, Montana, and Idaho we decided these three states would form the basis for the choice set. We designed the choice set by examining each state individually. Information on snowmobile destinations in each state is readily available on the Internet through official state sites, private promotions, and club postings. We relied heavily on these web sites to arrive at the lists of snowmobile sites and areas for each state.[1]

For Montana, we relied on a state-sponsored web site listing the primary snowmobile destinations in the state. These are referenced primarily by cities, and our Montana site list includes nearly all destinations that were listed. For Wyoming, we again relied on a state-sponsored web site listing and describing the main snowmobile areas in the state. These tend to be referenced by geographical areas. Finally, for Idaho we relied on a club web site describing the main destinations in the state by aggregate region. Because of the large number of destinations in each region, we designed the Idaho choice set as a mixture of specific destinations within regions that contained the largest number of trail miles and regional areas to indicate other destinations in the state.[2]

These decisions resulted in a choice set containing 52 alternatives (including YNP and GTNP as one alternative) for which respondents could indicate visits. The names of the alternatives and a map showing their locations throughout the three-state area can be found in the survey contained in Appendix B, page B-10. In Question 19 on page B-11, we solicited information from all respondents on the

[1] We are also grateful for advice on choice set construction from Chris Bastian, who previously conducted a survey of snowmobile riders in Wyoming. Our Wyoming choice set decisions in particular were influenced by his experience.

[2] The web sites used for choice set definition included http://skimt.com/snomobl.htm (MT), http://wyotrails.state.wy.us/snow/snomap.htm (WY), and www.idahosnowbiz.com/club.htm (ID).

number of trips they made during the 2001–2002 winter season to the sites included in the choice set. We used 2001–2002 as the base year to ensure that all respondents provided a season's worth of data. This information provided the basic visitation data used to estimate the model. One of the reviewers of this report suggested that it may have been appropriate to limit the choice set further for individual respondents through the addition of survey questions designed to elicit their willingness to travel for snowmobiling. Unfortunately, this type of information is not available from the survey data. In the absence of this adjustment, coefficient estimates may be underestimated through the inclusion of infeasible alternatives (Swait, 1984). However, studies exist (see e.g., Parsons and Hauber, 1998) that suggest welfare estimates in RUM models are not sensitive to including distant irrelevant sites because the predicted probabilities are close to zero.

6.2.3 Data Formatting and Summary

The final questionnaire consisted of four survey versions tailored for local versus distant respondents and snowmobile versus nonsnowmobile riders. The survey provided information from 625 individuals from around the county who answered the "snowmobile" version of the questionnaire from the YNP and GTNP Taggart Lake samples. Because the travel cost model constructs the implicit cost of a visit based on the road travel cost of site access, we were concerned about including people in the sample for whom driving to one of the sites was not an obvious option. The RUM model requires calculation of the travel costs for each person in the sample not only for the site visited, but also for the other 51 sites in the choice set. Thus, a consistent distance-based measure of travel costs is needed for all sites. As a result, this modeling approach is not well-suited for modes of travel other than driving, especially when there are mixed modes of travel (i.e., visitors traveling to the site via different forms of transportation). In addition, many visitors arriving from east of the Mississippi fly into the GYA on multiple purpose trips, where snowmobiling in YNP and/or GTNP is just one of several trip purposes and may not be the primary purpose. The travel cost model breaks down when we cannot assume that the activity of interest is at least the primary reason for travel. It would be incorrect to use the entire trip cost in the travel cost model as a

cost paid for snowmobiling in the parks (Haspel and Johnson, 1982; Mendelsohn et al., 1992; Smith and Kopp, 1980).

Those park visitors within a day's drive are more likely to be undertaking the trip for the primary purpose of snowmobiling in the parks. Thus, we made the decision to include only people living west of the Mississippi River in our sample. This ensures that most of the people in the sample can reach one of the sites in a little more than a day's driving time. Furthermore, many of the respondents did not visit a site in the choice set during the 2001–2002 winter season. Because we are interested in the value of access to a site conditional on making a trip, these respondents were also not included in the sample. Using these two filters we arrived at a sample of 191 people who report taking 1,677 trips. These trips serve as the units of observation in the model. The consumer surplus value per day calculated using this sample will be applied to all snowmobilers in the parks, so that the total snowmobile recreation benefits will be accounted for. The idea behind this filtering decision is to apply the model to the subsample of snowmobilers that meet the assumptions of the RUM model so that valid estimates of recreation benefits for snowmobilers in YNP and GTNP are obtained and then use that value as the best available approximation of what all snowmobilers in the parks receive.

Calculation of travel cost typically includes the round trip out-of-pocket travel costs and a monetary value for the opportunity cost of travel time. Using the commercial software package *PCMiler* we calculated the round trip distance (in miles) and travel time (in hours) between each person's home zip code and each of the 52 sites in the choice set. The imputed price for each site was computed based on the formula:

$$\text{price} = \$0.33 \times \text{distance} + (\text{income} / 2000) \times \text{time}.$$

The $0.33/mile out-of-pocket cost is based on the current American Automobile Association figure.[3] A very important consideration in calculating travel cost is the specification of the opportunity cost

[3] This cost reflects the cost per vehicle. Alternatively, the cost could have been adjusted downward to reflect the fact that out-of-pocket expenses would be shared among group members. However, we did not collect data on group composition for trips taken to all sites in the choice set.

associated with travel time, but the debate on the correct shadow value of time in recreation demand models has not yet been settled. While using a fraction of the wage rate a long tradition in empirical studies, use of the full wage rate is supported by recent empirical and conceptual work. Larson (1993) provides arguments for using the full wage rate even when workers face a fixed work schedule. More recently, Feather and Shaw (1999) provide an attractive method for inferring the shadow value of time from labor market choices and answers to stated behavior questions. Their empirical results suggest the shadow value of time for most respondents is closer to the full wage rate than the fractions typically used in the literature. Finally, recent conceptual work on dual constraint models from Larson and Shaikh (2001) supports the use of the full average wage rate if it is assumed that time costs are exogenous. Thus, the opportunity cost of time for this analysis is based on the full average wage rate (calculated using an average of 2,000 working hours in a year).[4] Income was calculated using the midpoint of the income ranges included in the survey. For the small number of observations that had missing income values we used the median of those included in the sample.

The people included in the sample are relatively avid snowmobile riders, taking an average of 8.78 trips per year.

Several summary statistics give a sense of the data. The people included in the sample are relatively avid snowmobile riders, taking an average of 8.78 trips per year. The median number of trips is 3, suggesting the average is influenced by a few people taking a larger number of trips but supporting the notion that the sample consists of relatively active users of snowmobile trails. The average income in the sample is $80,188. Because the respondents' homes and choice set sites are geographically dispersed, the average travel cost of site access for any given site is quite large and does not give a sense of the access costs actually incurred. More informative is the average cost of access for the 1,677 observed trips. For these visits, the average imputed price is $879, with a standard deviation of 947 and a median of $543.

Table 6-4 provides a summary of the visits and average price and distance for the 10 most frequently visited sites. The most visited

[4] The way that household income is used to calculate the average wage rate implicitly assumes a single worker in the household. An alternative method would have been to use the number of working people in the household to compute an average wage rate. This would have resulted in a smaller shadow value of time and smaller per-trip WTP measures.

Table 6-4 provides a summary of the visits and average price and distance for the 10 most frequently visited sites. The most visited Table 6-4. Top Ten Most Visited Sites[a]

Site Name	Observed Visits	Average Price[a]	Average Distance In Miles
Yellowstone/Grand Teton National Parks, WY	224	$1,330	1,332
Continental Divide Togwotee, WY	199	$719	888
West Yellowstone, MT	190	$1,066	1,014
Big Springs Area Trails, ID	109	$790	741
Bozeman/Big Sky, MT	77	$562	485
Ashton Area Trails, ID	74	$457	453
Continental Divide Gros Ventre, WY	70	$983	1,239
Bear Tooth, WY	56	$1,555	2,054
Wyoming Range Afton, WY	55	$1,125	1,021
Snowy Range, WY	54	$377	424

[a]Those prices include only transportation costs (out-of-pocket and opportunity cost of time), not the costs of lodging, meals, equipment rentals, etc.

site in our sample is YNP, with 224 observed visits.[5] This is followed by the Continental Divide (Togwotee) in Wyoming and West Yellowstone in Montana.

6.2.4 Estimation and Results

Based on our preliminary investigations, we arrived at the following specification for the utility function in the RUM model:

$$u_i = \beta price_i + \delta_1 YNP + \delta_2 WEST + \delta_3 DIVIDE + \delta_4 ID + \delta_5 MT + \varepsilon_i, \quad i=1, \ldots, 52, \tag{6.5}$$

where $price_i$ is the travel cost for the ith site calculated as described above. The remaining variables are dummies defined as follows:

- *YNP* is a fixed effect for trips to YNP/GTNP.
- *WEST* is a fixed effect for trips to West Yellowstone.
- *DIVIDE* is a fixed effect for trips to Continental Divide Togwotee.

[5]Of course, this is probably an artifact of the sample design, because a respondent had to be visiting YNP to be included in the sample. YNP would not necessarily be the most frequently visited site in the three-state area of Idaho, Montana, and Wyoming based on a random sample of all snowmobilers in those states. The sample is consistent with our objective of measuring the impact of policy changes on current park users, but should be kept in mind when interpreting the results.

- ➤ *ID* is a fixed effect for the site being in Idaho.
- ➤ *MT* is a fixed effect for the site being in Montana.

This implies trips to Wyoming are the omitted category. The three site-specific dummy variables represent the three most frequently visited sites and are intended to capture the effects of the unique characteristics of these sites relative to the others. They are included because a priori we believe there are nonprice aspects of these sites that may account for their higher visitation levels. The maximum likelihood parameter estimates from this model are reported in Table 6-5.

Table 6-5. Model Estimation Results

Parameter	Estimate (t-statistic)
β_{PRICE}	–0.0021 (–23.70)
δ_{1YNP}	2.511 (28.80)
δ_{2WEST}	2.549 (24.48)
$\delta_{3DIVIDE}$	2.204 (25.13)
δ_{4ID}	0.145 (2.03)
δ_{5MT}	–0.514 (–5.62)
Log likelihood	–5536
Pseudo R^2	0.1645

In general we find plausibly signed and statistically significant coefficient estimates.

In general we find plausibly signed and statistically significant coefficient estimates. For example, the price coefficient is negative as expected, suggesting that all else being equal people prefer to travel to a closer site than a more distant one. The fixed effects for YNP/GTNP, West Yellowstone, and the Continental Divide are positive and significant, suggesting that the price variables do not fully account for some attractive features of these sites. Finally, the state-specific dummy variables indicate that people are more likely to visit Idaho sites than sites in Wyoming or Montana and more likely to visit Wyoming than Montana.

Using the formula given above we can calculate the consumer surplus for a trip to YNP or GTNP by looking at the welfare impacts of eliminating YNP/GTNP from the choice set. Using this model, the mean WTP per trip (conditional on making a trip) to keep YNP/GTNP in the choice set is $70. We used the Krinsky-Robb

(1986) method for computing the standard error of this welfare measure. This involves taking draws from the estimated distribution for the parameter vector and computing the welfare measure for each draw. This gives an empirical distribution of the WTP statistic from which we can calculate the standard error. Using 200 draws of the parameter vector and the associated WTP we get an estimate of 4.94 for the standard error of the welfare measure. By way of comparison, the welfare estimate for West Yellowstone is $59 and $62 for the Continental Divide. The standard errors are 5.41 and 5.02, respectively.

6.2.5 Interpretations and Limitations

The analysis given above suggests a per-trip consumer surplus estimate of $70. Many of the trips in the sample, however, are for more than 1 day. For purposes of comparison to other analyses included in the report, we can assess the rough value of a day spent snowmobiling at YNP or GTNP using additional data gathered in the survey. Specifically, for the 91 people included in the sample who visited YNP/GTNP to snowmobile, the average days/trip was 2.21. Thus, a rough value per day is $32 per day.

It is important to note a number of caveats and limitations when interpreting these estimates. Most importantly, because the travel cost model relies narrowly on the imputed cost of travel to construct the price of site access. It is likely that our consumer surplus estimates understate the value of a trip to any of the sites in the model.

It is important to note a number of caveats and limitations when interpreting these estimates. Most importantly, because the travel cost model relies narrowly on the imputed cost of travel to construct the price of site access, ignoring several expense categories (such as accommodations, food, entry fees, and equipment rentals), it is likely that our consumer surplus estimates understate the value of a trip to any of the sites in the model. Because many of the omitted expense categories are endogenously determined or unobservable, we decided that the model would be most useful (and provide a reliable lower bound) if we focused only on the travel costs. Ward (1984) and Fix et al. (2000) demonstrate that you will get a biased estimate of consumer surplus if endogenously chosen travel costs are included in a travel cost model. In addition, costs for items such as lodging would most likely net out because they probably do not vary with distance traveled. As long as these costs are approximately equal, they will cancel out in calculating the difference in utility and will not affect the parameter estimates.

Furthermore, as noted above we have included in the sample only individuals who made a trip to one of the sites in the choice set

during the model year and have not attempted to describe the decision to make a trip or not. This conditions the interpretation of our welfare measure to be specific to a person who has already decided to make a trip to the three-state area during the season. In practice this implies our sample reflects the more avid riders. We made this decision to best gauge how those most likely to be affected would value a change in snowmobile access to YNP. Including the nontrip takers would change the interpretation, and likely the value, of the consumer surplus measure. This would be equivalent to adding another substitute to the model, which tends to decrease the value of any given option because more choices are available. That conclusion is tempered here, though, because the opt-out option is a very broad good that includes the possibility of doing anything other than taking a snowmobile trip to the sites included in the choice set, including both close substitutes such as similar trips to sites outside the choice set and poor substitutes such as indoor recreation. The WTP measure probably would decline with the addition of an opt-out option, but it is difficult to speculate as to the magnitude of the impact.

Another important caveat is that, for decisions concerning specification of the travel cost, we have tended to use figures on the high end of the range. To the extent that the cost per mile per person is overstated, this may lead to WTP estimates of per-trip consumer surplus which, conditional on other assumptions in the model, are an upper bound on WTP for access to a site in the choice set.

6.3 STATED PREFERENCE CONJOINT SURVEY

After reviewing previously published literature, pretesting the instrument, and meeting with park staff, we chose nine attributes to characterize winter trips to YNP and GTNP.

Choice-format conjoint surveys are a type of stated preference survey that allows researchers to value a variety of trips (or other goods) under conditions that can be similar to or different from current conditions. In this type of stated preference survey, researchers construct a set of attributes or features of a good, in this case a winter trip to YNP or GTNP. Each of these attributes can take on one of several possible levels. For example, the attribute "congestion" could occur as "high," "moderate," or "low." The levels of these attributes are varied to create trips with different characteristics. When combined in a series of choice tasks according to an appropriate experimental design, the pattern of

responses reveals the respondents' subjective, relative evaluation of various attribute levels. If cost is included as an attribute, these importance weights or utilities can be scaled by the incremental utility of a dollar to obtain the dollar equivalence or WTP for a change in utility from the status quo to a particular alternative.

The survey contains a series of conjoint tasks in which respondents were offered choices between different trips to YNP and GTNP. The attributes of the trips describe important features of visitors' trips that may be affected by changes in winter management of the parks.

6.3.1 Designing the Stated Preference Questions

The first step in developing a conjoint survey to value trips with different attributes is to specify a list of the most important factors that influence trip value. After reviewing previously published literature, pretesting the instrument, and meeting with park staff, we chose nine attributes to characterize winter trips to YNP and GTNP. These attributes are designed to capture features of an individual's trip to the parks that will be affected by the proposed management alternatives. The attributes focus on the outcomes in terms of conditions in the parks (e.g., noise, road conditions, congestion, and air quality), rather than the tools used to achieve those outcomes (e.g., rules for access and technology requirements). The size of the attribute set attempts to balance the cognitive burden of the survey for the respondent against the need to include all the factors that are important to visitors and affected by the management alternatives.

We created the descriptions of the noise and exhaust levels based on feedback from pretests and discussions with park staff, as well as advice from the NPS Social Science Program.

Table 6-6 presents the attributes and levels of the attributes used in the survey. The complexity of the experimental design increases with the number of levels for each attribute, so we constrained the attributes to have no more than four levels. The levels of the attributes should capture the full range of possible outcomes. We based the levels for the two snowmobile traffic variables on average, minimum, and maximum snowmobile traffic at each entrance and in the park as a whole for weekdays, weekends, and holidays during the 2001–2002 winter season. We created the descriptions of the noise and exhaust levels based on feedback from pretests and discussions with park staff, as well as advice from the NPS Social Science Program. The trip cost attribute presented a particular challenge. Although guided snowmobile and snowcoach tours can

Table 6-6. Attributes and Levels for Conjoint Questions

Attributes	Levels
Activity	• Snowmobile • Snowcoach tour • Snowcoach shuttle to cross-country ski or hike • Drive car to auto-tour, cross-country ski, or hike
Entrance where trip starts	• Yellowstone West near West Yellowstone, MT • Yellowstone North near Gardiner, MT • Yellowstone South near Flagg Ranch • Grand Teton National Park
Guided tour or not	• Guided tour • Unguided tour
Daily snowmobile traffic at the entrance where you started	• I did not see any snowmobiles near the entrance where my trip started • Low, 200 or fewer snowmobiles (typical North and East Entrances on all days and South Entrance on most weekdays and weekends) • Moderate, 300 to 600 snowmobiles (typical West Entrance on weekdays and South Entrance on busy holiday weeks) • High, 800 to 1,500 snowmobiles (typical West Entrance on a holiday or crowded weekend)
Snowmobile traffic at most crowded part of trip	• I did not see any snowmobiles on my most recent trip • Low, 200 or fewer snowmobiles (very uncrowded days at Old Faithful) • Moderate, 300 to 600 snowmobiles (typical Old Faithful on less crowded weekdays and weekends) • High, 800 to 1,500 snowmobiles (typical Old Faithful on a holiday and busy weekends or weekdays in late January and February)
Condition of snow on the road or trail surface for all or most of the trip	• Smooth • Bumpy and rough
Highest noise level experienced on trip	• Low noise, occasional • Moderate, you would need to raise your voice to talk to someone standing next to you, noise like a busy city street • Loud, standing next to the road you could not converse with someone standing next to you, noise level similar to standing next to a gas-powered lawn mower or a busy highway
Exhaust emission levels	• I did not notice any exhaust emissions • Noticeable for some of the trip • Very noticeable for most or all of the trip
Total cost for day per person	• Varied according to whether the trip was a car trip or unguided or guided tour.

Note: The descriptions in Table 6-6 are from the initial, practice conjoint question (see Appendix B, Question 20, page B-13). Shorter descriptions were used in the other conjoint questions to reduce the amount of text on the page based on feedback from pretests. Some of the attribute levels presented in the practice conjoint question were not included as part of the design of the conjoint questions. Only the levels included in the conjoint design are presented in Table 6-6.

cost over $100 and sometimes over $200 per person per day, the cost of an unguided car trip could be as low as the entrance fee to the park (which is currently $20). We created three cost ranges for car trips ($20 to $75), unguided tours ($75 to $150), and guided tours ($75 to $230). We adjusted these ranges after analyzing the results from the first 100 surveys returned to unguided tours ($50 to $150) and guided tours ($50 to $230). The cost ranges were designed around the prices for different types of unguided and guided trips currently offered by businesses around YNP and GTNP. To ensure respondents will trade off cost against other features of the trip, the upper end of the cost range is somewhat higher than the costs current visitors typically pay.

Ideally, from the standpoint of the experimental design, the attribute levels will vary independently. However, the choices also need to be realistic to the respondents. Based on current conditions in the park and results from pretesting, the following restrictions were placed on attribute levels:

- The activity "Drive car" was always unguided.
- The activity "Take a snowcoach tour" was always guided (but the snowcoach shuttle to cross-county ski or hike could be guided or unguided).
- The level of snowmobile traffic "No snowmobiles in the park" at the entrance always appeared with "No snowmobiles in the park" at the most crowded point in the trip.
- The snowmobile traffic level "No snowmobiles in the park" always appeared with low noise and not noticeable
- emissions, but low noise and emissions also appeared with other levels of snowmobile traffic.
- No car trips originated from the South and West Entrances.
- No snowcoach trips originated from GTNP.
- Crowding at the entrance was always less than or equal to crowding at the most crowded part of the trip.

Much of the debate about the snowmobile regulations in the parks has focused on whether current snowmobile riders will still visit the parks if they cannot snowmobile. The stated preference survey was designed to evaluate respondents' willingness to substitute among activities, so Trip A and Trip B always presented different activities.

In this survey, respondents were asked a series of six choice questions. In each question, they were asked to choose among two trips (Trip A and Trip B) plus the option of not visiting (the "opt-out" option). To reduce respondents' cognitive burden, only seven of the nine attributes varied in any given pair of trips. Much of the debate about the snowmobile regulations in the parks has focused on whether current snowmobile riders will still visit the parks if they

cannot snowmobile. The stated preference survey was designed to evaluate respondents' willingness to substitute among activities, so Trip A and Trip B always presented different activities. Appendix B (survey Questions 22 through 27, pages B-15 through B-20) contains an example set of conjoint questions.

The opt-out option was included because it is a realistic option for current visitors. If the visitor selected the opt-out option, she was asked a follow-up question about what she would most likely do instead. The choices were:

- Stay at home; I would not travel to the GYA
- Travel to the GYA to snowmobile outside the parks
- Travel to the GYA to cross-county ski outside the parks
- Travel to the GYA to downhill ski at Big Sky or one of the ski areas near Jackson Hole
- Other

Each of the attribute levels was defined in the introduction to the survey. To familiarize the respondents with the attributes and levels and to help them think about what they liked and did not like about their trips, we first asked the respondents to describe their most recent trip using the attributes and levels from the stated preference questions (see Appendix B, Question 20 page B-13 for the text of this question). Respondents then were offered an alternative trip and the option of not visiting and asked whether they would prefer the trip they just took, the alternative trip, or whether they would stay home. After this question, respondents were asked about one thing they would change about their most recent trip (see Table 5-6 for the answers to this question).

Most current marketing stated preference applications use an approximately orthogonal design to reduce the number of paired comparisons to the smallest number necessary for efficient estimation of utility weights (Dey, 1985). Huber and Zwerina (1996) list four properties of efficient designs:

- Level balance: levels of an attribute occur with equal frequency
- Orthogonality: the occurrences of any two levels of different attributes are uncorrelated
- Minimal overlap: cases where attribute levels do not vary within a choice set should be minimized

- Utility balance: the probabilities of choosing alternatives within a choice set should be as similar as possible

Most current stated preference studies in the academic literature only investigate small attribute-level spaces. Unfortunately, it is often not possible to achieve both level balance and orthogonality in small designs. Thus, design optimality generally requires trading off potential incompatibilities between these criteria. However, Kuhfeld, Tobias, and Garratt (1994) show that it is possible to produce relatively efficient designs that are neither balanced nor orthogonal. Such efficient designs can be produced using an iterative computer algorithm.

The experimental design for the stated preference questions was based on an algorithm that searches for D-efficient designs in the full factorial (Zwerina, Huber, and Kuhfeld, 1996; Huber and Zwerina, 1996). The experimental design program was run for 5,000 iterations. The ultimate design for the experiment was chosen from the five designs with the highest D-efficiency scores based on balance and correlation between attribute levels.

6.3.2 Conditional and Mixed Logit Estimates of Respondent Preferences

Respondents evaluated six choice tasks in which they chose among two trips and the option of not visiting the parks (the opt-out option). The data form a panel that can be analyzed using stochastic utility maximization theory.

Respondents evaluated six choice tasks in which they chose among two trips and the option of not visiting the parks (the opt-out option). The data form a panel that can be analyzed using stochastic utility maximization theory.

We estimate trip preferences with RUM models, including both conditional and mixed or random-parameters logit. The RUM model assumes the utility associated with a particular choice alternative is expressed as a function of individual characteristics and the attributes of the alternative. The RUM format is the same as that used for the multiple-site RUM described in Section 6.2. We present the model again to provide detail on the types of variables used in the conjoint analysis. Under the assumptions of the RUM model, individual indirect utility is expressed as a function of trip attributes and personal characteristics:

$$U_{jt}^{i} = V^{i}(X_{jt}, Z^{i}, p_{jt}; \beta^{i}, \delta^{i}) + e_{jt}^{i} \qquad (6.6)$$

where

U_{jt}^{i} is individual i's utility for a trip, where j = 0, 1, 2, denoting the three alternative trips in each choice set, and t = 1,...,6;

$V^{i}(\cdot)$ is the nonstochastic part of the utility function;

X_{jt} is a vector of attribute levels for the trip;

Z^{i} is a vector of personal characteristics;

p_{jt} is the cost of the trip;

β^{i} is a vector of attribute parameters;

δ^{i} is the marginal utility of money; and

e_{jt}^{i} is a disturbance term.

The linear specification of utility for the three alternatives is

$$\begin{aligned} U_{jt}^{i} &= V_{jt}^{i} + e_{jt}^{i} = \gamma_{0}^{i} + e_{jt}^{i} \quad j = 0 \\ U_{jt}^{i} &= V_{jt}^{i} + e_{jt}^{i} = X_{jt}\beta^{i} + p_{jt}\delta^{i} + e_{jt}^{i} \quad j = 1, 2 \end{aligned} \tag{6.7}$$

where U_{jt}^{i}, j = 0, 1, 2 is the utility of each of the three trip alternatives. U_{0t}^{i} is the utility of the opt-out choice, which in a simple model is just γ_0, an alternative-specific constant for the opt-out choice. The utility of Trip A is U_{1t}^{i} and the utility of Trip B is U_{2t}^{i}.

Stochastic utility maximization asserts that individual i will choose alternative j from among the full set of available alternatives K if, and only if, alternative j provides a higher overall level of utility than all other alternatives in the choice set.[6] Assuming the disturbance term follows a Type I extreme-value error structure, the probability that alternative j will be selected from choice set t is the standard conditional-logit expression:

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[6]Mathematically, individual i will choose alternative j from among the set of alternatives K,

if $U_{jt}^{i} > U_{kt}^{i}$ for all j in K, $j \neq k$

substituting for U_{jt}^{i} from Eq. (6.6), and rearranging terms we have

$V_{jt}^{i} - V_{kt}^{i} > e_{kt}^{i} - e_{jt}^{i}$.

$$Prob[C_t^i = j] = \frac{\exp\left(V_{jt}^i\right)}{\sum_{k=0}^{2}\exp\left(V_{kt}^i\right)} \quad (6.8)$$

where C_t^i is the selected alternative in each of six choice sets and V_{jt}^i is the determinate part of the utility of alternative j.[7] The probability that an alternative will be selected is the ratio of the exponentiated utility that alternative provides, relative to the exponentiated sum of the utilities that each alternative in the choice set provides. Individual characteristics do not vary among choices, and thus must be interacted with trip attributes or alternative-specific constants.

The conditional logit model specified by Eqs. (6.7) and (6.8) is estimated using maximum-likelihood. That is, given the characteristics of the alternatives in the choice sets presented to the respondents, the model estimates coefficients that maximize the likelihood that we would observe the actual choices in the sample. Thus, the coefficients show the relationship between the probability of selecting a trip and the attributes of that trip.

Conditional logit models are known to be subject to violations of the restrictive "independence of irrelevant alternatives" (IIA) assumption. This condition requires that the ratio of probabilities for any two alternatives be independent of the attribute levels in the third alternative. If IIA is violated, parameter estimates are biased. Second, the conditional logit models assume that differences in respondents' tastes are fully accounted for in the model specification and thus differences in value to respondents arise only from differences in probability of selecting choice alternatives. Finally, conditional logit does not account for correlations within each subject's series of choices.

Revelt and Train (1998) have proposed using random-parameter or mixed logit for stated preference data. Mixed logit is not subject to the IIA assumption,[8] accommodates correlations among panel observations, and accounts for unobserved heterogeneity in tastes across subjects.

[7]The basic exposition of the properties of this model can be found in McFadden (1981).

[8]Technically, this is only true when the definition of one or more stochastic effects is shared across alternatives.

Modifying Eq. (6.7) to introduce subject-specific stochastic components for each β,

$$\begin{aligned} U^i_{jt} &= V^i_{jt} + e^i_{jt} \equiv \left(\gamma^i_0 + \eta^i_0\right) + e^i_{jt} && j = 0 \\ U^i_{jt} &= V^i_{jt} + e^i_{jt} \equiv X_{jt}\left(\beta + \eta^i\right) + \delta^i P_{jt} + e^i_{jt} && j = 1, 2 \end{aligned} \tag{6.9}$$

Eq. (6.8) now becomes

$$Prob[C^i = (C^i_{j1}, C^i_{j2}, ..., C^i_{j6})] = \prod_{t=1}^{6}\left[\frac{\exp[V^i_{jt}(\beta^*)]}{\sum_{k=0}^{2}\exp[V^i_{kt}(\beta^*)]}\right] \tag{6.10}$$

where now $\beta^* = (\beta + \eta^i)$. In contrast to conditional logit, the stochastic part of utility now may be correlated among alternatives and across the sequence of choices via the common influence of η^i. McFadden and Train (2000) show that any RUM model can be approximated by some mixed logit specification.

The heterogeneity of preferences among winter visitors in YNP represents a challenge for estimating welfare impacts using the results of the stated preference questions. The biggest differences in the summary statistics presented in Section 5.2 appear to be between snowmobile riders and other winter visitors. To control for the heterogeneity, we estimated separate models for these two groups where snowmobile riders are those whose general primary activity was riding a snowmobile on their most recent trip and other winter visitors indicated their general primary activity as either snowcoach tour, auto touring, or cross-country skiing/snowshoeing (see Table 5-5).[9]

Cost is the only continuous variable in the model. The other variables, except the "No crowding at the entrance/destination" and opt-out variables, are modeled using effects coding instead of traditional dummy variables. Using effects coding, the base level of the variable (the excluded category in the regression) is coded as –1. The value of the excluded category is the negative sum of the coefficients for the other levels. Thus zero is normalized as the

[9] Each of the models assumed stochastic effects are normally distributed.

mean effect and statistical significance tests relate to the mean effect rather than the omitted category. "No crowding at the entrance/destination" and opt out are defined as a traditional dummy variable where 1 indicates that there were no snowmobiles in the park or that opt out was chosen, respectively.

Snowmobile Rider Results

Starting with the snowmobile riders, column 2 of Table 6-7 contains the results from a simple conditional logit, while column 3 contains the same specification estimated using the mixed logit. The mixed logit provides an estimate of both the parameter and the standard deviation for each variable except cost, which is held constant. Thus the mixed logit results indicate the degree of taste heterogeneity by the relative size of the standard deviation parameters relative to the corresponding point estimates.

Looking at Table 6-7, there are some differences between the two models in terms of the significance of the coefficients, but overall the models provide similar qualitative results. In both models, cost is negative and significant. In terms of activities, not surprisingly snowmobile riders were more likely to select snowmobile trips than the other options.

Although snowmobile riding increases utility for most riders, some riders get very high levels of enjoyment from the activity compared to other visitors.

Looking at the activity variables, the standard deviation on snowmobiling is significant, indicating that, although snowmobile riding increases utility for most riders, some riders get very high levels of enjoyment from the activity compared to other visitors. Although the coefficient on snowcoach tours is insignificant, the significant standard deviation is much larger than the size of the coefficient. Again there appears to be diverse preferences for the activity. Some people receive positive utility from snowcoach tours and others do not. Being part of a guided tour reduces utility on average, but again a large and significant standard deviation indicates that being on a guided tour provides positive utility to some portion of the sample. The *opt-out* option has a positive and significant coefficient as does its standard deviation. Compared to the other coefficients, the opt-out coefficient is large, suggesting that not visiting the parks was an attractive option for many people in

Table 6-7. Parameters of Conditional and Mixed Logit Models for Snowmobilers and Nonsnowmobilers

	Snowmobiler		Nonsnowmobiler	
	Conditional Logit	**Mixed Logit**	**Conditional Logit**	**Mixed Logit**
Attribute	**Model 1 Coefficient[a]**	**Model 2 Coefficient[a]**	**Model 1 Coefficient[a]**	**Model 2 Coefficient[a]**
Cost	–0.002**	–0.007***	–0.004***	–0.011***
	(0.001)	(0.002)	0.001	0.002
Entrance[b]				
West	0.190**	0.211	0.064	0.010
	0.079	0.135	0.086	0.145
Standard deviation		*0.236*		*0.386**
		0.309		*0.211*
North	–0.033	–0.201**	0.004	0.020
	0.056	0.101	0.069	0.114
Standard deviation		*0.439***		*0.754****
		0.181		*0.139*
South	–0.099	0.088	–0.091	–0.002
	0.076	0.136	0.103	0.163
Standard deviation		*0.296*		*0.252*
		0.193		*0.156*
Grand Teton[c]	–0.057	–0.098	0.024	–0.029
	0.103	0.172	0.122	0.205
Activity[b]				
Snowmobiling	1.054***	2.188***	–0.457***	–0.696***
	0.078	0.166	0.097	0.165
Standard deviation		*1.654****		*1.277****
		0.132		*0.142*
Snowcoach tour	–0.088	0.090	–0.127	–0.057
	0.097	0.169	0.103	0.173
Standard deviation		*0.956****		*0.652****
		0.173		*0.216*
Skiing/hiking	–0.440***	–0.482***	0.177**	0.309**
	0.074	0.122	0.077	0.127
Standard deviation		*0.045*		*0.015*
		0.192		*0.194*
Auto tour[c]	–0.526***	–1.797***	0.408***	0.444*
	0.146	0.273	0.173	0.282

(continued)

Table 6-7. Parameters of Conditional and Mixed Logit Models for Snowmobilers and Nonsnowmobilers (continued)

	Snowmobiler		Nonsnowmobiler	
	Conditional Logit	Mixed Logit	Conditional Logit	Mixed Logit
Attribute	Model 1 Coefficient[a]	Model 2 Coefficient[a]	Model 1 Coefficient[a]	Model 2 Coefficient[a]
Guided Tour[b]				
Guided tour	–0.422***	–0.891***	0.069	0.138
	0.044	0.093	0.068	0.114
Standard deviation		*1.193***		*0.952***
		0.091		*0.102*
Unguided tour[c]	0.422***	0.891***	–0.069	–0.138
	0.044	0.093	0.068	0.114
Crowding at Entrance[b]				
Low traffic	0.208***	0.372***	0.329***	0.445***
	0.070	0.118	0.085	0.128
Standard deviation		*0.039*		*0.513****
		0.168		*0.125*
Moderate traffic	–0.024	–0.057	–0.042	0.011
	0.070	0.123	0.083	0.132
Standard deviation		*0.036*		*0.070*
		0.194		*0.191*
High traffic[c]	–0.184***	–0.316***	–0.288***	–0.455***
	0.061	0.100	0.086	0.138
Crowding at Destination[b]				
Low traffic	0.237**	0.252	0.434***	0.707***
	0.095	0.157	0.099	0.164
Standard deviation		*0.007*		*0.202*
		0.163		*0.148*
Moderate traffic	0.081	0.046	–0.021	–0.104
	0.065	0.109	0.083	0.129
Standard deviation		*0.285***		*0.151*
		0.140		*0.143*
High traffic[c]	–0.319***	–0.297**	–0.413***	–0.603***
	0.094	0.155	0.127	0.201
Road Condition[b]				
Smooth	0.147***	0.359***	0.070	0.224***
	0.040	0.074	0.044	0.069
Standard deviation		*0.323****		*0.130*
		0.111		*0.097*
Bumpy and rough[c]	–0.147***	–0.359***	–0.070*	–0.224***
	0.040	0.074	0.044	0.069
Noise Level[b]				
Low	–0.007	0.157	0.159*	0.211
	0.073	0.124	0.087	0.138
Standard deviation		*0.727****		*0.738****
		0.113		*0.143*

(continued)

Table 6-7. Parameters of Conditional and Mixed Logit Models for Snowmobilers and Nonsnowmobilers (continued)

	Snowmobiler		Nonsnowmobiler	
	Conditional Logit	Mixed Logit	Conditional Logit	Mixed Logit
Attribute	**Model 1 Coefficient[a]**	**Model 2 Coefficient[a]**	**Model 1 Coefficient[a]**	**Model 2 Coefficient[a]**
Moderate	–0.174**	–0.250**	–0.121*	–0.058
	0.069	0.116	0.064	0.100
Standard deviation		*0.596***		*0.067*
		0.101		*0.127*
High[c]	0.181**	0.093	–0.038	–0.153
	0.091	0.149	0.109	0.173
Emissions Level[b]				
Not noticeable	–0.060	0.124	0.059	0.401**
	0.098	0.165	0.117	0.195
Standard deviation		*0.131*		*0.776****
		0.160		*0.169*
Noticeable	0.187***	0.211*	0.105	0.142
	0.068	0.118	0.084	0.139
Standard deviation		*0.348****		*0.027*
		0.128		*0.092*
Very noticeable[c]	–0.126**	–0.335***	–0.164**	–0.543***
	0.075	0.127	0.099	0.166
No Crowding at Entrance/Destination Dummy	0.189	–0.212	1.268***	2.111***
	0.153	0.277	0.180	0.301
Standard deviation		*1.239****		*0.824****
		0.237		*0.164*
Opt–Out Dummy	1.123***	1.377***	0.621***	0.430
	0.140	0.257	0.177	0.296
Standard deviation		*3.014****		*2.535****
		0.161		*0.142*
Number of choices	5,127	5,127	3,815	3,815
Log likelihood	–4,400.7802	–0.6965[d]	–3,418.7774	–0.7660[d]
LR $\chi^2(19)$	2,463.61		1,544.86	
Probability > χ^2	0.0000		0.0000	
Pseudo R^2	0.2187		0.1843	

[a]Standard errors are in parentheses.

[b]Attributes with multiple levels are coded using effects codes.

[c]The base level for the effects-coded variable. The value of the base level for the effects coded variable is minus the sum of the coefficients on the other categories. The standard error is calculated from the variance-covariance matrix using as the square root of $\text{var}\left(\sum X_i\right) = \sum \text{var}(X_i) + 2 \cdot \sum_{i>j}^{n} \sum_{j=1}^{n-1} \text{cov}(X_i, X_j)$ where the X_is are the other levels of the variables.

[d]Indicates mean log likelihood.

*** Statistically different from 0 at the 0.01 level of significance.

** Statistically different from 0 at the 0.05 level of significance.

* Statistically different from 0 at the 0.1 level of significance.

the sample given the other trip choices. In fact, overall opt out was selected almost 54 percent of the time.

Two crowding variables appear in the attribute list. For both variables, the coefficient on low crowding provides the largest increase in utility, moderate crowding is in the middle, and high crowding reduces utility.

Two crowding variables appear in the attribute list. For both variables, the coefficient on low crowding provides the largest increase in utility, moderate crowding is in the middle, and high crowding reduces utility. Low crowding at the entrance is significantly different from zero (the mean effect). Moderate crowding is not different from the mean effect (which is set to 0 for effects-coded variables); however, high crowding significantly lowers utility compared to moderate crowding. In terms of crowding at the most crowded part of the trip, low and moderate crowding are not significantly different from the mean effect in the mixed logit (although in the conditional logit, low crowding has a significant positive coefficient), but high crowding significantly lowers utility compared to the mean effect. A final variable related to crowding is "No crowding at entrance/destination," which was described as no snowmobiles at the entrance or the most crowded part of the visit. Not surprisingly, this variable is not significantly different from the mean effect. However, the standard deviation is large and significant. For some snowmobile visitors, no snowmobiles in the park increased utility. Crowding affects road conditions, and in pretesting, many people mentioned the importance of smooth road conditions to an enjoyable trip. The results from both the conditional logit and mixed logit confirm the importance of smooth roads with a positive and significant coefficient.

The attribute describing the level of noise from snowmobiles may seem somewhat puzzling at first glance. In the mixed logit results, low noise has a positive but insignificant coefficient, indicating that this coefficient is not different from the mean effect, while moderate noise has a significant and negative effect. However, high noise has a positive coefficient, implying the snowmobile riders get utility from noise. Both low and moderate noise have large, significant standard deviations as well. There are several possible explanations. Snowmobile riders may enjoy the noise associated with riding snowmobiles. In addition, the respondents may be interpreting the variable more broadly. For example, using current technology, lower noise might be associated with a four-stroke engine snowmobile, which is also less powerful than the more

commonly used two-stroke engine snowmobile. The preference for high noise may actually indicate a preference for two-stroke engine snowmobiles. Finally, moderate emissions bring higher utility than low emissions (although the difference is not significant), possibly for similar reasons, while high emissions decrease utility.

We ran several other specifications not presented in this report because the results were very similar both quantitatively and qualitatively. However, one interesting result observed in an alternate specification concerns the noise variables. When interacted with snowmobile ownership, it turns out that snowmobile owners have a large, positive coefficient on high noise. Snowmobile riders who do not own snowmobiles prefer low and moderate noise to high noise. This result lends support to the contention that snowmobile owners may be expressing a preference for technology rather than noise.

Nonsnowmobile Visitor Results

Table 6-7 presents the results from the conditional and mixed logits for other visitors. Again the coefficient on cost is negative and significant for all models. Looking at Models 1 and 2, the activity snowmobile reduces utility on average, while cross-country skiing and auto tours have positive and significant coefficients. The large and significant standard deviation on snowmobile suggests that preferences for snowmobiles vary within the group, having a negative impact on some visitors and a positive impact for others. Guided tour also has the opposite sign from the snowmobile models. Guided tour has a positive coefficient, although it is not significantly different from the mean effect. However, the standard deviation on guided tour is large and significant.

Turning to the crowding variables, the coefficients on both entrance crowding and crowding on the trip are ordered as expected. Lower crowding yields the highest utility, while high crowding yields the lowest utility, with all the levels significantly different from each other. For these visitors, the variable representing no snowmobiles in the park has a large positive and significant coefficient relative to most of the other coefficients in the model. Like snowmobile riders, these visitors also have a preference for smooth road conditions.

Low noise provides the highest level of utility; however, none of the coefficients on the noise levels are significant in Model 2, the mixed

logit results. In Model 2, the emission variables are also ordered as expected: low emissions provide positive utility and high emissions decrease utility.

Again, we ran a number of additional models to investigate the effects of alternative specifications. In particular, we were interested in the cost coefficient and emissions variable. Combining low and moderate emissions yields a positive and significant coefficient. Otherwise, the results are similar.

6.3.3 Testing for Consistency in Stated Preference Conjoint Data

Unlike contingent value surveys, the responses to conjoint surveys often allow the analyst to test whether individual stated preferences conform to the basic tenets of utility theory.

Recovering valid welfare measures from stated preference data requires that respondents' preferences be complete, monotonic, and transitive. In addition, we expect preferences to be stable at least within the conjoint survey. We refer collectively to monotonicity, transitivity, and stability as preference consistency. Unlike contingent value surveys, the responses to conjoint surveys often allow the analyst to test whether individual stated preferences conform to the basic tenets of utility theory. The design of the conjoint questions in this survey allowed us to test the conjoint data for monotonicity and preference stability. Monotonic preferences require that, holding costs constant, individuals should prefer more to less of any normal good. Stability requires that, in general, if respondents prefer A to B at the beginning of the one point in the sequence of questions, then they should prefer A to B at any subsequent point.

There are two possible tests for monotonicity. The first is a dominant-pair comparison. This test requires that all the attributes of one profile in a choice set be unambiguously better than all the attributes of the other profile in the comparison. Including a dominant-pair comparison in a conjoint survey provides a simple test of respondent consistency. However, including this simple test reduces overall design efficiency because a dominant-pair provides no information on respondents' willingness to accept trade-offs among attributes.

We employed an alternative test of monotonicity that involves comparing respondents' choices across two choice sets. This test requires that respondents see a particular profile at least twice. In addition, it requires that one of the profiles compared to the

repeated profile is either unambiguously better or worse than the other comparison profile. For example, suppose that a respondent sees two sets of pairs, Option X versus Option Y, and Option X versus Option Z. Further suppose that Options Y and Z are identical in all attributes but cost, and Option Z costs less. Given that a respondent prefers Option Y to Option X in the first pair, that individual should prefer Option Z to Option X at least as strongly, because Option Z provides the same utility at a lower cost.

If the experimental design permits, preference stability can be tested as well. For example, one could repeat questions at the beginning of the series and the end, although this version of the test reduces the efficiency of the overall experimental design. We used a stability test that compared the responses to two choice sets where Options X and Y are the same in both sets, but the third option is different. If respondents choose Option X in the first set, then preference stability requires that they not choose Option Y in the second set.

RTI has developed software that extracts consistency tests from a conjoint data set. For the monotonicity test, the data allowed for 853 tests that resulted in only 24 failures (and no respondents failed the test more than once). A total of 1,154 stability tests were performed resulting in only 123 failures (again, no respondents failed the test more than once). Results of such tests should be interpreted carefully, however. Conjoint tasks are cognitively challenging. Even the most attentive respondents with well-behaved preferences may report some inconsistent responses, particularly for cases where the utilities of two profiles are nearly equal. The low failure rate for the monotonicity and stability tests in this survey supports the reliability of the data.

6.3.4 Welfare Estimates

Once we have estimated the utility functions, we can determine the effect of changes in various attributes on individual utility. We will also be able to monetize changes in utility. Let X_j^0 represent the status quo vector of attribute levels. X_j^* represents a different vector of attribute levels. The WTP for a given change in commodity attributes $(X_j^* - X_j^0)$ is the amount of money $(p_j^* - p_j^0)$ that would leave respondent i indifferent between paying for the change in

attribute levels or remaining in the status quo state at no cost. Mathematically, this is the level of p_j^* that satisfies

$$V^i[\mathbf{X}_j^*, \mathbf{Z}^i, p_j^*; \beta^i, \delta^i(p, \mathbf{Z}^i)] = V^i[\mathbf{X}_j^0, \mathbf{Z}^i, p_j^0; \beta^i, \delta^i(p, \mathbf{Z}^i)]. \quad (6.11)$$

The negative of the estimated coefficient on the cost term ($-\delta$) can be interpreted as the marginal utility of money (i.e., the utility derived from having additional dollars). Therefore,

$$WTP^i\left(X^* - X^0\right) = p_j^* - p_j^0 = \frac{\left(X^* - X^0\right)\beta^i}{-\delta^i} \quad (6.12)$$

For both groups of visitors, moving from Baseline High (with high levels of crowding, noise, and emissions) to Baseline Moderate or to a Cap-Only policy that resulted in low crowding noise and emissions improves utility and yields similar WTP between $110 and $360.

We used the mixed logit models to calculate the changes in welfare associated with different trips according to Eq. (6.12) for changes in the levels of the attributes. In Table 6-8 we present welfare changes for some sample scenarios. These welfare calculations are based on one set of possible outcomes associated with the proposed management changes in the FSEIS (NPS, 2003).

Table 6-9 presents the per-day WTP for the specified changes. To estimate the WTP of snowmobile riders, we used the numbers from snowmobilers Model 2, and we used the numbers from nonsnowmobiler Model 2 for the nonsnowmobiler welfare estimates. For both groups of visitors, moving from Baseline High (with high levels of crowding, noise, and emissions) to Baseline Moderate or to a Cap-Only policy that resulted in low crowding noise and emissions improves utility and yields similar WTP between $110 and $360. Snowmobile riders lose utility if snowmobiles are banned. If the snowmobile riders did not visit the parks and instead chose opt out under the ban, their utility declines by $191. On the other hand, a policy that bans snowmobiles results in a welfare gain for nonsnowmobile riders of $437. One possible explanation for the large disparity in the magnitude of impacts between snowmobilers and nonsnowmobilers is that the model is set up as a day trip model and it appears that on any given day snowmobilers prefer snowmobile use outside the parks to snowmobiling in the parks. However, snowmobilers may still place a high value on being able to visit the parks as part of their visit to the GYA. Without the ability to snowmobile in the parks, many snowmobilers may choose to travel to a region other than the GYA for snowmobiling trips. Thus, the loss reported for restricting use in

Table 6-8. Sample Scenarios for Welfare Change Calculations

Attribute	Baseline Moderate	Baseline High	Ban	Cap and Guided Tours Low	Cap Only Low
Guided tour required?				Yes for snowmobiles	
Crowding at entrance	Moderate	High		Low	Low
Crowding at destination	Moderate	High		Low	Low
No snowmobiles in park			Yes		
Road condition	Rough	Rough	Smooth	Smooth	Smooth
Noise level	Moderate	High	Low	Low	Low
Emissions level	Noticeable	Very noticeable	Not noticeable	Not noticeable	Not noticeable

Table 6-9. Per-Day WTP Estimates for Sample Scenarios Using Results from Model 2[a]

	Baseline Unguided Snowmobile Trip	Baseline Snowcoach, Cross-Country Ski or Auto Trip
Baseline high to baseline moderate	$117	$155
Baseline high to cap only low	$362	$352
Baseline high to ban		$437
Baseline high to opt out	–$191	
Baseline high to cap and guided tours low	$102	$352
Baseline moderate to cap and guided tours low	–$16	$197

[a]These sample WTP estimates are point estimates calculated using parameter means.

the park may understate welfare losses by focusing on the losses for a given day.

Finally, a policy that requires snowmobile riders to be on guided tours (and results in low crowding, noise, and emissions) would increase welfare for snowmobile riders compared to a high crowding situation (Baseline High) but reduces welfare if Baseline Moderate is used. On average, guided tours reduce utility for snowmobile riders. However, snowmobile riders prefer low

crowding over high crowding enough that welfare increases under the Cap and Guided Tours policy when Baseline High is the baseline. In contrast, moving from a moderate crowding baseline to required guided tours reduces utility. The disutility of the guided tours is larger than the utility gains from lower crowding. In this model, the guided tour requirement for snowmobiles does not affect the utility of nonsnowmobilers, so the utility of moving from Baseline High to Cap and Guided Tours Low is the same as moving to Cap Only Low.

6.3.5 Interpretations and Limitations

The welfare estimates presented in Section 6.3.3 suggest a range of WTP values for snowmobile riders and nonsnowmobile riders that vary according to the baseline conditions in the park and the alternative scenario under consideration. As a point of comparison, the travel cost RUM model results reported in Section 6.3.4 concluded with an estimate of $32 per day of welfare loss associated with removing YNP/GTNP from the choice set for snowmobile riders. This number is significantly smaller than the welfare estimate from Model 2 in Table 6-9 for snowmobile riders who would choose to recreate outside the parks (the opt-out option) if a ban on snowmobiles were instituted.

There are some important considerations to keep in mind when interpreting these welfare estimates. First, the welfare estimates were calculated using the mean point estimates of the coefficients. Several of the coefficients in the mixed-logit models have large and significant standard deviations. For example, the standard deviation on the guided tour variable for snowmobile riders is large and significant compared to the size of the coefficient itself. On average, being on a guided tour reduces utility for snowmobile riders, but for some riders it increases utility. Using the mean coefficients to calculate welfare estimates masks this variation. In addition, the conjoint design did not include an attribute describing whether all the snowmobiles were on tours. As discussed above, this implies that the model will not predict any change in utility for nonsnowmobile riders if the snowmobiles are all on guided tours. As a result, the welfare estimates may either under- or overstate the benefits of requiring guided tours. Nonsnowmobile riders might prefer to have snowmobiles on tours if, for example, the result is that all the snowmobiles travel at slower speeds. However, if the

policy resulted in larger groups of people arriving all at once at various sites or rest stops, it might be an inconvenience to nonsnowmobile riders. Finally, the stated preference survey measures stated preferences over hypothetical alternatives. Although the results are intuitive and the consistency tests reported in Section 6.6.3 are favorable, the responses to the survey could differ from actual behavior.

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Appendix A: Winter Visitor Contact Form

1. On this trip, are you staying away from home overnight?
   ____ Yes, I am staying away from home overnight on this trip
   ____ No, I am here on a day trip

2. Are you snowmobiling in the park during this trip [if visitor is in a wheeled vehicle]?
   ____ Yes
   ____ No

3. If you are riding a snowmobile on this trip, is this trip the first time you have ridden a snowmobile?
   ____ Yes, this trip is my first time on a snowmobile
   ____ No, I have ridden a snowmobile before

_____

First Name Last Name

_____ _____

Street Address Email address

_____ _____ _____

City State Zip Code

Staff Use: Indicate mode of transportation **Date:**_____
____Snowmobile ____Snowcoach ___Auto, bus, van, RV ___Skis
___Other_____

Appendix B:
Survey Instrument

Section B.1 contains a copy of one version of the survey—the version for nonlocal, experienced snowmobile riders. The other versions of the survey contained mostly identical questions with the following exceptions:

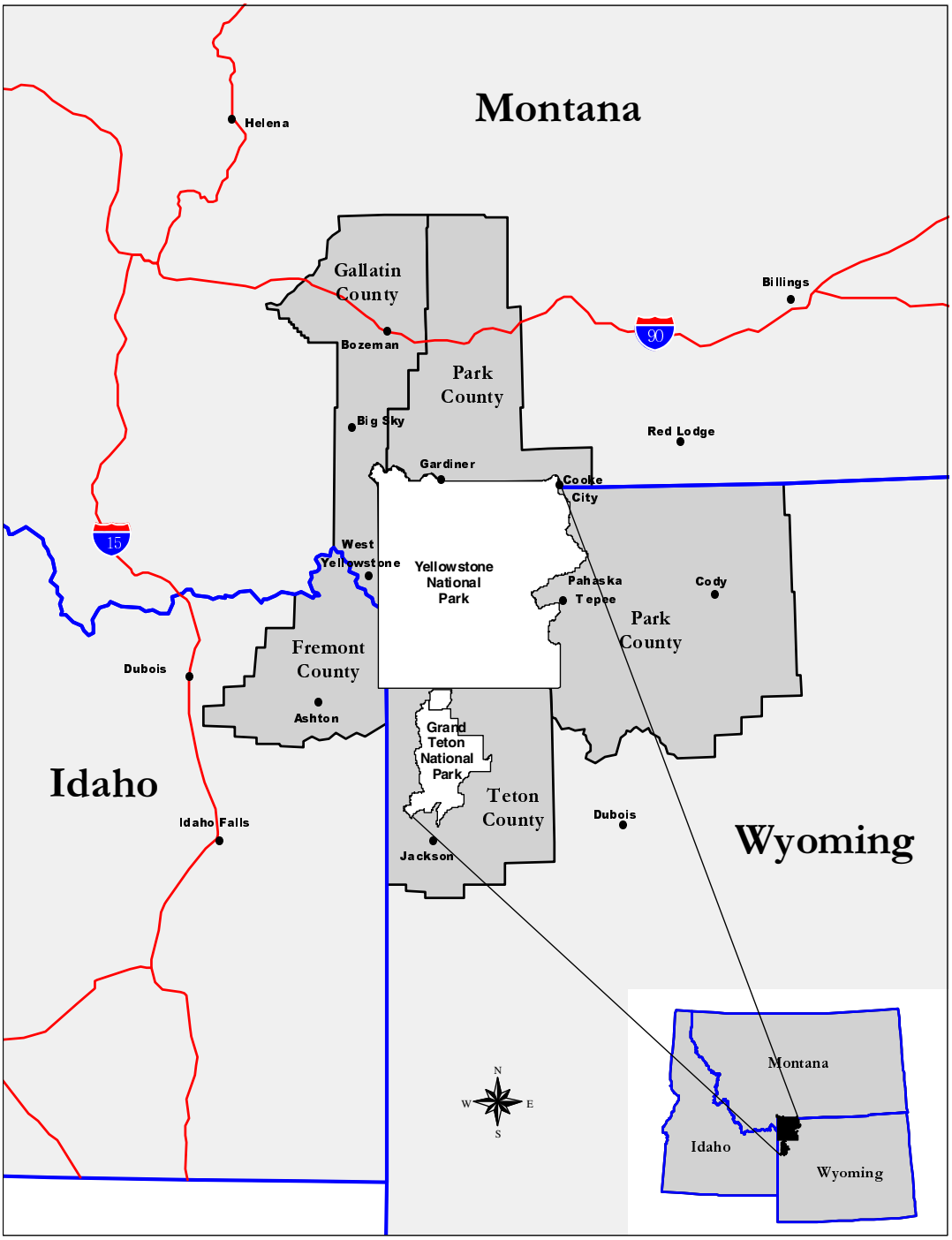
- The version for local visitors on day trips contains the same questions, except in a different order.[1]
- Question 19 was different for nonsnowmobile riders or for first-time snowmobile riders. Section B.2 contains the text of the alternative question asking about winter recreation trips.
- Questions 22 through 27 are the stated preference conjoint questions. The attributes of Trip A and Trip B varied according to an experimental design that was used to create four blocks of six questions each. The four blocks were randomized across respondents. The survey in this appendix contains one of the four blocks. The other blocks were similar. Section 5 contains more details on the design of the stated preference conjoint questions and the analysis of the data from these questions.
- Questions 28 and 29 are the stated behavior questions. There were three versions of the stated behavior questions. Each respondent only answered one of the three questions, and the three questions were distributed randomly across respondents. The survey in Section B.1 contains the stated behavior question based on a proposed winter management plan that would cap the number of snowmobiles allowed in YNP and GTNP each day. The text of the other two stated behavior questions is contained in Section B.3. The two other questions describe two additional proposed winter management plans: one banning snowmobiles from the parks and the other capping the number of snowmobiles allowed in the parks every day and requiring snowmobiles to be on a guided tour.

[1]For the first survey mailing, the local survey contained expenditure questions relevant only to day trips. However, concerns about accuracy of the answers to the screening questions led to the inclusion of expenditure questions relevant to overnight trips on one page of the local survey.

SECTION B.1

National Park Winter Recreation Survey

Greater Yellowstone Area including Yellowstone and Grand Teton National Parks and the 5 surrounding counties



ID # NLS_____
3Ac

16 U.S.C. 1a-7 authorizes collection of this information. This information will be used by park managers to better serve the public. Response to this request is voluntary. No action may be taken against you for refusing to supply the information requested. Your name is requested for follow-up mailing purposes only. When analysis of the questionnaire is completed, all name and address files will be destroyed. Thus permanent data will be anonymous. Data collected through visitor surveys may be disclosed in aggregate form without any personal identifying information to the Department of Justice when relevant to litigation or anticipated litigation, or to appropriate Federal, State, local or foreign agencies responsible for investigating or prosecuting a violation of law. Your name and address will remain totally confidential. An agency may not conduct or sponsor, and a person is not required to respond to, a collection of information unless it displays a currently valid OMB control number.

Burden estimate statement: Public reporting for this form is estimated to average 30 minutes per response. Direct comments regarding the burden estimate or any other aspect of this form to the Information Collection Clearance Officer, WASO Administrative Program Center, National Park Service, 1849 C Street, NW, Washington, D.C. 20240.

OMB Approval #1024-0224 (NPS #03-004)
Expiration Date: 09/30/2003

INTRODUCTION

Thank you for agreeing to take this survey. Your answers are important for future decisions about winter management of the parks and will help the National Park Service better understand winter visitation in Yellowstone and Grand Teton National Parks and the Greater Yellowstone Area. The "Greater Yellowstone Area" includes the five counties surrounding Yellowstone and Grand Teton National Parks: Teton and Park counties in Wyoming, Park and Gallatin counties in Montana, and Fremont county in Idaho. This area is shown on the map on the cover of the survey.

PLEASE TELL US ABOUT YOUR RECENT TRIP

1. What was the date of your trip to the Greater Yellowstone Area on which you agreed to take this survey?

   Date the trip started _____

   Date the trip ended _____

In this survey, when we ask you about **your recent trip**, we are talking about the trip during which we contacted you about this survey.

2. How long was your recent trip to the Greater Yellowstone Area?

   ☐ Multiple days

   ☐ One day, ***please skip to Question 4***

3. If you were on a multiple day trip:

   3a. How many days or parts of a day did you spend in the Greater Yellowstone Area **in total (see cover map)**? _____

   3b. How many days or parts of a day did you spend inside **Yellowstone National Park**? _____

   3c. How many days or parts of a day did you spend inside **Grand Teton National Park**? _____

   3d. How many days or parts of a day did you spend in the Greater Yellowstone Area **outside the parks**? _____

4. Which of the following statements ***best*** describes how you decided to visit the Greater Yellowstone Area on your recent trip?

   ☐ Limited planning was necessary since I live relatively close.

   ☐ I decided on a winter trip to the Greater Yellowstone Area, and then decided how many days to stay.

☐ I decided to spend a fixed number of days on a winter vacation, and then chose the Greater Yellowstone Area over a number of other alternatives.

☐ Other (please describe) _____

5. Which of the following statements ***best*** describes how you chose your activities on your recent trip?

☐ I decided to visit the Greater Yellowstone Area and then looked for available activities to try.

☐ I decided to visit the Greater Yellowstone Area based on a particular activity I wanted to do there.

☐ Other (please describe) _____

6. What was the **primary purpose** of your recent trip to the Greater Yellowstone Area? (***please check only one box).***

☐ Visit Yellowstone National Park

☐ Visit Grand Teton National Park

☐ Visit both Yellowstone and Grand Teton National Parks

☐ Visit recreation sites outside Yellowstone or Grand Teton National Parks (for example, downhill skiing, cross-country skiing, or riding a snowmobile in the National Forests or other areas around the parks)

☐ Visit friends living in the area

☐ Business in the area

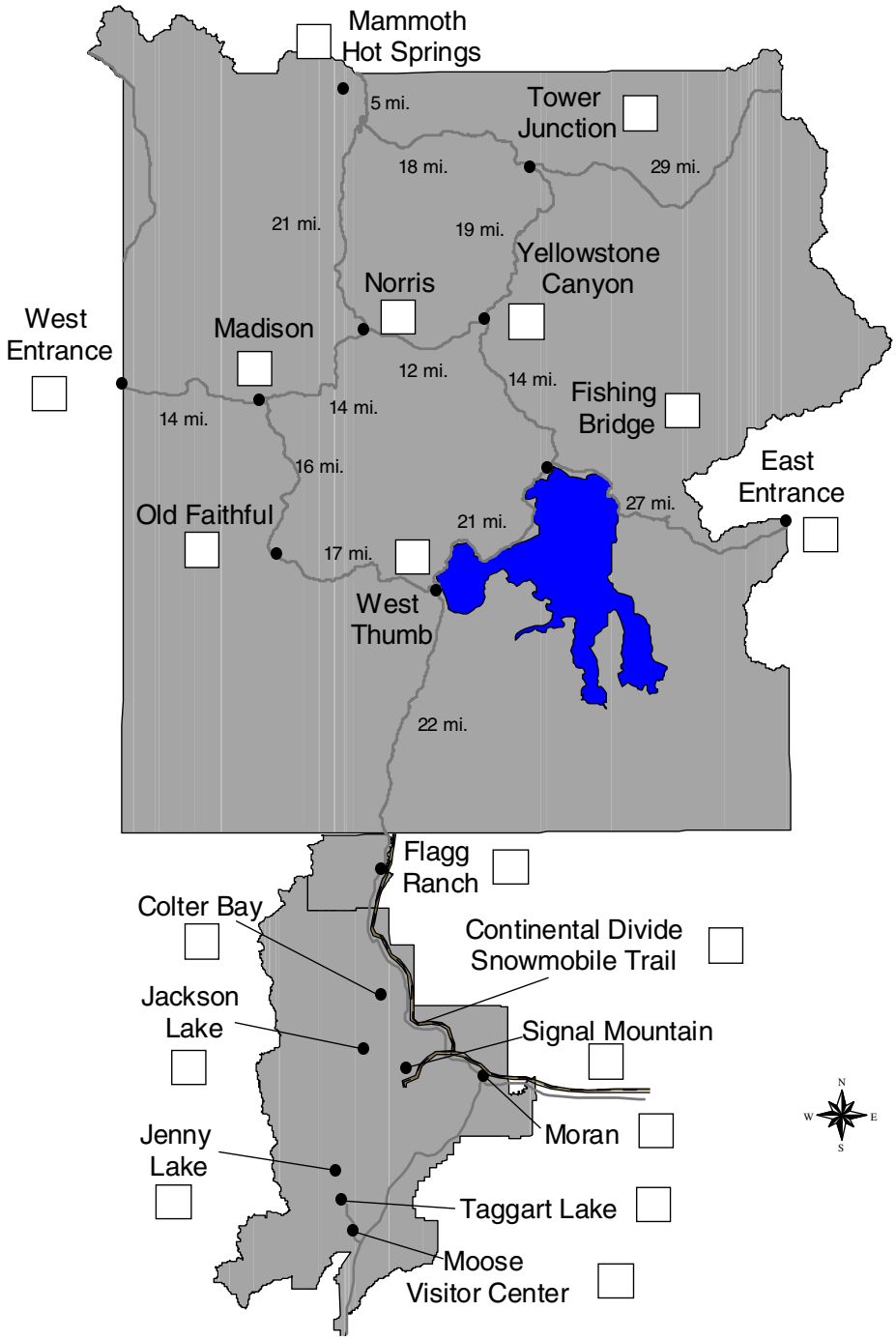
☐ Other (please describe) _____

7. We are interested in all the activities you did during your most recent trip to the Greater Yellowstone Area, both inside and outside the parks. **For each activity, please check all the locations that apply. If you did not participate in a particular activity leave that line blank.**

	Yellowstone National Park	Grand Teton National Park	Outside the Parks in the Greater Yellowstone Area
a. Snowmobiling without a commercial tour guide	☐	☐	☐
b. Snowmobiling with a commercial tour guide	☐	☐	☐
c. Cross-country skiing without a tour guide	☐	☐	☐
d. Cross-country skiing with a commercial tour guide	☐	☐	☐
e. Cross-country skiing with a National Park Service guide	☐	☐	☐
f. Snow Shoeing	☐	☐	☐
g. Snowcoach tour of park sights	☐	☐	☐
h. Driving tour of park sights in a car	☐	☐	☐
i. Bus tour of park sights	☐	☐	☐
j. Educational tours led by a National Park Service guide	☐	☐	☐
k. Winter Camping	☐	☐	☐
l. Downhill Skiing	☐	☐	☐
m. Other, please specify _____	☐	☐	☐

8. Looking at the activities you selected in Question 7, please write the letter or name of the activity that you consider the ***primary* activity** of your most recent trip to the Greater Yellowstone Area? (For example, write "K" for winter camping.) **Please choose only one.** _____

9. On the map below, check **all** the places you and your group visited during your recent trip to the Greater Yellowstone Area. Simply check the box beside each place you visited. If you did not visit a place, leave the box blank.



The following questions are for visitors who ride a snowmobile. Please skip to Question 15 on the following page if you have never ridden a snowmobile.

10. Do you own your own snowmobile?

- ☐ Yes
- ☐ No, skip to Question 12

11. If you own your own snowmobile, do you own a

- ☐ 2-stroke engine snowmobile
- ☐ A fuel-injected 2-stroke engine snowmobile
- ☐ 4-stroke engine snowmobile
- ☐ Don't know

12. Approximately how many years have you been riding a snowmobile? _____

13. Did you rent a snowmobile for your recent trip?

- ☐ Yes
- ☐ No, skip to Question 15

14. Which type of snowmobile did you rent?

- ☐ 2-stroke engine snowmobile
- ☐ 4-stroke engine snowmobile
- ☐ Don't know

15. How much time have you spent visiting the **Greater Yellowstone Area** so far this winter season (including your most recent trip)?

_____ total number of *trips*

_____ total number of *days*

16. How many of these days were spent inside **Yellowstone National Park**?

_____days

17. How many of these days were spent inside **Grand Teton National Park**?

_____days

18. Approximately how much ***additional*** time (if any) do you plan to spend visiting the **Greater Yellowstone Area** during the rest of this winter season?

_____ total number of **trips**

_____ total number of **days**

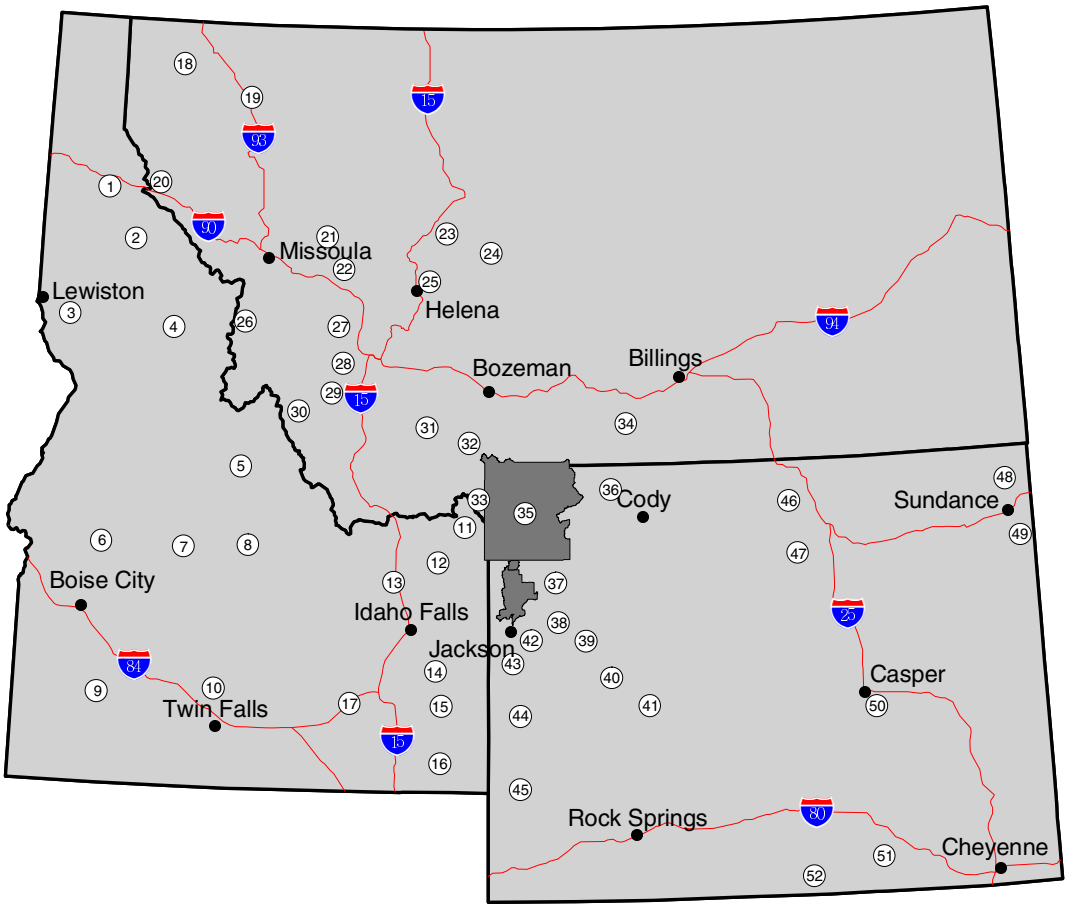
18a. How many of these days do you **plan** to spend inside **Yellowstone National Park**?

_____days

18b. How many of these days do you **plan** to spend inside **Grand Teton National Park**?

_____days

We would now like to ask about your snowmobiling activity* last *winter (December 2001-March 2002). We will ask you about trips you made to areas in Idaho, Wyoming, and Montana using the map and general area list on this page for reference.



Idaho

1. Wallace Area Trails
2. Northern Idaho Trails
3. Grangeville Area Trails
4. North-Central Idaho Trails
5. Salmon/Challis Area Trails
6. Smith's Ferry Area Trails
7. Stanley Area Trails
8. Central Idaho Trails
9. South-Western Idaho Trails
10. South-Central Idaho Trails
11. Big Springs Area Trails
12. Ashton Area Trails
13. Eastern Idaho Trails
14. Bone Snowmobile Trails
15. Pocatello Area Trails
16. Bear Lake Area Trails
17. South-Eastern Idaho Trails

Montana

18. Kootenai Country
19. Flathead Valley
20. Haugan
21. Seeley Lake
22. Garnet
23. Lincoln
24. Kings Hill/Little Belts
25. Helena
26. Lolo Pass
27. Georgetown Lake
28. Wise River
29. Dillion/Polaris
30. Wisdom/Jackson/Sula
31. Virginia City/Ennis
32. Bozeman/Big Sky
33. West Yellowstone
34. Cooke City/Silver Gate

Wyoming

35. Yellowstone/Grand Teton National Parks
36. Bear Tooth
37. Continental Divide Togwotee
38. Continental Divide Gros Ventre
39. Continental Divide Dubois
40. Wyoming Range Kemmerer
41. Continental Divide Lander
42. Granite Hot Springs
43. Wyoming Range Alpine
44. Casper Mountain
45. Wyoming Ranger Kemmerer
46. North Big Horn Mountains
47. South Big Horn Mountains
48. Bear Lodge Mountains
49. Black Hills of WY
50. Wyoming Range Afton
51. Snowy Range
52. Sierra Madre Mountains

19. Please list the numbers corresponding to the areas you visited last winter (December 2001–March 2002) and indicate the number of trips you made to that area and the total days you spent in the area on all the trips. If during a single trip you visited multiple areas list the area where you spent most of your time. If you visited an area not included on this list, please add this under the "other areas" category.

Snowmobile Areas	Number of Trips	Total Days
Montana		
Areas from list (numbers):		
_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____
Other areas (please name area and nearest city):		
_____	_____	_____
Idaho		
Areas from list (numbers):		
_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____
Other areas (please name area and nearest city):		
_____	_____	_____
Wyoming		
Areas from list (numbers):		
_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____
Other areas (please name area and nearest city):		
_____	_____	_____

ACTIVITY CHOICES

We will now ask you to think about different activities you might do for a day inside Yellowstone or Grand Teton National Parks. To begin, we will ask you to describe a typical day on your own recent trip to Yellowstone or Grand Teton National Park (the trip when we contacted you about the survey).

Instruction 1: Look at the table on the next page. Each row describes a different feature of your trip. Think about one day on your recent trip that was typical of your experience. In the column called "Your Trip," **please answer the questions in rows "a" through "h" by choosing the category that best describes conditions on one day during "Your Trip" in Yellowstone or Grand Teton National Parks.**

We describe the level of snowmobile traffic at two points on "Your Trip"—the number of snowmobiles that enter the park each day at the entrance where you entered the park, which captures congestion at the entrance and along the roads near the entrance, and the number of snowmobiles at the most crowded area of the park you visited.

Instruction 2: In the row labeled "Cost" (row i), please enter your best estimate of the cost for you of the day's activities inside the park including park entrance fees, supplies, equipment rentals , gas, and guided tour charges, **but do not include the cost of food or lodging**.

Instruction 3: After you fill out the table, look at the columns for "Your Trip" and "Trip B." **Imagine that "Your Trip" and "Trip B" were the only trips inside Yellowstone or Grand Teton National Park that you could choose from.**

Please check the box in the last row of the table (row j) indicating which trip you would prefer. If you did not enjoy your trip and you do not like "Trip B," you should choose the "Not Visit" option. "Not Visit" means you would stay home or you would still visit the Greater Yellowstone Area, but just not enter either of the parks.

20.

Features of Trip	Your Trip (please check ONE BOX in each row that best describes Your Trip)	Trip B	Not Visit
a. Activity?	☐ Snowmobile ☐ Snowcoach tour ☐ Snowcoach Shuttle to ski or snowshoe ☐ Drive car to sightsee, ski or snowshoe ☐ Other	Snowmobile	**I would not enter Yellowstone or Grand Teton National Park if these were my only choices**
b. Entrance where you started the day?	☐ Yellowstone West near West Yellowstone, MT ☐ Yellowstone East near Cody, WY ☐ Yellowstone North near Gardiner, MT ☐ Yellowstone South near Flagg Ranch ☐ Grand Teton Moose entrance near Jackson Hole, WY ☐ Grand Teton Moran entrance near Flagg Ranch ☐ Other (please describe)	Yellowstone West Entrance	
c. Did you take a guided tour?	☐ Yes ☐ No	Unguided	
d. Daily snowmobile traffic at the entrance where you started?	☐ High, 800 to 1,500 snowmobiles (typical West Entrance on a holiday or crowded weekend) ☐ Moderate, 300 to 600 snowmobiles (typical West Entrance on weekdays and South entrance on busy holiday weeks) ☐ Low, 200 or fewer snowmobiles (typical North and East entrances on all days and South entrance on most weekdays and weekends) ☐ I did not see any snowmobiles near the entrance where my trip started	Low, 200 or fewer snowmobiles	
e. Level of snowmobile traffic at the most crowded area of the park you visited?	☐ High, 800 to 1,500 snowmobiles (typical Old Faithful on a holiday and busy weekends or weekdays in late January and February) ☐ Moderate, 300 to 600 snowmobiles (typical Old Faithful on less crowded weekdays and weekends) ☐ Low, 200 or fewer snowmobiles (very uncrowded days at Old Faithful) ☐ I did not see any snowmobiles on my most recent trip	Moderate 300 to 600 snowmobiles	
f. Condition of snow on road or trail surface?	☐ Bumpy and rough for all or most of the trip ☐ Bumpy and rough for some of the trip ☐ Smooth	Smooth	
g. Noise level at the noisiest part of the park you visited?	☐ Loud, standing next to the road you could not converse with someone standing next to you, noise level similar to standing next to a gas-powered lawn mower or a busy highway ☐ Moderate, you would need to raise your voice to talk to someone standing next to you, noise like a busy city street ☐ Low noise, occasional	Moderate	
h. Level of exhaust emissions during your day?	☐ Very noticeable for most or all of the trip ☐ Noticeable for some of the trip ☐ I did not notice any exhaust emissions	Noticeable for some of the trip	
i. Cost per person for day?	$_____	$100	
j. I would choose… (check only one)	Your Trip ☐	Trip B ☐	Not Visit ☐

21. If you could change **one** thing about your trip, what would you change?

- ☐ Number of other visitors
- ☐ Number of other snowmobiles
- ☐ Number of other cars
- ☐ Noise level
- ☐ Smoother road surface
- ☐ Level of exhaust emissions
- ☐ Cost
- ☐ Other, please describe _____
- ☐ I would not change anything about my trip

The next 6 questions offer similar choices. There are no right or wrong answers. We are interested in the activities and other features of the trips that appeal to you.

Please indicate your choice in each question by checking the box at the bottom of the column.

Please assume you are staying close to the entrance where the trip starts, rather than where you stayed on your recent trip. The maps on the cover and on page 5 of the survey may help if you are not familiar with all the entrances. The map on page 5 provides mileage between roads in Yellowstone National Park.

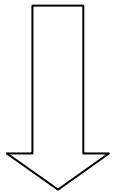
We know that these are not the only choices of activities to do in Yellowstone and Grand Teton National Parks, however as you answer each question please assume that the two trips describe your only two choices, in addition to the option of not entering the parks.

22. CHOICE 1: Which do you prefer—Trip A, Trip B or "Not Visit"?

Please check ONE box at the bottom of the table to indicate whether you prefer Trip A, Trip B or Not Visit. If you choose Trip A or Trip B, write the number of days you spend on a trip doing only that activity.

Note that we shaded the boxes that are the same for both trips. The conditions and prices described in this question may be different than what the parks are like today.

		Trip A	Trip B	Not Visit
Activity		Take a guided snowcoach tour to see park sights in Yellowstone starting at the South entrance (near Flagg Ranch)	Take an unguided snowmobile trip in Yellowstone starting from the West entrance (near West Yellowstone)	**I would not enter Yellowstone or Grand Teton National Park if these were my only choices**
Conditions during day trip	**Daily snowmobile traffic at the entrance where you started**	High (800 to 1,500 snowmobiles)	Moderate (300 to 600 snowmobiles)	
	Snowmobile traffic at most crowded part of the trip	High (800 to 1,500 snowmobiles)	Moderate (300 to 600 snowmobiles)	
	Condition of snow on the road or trail surface for all or most of the trip	Smooth	Bumpy and rough	
	Highest noise level experienced on trip	Loud (Like a gas-powered lawn mower or a busy highway)	Loud (Like a gas-powered lawn mower or a busy highway)	
	Exhaust emission levels	Very noticeable	Very noticeable	
	Total Cost for DAY per person	$230	$50	
I would choose… (check only one)		☐ If you planned a trip doing just this activity, how many days would you spend on the trip? _____ days	☐ If you planned a trip doing just this activity, how many days would you spend on the trip? _____ days	☐ **go to Question 22b below**



22b. Answer this question if you chose "Not Visit": What would you likely do instead?

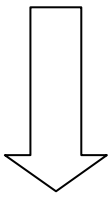
- ☐ Stay at home; I would not travel to the Greater Yellowstone Area
- ☐ Travel to the Greater Yellowstone Area to snowmobile outside the Parks.
- ☐ Travel to the Greater Yellowstone Area to cross-country ski outside the Parks.
- ☐ Travel to the Greater Yellowstone Area to downhill ski at Big Sky or one of the ski areas near Jackson Hole.
- ☐ Other, please describe activity _____
  location _____

23. CHOICE 2: Which do you prefer—Trip A, Trip B or "Not Visit"?

Please check ONE box at the bottom of the table to indicate whether you prefer Trip A, Trip B or Not Visit. If you choose Trip A or Trip B, write the number of days you spend on a trip doing only that activity.

Note that we shaded the boxes that are the same for both trips. The conditions and prices described in this question may be different than what the parks are like today.

		Trip A	Trip B	Not Visit
Activity		Take a guided snowcoach tour to see park sights in Yellowstone starting at the West entrance (near West Yellowstone)	Drive your car to auto-tour, cross-country ski or hike unguided in Grand Teton National Park	**I would not enter Yellowstone or Grand Teton National Park if these were my only choices**
Conditions during day trip	**Daily snowmobile traffic at the entrance where you started**	Moderate (300 to 600 snowmobiles)	Moderate (300 to 600 snowmobiles)	
	Snowmobile traffic at most crowded part of the trip	Low (200 or fewer snowmobiles)	Moderate (300 to 600 snowmobiles)	
	Condition of snow on the road or trail surface for all or most of the trip	Smooth	Bumpy and rough	
	Highest noise level experienced on trip	Moderate (Like a busy city street)	Low noise, occasional	
	Exhaust emission levels	Noticeable	Noticeable	
	Total Cost for DAY per person	$100	$20	
I would choose… (check only one)		☐ If you planned a trip doing just this activity, how many days would you spend on the trip? _____ days	☐ If you planned a trip doing just this activity, how many days would you spend on the trip? _____ days	☐ **go to Question 23b below**



23b. Answer this question if you chose "Not Visit": What would you likely do instead?

- ☐ Stay at home; I would not travel to the Greater Yellowstone Area
- ☐ Travel to the Greater Yellowstone Area to snowmobile outside the Parks.
- ☐ Travel to the Greater Yellowstone Area to cross-country ski outside the Parks.
- ☐ Travel to the Greater Yellowstone Area to downhill ski at Big Sky or one of the ski areas near Jackson Hole.
- ☐ Other, please describe activity _____
  location _____

24. CHOICE 3: Which do you prefer—Trip A, Trip B or "Not Visit"?

Please check ONE box at the bottom of the table to indicate whether you prefer Trip A, Trip B or Not Visit. If you choose Trip A or Trip B, write the number of days you spend on a trip doing only that activity.

Note that we shaded the boxes that are the same for both trips. The conditions and prices described in this question may be different than what the parks are like today.

		Trip A	Trip B	Not Visit
Activity		Take a guided tour into Yellowstone on a snowcoach shuttle to cross-country ski or hike starting at the West entrance (near West Yellowstone)	Drive your car to auto-tour, cross-country ski or hike unguided in Grand Teton National Park	**I would not enter Yellowstone or Grand Teton National Parks if these were my only choices**
Conditions during day trip	**Daily snowmobile traffic at the entrance where you started**	Moderate (300 to 600 snowmobiles)	No snowmobiles in the park	
	Snowmobile traffic at most crowded part of the trip	Moderate (300 to 600 snowmobiles)	No snowmobiles in the park	
	Condition of snow on the road or trail surface for all or most of the trip	Smooth	Smooth	
	Highest noise level experienced on trip	Loud (Like a gas-powered lawn mower or a busy highway)	Low noise, occasional	
	Exhaust emission levels	Not noticeable	Not noticeable	
	Total Cost for DAY per person	$150	$75	
I would choose… (check only one)		☐ If you planned a trip doing just this activity, how many days would you spend on the trip? _____ days	☐ If you planned a trip doing just this activity, how many days would you spend on the trip? _____ days	☐ **go to Question 24b below**

24b. Answer this question if you chose "Not Visit": What would you likely do instead?

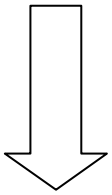
- ☐ Stay at home; I would not travel to the Greater Yellowstone Area
- ☐ Travel to the Greater Yellowstone Area to snowmobile outside the Parks.
- ☐ Travel to the Greater Yellowstone Area to cross-country ski outside the Parks.
- ☐ Travel to the Greater Yellowstone Area to downhill ski at Big Sky or one of the ski areas near Jackson Hole.
- ☐ Other, please describe activity _____
  location _____

25. CHOICE 4: Which do you prefer—Trip A, Trip B or "Not Visit"?

Please check ONE box at the bottom of the table to indicate whether you prefer Trip A, Trip B or Not Visit. If you choose Trip A or Trip B, write the number of days you spend on a trip doing only that activity.

Note that we shaded the boxes that are the same for both trips. The conditions and prices described in this question may be different than what the parks are like today.

		Trip A	Trip B	Not Visit
Activity		Take an unguided snowmobile trip in Yellowstone starting at the North entrance (near Gardiner)	Take a guided tour into Yellowstone on a snowcoach shuttle to cross-country ski or hike starting at the West entrance (near West Yellowstone)	**I would not enter Yellowstone or Grand Teton National Park if these were my only choices**
Conditions during day trip	**Daily snowmobile traffic at the entrance where you started**	Low (200 or fewer snowmobiles)	Moderate (300 to 600 snowmobiles)	
	Snowmobile traffic at most crowded part of the trip	Low (200 or fewer snowmobiles)	Low (200 or fewer snowmobiles)	
	Condition of snow on the road or trail surface for all or most of the trip	Bumpy and rough	Smooth	
	Highest noise level experienced on trip	Moderate (Like a busy city street)	Low noise, occasional	
	Exhaust emission levels	Noticeable	Noticeable	
	Total Cost for DAY per person	$150	$100	
I would choose… (check only one)		☐ If you planned a trip doing just this activity, how many days would you spend on the trip? _____ days	☐ If you planned a trip doing just this activity, how many days would you spend on the trip? _____ days	☐ **go to Question 25b below**



25b. Answer this question if you chose "Not Visit": What would you likely do instead?

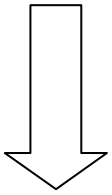
- ☐ Stay at home; I would not travel to the Greater Yellowstone Area
- ☐ Travel to the Greater Yellowstone Area to snowmobile outside the Parks.
- ☐ Travel to the Greater Yellowstone Area to cross-country ski outside the Parks.
- ☐ Travel to the Greater Yellowstone Area to downhill ski at Big Sky or one of the ski areas near Jackson Hole.
- ☐ Other, please describe activity _____
  location _____

26. CHOICE 5: Which do you prefer—Trip A, Trip B or "Not Visit"?

Please check ONE box at the bottom of the table to indicate whether you prefer Trip A, Trip B or Not Visit. If you choose Trip A or Trip B, write the number of days you spend on a trip doing only that activity.

Note that we shaded the boxes that are the same for both trips. The conditions and prices described in this question may be different than what the parks are like today.

		Trip A	Trip B	Not Visit
Activity		Take a guided tour into Yellowstone on a snowcoach shuttle to cross-country ski or hike starting at the West entrance (near West Yellowstone)	Drive your car to auto-tour, cross-country ski or hike unguided in Yellowstone starting at the North entrance on the road to Cooke City (from Gardiner to Cooke City)	**I would not enter Yellowstone or Grand Teton National Park if these were my only choices**
Conditions during day trip	**Daily snowmobile traffic at the entrance where you started**	No snowmobiles in the park	Moderate (300 to 600 snowmobiles)	
	Snowmobile traffic at most crowded part of the trip	No snowmobiles in the park	Moderate (300 to 600 snowmobiles)	
	Condition of snow on the road or trail surface for all or most of the trip	Smooth	Smooth	
	Highest noise level experienced on trip	Low noise, occasional	Low noise, occasional	
	Exhaust emission levels	Not noticeable	Noticeable	
	Total Cost for DAY per person	$100	$20	
I would choose… (check only one)		☐ If you planned a trip doing just this activity, how many days would you spend on the trip? _____ days	☐ If you planned a trip doing just this activity, how many days would you spend on the trip? _____ days	☐ **go to Question 26b below**



26b. Answer this question if you chose "Not Visit": What would you likely do instead?

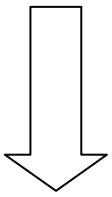
- ☐ Stay at home; I would not travel to the Greater Yellowstone Area
- ☐ Travel to the Greater Yellowstone Area to snowmobile outside the Parks.
- ☐ Travel to the Greater Yellowstone Area to cross-country ski outside the Parks.
- ☐ Travel to the Greater Yellowstone Area to downhill ski at Big Sky or one of the ski areas near Jackson Hole.
- ☐ Other, please describe activity _____
  location _____

27. CHOICE 6: Which do you prefer—Trip A, Trip B or "Not Visit"?

Please check ONE box at the bottom of the table to indicate whether you prefer Trip A, Trip B or Not Visit. If you choose Trip A or Trip B, write the number of days you spend on a trip doing only that activity.

Note that we shaded the boxes that are the same for both trips. The conditions and prices described in this question may be different than what the parks are like today.

		Trip A	Trip B	Not Visit
Activity		Take an unguided snowmobile trip in Yellowstone starting from the North entrance (near Gardiner)	Drive your car to auto-tour, cross-country ski or hike unguided in Grand Teton National Park	**I would not enter Yellowstone or Grand Teton National Park if these were my only choices**
Conditions during day trip	**Daily snowmobile traffic at the entrance where you started**	Low (200 or fewer snowmobiles)	High (800 to 1,500 snowmobiles)	
	Snowmobile traffic at most crowded part of the trip	Low (200 or fewer snowmobiles)	High (800 to 1,500 snowmobiles)	
	Condition of snow on the road or trail surface for all or most of the trip	Bumpy and rough	Bumpy and rough	
	Highest noise level experienced on trip	Moderate (Like a busy city street)	Loud (Like a gas-powered lawn mower or a busy highway)	
	Exhaust emission levels	Noticeable	Very noticeable	
	Total Cost for DAY per person	$125	$35	
I would choose… (check only one box)		☐ If you planned a trip doing just this activity, how many days would you spend on the trip? _____ days	☐ If you planned a trip doing just this activity, how many days would you spend on the trip? _____ days	☐ **go to Question 27b below**



27b. Answer this question if you chose "Not Visit": What would you likely do instead?

- ☐ Stay at home; I would not travel to the Greater Yellowstone Area
- ☐ Travel to the Greater Yellowstone Area to snowmobile outside the Parks.
- ☐ Travel to the Greater Yellowstone Area to cross-country ski outside the Parks.
- ☐ Travel to the Greater Yellowstone Area to downhill ski at Big Sky or one of the ski areas near Jackson Hole.
- ☐ Other, please describe activity _____
  location _____

As you may know Yellowstone and Grand Teton National Parks are evaluating the way winter access to the parks is managed. The parks are making plans for next winter season, but plans in future seasons may change. The following question will help us understand how you feel about one possible management option.

One proposed winter management plan for Yellowstone or Grand Teton National Parks would be phased in over several years.

- **Set daily limits on the number of snowmobiles allowed in the park that would primarily affect the West and South entrances to Yellowstone**
  - 550 per day from the West entrance and 250 per day from the South entrance. The current daily average at the West entrance is 538 snowmobiles each day and at the South 176 each day. Visitation is higher on holidays and weekends
- **Require all snowmobiles to be equipped with 4-stroke engine technology**
- **The average cost of entering the park for you could change (your actual costs might be somewhat higher or lower):**
  - Renting a 4-stroke snowmobile would cost on average $100 per day per person
  - A park entrance fee of $35 per person
- **Snowmobile trails and access in the surrounding National Forest areas would be unchanged.**
- **Expected changes in traffic, road conditions, noise, and level of exhaust fumes as a result of this plan are**:
  - Snowmobile traffic at the most crowded parts of Yellowstone National Park would be reduced from High (800 to 1,500) to Moderate (300 to 600) on a typical Saturday
  - Road conditions on a typical Saturday would generally be bumpy from the West entrance, but smooth from all other entrances
  - Noise levels on a typical Saturday would be reduced from high to moderate
  - Level of exhaust emissions on a typical Saturday would be reduced from very noticeable to noticeable some of your trip

28. If this plan had been in effect this winter season how would your decision to make your *recent trip* to Yellowstone or Grand Teton National Park have been affected? Please check only one.

- ☐ My visit would not have been different.
- ☐ I would have stayed *fewer* days. → How many fewer days? _____
- ☐ I would have stayed *more* days. → How many more days? _____
- ☐ I would not have visited the park.

29. If this plan were in effect this winter season how would your *total visits* to Yellowstone and Grand Teton National Parks be affected? Please check only one.

- ☐ No change in total visits.
- ☐ I would visit *less* often. → I would take _____fewer annual trips
- ☐ I would visit *more* often. → I would take _____more annual trips
- ☐ I would not visit Yellowstone and Grand Teton National Parks.

The questions below will be used to calculate the economic impact of park visitors on the local communities.

30. Where did you stay on your most recent trip to the Greater Yellowstone area? The map on the cover of the survey shows the location of the cities listed. **Please check all that apply and indicate the number of nights spent in each place.**

☐	West Yellowstone	→ number of nights _____
☐	Gardiner	→ number of nights _____
☐	Jackson	→ number of nights _____
☐	Pahaska Tepee at the East Entrance to Yellowstone	→ number of nights _____
☐	Cody	→ number of nights _____
☐	Old Faithful Snowlodge in Yellowstone National Park	→ number of nights _____
☐	Mammoth Hot Springs Hotel in Yellowstone National Park	→ number of nights _____
☐	Bozeman	→ number of nights _____
☐	Big Sky	→ number of nights _____
☐	Other	→ number of nights _____

31. Please indicate how you **traveled** from your home **to the Greater Yellowstone Area on your recent visit**. **Please check all that apply.**

- ☐ Personal vehicle
- ☐ Plane
- ☐ Rental car
- ☐ Other, please specify _____

32. If you drove, what type of vehicle did you drive from your home to get to the Greater Yellowstone Area?

- ☐ Car
- ☐ Minivan
- ☐ Sport utility vehicle (SUV)
- ☐ Pick-up truck
- ☐ Recreational vehicle (RV) or motor home
- ☐ Snowmobile
- ☐ Other _____
- ☐ I did not drive

33. On your recent trip, what kind of group were you with? **Please check all that apply**:

- ☐ Alone, please go to Question 35
- ☐ With family
- ☐ With friends
- ☐ With a club or other organized group
- ☐ Other _____

34a. If you were not alone how many adults (age 18 or older) were in your group? _____

34b. If you were not alone how many children (under age 18) were in your group? _____

35. Did you share expenses with people in the group on your most recent trip?

- ☐ Yes, I shared expenses with the other people in the group
  How many people did you share expenses with? _____
- ☐ No, I paid my own expenses and no one else's.
- ☐ Someone else paid for my trip expenses.

36. Did you reserve part or all of your recent trip to the Greater Yellowstone Area as a package?

- ☐ No, I purchased services individually
- ☐ Yes, I purchased a package

  How much did the package cost per person? _____

  Please check all the items that were included in the package:

  - ❑ Lodging → number of nights _____
  - ❑ Snowmobile rental → number of days _____
  - ❑ Snowmobile guided tour → number of days _____
  - ❑ Snowcoach tour → number of days _____
  - ❑ Meals → number of meals _____
  - ❑ Park entry fees
  - ❑ Other, please indicate _____

37. On your recent trip, what was the cost just for you in each of the categories below or what was your share of the expenses? For example, if you shared a hotel room that cost $100 with one other person, your share is $50. If you did not spend any money on an item, please write 0. You do not need to repeat information about items included in a package trip from Question 36.

		My cost was
a. Lodging during my stay in the Greater Yellowstone Area	$	
b. Lodging during **travel to** the Greater Yellowstone Area	$	
c. Food/drink at restaurants or bars during my stay in the Greater Yellowstone Area	$	
d. Food/drink from grocery or convenience stores during my stay in the Greater Yellowstone Area	$	
e. Transportation (airfare, gas, etc.) to **travel to** the Greater Yellowstone Area	$	
f. Transportation in the Greater Yellowstone Area (rental vehicle or other transport including gas)	$	
g. Park entry fees	$	
h. Souvenirs or gifts	$	
i. Tour or activity fees Please describe _____	$	
j. Equipment rental Please describe _____	$	
k. Other expenses Please specify _____	$	

Finally we would like to ask a few questions about you. These questions are needed to make sure our sample is representative of all types of visitors. Your answers will be kept strictly confidential.

38. What is your home zip code? _____

39. Which of the following categories best represents your level of schooling?

- ☐ Some high school
- ☐ High school graduate
- ☐ Some college or technical school
- ☐ College graduate
- ☐ Some graduate school
- ☐ Graduate degree

40. Which of these categories best describes your household employment status? Please check all that apply.

	You	***Spouse/Partner***
Employed full time	☐	☐
Employed part time	☐	☐
Retired	☐	☐
Student	☐	☐
Full time homemaker	☐	☐
Unemployed	☐	☐
Other (please specify)	_____	_____

41. If you are currently employed, do you have the option of working additional hours to increase your total income?

- ☐ No
- ☐ Yes, at $____ per _____.

42. If you are employed, how many weeks of vacation do you get annually? _____

43. If you are currently employed and you had the opportunity to work fewer hours and receive less income or work more hours and receive more income at your current rate of pay, would you change your hours? Please indicate the appropriate response.

- ☐ I would work more hours and receive more income
- ☐ I would work less hours and receive less income
- ☐ I would not change my working time.

44. Do you belong to any of the following (check all that apply):

- ☐ Snowmobile club or association
- ☐ Cross-country ski club or association
- ☐ Environmental organization
- ☐ Civic or business organization
- ☐ Other, _____

45. Do you own any of the following (check all that apply):

- ☐ Snowmobile
  Make, model, and year _____
- ☐ Cross-country skis
- ☐ Downhill skis
- ☐ Snowshoes
- ☐ Other winter activity equipment (please list) _____

46. Marital/family status:

- ☐ Married/long term relationship
- ☐ Single
- ☐ Divorced

47. What is your age? _____ years old

48. Number of children under age 18 living at home _____

49. What is your approximate total household annual income (before taxes) in 2002?

- ☐ Under $15,000
- ☐ $15,000–$24,999
- ☐ $25,000–$34,999
- ☐ $35,000–$44,999
- ☐ $45,000–$59,999
- ☐ $60,000–$74,999
- ☐ $75,000–$99,999
- ☐ $100,000–$124,999
- ☐ Over $125,000

50. If you are currently employed, are you paid by the hour or are you paid a fixed salary? (If you are not currently employed, please skip.)

- ☐ Hourly
- ☐ Salary

51. Are you?

- ☐ Male
- ☐ Female

Thank you very much for your help. Is there anything else you would like to tell us about winter use of Yellowstone National Park or Grand Teton National Park? Please use the space below if you would like to provide any additional information. Once you are done, please mail this completed questionnaire back to us in the postage-paid return envelope. If you have any questions, you can contact us toll-free at 1-866-590-7462 or email us at yellowstone_survey@rti.org.

COMMENTS:

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

Thank you for taking time to complete this survey.

B.2 Alternative to Question 19: Winter Recreation Trips

We would like to ask about your cross-country skiing, snowshoeing, winter hiking, and winter camping trips during the previous winter season (December 2001–March 2002).

11. Did you cross-country ski, snowshoe, winter hike, or winter camp during the previous winter season (December 2001–March 2002)? **Please check all that apply.**

- ☐ Cross-country ski
- ☐ Snowshoe
- ☐ Winter hiking
- ☐ Winter camping
- ☐ No, I did not participate in these activities last winter—please skip to page 10.

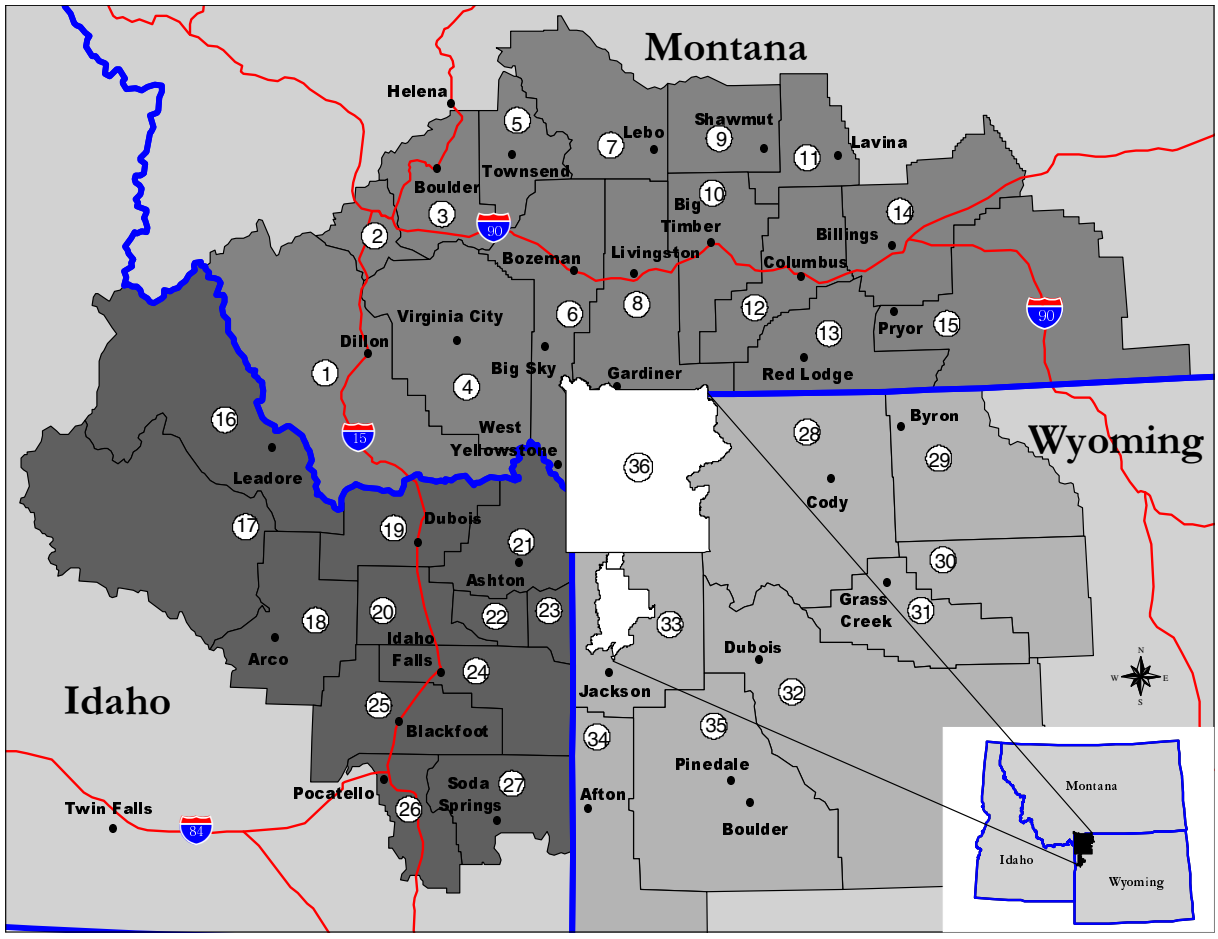
12. Looking at the map on the next page, did you make any trips in the counties in or around Yellowstone and Grand Teton National Parks during the previous winter season (December 2001–March 2002)?

- ☐ Yes—please fill out the following table using the map on the next page for reference.
- ☐ No—please skip to page 10.

Using the map and county list on the following page for reference please indicate the counties you visited and the number of trips you made in this county during the previous winter season for cross-country skiing, snowshoeing, winter hiking, and winter camping. If you visited more than one county on a trip please list the county where you spent the most time. Trips can be a day outing or a longer visit.

Counties Visited for Winter Recreation	# Trips	Total Days
(List numbers from map)		
_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____

Counties Surrounding Yellowstone and Grand Teton National Parks



Montana

1. Beaverhead
2. Silver Bow
3. Jefferson
4. Madison
5. Broadwater
6. Gallatin
7. Meagher
8. Park
9. Wheatland
10. Sweet Grass
11. Golden Valley
12. Stillwater
13. Carbon
14. Yellowstone
15. Big Horn

Idaho

16. Lemhi
17. Custer
18. Butte
19. Clark
20. Jefferson
21. Fremont
22. Madison
23. Teton
24. Bonneville
25. Bingham
26. Bannock
27. Caribou

Wyoming

28. Park
29. Big Horn
30. Washakie
31. Hot Springs
32. Fremont
33. Teton
34. Wyoming
35. Sublette
36. Yellowstone and Grand Teton National Parks

B.3: Two Alternatives to Questions 28 and 29

As you may know Yellowstone and Grand Teton National Parks are evaluating the way winter access to the parks is managed. The parks are making plans for next winter season, but plans in future seasons may change. The following question will help us understand how you feel about one possible management option.

Under one proposed management plan snowmobiles would not be allowed in either Yellowstone or Grand Teton National Parks. This plan would impact visitors as follows:

- **Snowmobiles would be prohibited.**
- **The average cost of entering the park for you could change (your actual costs might be somewhat higher or lower):**
  - A snowcoach tour would cost on average $135 per person for a full day trip
  - A park entrance fee of $35 per person
- **Snowmobile trails and access in the surrounding National Forest areas would be unchanged.**
- **Expected changes in traffic, road conditions, noise, and level of exhaust fumes as a result of this plan are:**
  - Snowmobile traffic would be eliminated
  - Road conditions would be smooth for snowcoach travel
  - Noise levels would be low
  - Level of exhaust emissions would not be noticeable

28. If this plan had been in effect this winter season how would your decision to make your *recent trip* to Yellowstone or Grand Teton National Park have been affected? Please check only one.

- ☐ My visit would not have been different.
- ☐ I would have stayed *fewer* days. → How many fewer days? _____
- ☐ I would have stayed *more* days. → How many more days? _____
- ☐ I would not have visited the park.

29. If this plan were in effect this winter season how would your *total visits* to Yellowstone and Grand Teton National Parks be affected? Please check only one.

- ☐ No change in total visits.
- ☐ I would visit *less* often. → I would take _____fewer annual trips
- ☐ I would visit *more* often. → I would take _____more annual trips
- ☐ I would not visit Yellowstone and Grand Teton National Parks.

As you may know Yellowstone and Grand Teton National Parks are evaluating the way winter access to the parks is managed. The parks are making plans for next winter season, but plans in future seasons may change. The following questions will help us understand how you feel about one possible management option.

One proposed winter management plan for Yellowstone or Grand Teton National Parks would be phased in over several years.

- **Set daily limits on the number of snowmobiles allowed in the park. The limits would primarily affect the West and South entrances to Yellowstone.**
  - New limit would be 550 snowmobiles per day from the West entrance and 250 per day from the South entrance. The current daily average at the West entrance is 538 snowmobiles each day and at the South 176 each day. Visitation is higher on holidays and weekends
- **Require all snowmobiles to be part of a guided tour in both parks.**
  - You could become a "non-commercial" guide by taking a 2 hour training course offered by the park
- **Require all snowmobiles to be equipped with 4-stroke engine technology**
- **The average cost of entering the park for you could change (your actual costs might be somewhat higher or lower):**
  - A commercially guided snowmobile trip would cost on average $135 per day per person
  - Renting a 4-stroke snowmobile would cost on average $100 per day per person
  - A park entrance fee of $35 per person
- **Snowmobile trails and access in the surrounding National Forest areas would be unchanged.**
- **Expected changes in traffic, road conditions, noise, and level of exhaust fumes as a result of this plan are:**
  - Snowmobile traffic at the most crowded parts of Yellowstone National Park would be reduced from High (800 to 1,500) to Moderate (300 to 600) on a typical Saturday
  - Road conditions on a typical Saturday would generally be bumpy from the West entrance, but smooth from all other entrances
  - Noise levels on a typical Saturday would be reduced from high to moderate
  - Level of exhaust emissions on a typical Saturday would be reduced from very noticeable to noticeable for some of the trip

28. If this plan had been in effect this winter season how would your decision to make your *recent trip* to Yellowstone or Grand Teton National Park have been affected? Please check only one.

- ☐ My visit would not have been different.
- ☐ I would have stayed *fewer* days. → How many fewer days? _____
- ☐ I would have stayed *more* days. → How many more days? _____
- ☐ I would not have visited the park.

29. If this plan were in effect this winter season how would your *total visits* to Yellowstone and Grand Teton National Parks be affected? Please check only one.

- ☐ No change in total visits.
- ☐ I would visit *less* often. → I would take _____fewer annual trips
- ☐ I would visit *more* often. → I would take _____more annual trips
- ☐ I would not visit Yellowstone and Grand Teton National Parks.

Appendix C: Statistical Analysis Weights for the Survey of Winter 2002–2003 Visitors to Yellowstone National Park

STATISTICAL ANALYSIS WEIGHTS FOR THE SURVEY OF WINTER 2002–2003[1] VISITORS TO YELLOWSTONE NATIONAL PARK

C.1 Person-Day Design Weights

Let r = 1,2,3,4 represent the entrances (N,S,E,W)

Let s = 1,2,3 represent weekdays, weekends, and holidays

Let t = 1,2 represent snowmobile and nonsnowmobile queues

Let i = 1,2,…, $M(r,s,t)$ represent the dates the r-th entrance was open within stratum (s,t)

Let $\pi_i(r,s,t)$ = probability of selection of day i within stratum (r,s,t)

Let j = 1,2,…, $N_i(r,s,t)$ represent the visitors aged 18 or older entering the park on day i in stratum (r,s,t)

Let $\pi_{j|i}(r,s,t)$ = probability of selection of visitor j within stratum (r,s,t), given that day i was selected

The design weight for the j-th visitor on day i in stratum (r,s,t) is the reciprocal of the overall probability of selection for the (i,j)-th person-day.

$$W_1(i,j|r,s,t) = \frac{1}{\pi_i(r,s,t)\,\pi_{j|i}(r,s,t)}$$

C.2 Multiplicity Adjustment to Produce Person-Level Weights

Let $m(i,j|r,s,t)$ = reported number of days that person j entered (or planned to enter) the park during the winter 2002–2003 season.

Let $\bar{m}(r,s,t) = \frac{1}{m(r,s,t)} \sum_{i=1}^{M(r,s,t)} \sum_{j=1}^{N_i(r,s,t)} m(i,j|r,s,t)\; I_R(i,j|r,s,t)$

[1]The winter season was defined to be:
North Entrance: January 5, 2003 – March 2, 2003
East Entrance: December 28, 2002 – March 2, 2003
South Entrance: December 18, 2002 – March 2, 2003
West Entrance: December 28, 2002 – March 3, 2003

where $I_R(i, j|r,s,t) = \begin{cases} 1 \text{ if person j is a respondent on day i} \\ 0 \text{ otherwise} \end{cases}$

and $m(r,s,t) = \sum_{i=1}^{M(r,s)} \sum_{j=1}^{N_i(r,s,t)} I_R(i, j|r,s,t)$

= number of stratum (r,s,t) respondents

Then, the multiplicity adjustment for the j-th sample member is

$$W_2(i, j|r,s,t) = \begin{cases} \dfrac{1}{m(i, j|r,s,t)} & \text{if person j is a respondent on day i} \\ \dfrac{1}{\bar{m}(r,s,t)} & \text{otherwise } [2] \end{cases}$$

The person-level design weight for the j-th sample members, adjusted for multiplicity, is then

$$W_3(i, j|r,s,t) = W_1(i, j|r,s,t)\, W_2(i, j|r,s,t)$$

C.3 Weighting Class Adjustment for Nonresponse

If there were at least 50 respondents within each stratum (r,s,t) at the end of data collection, we could have used them as weighting classes. Instead, we collapsed strata over type of day, "s," to form six weighting classes because the three different types of day had comparable response rates.

Let c=1,2,…, C represent the weighting classes.

The weighting class adjustment for nonresponse for all members of weighting class c is the following for the person-level weights:

$$W_4(c) = \frac{\sum_{j \varepsilon c} W_3(i, j|r,s,t)}{\sum_{j \varepsilon c} W_3(i, j|r,s,t)\, I_R(i, j|r,s,t)}$$

The adjusted weight for the k-th sample member is then

$$W_5(i, j|r,s,t) = W_3(i, j|r,s,t)\, W_4(c)\, I_R(i, j|r,s,t)$$

so that

[2] These averages were computed for the 18 unique, nonmissing levels of (r,s,t).

$$\sum_{j \varepsilon c} W_5(i, j|r, s, t) = \sum_{j \varepsilon c} W_3(i, j|r, s, t)$$

In addition, W_1 was used in place of W_3 above to produce an adjustment factor, W_{4A}, for the person-day weights. The person-day weight adjusted for nonresponse is

$$W_{5A}(i, j|r, s, t) = W_1(i, j|r, s, t)\, W_{4A}(c)\, I_R\,(i, j|r, s, t)$$

C.4 Poststratification Adjustment

Let $\mathrm{P}\,(r, s, t)$ represent the Park Service count of all visitors who entered the park during the winter 2002–2003 season through stratum (r, s, t). This count includes visitors under age 18 (who do not belong to the study population) and counts people each time they enter the park.

Two survey estimates of the number of entrances to the park by people age 18 or older during the winter 2002–2003 season through stratum (r, s, t) are given by

$$\sum_i \sum_j W_5(i, j|r, s, t)\, m(i, j|r, s, t)$$

and

$$\sum_i \sum_j W_{5A}(i, j|r, s, t)$$

These estimates should be uniformly smaller than the corresponding Park Service counts. If $\hat{P}_{18}$ is an estimate of the proportion of winter visitors who are 18 years of age or older, the ratio of the survey estimates to the Park Service estimates should be about this proportion. Hence, we reviewed those ratios:

$$\hat{P}_{18}(r, s, t) = \frac{\sum_i \sum_j W_5(i, j|r, s, t)\, m(i, j|r, s, t)}{P(r, s, t)}$$

and

$$\hat{P}_{18A}(r, s, t) = \frac{\sum_i \sum_j W_{5A}(i, j|r, s, t)}{P(r, s, t)}$$

If we ignore the fact that the Park Service counts include ineligible people (those under age 18), the post-stratification adjustment factors are

$$W_6(r,s,t) = \frac{P(r,s,t)}{\sum_i \sum_j W_5(i,j|r,s,t)\ m(i,j|r,s,t)}$$

$$W_{6A}(r,s,t) = \frac{P(r,s,t)}{\sum_i \sum_j W_{5A}(i,j|r,s,t)}$$

for the person-level and person-day-level weights, respectively.

So, the post-stratified person-level and person-day-level weights are, respectively

$$W_7(i,j|r,s,t) = W_5(i,j|r,s,t)\, W_6(r,s,t)$$

and

$$W_{7A}(i,j|r,s,t) = W_{5A}(i,j|r,s,t)\, W_{6A}(r,s,t)$$