

# **Supporting Statement for a New Collection RE: Winter Visitor Experiences in Yellowstone National Park**

**OMB Control Number 1024-New**

## **B. Collections of Information Employing Statistical Methods**

The agency should be prepared to justify its decision not to use statistical methods in any case where such methods might reduce burden or improve accuracy of results. When Item 17 on the OMB Form 83-I is checked "Yes", the following documentation should be included in the Supporting Statement to the extent that it applies to the methods proposed:

1. Describe (including a numerical estimate) the potential respondent universe and any sampling or other respondent selection method to be used. Data on the number of entities (e.g., establishments, State and local government units, households, or persons) in the universe covered by the collection and in the corresponding sample are to be provided in tabular form for the universe as a whole and for each of the strata in the proposed sample. Indicate expected response rates for the collection as a whole. If the collection had been conducted previously, include the actual response rate achieved during the last collection.

The potential respondent universe for the qualitative soundscape interviews, the soundscape survey, and the human-bison interaction survey is all visitors, 18 years of age or older, stopping at Snow Lodge and Old Faithful from 1/02/08 to 3/31/08. For the guide interview, the potential respondent universe is all snowmobile and snowcoach guides providing tours to Yellowstone National Park between 1/02/08 to 3/31/08.

The park is aware that the sampling universe at Old Faithful may not be representative of the entire winter visitation universe. All reporting will be made in this context, and results will be constrained to Old Faithful visitors. When selecting a sampling protocol for this study we considered our desire for on-site engagement of visitors to be sure we were communicating about the actual experience they were having that day and because of limitations in time and funding resources. While use patterns may have changed due to the new policies, the best data available on visitation patterns in winter were collected in 1996 by Littlejohn when 76 percent of all winter visitors went to Old Faithful. More recently, in a summer study, 90 percent visited Old Faithful (Littlejohn, 2006). In a study by Borrie et al., 1999, over sixty percent of winter visitors entered the park through the west entrance, followed by the south (19%) and north (16%) entrances. Only four percent of the visitors entered through the east entrance. Entrance was not a significantly explanatory variable on perceptions of the park conditions in that study. Given this knowledge, Old Faithful was selected as the most robust sampling site, given the desired protocol and constraints on time and resources.

### **Sampling plan/procedures:**

To address the soundscape and visitor-bison interaction research, interviews and surveys will be conducted of visitors to Old Faithful during January-early March, 2008. Sample times will include one 8-10 day period with a random start during January, and three four-day periods randomly selected during February and early March. Sample periods will be selected to ensure a balance of weekend and weekday periods and a distribution across the winter

season. Some constraints will be imposed on the sampling window to accommodate interviewer schedules and available accommodations in the Old Faithful area.

### **Qualitative Soundscape Interview**

For the qualitative soundscape interviews, we will seek a purposive sample of 45 completed interviews representing a range of respondent ages and primary recreational activities. Based on previous experience with this type of research and the nature of the questions being asked, we believe a sample of approximately 45 will be large enough to provide significant insight into the questions being asked. Interviewers will introduce themselves as researchers from the University of Montana working in cooperation with YNP. They will alert the individual that participation is voluntary and that anonymity will be protected. The interview should take approximately 30 minutes to complete.

Interviews will be conducted at and around the Snow Lodge and Old Faithful area and will employ an open-ended, in-depth process assisted by the use of an interview guide. These interviews will be audio-recorded and transcribed verbatim. Text from the interviews will be imported into a computerized analysis program (NVivo) and analyzed to find themes of perception and differences among respondents. Upon completion of the semi-structured interview, the respondent will be asked to complete a short questionnaire on socio-demographic information to assist in characterizing the sample and documenting its variability.

### **Quantitative Soundscape Survey and Human-Bison Interaction Survey**

The soundscape survey will obtain 400 completed questionnaires, which will require an average of 30 completions on 15 days of sampling. We will plan for 19 days of sampling with the assumption that weather conditions or other unforeseen events could reduce the effective number of days in the field. Both surveys will be conducted on the same days using two different interviewers in different locations within the park.

On selected sampling days, visitors will be contacted at the Old Faithful Area. Data collectors will approach visitors while they are in the lobby at the Snow Lodge, inside the visitor center at Old Faithful, or are waiting for the geyser to erupt and ask them to fill out the questionnaire on-site. The survey is relatively short, so filling out the survey outside is reasonable and can be done in comfort. This same sort of approach was used in the 1999 winter visitor studies (e.g., Davenport et al., 1999) done in Yellowstone National Park and visitors were willing to participate. The 1999 studies had high response rates; visitors were willing to participate and did not find the research design uncomfortable. Additionally, visitors will have the choice to fill out the survey outside at a table or to move inside to the visitor center if they find that more comfortable. Visitor contacts will occur based upon a pre-designed systematic schedule, starting with the first available group during the sample time. The sampled person will be an adult (18 years of age and older), and will be chosen using the next birthday method. Based on previous studies and visitor use data, every 5<sup>th</sup> group will be eligible and we will use the “next birthday” method to determine individual eligibility within a group. Once a surveyor has finished with one group, he/she will move on to the next eligible group that arrives at the survey site. If a group refuses to be interviewed, the surveyor will then contact the next eligible group, adhering to the sampling schedule of

intercepting every 5<sup>th</sup> group. Given the use patterns at Old Faithful, we anticipate that most data will be collected between 10:00 AM and 3:00 PM. All visitors over 18 years or older will be eligible to participate. Data collectors will introduce themselves as students from the University of Montana working in cooperation with YNP. They will alert the visitors that participation is voluntary and that visitor anonymity will be protected. The soundscape questionnaire should take approximately 15 minutes to complete and the human-bison interaction survey should take approximately 20 minutes.

### **Qualitative Guide Interview**

On selected sampling days, guides will be contacted outside near the Old Faithful Geyser. Data collectors will approach the guides after they let their parties off to visit Old Faithful. Guides generally have a 1-2 hour break during this time. Approximately 30 guides (evenly split between snowcoach and snowmobile) and purposively distributed to represent a range of companies will be interviewed during January and February of 2008. These interviews will be recorded and transcribed verbatim. Text from the interviews will be imported into a computerized analysis program (NVivo) and analyzed to find themes of perception and differences among respondents. Data collectors will introduce themselves as researchers from the University of Montana working in cooperation with YNP. They will alert the guide that participation is voluntary and that guide anonymity will be protected. The interview should take approximately 20 minutes to complete.

2. Describe the procedures for the collection of information including:
  - \* Statistical methodology for stratification and sample selection,
  - \* Estimation procedure,
  - \* Degree of accuracy needed for the purpose described in the justification,
  - \* Unusual problems requiring specialized sampling procedures, and
  - \* Any use of periodic (less frequent than annual) data collection cycles to reduce burden.

### **Qualitative Soundscape and Guide Interviews**

We will contact a purposive sample of 50 people for the soundscape interview and expect 45 individuals to participate, for a response rate of 90 percent. Approximately 37 guides will be contacted, and it's expected that 30 will agree to be interviewed, yielding a response rate of 80 percent. Because the soundscape and guide interviews are qualitative in nature and will be administered to relatively small samples, there is no statistical basis for generalizing the findings to all visitors. Therefore, response rates and confidence levels/intervals do not present the same concerns as they do in quantitative studies based on probability samples that employ inferential statistical analysis.

### **Quantitative Soundscape and Human-Bison Interaction Surveys**

For both the soundscape and human-bison interaction surveys, we will contact 440 individuals stratified by weekend and weekday periods and expect 400, or 90 percent, to agree to respond. With these anticipated sample sizes, we will be 90 percent confident that the true proportion in the population is +/- 5 percentage points of the sample statistic. A confidence interval of five percentage points is a standard level of precision for social science surveys of this type.

The goal of the both the soundscape and human-bison interactions surveys is to provide an

inventory and descriptive analysis of visitor's perceptions regarding various aspects of the park setting. Analyses will also include comparisons across broad groupings of user types (e.g., those whose primary activity is motorized versus those whose primary activity is non-motorized) to assess if perceptions about soundscape, bison interaction, and values for the park differ across visitors in different types of recreational use/access.

For these types of analyses we would compare perceptions of visitors whose primary activity in the park was motorized (combining snowmobiling with snowcoach touring) with visitors whose primary activity was non-motorized (combining cross-country skiers with snowshoers). The independent, or grouping, variable would come from question 4 of the bison survey and question 4 of the soundscape survey. The dependent variables in the analysis would be those that assess visitors' responses to questions evaluating their experience in the park or support for park management (for example, questions 12, 13, 14b, 15, and 17 in the bison survey and questions 11, 12, 13, and 14 in the soundscape survey). The null hypotheses to be tested would be that there is no difference between visitors whose primary activity in the park is motorized versus those whose primary activity is non-motorized.

The nature of the dependent variables in the analyses described above typically raises questions about the appropriateness of using ordinal level data in parametric statistical analyses like t-tests, an issue first raised in the social science statistical literature in the 1950's. Harwell and Gatti's (2001) analysis shows that using ordinal level (data from Likert and semantic differential response formats of the sort used in this study) is a common practice in social science research (73% of the published studies in their review of the literature). Harwell and Gatti note that the key statistical question underlying this issue is one of admissible transformations (i.e., linear versus monotonic). There is a large body literature suggesting that "a statistical technique's performance is evidently impervious to transformation of the metric for a wide variety of transformations" (Gregoire and Driver 1989). For example, Rasmussen's (1989) analysis showed that 5-point Likert-type scales of the sort employed in the survey questions described above perform well in parametric tests. The conclusion that can be drawn is that the widespread practice in the social sciences of using ordinal measures (i.e., those generated from Likert or semantic differential response formats of the sort used in this study) as dependent variables in parametric tests such as t-tests is statistically valid.

Past winter surveys in Yellowstone all attained response rates of over 70 percent. Based on current day use estimates and the number of surveyors contacting visitors, a total of 880 visitor groups will be contacted during the sampling period, 440 approached with the soundscape questionnaires, and 440 for the human-bison interaction instrument. We anticipate a very high response rate (approaching 90%), but even a 75 percent response rate would leave us with over 300 completed questionnaires for each instrument. An 80 percent power level for a two tailed t-test at the .05 alpha level, assuming a difference in the true mean of .5, would require an "n" of 64 in each cell. Thus, the proposed sample size will certainly be adequate for bivariate comparisons and will also allow for more sophisticated multivariate analysis if deemed necessary.

One other statistical analysis to be conducted warrants careful deliberation regarding sample size. The inventory of values will require the use of factors analysis. Specifically, this statistical procedure will be used to analyze the sets of multi-item value statements in question 16 of the human-bison interaction survey and question 6 of the soundscape survey. The adequacy of the sample size for this analysis depends on the number of items, the number of factors, and the strength of the correlations among items within factors. The statistical literature on adequacy of sample sizes for factor analyses focuses primarily on, and is most explicit about, the question of number of items. Gorsuch (1983) states that a sample size of at least 100 individuals is necessary for identifying reliable factors. Stevens (1986) suggests that a sample size of over 100 is needed for multi-item scales with 30–40 items, and a sample size of over 200 is needed for scales with 40 to 50 items. Both Gorsuch (1983) and Tabachnick and Fidell (1989) argue that having at least five respondents per item is necessary to identify reliable and stable factors. The scales in our survey have 14 items (human-bison interaction survey) and 28 items (soundscape survey); therefore, our sample size of 400 exceeds the standards for a reliable analysis found in the statistical literature on this topic.

The literature is more vague with respect to the question of strength of correlations and number factors. When the number of factors is small and underlying inter-item correlations between items are strong, a sample size of 50 can be adequate (Tabachnick and Fidell 1989). The multi-item measures we employ in questions 6 (soundscape survey) and 16 (human-bison interaction survey) are adapted from prior studies on similar topics which were shown to generate a small number of reliable factors with good inter-item correlations (see Borrie et al. 2002; Bright and Manfredi, 1996; Teel et al. 2005). Thus, the proposed sample size exceeds the standards necessary for a reliable factor analysis from this perspective as well.

#### Bibliography of References Cited in this Section

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3. Describe methods to maximize response rates and to deal with issues of non-response. The accuracy and reliability of information collected must be shown to be adequate for intended uses. For collections based on sampling, a special justification must be provided for any collection that will not yield "reliable" data that can be generalized to the universe studied.

The possibility of nonresponse bias is an important issue in any study. This is an on-site survey. OMB regulations for these types of surveys, together with professional ethics and Institutional Review Board regulations, require that participation in the study be voluntary, i.e., potential respondents must be aware that their participation is voluntary and that they

may freely decline to participate in the study. Thus, nonresponse in this study will come from those visitors who indicate that they do not wish to participate.

Data will be collected on-site using standardized survey instruments and interview guides. The presence of interviewers should lower the incidence of item non-response in the surveys. We have provided both indoor and outdoor stations for completing the survey instruments to maximize respondent comfort and thus response rates in the winter. Additionally, the 1999 winter visitor study (Davenport et al., 1999) also employed this general approach to outdoor winter visitor research and was successful.

Under the circumstances present in this study, collecting information to conduct a meaningful nonresponse bias check is extremely difficult. Fortunately, there are observable characteristics that would allow for a meaningful non-response bias analysis. One of the key characteristics for which perceptions of the issues may be studied is whether visitors are engaged primarily in motorized activities (e.g., snowmobile or snowcoach riders) or non-motorized activities (cross-country skiing and snowshoeing). The winter apparel worn by visitors engaged in these activities is distinctively different. Further, the location of the sampling will often make it possible to observe whether the visitors come from snowmobiles or snowcoaches. This is the variable “User type” in the survey log. Naturally, there is the possibility of some error in these observations; however, we believe these observations will generate a meaningful surrogate from analyzing the issue of nonresponse bias related to one of the key independent variables (those whose activity is primarily motorized versus those whose activity is primarily non-motorized). If the analyses suggest there is a difference in perception based on these user types, the observational data will provide us insight into the degree to which motorized and non-motorized users were willing to participate in the study allowing us discuss this issue when reporting the data.

There are other reasons why visitors might decline to participate, including weather and time of contact (e.g., visitors arriving late in the day). These data will also be recorded in the survey log for each contact. In discussing the question of nonresponse, it would be useful to ascertain if non-responses are related to these types of factors so that the discussion of limitations associated with the research could explore the possible consequences of these issues. This information would also help guide decisions about sampling in future studies of winter use visitors at Yellowstone National Park.

In addition to observed characteristics, the survey log will be used to record answers to three attitudinal questions from respondents and non-respondents that are especially relevant to the focus of the study. One question occurs on both the soundscape and human-bison interaction survey instruments and is an overall evaluation of the park’s winter setting. The remaining two are drawn from the specific survey instrument for which the visitor was contacted (i.e., soundscape or human-bison interaction questionnaire).

From the human-bison interaction survey, we added a question to the survey log about whether the visitor agrees that “visitor access should take priority over the protection of bison” (question 16). We also added a question about how acceptable the visitors felt the human-bison interactions they witnessed were (question 13).

From the soundscape survey, we added a question about how important natural sounds were to the visitor's experience (question 8). Additionally, we added a question about how satisfied the visitor was with their experience of natural sounds (question 11).

4. Describe any tests of procedures or methods to be undertaken. Testing is encouraged as an effective means of refining collections of information to minimize burden and improve utility. Tests must be approved if they call for answers to identical questions from 10 or more respondents. A proposed test or set of tests may be submitted for approval separately or in combination with the main collection of information.

The more psychologically complex "values-based" questions in the surveys come from scales used in previous studies. The page long multi-item scale exploring visitor perceptions of the purpose and value of Yellowstone National Park (Question #6, Appendix B, Question #18, Appendix C) was used in the 1998 study of Yellowstone National Park visitors (Freimund and Borrie 2001; Borrie et al. 2002; Davenport et al. 2002). The only change is the addition of 3 new items exploring the value of the park in terms of protecting soundscapes/natural sounds to complement the focus of the soundscape study. The items measuring symbolic beliefs about bison (Question #16, Appendix C) were drawn primarily from prior studies exploring beliefs, attitudes, and values toward wildlife (Bright and Manfredi, 1996; Teel et al. 2005). However they were adapted to the current research context (e.g., identifying bison as the species and Yellowstone National Park as the location). Additionally, two items specific to Yellowstone National Park and bison were generated for this study (one dealing with the priority of visitor access versus bison protection and the second with bison and snowmobiles). These items were added because they emerged as central issues in interviews with Yellowstone visitors in 1999 (Davenport et al. 2002). The semantic differential questions focusing on visitor affective appraisals of bison (Questions #12, #13, #15 in Appendix C) and the winter setting at Yellowstone (Question #13 in Appendix B, Question #17 in Appendix C) came from literature on affective appraisals in general (Russell and Snodgrass, 1987) and from prior studies exploring visitor perception of animals in zoo settings (Finlay et al., 1988; Reade and Waran, 1996). Normative appraisals (visitors' prescriptive judgments about the acceptability of situations encountered) (Questions #13 and #17) are one of the most commonly studied types of visitor perceptions in national parks and other wildland settings over the last three decades (see, for example, Vaske et al. 1986). Additionally, questions on importance-performance and visitor satisfaction (Questions #7-#13 in Appendix B and Question #12 in Appendix C) follow standard formats used in satisfaction research and importance-performance analyses (see for example Borrie and Birzell, 2001; Tomas et al. 2003).

When developing the current survey, we engaged in participant observation of Yellowstone National Park visitors during a weekend in February 2005 (snowmobile access) and a weekend in March 2005 (snowcoach access). During this time we observed how winter visitors experienced, reacted to, and discussed sound and bison-related experiences; informally asked visitors questions about these experiences (less than 10 visitors per question); tested wording of possible questions on visitors (less than 10 per question), and explored the feasibility of different sampling strategies. In addition, one of the principal investigators, Wayne Freimund, co-designed the 1998 and 1999 YNP winter visitor surveys which involved both on-site interviews (93 interviews) and a questionnaire (1,064 survey



respondents). His experiences with this winter visitor survey informed our design of the current research. The experiences during this prior study were particularly important in determining the burden estimate for the winter season. Finally, survey and interview questions were reviewed by YNP staff and researchers at the University of Montana. This was especially important for Question #15 in Appendix B (visitor support for management actions) and Question #8-#11 of Appendix C (visitor perception of bison reactions) to ensure the surveys met the information needs of YNP.

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5. Provide the name and telephone number of individuals consulted on statistical aspects of the design and the name of the agency unit, contractor(s), grantee(s), or other person(s) who will actually collect and/or analyze the information for the agency.

Wayne A. Freimund of the Department of Society and Conservation, University of Montana, was consulted on statistical aspects of the design and will assist in statistical analysis of the information for the agency. He also assisted with the design of the survey implementation schedule and associate sample size. His number is (406) 243-5184.

Michael Patterson of the Department of Society and Conservation, University of Montana, was consulted on statistical aspects of the design and will assist in statistical analysis of the information for the agency. He also assisted with the design of the survey implementation schedule and associated sample size and distribution plan. His number is (406) 243-6614.

Shelley Saxen of the Department of Society and Conservation, University of Montana, helped design of the surveys, interview guides, and will assistant in analysis of both components. Her number is (406) 243-6610.

Douglas Dalenberg of the Department of Economics, University of Montana was consulted on aspects of the statistical design. His number is: (406) 243-4406.

Steve McCool of the Department of Society and Conservation, University of Montana was consulted on aspects of the statistical design. His number is (406) 243-5406.