National Park Service
U.S. Department of the Interior
Grand Teton / Yellowstone National Parks
John D. Rockefeller, Jr. Memorial Parkway
Wyoming / Montana / Idaho

Winter Use Plans
Environmental Assessment

November 2008

Winter Use Plans

Environmental Assessment

Summary

This environmental assessment considers two alternatives for a winter use plan in Yellowstone and Grand Teton National Parks and the John D. Rockefeller, Jr. Memorial Parkway. Alternative 1 is the No Action alternative: the 2004 winter use plans regulations would remain in place and neither snowcoach nor snowmobile access would be permitted. Wheeled vehicle travel would continue on roads that have been traditionally plowed, and the parks would be open to skiing and snowshoeing. Alternative 2 would continue recent trends of snowmobile and snowcoach access and is the preferred alternative. It would allow 318 snowmobiles per day in Yellowstone for a period of up to three winters (i.e., through the winter of 2010-2011). In Yellowstone, this alternative requires that all recreational snowmobiles be best available technology, and travel with commercial guides. Seventy-eight snowcoaches would be authorized to operate daily in Yellowstone. All would be commercially guided, and also allowed for the same three-winter period as snowmobiles. For Grand Teton and the Parkway, a total of 50 snowmobiles would be allowed, but not subject to the three-year limitation. Snowmobile use on Jackson Lake and the Grassy Lake Road would not be required to be commercially guided; snowmobiles on Jackson Lake must be best available technology. Snowmobiles being operated between Flagg Ranch and the South Entrance of Yellowstone must be accompanied by a guide.

Public Comment

If you wish to comment on the environmental assessment, you may post comments online at http://parkplanning.nps.gov/yell, mail comments to National Park Service, Management Assistant's Office, P.O. Box 168, Yellowstone National Park, Wyoming 82190, or hand-deliver them to the same address. Comments must be RECEIVED BY Nov. 17, 2008.

Before including your address, phone number, e-mail address, or other personal identifying information in your comment, you should be aware that your entire comment – including your personal identifying information – may be made publicly available at any time. Although you can ask us in your comment to withhold your personal identifying information from public review, we cannot guarantee that we will be able to do so.

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Winter Use Plans
Environmental Assessment

Yellowstone and Grand Teton National Parks
John D. Rockefeller, Jr. Memorial Parkway

Table of Contents

CHAPTER 1: PURPOSE AND NEED

Winter Use Planning History

1974 *Master Plan* and *Final Environmental Statement*

The 1974 *Master Plan* states "Yellowstone will be managed on a year-round use basis. There are two defined periods of heavy use, and the management and operation must be geared to such for maximum enjoyment of the resources by the visitor – May 1 through October 31 and December 1 through March 15." Further elaboration is provided in the *Final Environmental Statement* (for the Master Plan, p. 10): "No visitor protection concept can be considered complete if it did not address itself to the rapidly emerging phenomena of winter use. To this end, present and proposed programs diagrammed in the following sketch suggest the hierarchy of challenge possible within the park proper. A fleet of 12 passenger snow machines (Bombardiers) provide daily scenic introductory tours along prime wildlife winter ranges. For the more hearty individual, snowmobiling along designated and maintained road corridors is available. Proposed for those willing to test their mettle against the Yellowstone winter will be a number of cross-country ski or snowshoeing routes."

The 1990 *Winter Use Plan*

In 1990, the National Park Service completed a Winter Use Plan for Yellowstone National Park, Grand Teton National Park, and the John D. Rockefeller, Jr. Memorial Parkway (the Parkway; collectively, the parks). That plan projected that by the year 2000, winter visitation to Yellowstone would be 143,000 visitors. Visitation to the parks grew at a rate much faster than expected, and reached the forecasted level by the winter of 1992–1993 (total visitors to Yellowstone and Grand Teton in that year were 142,744 and 128,159, respectively). That same winter, the Continental Divide Snowmobile Trail (CDST) opened in Grand Teton.

These changes (increased visitation and the CDST opening) prompted the Greater Yellowstone Coordinating Committee, composed of national park superintendents and national forest supervisors within the Greater Yellowstone Area (GYA), to collect information and analyze winter use in the entire GYA. The interagency study team released its results in 1999 as "Winter Visitor Use Management: A Multi-agency Assessment." The assessment identified desired conditions for the GYA, current areas of conflict, issues and concerns, and possible ways to address them. The final document incorporated many comments from the public, interest groups, and local and state governments surrounding public lands in the GYA.

The 1997 Fund for Animals, et al., Lawsuit

In May 1997, the Fund for Animals, Biodiversity Legal Foundation, and certain other plaintiffs filed suit against the NPS in the U.S. District Court for the District of Columbia (D.C. District Court). The suit was prompted in part by the extraordinary winter of 1996–1997 and the killing of 1,084 Yellowstone bison that winter. The groups alleged violations of the Endangered Species Act and the National Environmental Policy Act (NEPA), and other laws. In October 1997, the Department of the Interior and the plaintiffs reached a settlement agreement wherein the NPS agreed, in part, to prepare an environmental impact statement (EIS) for new winter use plans for the parks.

The EIS and Decision of 2000

In preparing the EIS, nine county, state, and federal agencies joined the NPS as cooperating agencies. These were the states of Montana, Idaho, and Wyoming; Fremont County in Idaho, Gallatin and Park Counties in Montana, Park and Teton Counties in Wyoming; and the U.S. Forest Service. The NPS released the Final EIS (FEIS) on October 10, 2000. Based on the FEIS, NPS Intermountain Regional Director Karen Wade signed the Record of Decision (ROD) on November 22, 2000. The decision was to eliminate both snowmobile and snowplane use from the parks by the winter of 2003–2004, and provide visitor access via an NPS-managed mass-transit snowcoach system. The decision was based upon the finding that existing snowmobile and snowplane use impaired the parks' resources and values (specifically its wildlife, air quality, natural soundscapes, and visitor experience), thus violating the statutory mandate of the NPS.

Following publication of a proposed rule and its public comment period, a final rule implementing the decision was published in the *Federal Register* on January 22, 2001, becoming effective on April 22, 2001. The rule provided for a phase-out of snowmobiles beginning with the winter of 2002-2003, with full implementation of the plan in the winter of 2003-2004.

On December 6, 2000, the International Snowmobile Manufacturers' Association (ISMA) and several other plaintiffs filed a lawsuit in the U.S. District Court for the District of Wyoming (Wyoming District Court). They alleged, among other things, that in preparing the FEIS and ROD, the NPS violated the National Environmental Policy Act (NEPA) and the Administrative Procedure Act (APA). On June 29, 2001, a settlement agreement was reached in which the NPS would prepare a Supplemental Environmental Impact Statement (SEIS) to provide additional opportunities for public involvement and to consider information on cleaner and quieter snowmobile technology.

The *Supplemental EIS* and Decision of 2003

In late 2001, the National Park Service began the SEIS, focusing on the cleaner and quieter snowmobiles that were becoming commercially available. In addition to the nine cooperating agencies that participated in the 2000 EIS, the NPS also used the expertise of the Environmental Protection Agency (EPA). On February 20, 2003, the NPS issued the Final SEIS, pursuant to the settlement agreement. The Regional Director signed the ROD on March 25, 2003, and the NPS published the new regulation governing winter use in the parks in the *Federal Register* on December 11, 2003. The decision was to continue allowing snowmobile use under strict conditions: winter visitation was to be limited to no more than 950 snowmobiles daily in Yellowstone; all snowmobiles would have to use the best available technology; and 80 percent of snowmobile users would have to be led by commercial guides. The remaining 20 percent were to be non-commercially guided. Other operational restrictions were also put in place.

On December 16, 2003, the D.C. District Court ruled on lawsuits filed by the Fund for Animals and the Greater Yellowstone Coalition earlier in 2003 regarding the SEIS. The Fund for Animals alleged that the 2003 decision failed to address the issue of bison and road grooming, and the Greater Yellowstone Coalition alleged that the decision to allow managed snowmobile use was not supported by the 2003 SEIS. The court's ruling vacated the regulation of December 11, 2003 and the SEIS, and effectively reinstated the January 22, 2001, regulation phasing out recreational snowmobiling (based on the initial ROD). Specifically, up to 493 snowmobiles a day were to be allowed into Yellowstone for the 2003–2004 season, and another 50 in Grand Teton and the

Parkway combined. All snowmobiles in Yellowstone were required to be led by a commercial guide. Snowmobiles were to be phased out entirely from the parks in the 2004–2005 season.

In early December 2003, ISMA and the State of Wyoming reopened their December 2000 lawsuit against the Interior Department and the NPS. On February 10, 2004, the Wyoming District Court issued a preliminary injunction preventing the NPS from continuing to implement the snowmobile phase-out (the January 22, 2001, regulation). The court also directed the superintendents of Yellowstone and Grand Teton to issue winter use rules that were "fair and equitable" to all parties to allow visitation to continue for the remainder of the 2003-2004 winter season. The NPS responded by allowing up to 780 snowmobiles a day into Yellowstone and up to 140 into Grand Teton and the Parkway combined. In Yellowstone, the requirement that all snowmobile users travel with a commercial guide remained in effect.

The *Temporary Winter Use Plans EA* of 2004

Because the vacatur of the two prior winter use plans left the agency with no clear rules under which to manage Yellowstone for the winter of 2004-2005, the NPS prepared a *Temporary Winter Use Plans Environmental Assessment* in 2004. The temporary plan was intended to provide a framework for managing winter use in the parks for a period of three years, and was approved in November 2004 with a "Finding of No Significant Impact" (FONSI) and a Final Rule published in the *Federal Register*, and implemented with the 2004–2005 winter season. Its provisions included:

- 720 snowmobiles were allowed to enter Yellowstone each day, and 140 per day were allowed in Grand Teton and the Parkway.
- All snowmobiles in Yellowstone had to be commercially guided.
- All recreational snowmobiles entering the parks had to meet Best Available Technology (BAT) requirements for reducing noise and air pollution (with limited exceptions at Grand Teton and the Parkway).

The temporary plan was in effect through the 2006–2007 winter season, during which time the NPS prepared another new long-term winter use plan and EIS for the parks. The new long term winter use plan was necessary since the provisions of the temporary winter use rules that allowed for the operation of both snowmobiles and snowcoaches in the parks expired at the end of the 2006-2007 winter season. Thus, without a new plan upon which to base rulemaking, the use of snowmobiles and snowcoaches would not have been allowed after the 2006-2007 winter season pursuant to the 2004 regulations.

Several litigants challenged the temporary plan in both the Wyoming District Court and the D.C. District Court. In October 2005, the Wyoming District Court ruled on a suit from the State of Wyoming and the Wyoming Lodging and Restaurant Association against the NPS contesting the temporary winter use plan, upholding the validity of the 2004 rule. The D.C. District Court denied the Fund for Animals and Federal defendants' motions for summary judgment and denied a motion by the Greater Yellowstone Coalition that would have had a practical effect of enforcing the adaptive management standards of the 2003 decision. In September 2006, the Fund for Animals filed a motion renewing their previous request for summary judgment; the motion was dismissed as moot in September 2007. In June 2007, the Wyoming District Court ruled on a suit from Save Our Snowplanes, upholding the validity of the temporary winter use

plan and final regulation and their provisions prohibiting snowplane use on Jackson Lake. That ruling is on appeal to the 10th Circuit Court of Appeals.

The 2007 *Winter Use Plans, Final Environmental Impact Statement*

In September 2007, the NPS released the *Winter Use Plans Final Environmental Impact Statement*, with the associated *Record of Decision* signed in November and the pertinent rule published in the *Federal Register* on December 13, 2007. On July 16, 2008, the NPS approved a *Record of Decision Amendment* regarding avalanche management on Sylvan Pass in Yellowstone. Although the FEIS and associated rule-making continued most of the provisions of the *2004 Temporary Winter Use Plans* for the winter of 2007-08, they would have implemented the following changes beginning with the winter of 2008-09:

- 540 snowmobiles would have been permitted to enter Yellowstone per day, along with 83 snowcoaches.
- All snowmobilers would have been guided, with Best Available Technology (BAT) requirements continuing for snowmobiles and implemented for snowcoaches.
- In Grand Teton, 25 snowmobiles would have been permitted daily on the Grassy Lake Road (with no BAT or guiding requirement) and 40 on Jackson Lake (no guiding requirement). The Continental Divide Snowmobile Trail would have been closed.

Several litigants challenged the validity of the 2007 Final Rule. In the U.S. District Court for the District of Columbia, the Greater Yellowstone Coalition (and others) and National Parks Conservation Association filed separate suits; on September 15, 2008, that court vacated and remanded to the agency the 2007 FEIS, ROD, and Final Rule. In the U.S. District Court for the District of Wyoming, the State of Wyoming and Park County, Wyoming filed separate suits. A hearing was held on the merits of their case on September 15, 2008; a decision from the court is pending.

Purpose and Need

The purpose of the *2008 Winter Use Plans Environmental Assessment* is to ensure that visitors to Yellowstone have a range of appropriate winter recreational opportunities for an interim period, pending court decisions and NPS actions to respond. The purpose of this EA is also to ensure that these recreational activities are in an appropriate setting and that they do not impair or cause unacceptable impacts to park resources or values. The NPS Organic Act, which is the fundamental law guiding national park management, mandates each of these purposes in that it requires that the NPS conserve park resources and values, prevent their impairment, and promote their enjoyment.

There is substantial confusion and uncertainty among the public about winter use, in part due to uncertainty posed by continued litigation. Another purpose of the *2008 Winter Use Plans EA* is to provide the public with some degree of certainty about how winter use will be managed in Yellowstone for an interim period.

The final purpose of this EA is to provide a structure for winter use management in Yellowstone for an interim period. Due to recent court decisions, it is currently unclear what winter use management plan will be in place for the winter of 2008-2009 or future winters and whether snowmobiles will be permitted. However, the purpose of this EA is to provide an interim winter

use plan that will have no significant adverse effects on park resources or values pending NPS's response to guidance provided by relevant court decisions.

This EA is not intended to result in a permanent regulation authorizing continued public recreational snowmobile and snowcoach use in Yellowstone. A permanent regulation on snowmobile and snowcoach use in Yellowstone may be the product of future winter use analysis.

In addition, the EA is intended to serve all of the same purposes for Grand Teton and the Parkway, except that for these two park areas, the EA is expected to serve as the basis for a long-term regulation to guide winter use management.

Need

The NPS is taking action through this EA to shape the course of winter use management in the three parks. As stated in the introduction of this chapter, the U.S. District Court for the District of Columbia vacated the 2007 ROD and Final Rule on September 15, 2008.

Due to this and other court decisions, none of the winter use regulations promulgated in 2001, 2003, and 2007 are currently in effect in the parks. Rather, the 2004 regulation is the extant rule in the parks. The rule does not authorize snowmobile or snowcoach access after the winter of 2006-07. The NPS general regulations governing snowmobile use at 36 CFR 2.18 state that snowmobiles are prohibited in units of the National Park System unless snowmobile routes and water surfaces are promulgated as special regulations in accordance with the Administrative Procedure Act. Regarding snowcoaches, the NPS general regulations also state (at 36 CFR 1.2 (c)) that the regulations contained in part 7 are special regulations that may amend, modify, relax, or make more stringent the regulations contained in parts 1 through 5 of 36 CFR. Furthermore, 36 CFR 1.5(b) clearly states that designating or restricting use requires rule making.

Thus, the need for this EA is to outline the type and extent of public recreational snowmobile and snowcoach access to Yellowstone for up to three winters, as well as at Grand Teton and the Parkway. Part of the decision includes the type and extent of restrictions on public recreational snowmobile and snowcoach use, if it is allowed; how winter use will be managed in the three park units; and specifically, whether snowmobiles and snowcoaches will be permitted. This EA process will culminate with revisions to the parks' winter use regulations at 36 CFR 7.13, 7.21, and 7.22, if those revisions are indeed needed (i.e. if Alternative 2 is selected).

The desired condition of the three parks for winter use has not changed since the 2000 EIS was prepared. As stated on pages 6–7 of the 2007 Final EIS, the desired condition stems from NPS mandates, which include legislation, regulations, executive orders, and governing policies.

The desired conditions are:

- Visitors have a range of appropriate winter recreation opportunities from primitive to developed. Winter recreation complements the unique characteristics of each landscape within the ecosystem.

- Recreational experiences are offered in an appropriate setting; they do not take place where they will irreparably impact air quality, wildlife, cultural areas, the experiences of other park visitors, or other park values and resources.
- High quality facilities are provided in parks to support the need for safety and enhanced visitor experiences.
- Conflicts among user groups are minimal.
- Visitors know how to participate safely in winter use activities without damaging resources.
- Oversnow vehicle sound and emission levels are reduced to protect employee and public health and safety, enhance visitor experience, and protect natural resources.

The desired objectives are:

- Provide the public with some degree of certainty about how winter use will be managed in Yellowstone for an interim period.
- Provide a structure for winter use management in Yellowstone for an interim period.
- Provide an interim winter use plan pending court decisions and NPS response that will have no significant adverse effects on Yellowstone resources or values.

Figure 1-1: Yellowstone National Park.

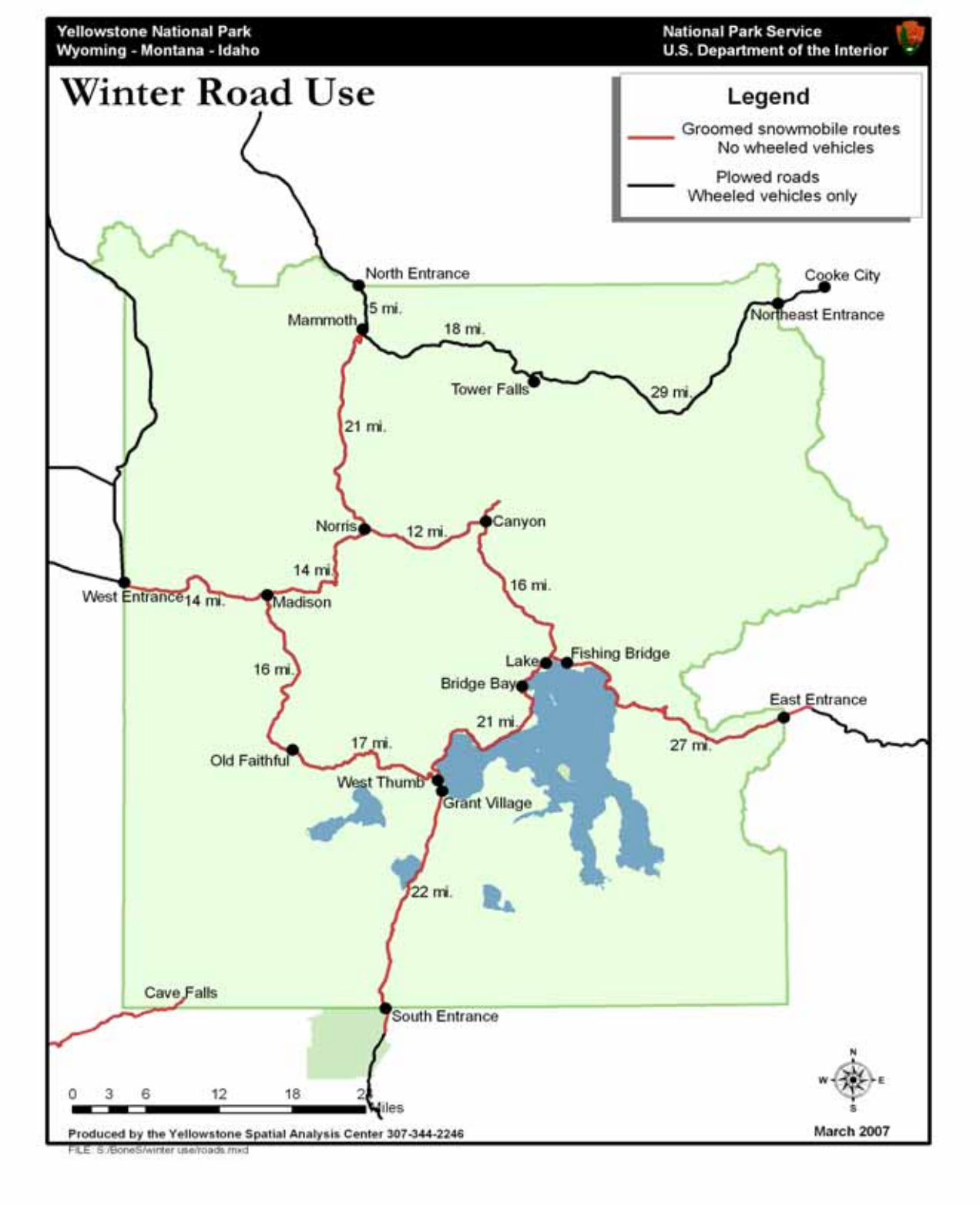
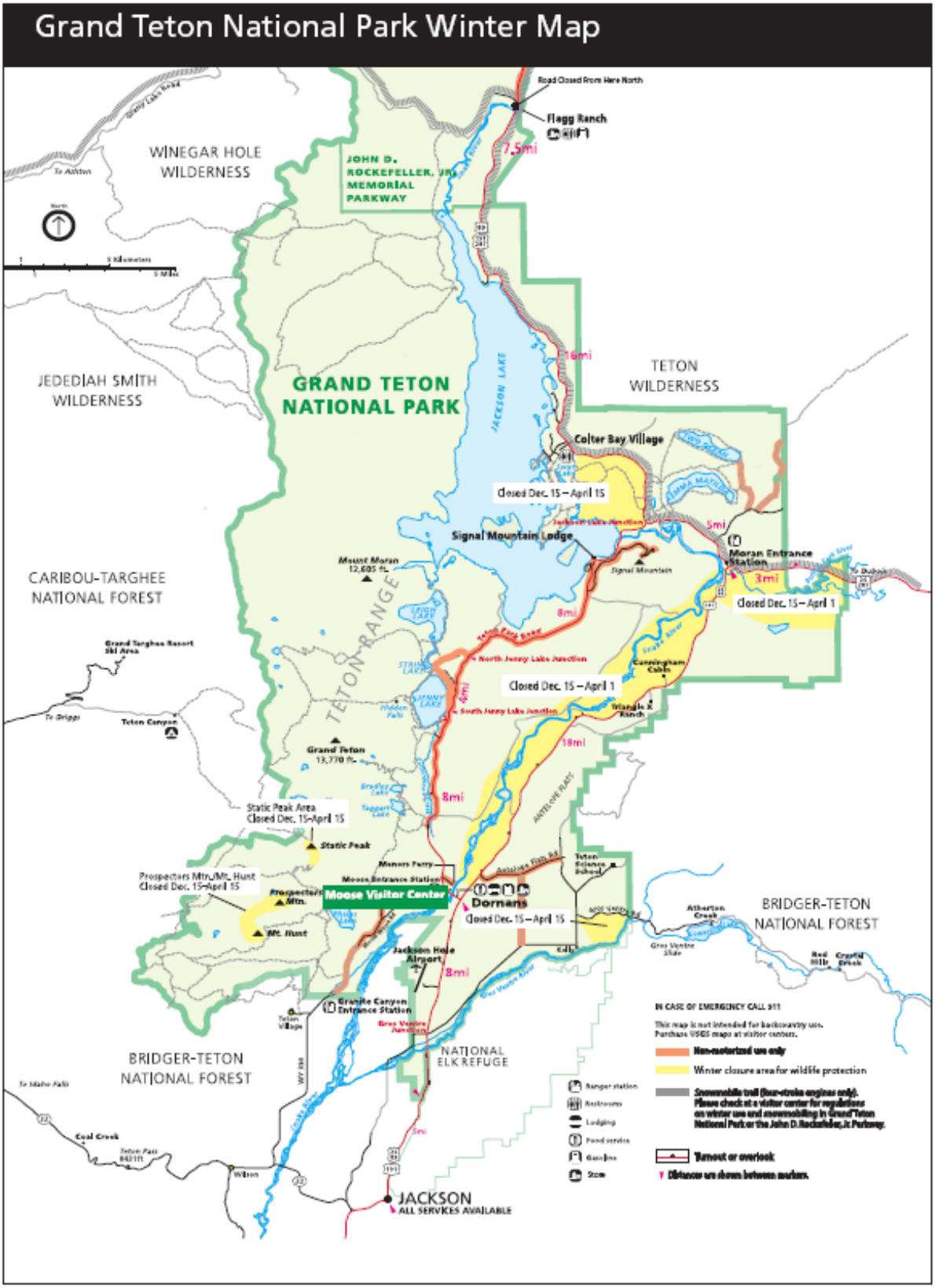


Figure 1-2: Grand Teton National Park and the John D. Rockefeller, Jr. Memorial Parkway.



Appropriate Use

Section 1.5 of *Management Policies* (2006), "Appropriate Use of the Parks," directs that the National Park Service must ensure that park uses that are allowed would not cause impairment of, or unacceptable impacts on, park resources and values. A new form of park use may be allowed within a park only after a determination has been made in the professional judgment of the park manager that it will not result in unacceptable impacts.

Section 8.1.2 of *Management Policies* (2006), Process for Determining Appropriate Uses, provides evaluation factors for determining appropriate uses. All proposals for park uses are evaluated for

- consistency with applicable laws, executive orders, regulations, and policies;
- consistency with existing plans for public use and resource management;
- actual and potential effects on park resources and values;
- total costs to the Service; and
- whether the public interest will be served.

Park managers must continually monitor all park uses to prevent unanticipated and unacceptable impacts. If unanticipated and unacceptable impacts emerge, the park manager must engage in a thoughtful, deliberate process to further manage or constrain the use, or discontinue it.

From Section 8.2 of *Management Policies*: "To provide for enjoyment of the parks, the National Park Service will encourage visitor use activities that

- are appropriate to the purpose for which the park was established, and
- are inspirational, educational, or healthful, and otherwise appropriate to the park environment; and
- will foster an understanding of and appreciation for park resources and values, or will promote enjoyment through a direct association with, interaction with, or relation to park resources; and
- can be sustained without causing unacceptable impacts to park resources and values."

Sections 8.2.3 and 8.2.3.2 of the *Management Policies* provide more specific guidance regarding motorized uses and snowmobile use in particular. The relevant sections are provided in Appendix A.

The 1974 *Master Plan* states "Yellowstone will be managed on a year-round use basis. There are two defined periods of heavy use, and the management and operation must be geared to such for maximum enjoyment of the resources by the visitor – May 1 through October 31 and December 1 through March 15." Oversnow vehicular winter use of Yellowstone National Park has been occurring since 1949, and snowmobiles have been used for 45 of the park's 136 years. Distances between attractions at Yellowstone are great, and some form of vehicular access is needed to access various destination areas. Snowmobiles and snowcoaches are used in winter,

as private vehicles and buses are used in summer. The master plan and other winter use documents decided that winter vehicle use of Yellowstone is appropriate, so the next question is whether such use, and the associated necessary and appropriate impacts, can be sustained without causing unacceptable impacts to park resources and values. That analysis is found in the *Environmental Consequences* section.

Impairment and Conservation of Park Resources and Values

National Park Service's *Management Policies, 2006* require analysis of potential effects to determine whether or not actions would impair park resources (see Appendix A for specific *Management Policies* citations). The fundamental purpose of the national park system, established by the Organic Act and reaffirmed by the General Authorities Act, as amended, begins with a mandate to conserve park resources and values. National Park Service managers must always seek ways to avoid, or to minimize to the greatest degree practicable, adversely impacting park resources and values.

However, the laws do give the National Park Service the management discretion to allow impacts to park resources and values when necessary and appropriate to fulfill the purposes of a park, as long as the impact does not constitute impairment of the affected resources and values. Although Congress has given the National Park Service the management discretion to allow certain impacts within park, that discretion is limited by the statutory requirement that the National Park Service must leave park resources and values unimpaired, unless a particular law directly and specifically provides otherwise. The prohibited impairment is an impact that, in the professional judgment of the responsible National Park Service manager, would harm the integrity of park resources or values. An impact to any park resource or value may, but does not necessarily, constitute an impairment, but an impact would be more likely to constitute an impairment when there is a major or severe adverse effect upon a resource or value whose conservation is:

- necessary to fulfill specific purposes identified in the establishing legislation or proclamation of the park;
- key to the natural or cultural integrity of the park; or
- identified as a goal in the park's general management plan or other relevant NPS planning documents.

Impairment may result from National Park Service activities in managing the park, visitor activities, or activities undertaken by concessioners, contractors, and others operating in the park. A determination on impairment is made in the *Environmental Consequences* section for natural and cultural resource topics.

In addition to mandating the prevention of impairment, the Organic Act requires that the NPS prioritize conservation over use whenever the two are found to be in conflict. The NPS complies with this mandate by ensuring that a proposed use of the parks will not result in unacceptable impacts to park resources and values.

Scoping

Scoping is an early and open process to determine the breadth of environmental issues and alternatives to be addressed in an environmental assessment. Scoping and public comment opportunities on previous winter use plans were extensive. The public was provided opportunities to comment on the 1990 *Winter Use Plan*, the 2000 *Winter Use Plan,* the 2003 *Winter Use Plan*, the 2004 *Temporary Winter Use Plan EA*, and the 2007 *Winter Use Plans*. The Park Service has a good understanding of public concerns on these issues, and because there is only a short time to get a new rule in place prior to the December 15, 2008 winter use season, previous scoping comments were used for this environmental assessment.

Impact Topics

In this section, the NPS takes a "hard look" at all potential impacts by considering the direct, indirect, and cumulative effects of the proposed action on the environment, along with connected and cumulative actions. Impacts are described in terms of context and duration. The context or extent of the impact is described as localized or widespread. The duration of impacts is described as short-term, ranging from days to three years in duration, or long-term, extending up to 20 years or longer. The intensity and type of impact is described as negligible, minor, moderate, or major, and as beneficial or adverse. The NPS equates "major" effects as "significant" effects. The identification of "major" effects would trigger the need for an EIS. Where the intensity of an impact could be described quantitatively, the numerical data is presented; however, most impact analyses are qualitative and use best professional judgment in making the assessment.

The NPS defines "measurable" impacts as moderate or greater effects. It equates "no measurable effects" as minor or less effects. "No measurable effect" is used by the NPS in determining if a categorical exclusion applies or if impact topics may be dismissed from further evaluation in an EA or EIS. The use of "no measurable effects" in this EA pertains to whether the NPS dismisses an impact topic from further detailed evaluation in the EA. The reason the NPS uses "no measurable effects" to determine whether impact topics are dismissed from further evaluation is to concentrate on the issues that are truly significant to the action in question, rather than amassing needless detail as required by CEQ regulations at 1500.1(b).

In this section of the EA, NPS provides a limited evaluation and explanation as to why some impact topics are not evaluated in more detail. Impact topics are dismissed from further evaluation in this EA if:

- they do not exist in the analysis area,
- they would not be affected by the proposal, or the likelihood of impacts are not reasonably expected, or
- through the application of mitigation measures, there would be minor or less effects (i.e. no measurable effects) from the proposal, and there is little controversy on the subject or reasons to otherwise include the topic.

Due to there being no effect or no measurable effects, there would either be no contribution towards cumulative effects or the contribution would be low. For each issue or topic presented below, if the resource is found in the analysis area or the issue is applicable to the proposal, then a limited analysis of direct and indirect, and cumulative effects is presented. There is no

impairment analysis included in the limited evaluations for the dismissed topics because the NPS's threshold for considering whether there could be an impairment is based on "major" effects.

Social and Economic Issues

Public and cooperating agency comments on previous winter use planning documents voiced concern about the potential economic impacts of various winter use elements on local businesses and economies. Comments range from statements that protection of park resources is paramount, to the social and economic benefits of various access options. Some commentors raised concern about potential closure or allocation changes at various entrances. Some desired a balance between resource protection and socioeconomics.

Human Health and Safety

Three primary health and safety issues regarding winter visitor use were identified, and are addressed in this EA, which affect different areas of the three NPS units to a varying extent:

- The effect of motorized vehicular emissions and noise on employees and visitors;
- Avalanche hazards; and
- Safety problems where different modes of winter transport are used in the same place or in close proximity.

Wildlife

The impact of snowmobiles, snowcoaches, and oversnow vehicle road grooming on wildlife was identified and are addressed in this EA, including the topic of ungulate use of groomed roads. The issue of whether or not groomed roadways affect bison movements, habitats, and population distribution has played a large role in the history of winter use planning and associated litigation. Analysis in this EA is informed by recently published papers, monitoring results, and other recent reports. The information is summarized in the *Affected Environment* section.

Air Quality

The impact of recreational snowmobile and snowcoach travel on air quality, including emissions, visibility, and air quality-related values, was raised and is addressed in this EA. The issue is a question of how much pollution emitted by oversnow vehicles is acceptable relative to laws and policies governing national park units. Air quality is a key resource in itself as well as a highly prized (and expected) element of the park visitor experience. Analysis in this EA is based primarily upon monitoring information from the last five winters.

Natural Soundscapes

The impact of noise from recreational snowmobile and snowcoach travel on the natural soundscape was raised and is addressed in this EA. The issue is a question of whether the character and amount of sound emitted by these vehicles is acceptable relative to laws and policies governing national park units. Soundscapes are a key resource, as well as a highly prized (and expected) element of the park visitor experience. Analysis in this EA is based primarily upon monitoring data collected over the past five winters.

Visitor Use and Access

Various user groups contend that the parks offer either too much or not enough of various types of use. Those who advocate for snowmobile use indicate that there is a right to personal (individual) access to the parks for this use. Those who advocate for snowcoach-only access indicate that snowmobile technology does not adequately protect park resources. Others advocate that any motorized use is inappropriate during the winter season. For these reasons, visitor use and access is addressed in this EA.

Visitor Experience

Expectations for quality winter recreation experiences vary among individuals and among user groups. This creates conflict between those who expect to find quiet, solitude, and clean air in the parks and the impacts of oversnow vehicles, especially when facilities for these different groups are in close proximity. At issue is the nature of visitor enjoyment and its relationship to the management and conservation of park resources and values. For these reasons, visitor experience is addressed in this EA.

Impact Topics Dismissed from Further Consideration

The decision to be made in this EA will not hinge on these topics relative to direct, indirect or cumulative impacts, nor is there new information to indicate that these issues require analysis in this EA. Therefore, the following topics are dismissed from additional analysis as indicated in each discussion below.

Ungulates Other Than Bison and Elk

No new information on ungulate species other than bison and elk is available to report in the affected environment and no new impacts are associated with the alternatives presented in this EA. For these reasons, this topic is dismissed from further consideration.

Black Bear (Ursus americanus)

Previous analysis has demonstrated that existing winter recreation activities in the parks does not affect black bears. Destruction of den sites or den habitat does not appear to be an issue in the parks. Bears are not being disturbed while they are preparing or occupying den sites (Reinhart and Tyers 1999; Podruzny et al. 2002; Haroldson et al. 2002). The main concern is the potential for bear-human conflicts and displacement of bears while they are foraging during the pre-denning and post-emergence periods. The current winter recreation season in the parks does not overlap with most bear activity and, therefore, precludes most risks of bear-human conflicts. For these reasons, impacts on black bear are dismissed from further consideration.

Mid-Sized Carnivores

Mid-sized carnivores not addressed further in this analysis include the bobcat *(Felis rufus)* and red fox *(Vulpes vulpes)*. These species are not considered rare or in need of special protection in the parks. No new information on mid-sized carnivore species other than wolverine (*Gulo gulo*) and coyote (*Canis latrans*), both which are discussed further under *Other Species of Concern* and Canada lynx (*Lynx canadensis*), which are addressed under *Threatened and Endangered Species*, is available to report in the affected environment, and no new impacts are associated with the

alternatives presented in this FEIS. For these reasons, mid-sized carnivores other than wolverine, coyote, and Canada lynx are dismissed from further consideration.

Subnivian Fauna

Subnivian fauna are small mammals that live under snow during winter, including shrews, voles, pocket gophers, and mice. They are active throughout the year, eat a variety of plant and animal foods, and generally occupy habitats on or below the ground. They are important prey species for a variety of birds and mammals. In general, subnivian fauna are abundant residents of the parks and any potential loss of habitat caused by road grooming or plowing operations is compensated for by the vast amount of unroaded area found in the parks. Since OSV travel is only allowed on hard road surfaces that are driven upon during non-winter months, no impacts to subnivian species or their habitat are likely. Research in other areas indicates that subnivian pits and burrows have been located under roads groomed for oversnow vehicle use and in snowmobile play areas (Wildlife Resource Consultants 2004). Therefore, subnivian fauna are dismissed from further consideration.

Birds

Most bird species are not addressed further in this analysis because they only occur in the parks in the summer or their habits are not considered threatened by winter recreation. This includes peregrine falcons *(Falco peregrinus),* a species of special concern that was removed from the endangered species list in 1999. Peregrines' seasonal occurrence precludes them from being affected by winter recreation. No new information on bird species, other than those listed below, is available to report in the affected environment, and no new impacts are associated with the alternatives presented in this EA. For these reasons, this topic is dismissed from further consideration.

Bald eagles *(Haliaeetus leucocephalus)* and trumpeter swans *(Cygnus buccinator)* are discussed under *Other Species of Concern*. Ravens *(Corvus corax)* may be affected by human recreational activities due to their tendency to habituate to human use and activity and are discussed under *Other Species of Concern*.

Vegetation, including Plant Species of Special Concern and Threatened Plants

Most documented vegetation impacts from snowmobiles occur when they are driven away from established roads and trails. In the parks, oversnow motorized activities are limited to roads and along road margins where motorized use is allowed throughout the year. Because little to no vegetation exists on these routes, oversnow motorized use would have negligible impact on vegetation (Stangl 1999). For this reason, and others stated below, impacts upon endangered or threatened plants are dismissed without further analysis. Two species of plants considered to be of special concern are discussed below.

Ross' bentgrass *(Agrostis rossiae)* and Yellowstone sand verbena *(Abronia ammophila)* are unique to Yellowstone National Park, restricted to very specialized habitats within the park. These species are of special management concern because of their rarity and localized occurrences. Ross' bentgrass is found primarily on marl around hot springs and geysers near Old Faithful. Despain (1990) theorized that bison or elk may transport the seeds of Ross' bentgrass between thermal areas. Because of its highly localized habitat, this species is probably the vascular plant most vulnerable to extinction in Wyoming (Clark et al. 1989). Yellowstone

sand verbena, a sand obligate, is found along sandy shorelines of Yellowstone Lake; extensive searches have failed to find it elsewhere in the park. Little is known of its life history. Winter use is not expected to affect either species (Whipple, pers. comm., 2000).

The threatened Ute Ladies' tresses orchid *(Spiranthes diluvialis)* is the only plant listed under the ESA that may potentially occur in the parks. However, this orchid has never been reported within the parks. Known populations occur in Idaho, Montana, and Wyoming at elevations lower than the Yellowstone plateau. Therefore, this species is not addressed.

Exotic Species - Plants

About 200 nonnative plant species are known to occur in the parks (Whipple, pers. comm., 2000). The parks maintain aggressive exotic weed control programs using an Integrated Weed Management approach that relies on prevention, early detection and control, and mechanical, cultural, and chemical control strategies. While winter recreation does not occur during the plant growing season, exotic weed propagation may occur through ground disturbance associated with winter-use facility construction and oversnow vehicles that may act as vectors for weed dispersal. Oversnow vehicles can be a source of weed propagation along park roads and in developed areas, but not nearly as likely a source as vehicles that enter the parks during other seasons. Because all motorized winter use in the parks occurs on roads or their immediate margins, because of existing aggressive control programs, and because no new information is available for consideration in the affected environment, no further analysis of the effects on or of exotic plant species is included in the EA.

Exotic Species - Animals

Mountain goats were historically found in the mountains of the northwest coast and the Rocky Mountains. Through state fish and game agency introductions, their distribution has expanded both within and outside of their historic range (Varley 1999). Consequently, although mountain goats were historically absent from the GYA, they currently inhabit most mountain ranges in the GYA. Throughout their range, mountain goats inhabit steep, rocky terrain during all seasons of the year. Winter range habitats include areas close to cliffs, and steep, rocky, south facing slopes. Potential impacts to mountain goats are not assessed in this document because they are non-native species and human winter recreation tends to occur well outside of mountain goat and/or bighorn sheep range in the parks. For these reasons, this topic is dismissed from further consideration.

Possible conflicts between the proposed action and other plans, policies, or controls

There are no conflicts between the proposed action and any other NPS plans, policies, or controls. The proposed action is also consistent with local and regional plans.

Energy requirements and conservation potential

Operations for all three park units use energy to maintain park facilities and operate motor vehicles throughout the winter. Alternative 1 (No Action) would result in substantially reduced energy use compared to Alternative 2. Within Alternative 2, most snowmobiles would utilize Best Available Technology (BAT). For snowmobiles, the BAT requirement has substantially cut snowmobile fuel consumption relative to historic conditions. Consequently, implementation of Alternative 2 would continue the lower energy consumption for visitor transportation and services seen in the last five years in Yellowstone.

Energy consumption for visitor transportation is discussed at the end of *Affected Environment*. Because administrative energy consumption would be similar across alternatives, that component of energy requirements and conservation potential is dismissed from further consideration.

Natural or depletable resource requirements and conservation potential

The range of alternatives and the purpose and need of this document are fully within the scope of NPS mandates and policies. No natural or depletable resources would be extracted under this plan nor will natural resource commodities be produced. Therefore, this topic is dismissed from further consideration.

Urban quality, historic and cultural resources and design of the built environment

The winter visitor use activities described in Alternative 2 would occur on existing roads, deep snowpack over frozen ground, or frozen lake surfaces. Therefore, it would not affect known archeological resources. To ensure that adequate consideration and protection are accorded potential archeological resources during the construction of visitor services (such as permanent warming huts and other day-use facilities) or of trails, archeological surveys would precede all significant ground-disturbing activities. Archeological monitoring would occur where less ground disturbance is expected. If previously undiscovered archeological resources are unearthed during construction activities, all work in the immediate vicinity of the discovery would be halted until the resources could be identified and documented and an appropriate mitigation strategy developed, if necessary. If construction impacts upon archeological sites could not be avoided, the recommended mitigation strategy of site testing and data recovery would be implemented after consulting with the Wyoming or Montana State Historic Preservation Office (as appropriate). Consultation would ensure that the informational significance of the sites would be preserved.

If permanent warming huts or other day-use facilities are erected either in or near historic districts or potential cultural landscapes, application of several guidelines would blend facilities into both the built and natural surroundings of the parks:

1) Sensitive design and location of facilities;

2) Use of appropriate materials and colors in construction; and

3) Select plantings of native vegetation as visual buffers.

If historic structures are adaptively rehabilitated for visitor services, the integrity and character of each structure's exterior would be preserved while establishing the most efficient use of the interior's available space. All work would be performed in accordance with the Secretary of the Interior's Standards for the Treatment of Historic Properties (1995). Materials removed during rehabilitation of historic structures would be evaluated to determine their value to the parks' museum collections or for their comparative use in future preservation work at the sites. Any corresponding visual, audible, and atmospheric intrusions associated with increases in visitation would not be significant enough to alter or diminish the integrity of historic districts or potential cultural landscapes.

The plowing of roads and highways and maintenance of groomed motorized routes throughout the winter season would have no effect upon roads or road systems that are either potentially eligible to be listed in the National Register of Historic Places or are contributing elements of

potential cultural landscapes. Existing road contours would be unaltered. There would be no adverse impacts to known ethnographic resources. No new information is available to report in the affected environment and no new impacts are associated with the alternatives presented in this EA. For these reasons, this topic is dismissed from further consideration.

Socially or economically disadvantaged populations

Presidential Executive Order 12898, *General Actions to Address Environmental Justice in Minority Populations and Low-Income Populations*, requires all federal agencies to incorporate environmental justice into their missions by identifying and addressing the disproportionately high and/or adverse human health or environmental effects of their programs and policies on minorities and low-income populations and communities. The proposed action would not have disproportionate health or environmental effects on minorities or low-income populations or communities as defined in the U.S. Environmental Protection Agency environmental justice guidance (U.S. EPA 1998). Therefore, environmental justice was dismissed as an impact topic in this EA.

Wetlands and Floodplains

Executive Order 11988 and NPS policy require that impacts on floodplains be considered in NPS undertakings. The intent of the order and guidelines is to provide for human safety and protect floodplain functions by preventing development in 100-year floodplains. Floodplains for all three units are well defined. There are no actions proposed in this EA that would occur in or encroach upon floodplains and all actions would occur during the winter months when there is little concern for flooding. With this finding, no further analysis of floodplains is necessary.

Similarly, Executive Order 11990 and NPS policy require that impacts on wetlands be considered in NPS undertakings. The intent of the order and guidelines is to protect the high resource values found in wetlands by requiring that evaluation of alternatives occur and mitigation be designed prior to development in wetlands. Wetlands for all three units are well defined. There are no actions proposed in this EA that would occur in or encroach upon wetlands and all actions would occur during the winter months on primarily paved roads that are open for wheeled vehicle travel in the summer. For these reasons, this topic is dismissed from further consideration.

Prime and unique agricultural lands

Private land in-holdings exist within the boundaries of Grand Teton National Park. None of the actions proposed in the range of alternatives would affect such lands, access to them, or their agricultural properties. Therefore, this topic is dismissed.

Important scientific, archeological, and other cultural resources; sacred sites and Indian Trust resources

Effects on wildlife, air quality, and soundscapes are discussed in *Affected Environment* and *Environmental Consequences* sections of the EA. The two alternatives evaluated in this EA, with their prescribed mitigations, would not create adverse effects on geothermal, archeological or historic resources, ethnographic resources, cultural landscapes, sacred sites or Indian Trust resources. Previous consultation, public and agency review of the 2007 Draft EIS, and scoping on that DEIS and other winter planning documents has not identified any impacts on sacred sites or Indian trust resources. As part of government-to-government relationships, consultation

with affiliated tribes has and will occur on winter use and other planning and management topics. For these reasons, this topic is dismissed from further consideration.

Ecologically critical areas, wild and scenic rivers, and other unique natural resources

The range of alternatives and the purpose and need are fully within the scope of NPS mandates and policies. No action proposed in the range of alternatives would affect the eligibility or designation of a wild and scenic river or wilderness area. The scope of the purpose and need for action does not allow consideration of alternatives that directly affect proposed or recommended wilderness in the parks. Therefore, there are no actions proposed, such as trails, grooming, facility construction, or motorized use that would impact wilderness values.

Wilderness values consist of elements that are intrinsic to wilderness, as well as elements that are experiential and relative to people's appreciation of wilderness. The analysis does consider impacts on wilderness values like natural quiet, scenic quality, wildlife, and air quality. Such elements are recognized as important wilderness components and impacts on them are considered as disclosure of indirect impacts. Because of this disclosure, and because proposed actions are overtly designed to avoid impacting proposed and recommended wilderness, this topic is dismissed from further discussion.

Climate Change and Sustainability

Although climatologists are unsure about the long-term results of global climate change, it is clear that the planet is experiencing a warming trend that affects ocean currents, sea levels, polar sea ice, and global weather patterns. Although these changes will likely affect winter precipitation patterns and amounts in the parks, it would be speculative to predict localized changes in snow water equivalency or average winter temperatures, in part because there are many variables that are not fully understood and there may be variables not currently defined. Therefore, the analysis in this document is based on past and current weather patterns and the effects of future climate changes are not discussed further.

In part to address and prepare for such changes, the NPS commissioned a report quantifying the historic snow water equivalent and temperatures for the parks, comparing snow water equivalency with opening and closing dates of oversnow vehicle travel, and providing estimated opening and closing dates that would have been possible over the historic period of record (Farnes and Hansen 2005). That information was used in the analysis for this EA and will be used in winter operations under any alternative chosen.

Yellowstone has a strong track record of environmental stewardship, particularly in the last decade with implementation of initiatives such as the Greening of Yellowstone. The Greening initiative includes recycling, waste reduction, energy reduction, building a compost facility for park wastes, LEED building certification, and the use of hybrid vehicles and bio-fuels in summer and winter. Although all the projects and initiatives undertaken in and near the parks are too numerous to list here, the reader should be aware that although this topic is specifically dismissed from the analysis, the parks continue to lead the region in environmental education and action, including steps to reduce activities that contribute to climate change.

Water and Aquatic Resources

One of the longer-term monitoring projects in the parks has measured deposition of pollution in the snowpack. Work by the U.S. Geological Survey has been underway since about 1996 to measure regional trends as well as the effect of oversnow vehicles. The regional perspective has provided a picture of pollution deposition in the snowpack throughout the northern Rocky Mountains, including the parks. The local measurement has increased our understanding of deposition from oversnow vehicles.

Although there is a clear relationship between oversnow vehicle use and pollutant deposition in the snowpack, monitoring has not shown more than negligible to minor quantities of oversnow-related pollution in snowmelt. Any detectable vehicle-related pollution in snowmelt has been found to be in the range of background or near-background levels (Ingersoll et al. 2005).

The NPS and USGS will continue to monitor pollution deposition in the snowpack, and with any of the alternatives, application of a monitoring program and adaptive management would represent appropriate protective actions regarding water and aquatic resources. The alternatives in this EA are not expected to appreciably differ in their impact on aquatic resources; therefore, this topic is dismissed from further consideration.

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CHAPTER 2: ALTERNATIVES

Introduction

This chapter presents a detailed description of two alternatives for winter visitor use in Yellowstone National Park, Grand Teton National Park, and the John D. Rockefeller, Jr. Memorial Parkway. Both of the alternatives must meet the stated purpose and need for action (see *Purpose and Need* section). The alternatives are presented in a comparative form and mitigation measures are described. This EA is intended to provide guidance for winter use management in Yellowstone for the next three years only. During that time period, the National Park Service will seek a longer term resolution to the winter use controversy, along with associated rules under which the parks will operate. The EA is also intended to provide a framework for management of winter use in Grand Teton and the Parkway for the foreseeable future. The three-year limitation would not apply in Grand Teton and the Parkway, and any references to the interim, or three year limit, are applicable only to Yellowstone National Park.

Alternative 1 is the "No Action" alternative, the management of the parks that will result if the agency takes no action. Alternative 2 is the action alternative; it would allow motorized oversnow visitation to continue, for the next three winters (i.e. through the winter of 2010-11) only.

Formulation of the Alternatives

Two alternatives were formulated in response to:

- Recent monitoring and studies;
- Court decisions in Washington, D.C. and pending in Wyoming;
- Public comments on the 2004 *Temporary Environmental Assessment* and the 2007 *Environmental Impact Statement*, from a wide variety of stakeholders; and
- Past winter planning processes and the wide range of ideas that were explored in the 2000 EIS, 2003 SEIS, 2004 EA and 2007 EIS.

Definitions

In both alternatives, the following definitions apply:

Commercial guide: A guide who operates for a fee or compensation and is authorized to operate in the park(s) under a concession contract or commercial use authorization, or is affiliated with a commercial guiding service or commercial tour.

Commercial tour: One or more persons traveling on an itinerary that has been packaged, priced, or sold for leisure/recreational purposes by an organization that realizes financial gain through the provision of the service.

Designated "non-motorized recreation" route: A marked or otherwise indicated oversnow travel route.

Gateway communities: The towns of Jackson and Cody, Wyoming, and Gardiner, Cooke City, and West Yellowstone, Montana.

Historic snowcoach: A Bombardier snowcoach manufactured in 1983 or earlier. Any other snowcoach is considered a non-historic snowcoach.

Oversnow vehicles (OSVs): Self-propelled vehicles intended for travel on snow, driven by a track or tracks in contact with the snow, and that may be steered by skis or tracks in contact with the snow. This term includes both snowmobiles and snowcoaches.

Oversnow route: That groomed portion of the unplowed roadway located between the road shoulders and designated by snow poles or other poles, ropes, fencing, or signs erected to regulate over-snow activity. Oversnow routes include pullouts or parking areas that are groomed or marked similarly to roadways and are adjacent to designated oversnow routes.

Snowcoaches: Self-propelled, mass transit vehicles intended for travel on snow, with a curb weight of over 1,000 pounds (450 kg), driven by a track or tracks, steered by skis or tracks, and that have a capacity of at least eight passengers. A snowcoach has a maximum size of 102 inches wide, plus tracks (not to exceed 110 inches wide with tracks); a maximum length of 35 feet; and a Gross Vehicle Weight Rating (GVWR) not to exceed 25,000 pounds.

Snowmobiles: Self-propelled vehicles intended for travel on snow, with a curb weight of not more than 1,000 pounds (450 kg), driven by a track or tracks in contact with the snow, and that may be steered by a ski or skis in contact with the snow.

Snowplane: A self-propelled vehicle intended for oversnow travel and driven by an air-displacing propeller.

Management Zones

For both alternatives, the parks are divided into four management zones, as shown in Figures 2-1 and 2-2 and described below. Zones, and their definitions, do not change by alternative, although the impact definition thresholds for each impact category may differ between the zones. Each zone is compared to one of the land classifications used under the Recreation Opportunity Spectrum (ROS), a recognized framework for inventorying, planning, and managing the recreational experience and setting of federal lands.

Developed area: Areas in the direct influence of human development and dominated by human structures. These range in size from small areas such as the Indian Creek warming hut to large areas such as Old Faithful. Structures include buildings, sewage treatment facilities, campgrounds, employee housing areas, maintenance yards and structures, boardwalks, hotels, and lodges. This zone is most similar to ROS classes "Rural" and "Urban." It includes areas within 100 yards of developed areas (but does not include backcountry cabins or utility lines).

Road corridor: Areas directly influenced by roads; specifically, all primary and secondary roads open to either visitor or administrative motorized travel in the winter. As with the Developed area, this zone extends out to 100 yards on either side of the road's center line. This zone is most similar to ROS class "Roaded Natural." Note that

this zone for purposes of this EA would not include roads open in the summer to motorized use but closed in the winter to OSV use. Boardwalks and some utility lines would appear in this zone, but no buildings (which are zoned as developed areas).

Transition zone: Areas indirectly influenced (mainly by sight and sound) by developed areas and roads. Specifically, they include all areas between 100 yards and 1.5 miles from either a developed area or a road corridor. This zone would include those roads not open to OSV travel in winter (with the possible exception of NPS authorized ski trail grooming equipment) but that may be open to motorized travel in summer. Yellowstone's Blacktail Plateau Drive, Bunsen Peak Road, and Lone Star Geyser Trail are examples of secondary roads included within transition zones. For Grand Teton, examples of areas designated as transition zones include the Teton Park Road and Jackson Lake. When a groomed ski trail is designated a transition zone, the zone would be 100 yards on either side of the groomed trail's center line. This zone would be most similar to ROS class "Roaded Natural" within ½ mile of roadways. From ½ mile to 1.5 miles from roads, "Semi-Primitive Non-motorized" would be the nearest ROS class or, as is sometimes used, "Semi-Primitive Wilderness," since these areas are recommended wilderness. Some utility lines could appear within this zone.

Backcountry: Areas where natural sights, sounds, and smells dominate and human-caused activities are minimal or completely absent. Specifically, this zone includes all areas more than 1.5 miles from the nearest road or developed area. This zone would be most similar to the "Primitive" ROS class.

Figure 2-1: Yellowstone National Park Management Zones

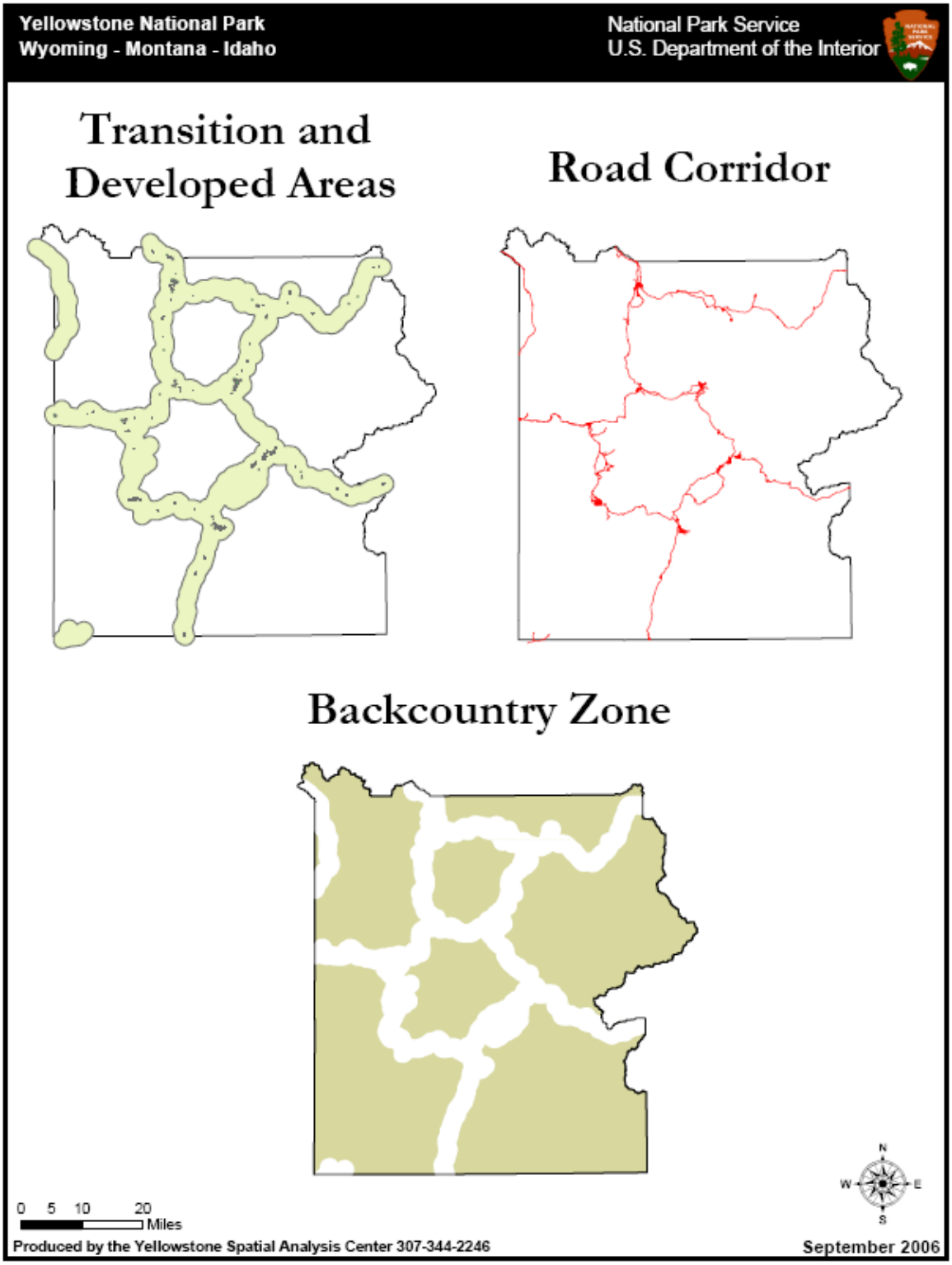
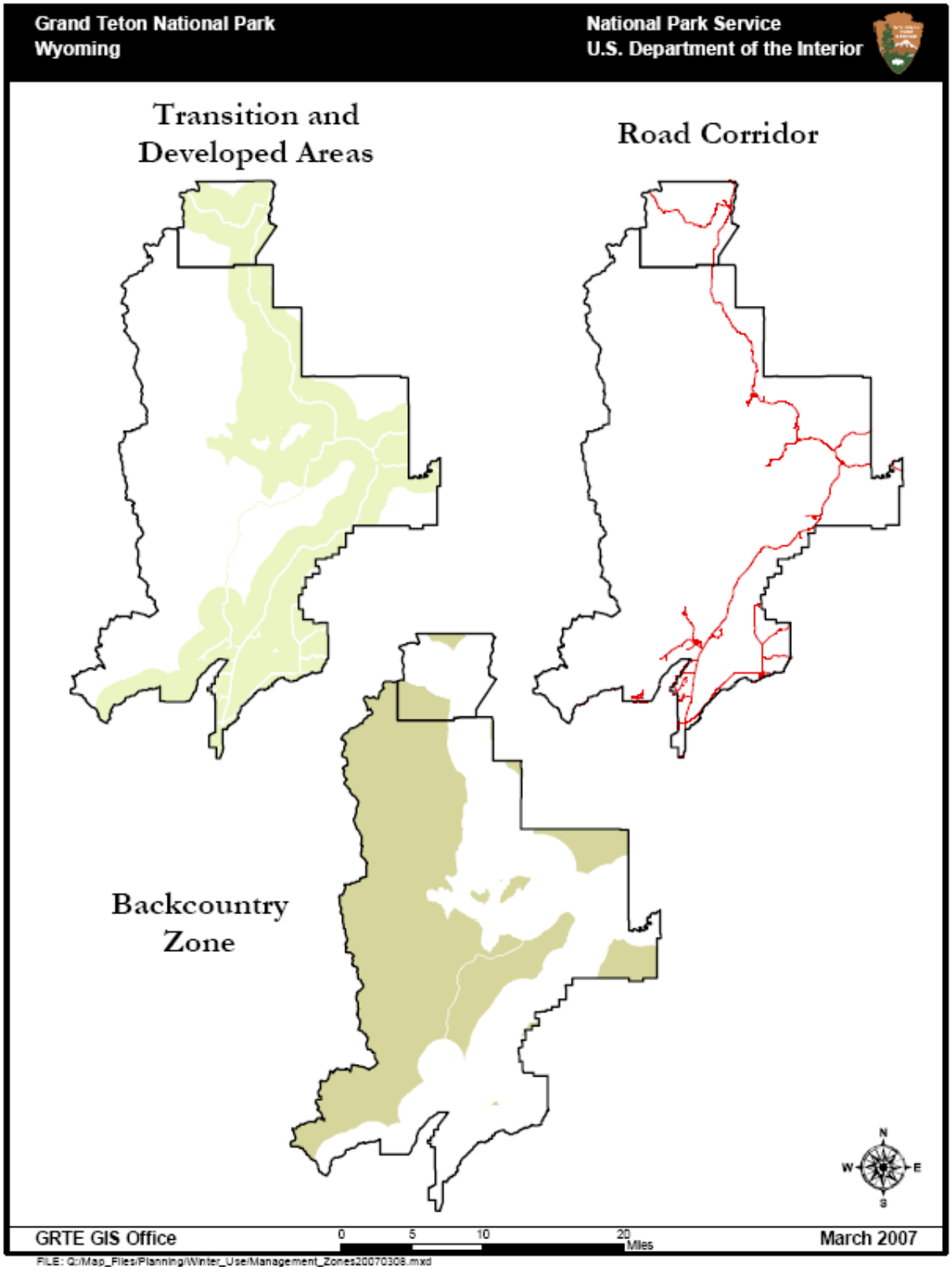


Figure 2-2: Grand Teton National Park Management Zones



Alternatives Dismissed from Further Consideration

Comments received during scoping for the 2007 EIS, at meetings and open houses associated with that planning, and during review of the 2007 DEIS included suggestions for alternatives or actions within alternatives. For various reasons, most of these ideas were eliminated from further study. Such ideas and the rationale for those decisions are presented here.

Allow snowcoaches (only) into Yellowstone—ban snowmobiles.

Some interested stakeholders have long advanced the position of converting all oversnow vehicle traffic in Yellowstone to snowcoaches (banning snowmobiles). Considered in the 2007 FEIS (as Alternative 2), that alternative is not considered in this EA for the following reasons:

- According to the modeling done for alternative 2 in the 2007 EIS, snowcoaches-only resulted in major soundscapes impacts because they would be audible for 70% of the time in travel corridors and 78% of the time at the West Thumb developed area. These results were from modeling recreational vehicles only and did not factor in the contribution of administrative vehicles or other mechanical sounds. Alternative 2 called for up to 120 coaches per day. Since the NPS has never implemented a snowcoach-only winter management, the agency must rely upon modeling to determine its likely impacts. An objective of this EA was that the preferred alternative has no major adverse effects (no significant effects) on park resources or values.
- As computed in the 2007 EIS, snowcoaches consume more fuel to transport the same number of people the same distance as either snowmobiles or wheeled vehicles (they consume 2.5 times as much fuel as do wheeled vehicles for this task, for example). There is a direct correlation between fuel consumed and carbon dioxide, the most common greenhouse gas, emitted into the atmosphere. Providing transportation by only the most carbon-intensive mode of transportation possible, when other less carbon-intensive modes are available, would contribute unnecessarily to global warming.
- According to wildlife monitoring for the past several winters, snowcoaches elicit greater wildlife response than do snowmobiles, probably because of their larger visual profile. Specifically, last winter 10% of wildlife responses to groups of only snowcoaches were travel, alarm, or flight, while only 7% of such responses to groups of only snowmobiles were this severe (McClure and Davis 2008; Davis 2007). Although the 2007 FEIS predicted that a snowcoaches-only management system would have moderate or less impacts on wildlife, the NPS remains concerned about the potential impacts of conversion to snowcoaches as the only form of winter transportation in Yellowstone. Such a management scheme could even result in major impacts, considering that coach numbers could increase four-fold over recent use levels.
- With the increase of snowcoach numbers from an average of 15 per day historically to a peak day of 60 last winter, park staff have become increasingly concerned about damage to snow roads (Van De Polder 2006). Both snowmobile

and snowcoach use wears on the snow road surface. Snowmobiles tend to create moguls or bumps, while snowcoaches create ruts, especially heavier coaches operating in soft snow conditions (Alger et al. 2002). These ruts can be several inches deep, making travel challenging and sometime hazardous. This has become more pronounced as coach numbers have increased and their size and weight (in pounds per square inch) has also increased. That is why the NPS imposed a size and weight limit on coaches. Allowing coach numbers to quadruple (as alternative 2 in the 2007 EIS would have allowed) could exacerbate the safety issue.

- Snowmobiles offer a different experience to park visitors—an experience that, in some ways, is more directly connected to nature—than snowcoaches do. The regulated use of snowmobiles (i.e., with BAT and guide restrictions) promotes the enjoyment of park resources and values in a different, and appropriate, way than do snowcoaches. Converting to snowcoaches-only would diminish the ways in which NPS can promote the appropriate enjoyment of park resources.

Alternatives with higher numbers of snowmobiles or snowcoaches.

Some stakeholders have consistently desired alternatives allowing higher numbers of snowmobiles, while others have desired higher numbers of snowcoaches. Alternatives with higher numbers of vehicles (540, 720, 1025 snowmobiles; 120 snowcoaches) were identified in the 2007 EIS as having major adverse impacts. Specifically, all of these limits were modeled to incur major sound impacts because they would be audible too much of the day or would have high sound levels, and 1025 snowmobiles was modeled to have major air quality impacts because of the amount of carbon monoxide produced. In addition, because of concerns with the levels of impacts on wildlife, air quality, and soundscapes associated with the 540-snowmobile limit in the 2007 FEIS expressed by the U.S. District Court for the District of Columbia in its recent opinion, that level was not considered in this EA. Therefore, no alternatives allowing higher amounts of oversnow vehicle use were considered in this EA.

Alternatives with lower numbers of snowmobiles or snowcoaches.

Other stakeholders have suggested alternatives with lower numbers of snowmobiles or snowcoaches allowed into the park on a daily basis. Although such alternatives might meet the purpose and need for this EA, they would unnecessarily limit the amount of visitor use and access of the park. Additionally, as revealed in this EA, both snowmobiles and snowcoaches have environmental impacts, although the kinds of impacts are somewhat different. Reducing one form of visitation severely would likely mean an increase in the other form; doing such would mean that some impacts would be too severe, while balancing winter use between the two forms of visitation reduces the impacts of each form of transportation to acceptable levels. For example, converting all visitation to only snowcoaches or only snowmobiles could result in major soundscapes impacts, while balancing use between the two forms of access reduces the distinctive soundscapes impacts of each to acceptable levels (see *Affected Environment* for more discussion of their soundscape impacts).

Return to the 1983 regulations guiding winter use in the parks/remove limits to visitor use and eliminate best available technology requirements on some or all routes and for some or all visitors.

These regulations are supported by the 1990 *Winter Use Plan Environmental Assessment*. They restrict snowmobile use to designated routes in the parks. However, the 1983 regulations describe a type and amount of snowmobile use that was found to constitute impairment of park resources and values in the 2000 Record of Decision and the 2003 SEIS and 2007 EIS. This alternative may not be legally permissible and thus does not meet the purpose and need's criteria for detailed consideration in this EA.

Allow unguided and non-commercially guided snowmobile use.

A number of commentors have presented suggestions for varying levels of unguided and/or non-commercially guided tours, ranging from 20 to 100 percent. Because the U.S. District Court for the District of Columbia identified concerns with snowmobile impacts upon wildlife as one of the reasons in its decision, and because unguided snowmobilers can contribute disproportionately to such impacts (because unguided snowmobilers may not know how to minimize their impacts upon wildlife), provisions for any unguided or non-commercially guided snowmobile use were not considered.

Establish a monorail system in Yellowstone.

Constructing a monorail in Yellowstone would be prohibitively expensive, particularly given Yellowstone's seismically active nature, unstable thermal ground, harsh weather, and remoteness. A 1994 study, for example, estimated the cost of building a 16-mile monorail through Hayden Valley at $880 million (BRW Inc. 1994). Ongoing maintenance costs would be exorbitant in Yellowstone's harsh climate. Many of these costs would have to be passed on to the visitor, which would dramatically increase the cost of a Yellowstone visit, making it unaffordable for many. Further, the visitor experience would be substantially altered, as a monorail could only stop and discharge passengers at fixed locations (unlike snowcoaches, buses, or automobiles, which may stop almost anywhere), and the monorail would physically distance visitors from the natural world much more than any other mode of transportation. Additionally, even though such a monorail would presumably be constructed on or near existing roadways, its intrusion upon the landscape would be far greater than that of contemporary roadways and traffic in the parks (BRW Inc. 1994). Such limitations of the visitor experience and visual intrusions could constitute an unacceptable impact or impairment of park resources, which would violate the purpose of this EA. Finally, it is uncertain whether wildlife would learn to pass under the monorail system. If they did not, one of the needs for this EA would not be addressed. In any event, the monorail could not possibly be constructed prior to December 15, the normal start to the winter season, presenting another reason that this alternative would not meet the purpose and need for this EA. Therefore, this alternative is dismissed.

Plow park roads and allow private vehicles on them.

The idea of plowing Yellowstone's roads in winter was first suggested in 1932, has been debated numerous times since then, and was an alternative in both the 2007 EIS and the 2000 EIS (plowing only roads on the west side of Yellowstone, not those on the east or south sides, which receive much more snow). Plowing the west-side roads, which receive

a moderate amount of snow, is quite feasible. However, given the temporary intent of this EA and the fact that most winter snowmobile and snowcoach operators have already purchased machines for use this winter, plowing park roads in the next three years would present undue hardships on these businesses. Although many snowcoaches could be used on plowed roads because many are converted passenger vans, not all can be, and snowmobiles cannot be used on plowed roads. Consequently, these businesses would lose substantial investments that they were justified in making, given the assumption that the 2007 Final Rule would actually be implemented in the parks. In addition, the *Master Plan* identifies that the park will have an oversnow motorized winter season (for perspective on the *Master Plan* and the era in which it was written, see Yochim (in press)). It would be more appropriate to amend the *Master Plan* through a long-term planning document. Finally, converting to plowed roads with just a month's notice would add more uncertainty to an issue already clouded by great levels of uncertainty in the last five years. For these reasons, the idea of plowing park roads is dismissed.

Nothing in this discussion is meant to preclude plowing park roads in the event of an emergency or insufficient snowfall.

Options for management of Cooke Pass to the east of Cooke City, Montana.

Because this road is outside of Yellowstone and the roadbed is not owned by the park, the NPS does not have management authority over its operation. Therefore, this alternative is outside of the scope of this EA. However, the NPS will work with the decision makers (the States of Wyoming and Montana, the Federal Highway Administration, and the United States Forest Service) to evaluate year-round plowing of the eight miles of road between Cooke City, Montana and the Pilot Creek Pit area in Wyoming (over Cooke Pass) should this become a possibility.

Remove limits on snowmobile use on Jackson Lake.

Because snowmobile noise travels great distances over flat ice, allowing unlimited numbers of snowmobiles on Jackson Lake would result in unacceptable impacts upon Grand Teton's natural soundscape. Consequently, this suggestion would not meet the purpose or need of this EA.

Re-evaluate non-motorized winter use activities in Grand Teton.

This EA will not reevaluate measures previously adopted for the regulation and facilitation of non-motorized activities in Grand Teton National Park such as trail marking, grooming, or areas available (and not available) for cross-country skiing, snowshoeing, or similar activities.

Allow snowplane use on Jackson Lake and OSV use on Teton Park Road.

This EA will not reevaluate decisions about the management of winter recreational use that have already been implemented. This includes the prohibition of snowplanes on Jackson Lake and motorized activities on Teton Park Road. Snowplane use on Jackson Lake was found to impair park resources and values in the analysis for the 2000 EA and the NPS supports the validity of that study. The prohibition on such use was upheld by the U.S. District Court for the District of Wyoming; the plaintiffs have appealed this decision and the appeal is pending. Changes to discontinue snowmobile use of the Teton Park Road were made before the 2002-2003 season began, and will also not be

reconsidered. Both of these decisions were supported by the analysis in the 2000 EIS, which remains relevant and is incorporated by reference.

Prohibit cross-country skiing on routes groomed for oversnow vehicle travel.

The NPS currently allows cross-country skiing, snowshoeing, and walking on its groomed OSV routes. Such uses are little different than pedestrian use of roadways in summer. Under most alternatives, the continued use of commercial guides in Yellowstone creates large windows of time free of motorized traffic on the roads, reduces conflicts between user groups, and improves safety. Guides are trained to navigate around pedestrians safely and in a manner that reduces disturbances to all users. Prohibiting such use would not meet the purpose of this EA, because it would unnecessarily restrict the range of visitor activities.

Alternate periods (days or weeks) of motorized and non-motorized use.

Effective management of concessions, businesses, and park facilities demands a level of consistency within and between seasons and in use and types of use from year to year. Further, visitors need a level of predictability in making their travel plans. This alternative would be too logistically difficult to implement and would not provide the range of activities desired in the purpose of this EA.

Designate an area either inside or outside of Yellowstone as an off-trail or extreme snowmobiling area.

Off-trail use of snowmobiles in national parks is prohibited by Executive Order 11644 and its implementing regulations. Although the NPS does not have management authority outside of national parks, many off-trail areas already exist in other areas near the parks.

Consider managing all snowmobiles by a daily or annual group limit.

Although the analysis for the 2007 FEIS included this concept, as well as the suggested group size of 6 snowmobiles, the EIS did not adopt this idea. The NPS believes that for the alternative that allows snowmobile use in the parks, allocating a set number of snowmobile entries per entrance provides guides and visitors with the greatest flexibility. Under a daily group limit, some groups would not be filled to the group size limit (for example, if the group size limit were 6, some groups would be only four snowmobiles in size, or three, or two, etc.). Managing visitor use by a daily entrance limit would allow more visitors to tour the park. Additionally, minimum and maximum group sizes were successfully utilized for the duration of the Temporary Plan; these same limits are carried forward in the preferred alternative. Also, an inherent part of the analysis, especially for soundscapes, was the concept of grouping snowmobiles.

Allow snowbikes on snowroads.

A comment during public review of the 2007 DEIS suggested the parks allow snowbikes. Snowbikes are modified bicycles with large, low-pressure tires to facilitate use on groomed routes. The NPS believes that the use of snowbikes could conflict with and/or create safety hazards along routes on which substantial numbers of snowmobiles and snowcoaches operate, such as the groomed roads in Yellowstone. Within units of the

National Park System, bicycles may only be used on park roads, parking areas, and on routes designated for such use by special regulation. The NPS may consider whether the use of snowbikes would be appropriate on certain groomed roads in Grand Teton where conflicts with oversnow vehicles, other visitors, or wildlife are not an issue.

Allow a variable daily limit.

This alternative would allow more vehicles on holidays and weekends and fewer during mid-week periods. This concept was set aside because of the administrative challenge of overseeing variable limits and because of the potential for major adverse impacts on the higher user days and denying even more people access on mid-week days. Historically holidays and Saturdays were the peak days, far exceeding mid-week periods. One of the changes in visitor use patterns over the past five years has been a flattening of use. Mid-week days are nearly as high as weekends, and in some weeks, Tuesday or Wednesday is the peak visitation day (this is the summer daily pattern). Thus reducing the mid-week limit significantly below 318 would turn even more people away. Increasing the holiday and weekend limit much above 318 could result in major adverse impacts on those days. Therefore this concept is not considered further in this temporary EA.

Manage using a seasonal limit.

This concept would establish a seasonal limit for the guides and outfitters and allow them to bring as many people as they wish (perhaps within some upper daily cap) per day until that allocation is consumed. This concept was explored in alternative 5 of the 2007 EIS, and it is employed by the U.S. Forest Service for some winter guiding activities in the national forests of the Greater Yellowstone Area. The result could be significantly higher numbers over the early, holiday parts of the season, with resulting major adverse impacts, and virtually no use (assuming the allocations are used up) at the end of the winter season, denying visitors access to the park throughout the winter season. Therefore this concept is not considered further in this temporary EA.

Alternative 1: Eliminate Motorized Recreational Oversnow Travel (No Action)

Chapter 36 of the Code of Federal Regulations states, “Snowmobiling is generally prohibited except on designated routes and water surfaces available for motorized use at other times” (36 CFR 2.18). Parks must designate routes for snowmobile use in order for that use to be authorized. For Yellowstone, Grand Teton and the Parkway, routes were designated for snowmobile and snowcoach use in 36 CFR Part 7 (Sections 7.13, 7.21 and 7.22). Regarding snowcoaches, the NPS general regulations state (at 36 CFR 1.2 (c)) that the regulations contained in part 7 are special regulations that may amend, modify, relax, or make more stringent the regulations contained in parts 1 through 5 of 36 CFR. Furthermore, 36 CFR 1.5(b) clearly states that designating or restricting use requires rule making. Sections 7.13, 7.21 and 7.22 of the CFR made more stringent the conditions for use of snowcoaches in the parks and authorized their use.

Oversnow vehicle use for the winter of 2007-08 was authorized under the rules published in the *Federal Register* on December 13, 2007 (72 *Federal Register* 239: 70781-70804—the final rule associated with the 2007 FEIS). That rule was vacated by the U.S. District Court for the District of Columbia, reinstating the rule from the *Temporary*

Winter Use Plan of 2004 (69 *Federal Register* 217: 65348-65366). That rule is still valid, but it only provided for oversnow vehicle use—either snowmobile or snowcoach—for three winters, through the winter of 2006-07. Therefore, in the absence of any action on the part of the agency, these means of motorized oversnow access to the park are no longer authorized; no form of oversnow vehicle use can be permitted for the winter of 2008-09 forward. Continued snowmobile and/or snowcoach use of the parks requires action (rulemaking and associated analysis) on the part of the NPS. Thus, the no action alternative would have neither snowmobile nor snowcoach use in the parks. Alternative 1 represents the continuation of current management direction and regulation, and is therefore the "no action" alternative.

Alternative 1 most specifically addresses the purpose and need related to park resource and values, and bison in particular. In Yellowstone, the primary visitor access would be via wheeled vehicles from Yellowstone's North to Northeast Entrances. The balance of Yellowstone would be accessible for skiing and snowshoeing. In Grand Teton, traditionally plowed roads would continue to be plowed for wheeled vehicle access and certain short access routes would remain open for snowmobile travel. The backcountry would remain open throughout both parks.

Key Actions

Routes: No recreational snowmobile or snowcoach use would be allowed in any of the parks, except snowmobiles operating on these short routes in Grand Teton:

- On the CDST between the east boundary of GTNP and the Buffalo Fork River.
- From the parking area at Shadow Mountain directly along the unplowed portion of the road to the east park boundary.
- Along the unplowed portion of the Ditch Creek Road directly to the east park boundary.

The superintendent may open or close these oversnow routes, or portions thereof, after taking into consideration the location of wintering wildlife, adequate snowpack, public safety, and other factors. Notice of such opening or closing would be provided by one or more of the methods listed in 36 CFR 1.7(a).

The following roads in Yellowstone would continue to be plowed:

- From the North Entrance to Mammoth Hot Springs
- From Mammoth Hot Springs to the Upper Terrace Drive
- From Mammoth Hot Springs to Tower Junction and the Northeast Entrance
- Roads within the developed areas at Mammoth Hot Springs, Tower Ranger Station, Lamar Ranger Station, Northeast Entrance, and Gardiner.

In GTNP and the Parkway, the following roads would continue to be plowed:

- Highway 26/89/191, from the south boundary of GTNP to Moran
- Highway 89/191/287, from Moran to Flagg Ranch
- Highway 26/287, from Moran to the east boundary of GTNP

- Teton Park Road, from Moose Junction to Taggart Lake Trailhead
- Teton Park Road, from Jackson Lake Junction to Signal Mountain Lodge
- Pacific Creek Road, from Highway 89/191/287 to the GTNP boundary
- Gros Ventre Road, from Gros Ventre Junction to east boundary, via Kelly and Kelly Warm Springs
- The road from Kelly to end of pavement, approximately two miles north of Mailbox Corner
- Teton Science School Road to the east boundary
- The Moose–Wilson Road, from the Granite Canyon Entrance to the Granite Canyon Trailhead

Current winter closures would remain in effect on the Snake River floodplain, the Buffalo Fork River floodplain, and the Uhl Hill area, Willow Flats, Kelly Hill, Static Peak, Prospectors Mountain, and Mount Hunt.

Motorized access to inholdings and adjacent public and private lands would continue to be available through a combination of plowed roads for wheeled vehicles and staging areas for snowmobiles traveling to immediately adjacent lands.

Reasonable and direct access to adjacent public and private lands, or to privately owned lands within the park with permitted or historical motorized access, would continue via paved and plowed routes or via oversnow routes from GTNP.

Destination and support facilities may continue to be provided at Moose Triangle X, Colter Bay, and Flagg Ranch, and warming hut facilities may be available along the Teton Park Road to provide visitor services and interpretive opportunities.

Non-Motorized Access

The parks' backcountry would remain open for non-motorized access. In Yellowstone, backcountry non-motorized use would continue to be subject to the Winter Severity Index program. The program restricts backcountry use of the park when winter snowpack and weather conditions become severe and appear to be adversely affecting wildlife.

In Yellowstone, groomed ski routes and boardwalks accessible from the Gardiner to Cooke City road could remain groomed or shoveled. In Grand Teton, the Teton Park Road may continue to be groomed.

Actions and Assumptions Common to all Park Units

Emergency Action

None of the actions in this alternative preclude closures for safety, resource protection, or other reasons as identified in 36 CFR 1.5 or 2.18. The superintendents would continue to have the authority under 36 CFR 1.5 to take emergency actions to protect park resources or values.

Administrative Use

Non-recreational, administrative use of snowmobiles would be allowed by park personnel or parties duly permitted under the provisions of 36 CFR 1.5 and 1.6. Permitted parties must meet BAT requirements (as described in Alternative 2) unless specifically authorized otherwise by the park superintendent. Such use would not be subject to guiding requirements.

Administrative use of snowmobiles may be supplemented with administrative snowcoaches. When administrative snowmobiles are necessary, the NPS would generally use BAT snowmobiles. Some non-BAT snowmobiles would be permitted for law enforcement, search and rescue, and other administrative purposes on a limited basis.

Contractors, researchers, and other partners working in the parks would be encouraged to use snowcoaches and they would be required to use BAT snowmobiles unless non-BAT machines are necessary for a particular project and are approved in advance of use by the NPS. The need for non-BAT machines outside the parks does not constitute a reason to use the non-BAT snowmobile in the park when a BAT snowmobile or snowcoach would suffice.

NPS employees and their families living in the interior of Yellowstone (and their visitors) may continue to use snowmobiles. Subject to available funding, the NPS would provide BAT snowcoaches and snowmobiles for employee use. In order to encourage the conversion of all employee-owned snowmobiles to BAT by 2011-2012 (after the term of this temporary plan), the NPS would encourage employees to replace their non-BAT machines during the life of this plan. It is expected that beginning in the 2011-2012 season, all employee-owned snowmobiles operated in the parks must meet BAT requirements, and visitors to these employees must also use BAT snowmobiles or snowcoaches.

Concessioners and their employees and families living in the interior of Yellowstone (and their visitors) may continue to use snowmobiles. To the extent practicable (through permits and contracts), concessioners, their employees and families would be required to use BAT snowmobiles and encouraged to use snowcoaches. In order to encourage the conversion of all concession employee-owned snowmobiles to BAT by 2011-2012 (after the term of this temporary plan), the NPS would encourage concession employees to replace their non-BAT machines during the life of this plan. It is expected that beginning in the 2011-2012 season, all concession employee-owned snowmobiles operated in the parks must meet BAT requirements, and visitors to these concessioner employees must also use BAT snowmobiles or snowcoaches.

Administrative oversnow vehicle travel by NPS employees, their families, and their guests and by concession employees, their families, and their guests would occur only on groomed roads that meet safety criteria and are open for travel.

Plowed Roads

Sand, or an equally environmentally neutral substance, may be used for traction on all plowed winter roads. No salts would be used, and sand would be generally spread only in the shaded, icy, or hilly areas of plowed roads. Before spring opening, sand removal operations would be conducted on all plowed park roads.

Accessibility

This alternative continues implementation of transition and action plans for accessibility and support the philosophy of universal access in the parks. The NPS would make reasonable efforts to ensure accessibility to buildings, facilities, programs, and services.

The NPS would develop strategies to ensure that new and renovated facilities, programs, and services (including those provided by concessioners) are designed, constructed, or offered in conformance with applicable policies, rules, regulations, and standards, including but not limited to the Architectural Barriers Act of 1968, the Americans with Disabilities Act of 1990, the Uniform Federal Accessibility Standards of 1984, and the Guidelines for Outdoor Developed Areas of 1999. The NPS would evaluate existing buildings and existing and new programs, activities, and services, including telecommunications and media, to determine current accessibility and usability by disabled winter visitors. Action plans to remove barriers would be developed.

Personal Protective Equipment

Personal protective equipment is recommended for snowmobilers, including helmet, snowmobile suit and gloves, proper footwear, and hearing protection. Persons traveling by snowcoach should also wear or have access to appropriate personal protective equipment including winter clothing, footwear, and hearing protection. Non-motorized users are also recommended to wear and carry personal protective equipment as appropriate for their winter travel. For all user groups, personal protective equipment should include avalanche rescue gear (shovel, probe, and transceiver) as appropriate.

Mitigating Measures/Monitoring

Monitoring of Winter Visitor Use and Park Resources

In addition to the mitigating measures above, scientific studies and monitoring of winter visitor use and park resources (including air quality, natural soundscapes, wildlife, employee health and safety, water quality, and visitor experience) would continue. Selected areas of the parks, including sections of roads, may be closed to visitor use if studies indicate that human presence or activities have unacceptable effects on wildlife or other park resources that could not otherwise be mitigated. The appropriate level of environmental analysis under NEPA would be completed for all actions as required by the Council on Environmental Quality regulations (40 CFR 1500–1508). A one-year notice would be provided before any such closure would be implemented unless immediate closure is deemed necessary to avoid impairment of park resources.

A Monitoring and Adaptive Management Program is a key element of this Alternative (see Appendix B). Generally non-emergency changes in park management implemented under the adaptive management program would be implemented only after at least one or two years of monitoring, followed by a 6- to 12-month notification and waiting period. The superintendents would continue to have the authority under 36 CFR 1.5 to take emergency actions to protect park resources or values.

Wildlife

Bison and Roads

The NPS would implement the research proposal by Robert A. Garrott and P.J. White entitled "Evaluating Key Uncertainties Regarding Road Grooming and Bison Movements" (at http://www.nps.gov/yell/parkmgmt/winterusetechnicaldocuments.htm). This proposal specifically addresses the uncertainty recognized in the 2007 FEIS as to whether grooming of the Madison to Norris road segment (Gibbon Canyon) has led to alterations of bison movements and distribution in Yellowstone, a question identified in the report by Cormack Gates et al., "The Ecology of Bison Movements and Distribution In and Beyond Yellowstone National Park" (2005, posted at above site).

Garrott and White propose to analyze existing data on GPS-collared bison, track additional GPS-collared bison for 5 years, and deploy cameras along travel routes to gain information on the relationship between road grooming and bison travel without closing the Gibbon Canyon Road to motorized oversnow administrative vehicle travel (during this five-year period).

During the five year period, other roads or routes may be investigated to help describe the relationship between snow depth, grooming, and bison movement. For example, the Firehole Canyon Drive may be closed to oversnow travel, forcing bison to travel cross country or along the ungroomed Firehold Canyon Drive. Similarly, the Madison to Norris Road may be fenced or gated in the vicinity of the new bridge over the Gibbon River (proposed to be built in 2009) to restrict bison movement on the groomed roadway and force bison to travel cross country (while permitting snowmobile and snowcoach travel). Thus bison movement and snow depth and roads may be tested without closing a main road.

After five years of such data gathering and analysis (beyond the term of this temporary plan), the NPS would consider closing the main road between Madison and Norris in its entirety to observe bison response. It is uncertain until the five-year period of data gathering and analysis has finished whether such closure would yield informative data or conclusions. Such a closure, if determined to be appropriate, would likely be a multi-year closure.

Other recommendations of the Gates report would be evaluated as part of Yellowstone's bison management program.

Other Wildlife, Including Federally Protected Species and Species of Special Concern

At periodic intervals when snow depth warrants, routine plowing operations would include laying back roadside snow banks that could be a barrier to wildlife exiting the road corridor.

NPS personnel would patrol sensitive resource areas to ensure compliance with area closures.

The parks would continue to support the objectives of the Greater Yellowstone Bald Eagle Management Plan, and the eagle population would continue to be monitored to identify and protect nests.

Monitoring of wolves would continue.

Monitoring of grizzly bear populations would continue in accordance with the Interagency Grizzly Bear Management Guidelines and the parks' bear management plans.

Wildlife-proof garbage holding facilities for interior locations would be provided as part of regularly-occurring park operations.

Monitoring and protection of trumpeter swan habitats and nests would continue, including the closure of nest sites to public access when warranted.

Monitoring potential or known winter use conflicts would result in area closures if necessary to protect wildlife and their habitat.

If monitoring indicates that undesirable impacts are occurring, further measures including avoiding, minimizing, rectifying, reducing, or compensating for those impacts would be identified and taken.

Cultural Resources

If human remains, funerary objects, sacred objects, or objects of cultural patrimony are discovered, applicable provisions of the Native American Graves Protection and Repatriation Act of 1990 (25 USC 3001) would be followed.

Water Resources

Best management practices would be used during the construction, reconstruction, or winter plowing of trails and roads to prevent unnecessary vegetation removal, erosion, and sedimentation.

Water resource monitoring, which has not indicated a problem in recent years, would continue on an as-needed basis. If necessary, best management practices would be implemented.

Alternative 2: Continue Recent Use Levels (Preferred Alternative)

Description of the Alternative

Alternative 2 would allow 318 snowmobiles and 78 snowcoaches in Yellowstone and 50 snowmobiles in Grand Teton. These numbers are a reflection of the recent (previous five years) use trends in the parks, especially snowmobile use trends in Yellowstone. There has been a 3.6% average annual increase in daily snowmobile use since 2003-2004. The 318 number represents a maximum 8.2% increase over the next three years compared to the 2007-2008 average of 294 snowmobiles and 35 snowcoaches per day. Snowmobile numbers have averaged between about 240 and 300 for this time period, with the higher numbers seen in the last two years. This alternative would approximate that level of usage while allowing for a small level of potential growth.

Because there have been several winters with use approximating that proposed in this alternative, the NPS has actual use and monitoring information for snowmobile use levels at about 318 per day to rely upon for the analysis. That monitoring information did not indicate major adverse effects from current use levels.

One of the objectives of this EA was to provide an interim winter use plan that would have no significant impacts on park resources or values. A snowmobile use level of 318 was analyzed in the 2004 EA (also Alternative 2 in that plan), and the impacts of the alternative in that analysis were no more than moderate. Due to the short time frame for this EA, it was practical and reasoned to develop an alternative at the 318 snowmobile use level that could use previous analysis in the 2004 EA and current monitoring information.

This proposed level of use also derives from the number of snowmobile outfitters at Yellowstone's various entrances, and is specifically calculated as shown in the following table:

Table 2-1: Snowmobile limits and allocations for Alternative 2.

Entrance	Number of Snowmobile Guide Companies Under Permit or Contract to NPS	Snowmobiles authorized per Company under Alternative 2	Total
West	8	20	160
South	12 (including Flagg Ranch)	9 (with an allocation of 15 to Flagg Ranch)	114
East	1	20	20
North	1 (Xanterra)	12	12
Old Faithful	1 (Xanterra)	12	12
Total			318

Seventy-eight snowcoaches are currently permitted in Yellowstone. This alternative would carry forward the same number of snowcoaches because NPS is midway through 10-year contracts with concessioners.

For Yellowstone National Park all snowmobiles would be required to meet NPS Best Available Technology (BAT) requirements for air and sound emissions and all snowmobilers would have to travel with a commercial guide. This alternative would also manage several side-roads with temporal and spatial zoning to facilitate a variety of uses (some side-roads would be snowcoach-only in the mornings or all day, while others would be open to all OSVs all day).

Sylvan Pass would be open for oversnow travel (both motorized and non-motorized) from December 22 through March 1 each winter, subject to weather-related constraints and NPS fiscal, staff, infrastructural, equipment, and other safety-related capacities. A combination of avalanche mitigation techniques may be used, including forecasting and helicopter and howitzer dispensed explosives. The results of previous safety evaluations of Sylvan Pass by the Occupational Safety and Health Administration (OSHA) and an Operational Risk Management Assessment (ORMA) would be reviewed and updated, and the NPS would evaluate additional avalanche mitigation techniques and risk assessment tools to further improve safety and visitor access.

From March 2 to March 15, the NPS would maintain the road segment from the East Entrance to a point approximately four miles west of the entrance station to provide for

opportunities for cross-country skiing and snowshoeing. Limited snowmobile and snowcoach use would be allowed in order to provide drop-offs for such purposes.

This alternative includes an intensive monitoring and adaptive management program, outlined in Appendix B. The NPS would continue monitoring of park resources and values, including air quality, natural soundscapes, wildlife, employee health and safety, and visitor experience. This would provide the NPS with the ongoing information necessary to assess the impacts resulting from implementation of this alternative on park resources and values, and visitor access, and to make adjustments, as appropriate, in winter use management. The thresholds within the adaptive management framework are a tool for managers to help them determine if the goals and objectives of the winter use plans are being achieved. Managers would use monitoring results, along with changes in technology and other new information, to help inform future actions. Managers have at their disposal a wide variety of tools. Some of the management techniques available include adjustments in snowmobile or snowcoach use levels (up or down), adjustment in BAT requirements, visitor and guide education, timing of entries, and group sizes. Through adaptive management, if monitoring of use levels of snowmobiles and snowcoaches allowed under this alternative indicates acceptable conditions, the NPS would increase use levels to the extent acceptable conditions can be maintained. Conversely, if monitoring of use levels of snowmobiles and snowcoaches allowed under this alternative indicates unacceptable conditions, the NPS would reduce use to the levels at which acceptable conditions can be maintained.

In Grand Teton National Park, 25 snowmobiles would be allowed on Jackson Lake each day in order to provide access for ice fishing, subject to the condition that they meet BAT requirements for air and sound emissions and their operators be in possession of a valid Wyoming fishing license. The use of snowmobiles on Jackson Lake may be adjusted up or down by the Superintendent depending on the results of monitoring and adaptive management. A maximum of 40 per day would be allowed. The use of snowmobiles not meeting BAT requirements would continue to be allowed on certain designated routes in order to access inholdings or adjacent public and private lands. The interim, or three year limit, would not apply in Grand Teton.

Within the John D. Rockefeller, Jr. Memorial Parkway, 25 snowmobiles would be allowed to access the Grassy Lake Road at Flagg Ranch each day. The BAT requirement would not apply to snowmobiles using the Grassy Lake Road, and the daily entry limit would apply to snowmobiles originating a trip at Flagg Ranch. The interim, or three year limit would not apply in the Parkway.

The Continental Divide Snowmobile Trail (CDST) within both Grand Teton and the Parkway is a portion of a much longer trail that extends through northwest Wyoming to the Pinedale and Lander areas. Except for the segment of the CDST between the east boundary of Grand Teton and the vicinity of Moran Junction, this route would no longer be designated for snowmobile use, in essence converting it to a trailered segment of the CDST. Snowmobiles could be hauled by trailer between Moran Junction and Flagg Ranch, at that point connecting with the Grassy Lake Road and oversnow access to points in the Caribou-Targhee National Forest and beyond.

Key Actions

Actions Specific to Yellowstone

Routes Open to Snowmobile Use

The superintendent may open or close these routes, or portions thereof, for snowmobile travel after taking into consideration the location of wintering wildlife, adequate snowpack, public safety, and other factors. Notice of such opening or closing would be provided by one or more of the methods listed in 36 CFR 1.7(a).

The following routes are designated for snowmobile use:

- Grand Loop Road, from its junction with Upper Terrace Drive to Norris Junction
- Norris Junction to Canyon Junction
- Grand Loop Road, from Norris Junction to Madison Junction
- West Entrance Road, from the park boundary at West Yellowstone to Madison Junction
- Grand Loop Road, from Madison Junction to West Thumb
- South Entrance Road, from the South Entrance to West Thumb
- Grand Loop Road, from West Thumb to its junction with the East Entrance Road
- East Entrance Road, from the East Entrance to its junction with the Grand Loop Road
- Grand Loop Road, from its junction with the East Entrance Road to Canyon Junction
- South Canyon Rim Drive
- Lake Butte Road
- Firehole Canyon Drive, from noon to 9 p.m. only
- North Canyon Rim Drive, from noon to 9 p.m. only
- Riverside Drive, from noon to 9 p.m. only
- Cave Falls Road, with no BAT or guiding requirement, and a daily entry limit of 50 snowmobiles (which does not count against the 318 total in Yellowstone)
- Roads in the developed areas of Madison Junction, Old Faithful, Grant Village, West Thumb, Lake, East Entrance, Fishing Bridge, Canyon, Indian Creek, and Norris.

Routes Open to Snowcoach Use

The superintendent may open or close the following oversnow routes, or portions thereof, or designate new routes for snowcoach travel after taking into consideration the location of wintering wildlife, adequate snowpack, public safety, and other factors.

Notice of such opening or closing would be provided by one or more of the methods listed in 36 CFR 1.7(a).

All routes designated for snowmobile use are also open to snowcoach use. In addition, the following routes are open to snowcoaches:

- Firehole Canyon Drive, all day (7 a.m. to 9 p.m.)
- Fountain Flat Road
- North Canyon Rim Drive, all day (7 a.m. to 9 p.m.)
- Riverside Drive, all day (7 a.m. to 9 p.m.)
- Grand Loop Road from its junction with Mammoth Terrace Drive to its junction with North Entrance Road (rubber-tracked coaches only)
- Roads in the developed area of Mammoth Hot Springs (rubber-tracked coaches only)
- Grand Loop Road, from Canyon Junction to the Washburn Hot Springs overlook.

Guiding Requirements

All snowmobilers in Yellowstone, except those on the Cave Falls Road, would be required to travel with a commercial guide who is affiliated with a commercial guiding service that is authorized by contract to operate in the park.

No more than eleven snowmobiles would be permitted in a group including at least one commercial guide. That is, group numbers include the commercial guide sled(s).

All snowcoaches operating in the park would have to operate in accordance with a concessions contract. Private snowcoaches would not be allowed.

All businesses providing commercial guiding services and other commercial services in the park are required to have contracts authorizing their operation.

Snowmobile and Snowcoach Limits

Table 2-2: Yellowstone Daily Snowmobile and Snowcoach Entry Limits

Entrance	Commercially Guided Snowmobiles	Commercially Guided Snowcoaches
West Entrance	160	34
South Entrance	114	13
East Entrance	20	2
North Entrance	12	13
Old Faithful	12	16
Total	318	78

Plowed Roads

The following roads in Yellowstone would continue to be plowed:

- From the North Entrance to Mammoth Hot Springs
- From Mammoth Hot Springs to the Upper Terrace Drive
- From Mammoth Hot Springs to Tower Junction and the Northeast Entrance
- Roads within the developed areas at Mammoth Hot Springs, Tower Ranger Station, Lamar Ranger Station, Northeast Entrance, and Gardiner.

Non-Motorized Access

Backcountry non-motorized use would continue to be allowed throughout the park (see the "sensitive areas" exception below), subject to the Winter Severity Index program. The program restricts backcountry use of the park when winter snowpack and weather conditions become severe and appear to be adversely affecting wildlife.

Snow road edges may continue to have track set for skiing where feasible.

About 35 miles of roads would continue to be groomed for cross-country skiing in Yellowstone. These are mainly roads used by summer vehicles, but which are closed to oversnow vehicle travel. These roads may continue to be machine groomed for skiing. Existing and new routes could be evaluated in the future, and changes announced through one or more of the methods listed in 36 CFR 1.7(a). The Virginia Cascades Road in Yellowstone may be groomed for skiing.

Ski and snowshoe use of the South Entrance Road and East Entrance Road, as noted above, would be allowed to continue after the balance of roads close to winter operations (during spring plowing). When spring plowing operations approach the entrances, the roads would then be closed to skiing and snowshoeing for safety concerns. Bear management closures of the park's backcountry would continue as in previous years.

Sensitive areas within the inner gorge of the Grand Canyon of the Yellowstone and the McMinn Bench bighorn sheep area would continue to be closed to recreational winter use.

East Entrance Road

Sylvan Pass would be open for oversnow travel (both motorized and non-motorized) for a limited core season, from December 22 through March 1 each winter, subject to weather-related constraints and NPS fiscal, staff, infrastructural, equipment, and other safety-related capacities. A combination of avalanche mitigation techniques may be used, including forecasting and helicopter and howitzer dispensed explosives. The results of previous safety evaluations of Sylvan Pass by OSHA and an Operational Risk Management Assessment would be reviewed and updated, and the NPS would evaluate additional avalanche mitigation techniques and risk assessment tools in order to further improve safety and visitor access.

From March 2 to March 15, the NPS would maintain the road segment from the East Entrance to a point approximately four miles west of the entrance station to provide for opportunities for cross-country skiing and snowshoeing. Limited snowmobile and snowcoach use would be allowed in order to provide drop-offs for such purposes. In addition, from March 2 to March 15, the road segment between Fishing Bridge and Lake Butte Overlook would be maintained for oversnow vehicle travel, subject to weather-related safety constraints.

Speed Limits

The speed limit from the West Entrance to Madison to Old Faithful would remain at 35 mph. The remaining snow-roads have a 45 mph limit, except where posted at lower speeds in designated segments to protect wildlife and natural soundscapes and to enhance visitor safety.

Winter Oversnow Vehicle Season

In general, Yellowstone's winter season would begin December 15 and close March 15 each year. Actual opening or closing dates for oversnow travel would be determined by adequate snowpack or snow water equivalency. Early closures of the Grand Loop Road, from its junction with Upper Terrace Drive to Madison Junction and from Norris Junction to Canyon and Fishing Bridge Junction, would occur to facilitate spring plowing. To protect road surfaces, the NPS would continue to implement temporary vehicle type restrictions (for example, rubber-tracked vehicles only), as necessary. As discussed above, Sylvan Pass would be open for a limited core season, from December 22 to March 1 each year, subject to weather-related safety constraints and NPS fiscal, staff, infrastructural, equipment, and other safety-related capacities.

In Yellowstone, the NPS would continue to plow the roads from Gardiner to Mammoth, Mammoth to Tower, and Tower to the Northeast Entrance (Cooke City) throughout the winter. U.S. Highway 191 would continue to be plowed in Yellowstone. Rubber tracked vehicles would not be allowed on these roads.

Facilities

Warming huts may be available for visitor use at Old Faithful, Norris, Madison, Canyon, Fishing Bridge, Indian Creek, Mammoth Terraces, and other appropriate sites.

Actions Specific to Grand Teton and the Parkway

Routes Open to Snowmobile Use

The superintendent may open or close these routes, or portions thereof, for snowmobile travel and may establish separate zones for motorized and non-motorized use on Jackson Lake, after taking into consideration the location of wintering wildlife, adequate snowpack, public safety and other factors. Notice of such opening or closing would be provided by one or more of the methods listed in 36 CFR 1.7(a).

The following routes are designated for snowmobile use:

- The CDST along U.S. 26/287, from the east boundary of GTNP to the vicinity of Buffalo Fork River.
- In the developed area of Flagg Ranch.

- U.S. 89/191/287 from Flagg Ranch to the north boundary of the Parkway.
- Grassy Lake Road (Flagg-Ashton Road), from Flagg Ranch to the west boundary of the Parkway.
- The frozen surface of Jackson Lake for purposes of ice fishing by persons possessing a valid Wyoming state fishing license and the proper fishing gear. Jackson Lake would be open generally from the time that the ice reaches sufficient thickness to make the lake safe for snowmobile use. The season would extend until late March or early April, depending on lake conditions, public safety, and resource concerns.

Routes Open to Snowcoach Use

The superintendent may open or close these oversnow routes, or portions thereof, or designate new routes for snowcoach travel after taking into consideration the location of wintering wildlife, adequate snowpack, public safety, and other factors. Notice of such opening or closing would be provided by one or more of the methods listed in 36 CFR 1.7(a).

- U.S. Highway 89/191/287, from Flagg Ranch to the north boundary of the Parkway.
- In the developed area of Flagg Ranch.

Guiding Requirements

Snowmobile use on Jackson Lake and the Grassy Lake Road would not require the use of commercial guides; however, requests to provide commercial guiding services would be considered by the NPS. Snowmobiles being operated between Flagg Ranch and the South Entrance of Yellowstone must be accompanied by a guide.

All snowcoaches operating in the Parkway would have to be operated in accordance with a concessions contract, or other NPS-issued permit.

Snowmobile Limits

Table 2-3: Grand Teton and the Parkway Daily Snowmobile Entry Limits

Entrance	Snowmobiles
Grassy Lake Road (Flagg-Ashton Road)	25*
Jackson Lake	25**
Total	50

* As measured by counting snowmobiles originating a westbound trip at Flagg Ranch.

** The use of snowmobiles on Jackson Lake may be adjusted up or down by the Superintendent depending on the results of monitoring and adaptive management. A maximum of 40 per day would be allowed.

Non-Motorized Access

Non-motorized winter use would continue to be managed consistent with prior decisions and rules.

Snow road edges may continue to have track set for skiing where feasible.

About 15 miles of the Teton Park Road are currently groomed for cross-country skiing in Grand Teton. This road may continue to be machine groomed for skiing.

Plowed Roads

In GTNP and the Parkway, the following roads would continue to be plowed:

- Highway 26/89/191, from the south boundary of GTNP to Moran
- Highway 89/191/287, from Moran to Flagg Ranch
- Highway 26/287, from Moran to the east boundary of GTNP
- Teton Park Road, from Moose Junction to Taggart Lake Trailhead
- Teton Park Road, from Jackson Lake Junction to Signal Mountain Lodge
- Pacific Creek Road, from Highway 89/191/287 to the GTNP boundary
- Gros Ventre Road, from Gros Ventre Junction to east boundary, via Kelly and Kelly Warm Springs
- The road from Kelly to end of pavement, approximately two miles north of Mailbox Corner
- Teton Science School Road to the east boundary
- The Moose–Wilson Road, from the Granite Canyon Entrance to the Granite Canyon Trailhead

Current winter closures would remain in effect on the Snake River floodplain, the Buffalo Fork River floodplain, and the Uhl Hill area, Willow Flats, Kelly Hill, Static Peak, Prospectors Mountain, and Mount Hunt.

Motorized access to inholdings and adjacent public and private lands would continue to be available through a combination of plowed roads for wheeled vehicles and staging areas for snowmobiles traveling to immediately adjacent lands.

Reasonable and direct access to adjacent public and private lands, or to privately owned lands within the park with permitted or historical motorized access, would continue via paved and plowed routes or via oversnow routes from GTNP.

Snowmobiles that meet the best available technology requirements would be phased in for administrative use, subject to the availability of funding during the term of this temporary plan. The NPS, and other parties authorized by the NPS, may continue to use non-BAT snowmobiles where necessary for specialized purposes, such as search and rescue, law enforcement, facility repair and maintenance, and other emergency operations.

Destination and support facilities may continue to be provided at Moose, Triangle X, Colter Bay, and Flagg Ranch, and warming hut facilities may be available along the Teton Park Road to provide visitor services and interpretive opportunities.

Winter Season

The winter use season would generally coincide with the season established for Yellowstone, from December 15 to March 15 each year. Actual opening or closing dates for oversnow travel would be determined by adequate snowpack, snow water equivalency, or the condition of the frozen surface of Jackson Lake, as applicable.

Grassy Lake Road

The approximately 6 mile portion of the Grassy Lake (Flagg - Ashton) Road within the Parkway is currently, and historically has been, groomed by the Fremont County, Idaho, Department of Parks and Recreation. The grooming of this route is performed in conjunction with grooming of the snowmobile route through the Caribou-Targhee National Forest. In the event that Fremont County ever chooses not to, or is unable to continue grooming the road, the National Park Service does not intend to undertake that responsibility. Therefore, unless another other entity were available to provide that service, that portion of the Grassy Lake (Flagg – Ashton) Road within the Parkway would no longer be designated as being open to oversnow vehicle use.

Actions and Assumptions Common to all Park Units

Emergency Action

None of the actions in this alternative preclude closures for safety, resource protection, or other reasons as identified in 36 CFR 1.5 or 2.18. The superintendents would continue to have the authority under 36 CFR 1.5 to take emergency actions to protect park resources or values.

Administrative Use

Non-recreational, administrative use of snowmobiles would be allowed by park personnel or parties duly permitted under the provisions of 36 CFR 1.5 and 1.6. Permitted parties must meet BAT requirements unless specifically authorized otherwise by the park superintendent. Such use would not count against daily recreational entry limits and would not be subject to guiding requirements.

Administrative use of snowmobiles may be supplemented with administrative snowcoaches. When administrative snowmobiles are necessary, the NPS would generally use BAT snowmobiles. Some non-BAT snowmobiles would be permitted for law enforcement, search and rescue, and other administrative purposes on a limited basis.

Contractors, researchers, and other partners working in the parks would be encouraged to use snowcoaches and they would be required to use BAT snowmobiles unless non-BAT machines are necessary for a particular project and are approved in advance of use by the NPS. The need for non-BAT machines outside the parks does not constitute a reason to use the non-BAT snowmobile in the park when a BAT snowmobile or snowcoach would suffice.

NPS employees and their families living in the interior of Yellowstone (and their visitors) may continue to use snowmobiles. Subject to available funding, the NPS would provide BAT snowcoaches and snowmobiles for employee use. In order to complete the conversion of all employee-owned snowmobiles to BAT by 2011-2012 (after this temporary plan has ended), the NPS would encourage employees to replace their non-BAT machines during the life of this plan. It is expected that beginning in the 2011-2012 season, all employee-owned snowmobiles operated in the parks must meet BAT requirements, and visitors to these employees must also use BAT snowmobiles or snowcoaches.

Concessioners and their employees and families living in the interior of Yellowstone (and their visitors) may continue to use snowmobiles. To the extent practicable (through permits and contracts), concessioners, their employees and families would be required to use BAT snowmobiles and encouraged to use snowcoaches. In order to complete the conversion of all concession employee-owned snowmobiles to BAT by 2011-2012 (after this temporary plan has ended), the NPS would encourage concession employees to replace their non-BAT machines during the life of this plan. It is expected that beginning in the 2011-2012 season, all concession employee-owned snowmobiles operated in the parks must meet BAT requirements, and visitors to these concessioner employees must also use BAT snowmobiles or snowcoaches.

Administrative oversnow vehicle travel by NPS employees, their families, and their guests and by concession employees, their families, and their guests would occur only on groomed roads that meet safety criteria and are open for travel. Between December 22 and March 1, Sylvan Pass would only be open for administrative travel when the pass is open to the public.

Hours of Operation

Motorized travel from 9 p.m. to 7 a.m. would be prohibited except for emergency purposes or when approved by the superintendent for administrative use or by special permit for necessary travel. Yellowstone's East Entrance would open to recreational snowmobile and snowcoach travel no earlier than 8 a.m.

Plowed Roads

Sand, or an equally environmentally neutral substance, may be used for traction on all plowed winter roads. No salts would be used, and sand would be generally spread only in the shaded, icy, or hilly areas of plowed roads. Before spring opening, sand removal operations would be conducted on all plowed park roads.

Accessibility

This alternative continues implementation of transition and action plans for accessibility and support the philosophy of universal access in the parks. The NPS would make reasonable efforts to ensure accessibility to buildings, facilities, programs, and services.

The NPS would develop strategies to ensure that new and renovated facilities, programs, and services (including those provided by concessioners) are designed, constructed, or offered in conformance with applicable policies, rules, regulations, and standards, including but not limited to the Architectural Barriers Act of 1968, the Americans with Disabilities Act of 1990, the Uniform Federal Accessibility Standards of 1984, and the

Guidelines for Outdoor Developed Areas of 1999. The NPS would evaluate existing buildings and existing and new programs, activities, and services, including telecommunications and media, to determine current accessibility and usability by disabled winter visitors. Action plans to remove barriers would be developed.

Personal Protective Equipment

Personal protective equipment is recommended for snowmobilers, including helmet, snowmobile suit and gloves, proper footwear, and hearing protection. Persons traveling by snowcoach should also wear or have access to appropriate personal protective equipment including winter clothing, footwear, and hearing protection. Non-motorized users are also recommended to wear and carry personal protective equipment as appropriate for their winter travel. For all user groups, personal protective equipment should include avalanche rescue gear (shovel, probe, and transceiver) as appropriate.

Measures to Minimize Environmental Harm

Best Available Technology (BAT)

If the EPA adopts standards for any class of oversnow vehicle that are more stringent than the requirements resulting from this NEPA process and decision, the EPA standards would replace the NPS standard.

The NPS recommends the use of environmentally preferred fuels and lubricants for all motorized winter vehicle use for all alternatives. For example, this could include lubricants meeting the EPA "highly biodegradable" classification, and fuels like biodiesel and ethanol blends. Additionally, the NPS encourages the use of fuel-efficient winter vehicles in the parks.

Revisions to testing procedures may be described and implemented per NPS procedures used to certify a snowmobile or snowcoach as BAT.

Individual snowcoaches or snowmobiles may be subject to periodic inspections to determine compliance with the emission and sound requirements.

Snowmobile BAT

All recreational snowmobiles operating in the parks must meet BAT requirements, except:

- Snowmobiles traveling on the Grassy Lake Road to and from Flagg Ranch would be exempt from BAT requirements.
- Snowmobiles using the Cave Falls Road in Yellowstone would not be required to be BAT.
- Snowmobiles using routes within Grand Teton established to allow access to inholdings or adjacent public or private lands.
- Snowmobiles using the portion of the CDST between the east park boundary and Moran Junction.

The superintendents would maintain a list of approved snowmobile makes, models, and years of manufacture that meet the BAT requirements and a procedure to certify a

snowmobile as BAT. The list would be posted on the park website, and notice would be provided by one or more of the methods listed in 36 CFR 1.7(a).

The NPS anticipates that snowmobile manufacturers would conduct research to continually improve sound and emissions in available machines. Information on the full spectrum of pollutant criteria is critical to prevent an inadvertent increase in some pollutants.

Once approved, a snowmobile would be certified as BAT for a period of six years. In the absence of new emissions and sound information, after six years a snowmobile make and model would no longer be BAT-certified and its use would not be allowed in the parks. In recognition of the possibility that some privately owned snowmobiles used for ice fishing on Jackson Lake may have relatively low mileage after a period of 6 years, the certification for these snowmobiles may be extended up to a total of 10 years, as long as the mileage of the individual machine does not exceed 6,000 miles.

Snowmobiles that have been modified in a manner that may affect air or sound emissions may be prohibited by the superintendent.

In addition, all critical snowmobile emission, sound and odometer-related components that were originally installed by the manufacturer must be in place and functioning properly. Such components may only be replaced with the original equipment manufacturer (OEM) component or its equivalent. If OEM parts are not available, aftermarket parts may be used if they do not worsen sound or emission characteristics.

Snowmobile Air Emissions Requirements

All snowmobiles must achieve a 90% reduction in hydrocarbons and a 70% reduction in carbon monoxide emissions, relative to EPA's baseline emissions assumptions for conventional two-stroke snowmobiles. Specifically, beginning with the 2005 model year, all snowmobiles must be certified under 40 CFR 1051 and 1065 to a Family Emission Limit no greater than 15 g/kW-hr for hydrocarbons and 120 g/kW-hr for carbon monoxide. If the existing procedures or requirements of 40 CFR 1051 and 1065 and the Family Emission Limit are superseded, all snowmobiles must be certified by their manufacturer to meet the above emission requirements.

For 2004 model year snowmobiles, measured emissions levels (official emission results with no deterioration factors applied) must comply with the emission limits specified above.

Pre-2004 model year snowmobiles may be operated only if they have been shown to have emissions that do not exceed the limits specified above.

Snowmobiles must be tested on a five-mode engine dynamometer, consistent with the existing test procedures specified by EPA (40 CFR 1051 and 1065).

Snowmobile Sound Requirements

Snowmobiles must operate at or below 73dBA as measured at full throttle according to Society of Automotive Engineers (SAE) J192 test procedures (revised 1985).

Snowmobiles may be tested at any barometric pressure equal to or above 23.4 inches Hg uncorrected (as measured at or near the test site).

The NPS recognizes that the SAE procedures changed in 2003 and are continuing to change; thus the 2003 procedures may be supplanted. The NPS intends to continue to work with industry to update the BAT sound measurement procedures. NPS would consider such new protocols or procedures as they are modified by SAE.

Snowcoach Air Emission and Sound Requirements

During the duration of this temporary plan, all non historic snowcoaches must meet air emission requirements, which will be the EPA emissions standards in effect when the vehicle was manufactured. This will be enforced by ensuring that all critical emission-related exhaust components are functioning properly. Malfunctioning critical emissions-related components must be replaced with the original equipment manufacturer (OEM) component where possible. If OEM parts are not available, aftermarket parts may be used. In general, catalysts that have exceeded their useful life must be replaced unless the operator can demonstrate the catalyst is functioning properly. Modifying or disabling a snowcoaches' original pollution control equipment is prohibited except for maintenance purposes. Individual snowcoaches may be subject to periodic inspections to determine compliance with emission and sound requirements.

However, for the duration of this plan, the NPS will encourage snowcoach operators to replace or retrofit their coaches with models that meet higher emission standards. In the 2007 FEIS, the NPS anticipated that snowcoach air and sound emission requirements would go into effect in 2011-2012, after the duration of this temporary plan. Thus these recommendations will assist snowcoach operators anticipating future possible requirements.

During these intervening years, the NPS will recommend that diesel vehicles with a Gross Vehicle Weight Rating (GVWR) of 8,500 pounds or more meet, at a minimum, the EPA 2004 "engine configuration certified" diesel air emission standards. The NPS will further recommend that diesel vehicles meet the 2007 "engine configuration certified" air emission standard. If a new vehicle is being purchased, the NPS recommends that operators confirm that the vehicle has, at a minimum, an engine that meets the 2004 standard. If it is the operator's intention to purchase a vehicle with the newest diesel emission technology, the NPS recommends that the vehicle has a "2007 standard" engine. If a diesel engine is being purchased for retrofit into an existing vehicle, the above recommendations apply. If the diesel vehicle has a GVWR between 8,500 and 10,000 pounds, there may be a configuration that meets the EPA light duty Tier II standards, which would achieve the best results from an emissions perspective.

For air emissions from gasoline vehicle air emissions, the NPS will recommend the vehicle's engine meet EPA Tier 1 emission requirements. The NPS will further recommend that gasoline vehicles meeting EPA Tier II requirements be used. If a new vehicle is being purchased, the NPS will recommend the vehicle has, at a minimum, an engine that meets the Tier I requirements or more ideally, the vehicle will meet Tier II requirements. If an existing gasoline engine and exhaust system is being retrofitted, the vehicle should have, at a minimum, a computer controlled, port-fuel injected engine and a catalytic converter in the exhaust system (Bishop 2007).

Regarding the sound emission recommendations, the NPS will recommend that new and retrofitted snowcoaches not exceed 73 dBA when measured by operating the coach at or near full throttle for the test cycle. Thus a coach might be travelling at a speed of 25-30

miles per hour for the passby test to determine if the vehicle produces no more than 73 dBA.

Monitoring of Winter Visitor Use and Park Resources

Scientific studies and monitoring of winter visitor use and park resources (including air quality, natural soundscapes, wildlife, employee health and safety, water quality, and visitor experience) would continue. Selected areas of the parks, including sections of roads, may be closed to visitor use if studies indicate that human presence or activities have unacceptable effects on wildlife or other park resources that could not otherwise be mitigated. The appropriate level of environmental analysis under NEPA would be completed for all actions as required by the Council on Environmental Quality regulations (40 CFR 1500–1508). A one-year notice would be provided before any such closure would be implemented unless immediate closure is deemed necessary to avoid impairment of park resources.

A Monitoring and Adaptive Management Program is a key element of this Alternative (see Appendix B). Generally non-emergency changes in park management implemented under the adaptive management program would be implemented only after at least one or two years of monitoring, followed by a 6- to 12-month notification and waiting period. The superintendents would continue to have the authority under 36 CFR 1.5 to take emergency actions to protect park resources or values.

Wildlife

Bison and Roads

The NPS would implement the research proposal by Robert A. Garrott and P.J. White entitled "Evaluating Key Uncertainties Regarding Road Grooming and Bison Movements" (at http://www.nps.gov/yell/parkmgmt/winterusetechnicaldocuments.htm). This proposal specifically addresses the uncertainty as to whether grooming of the Madison to Norris road segment (Gibbon Canyon) has led to alterations of bison movements and distribution in Yellowstone, a question identified in the report by Cormack Gates et al., "The Ecology of Bison Movements and Distribution In and Beyond Yellowstone National Park" (2005, posted at above site).

Garrott and White propose to analyze existing data on GPS-collared bison, track additional GPS-collared bison for 5 years, and deploy cameras along travel routes to gain information on the relationship between road grooming and bison travel without closing the Gibbon Canyon Road to public motorized oversnow vehicle travel (during this five-year period).

During the five year period, other roads or routes may be investigated to help describe the relationship between snow depth, grooming, and bison movement. For example, the Firehole Canyon Drive may be closed to oversnow travel, forcing bison to travel cross country or along the ungroomed Firehold Canyon Drive. Similarly, the Madison to Norris Road may be fenced or gated in the vicinity of the new bridge over the Gibbon River (proposed to be built in 2009) to restrict bison movement on the groomed roadway and force bison to travel cross country (while permitting snowmobile and snowcoach travel). Thus bison movement and snow depth and roads may be tested without closing a main road.

After five years of such data gathering and analysis (beyond the term of this temporary plan), the NPS would consider closing the main road between Madison and Norris in its entirety to observe bison response. It is uncertain until the five-year period of data gathering and analysis has finished whether such closure would yield informative data or conclusions. Such a closure, if determined to be appropriate, would likely be a multi-year closure.

Other recommendations of the Gates report would be evaluated as part of Yellowstone's bison management program.

Other Wildlife, Including Federally Protected Species and Species of Special Concern

At periodic intervals when snow depth warrants, routine plowing operations would include laying back roadside snow banks that could be a barrier to wildlife exiting the road corridor.

NPS personnel would patrol sensitive resource areas to ensure compliance with area closures.

The parks would continue to support the objectives of the Greater Yellowstone Bald Eagle Management Plan, and the eagle population would continue to be monitored to identify and protect nests.

Monitoring of wolves would continue.

Monitoring of grizzly bear populations would continue in accordance with the Interagency Grizzly Bear Management Guidelines and the parks' bear management plans.

Wildlife-proof garbage holding facilities for interior locations (including Old Faithful Snowlodge) would be provided as part of regularly-occurring park operations.

Monitoring and protection of trumpeter swan habitats and nests would continue, including the closure of nest sites to public access when warranted.

Monitoring potential or known winter use conflicts would result in area closures if necessary to protect wildlife and their habitat.

If monitoring indicates that undesirable impacts are occurring, further measures including avoiding, minimizing, rectifying, reducing, or compensating for those impacts would be identified and taken.

Cultural Resources

If human remains, funerary objects, sacred objects, or objects of cultural patrimony are discovered, applicable provisions of the Native American Graves Protection and Repatriation Act of 1990 (25 USC 3001) would be followed.

Water Resources

Best management practices would be used during the construction, reconstruction, or winter plowing of trails and roads to prevent unnecessary vegetation removal, erosion, and sedimentation.

Water resource monitoring, which has not indicated a problem in recent years, would continue on an as-needed basis. If necessary, best management practices would be implemented.

Environmentally Preferred Alternative

The environmentally preferred alternative is the alternative that promotes the national environmental policy as expressed by §101 of the National Environmental Policy Act. That section states that it is the responsibility of the federal government to improve and coordinate federal plans, functions, programs, and resources "to the end that the Nation may:

- Fulfill the responsibilities of each generation as trustee of the environment for succeeding generations;
- Ensure for all Americans safe, healthful, productive, and aesthetically and culturally pleasing surroundings;
- Attain the widest range of beneficial uses of the environment without degradation, risk of health or safety, or other undesirable and unintended consequences;
- Preserve important historic, cultural, and natural aspects of our national heritage and maintain, wherever possible, an environment that supports diversity and variety of individual choice;
- Achieve a balance between population and resource use that will permit high standards of living and a wide sharing of life's amenities; and
- Enhance the quality of renewable resources and approach the maximum attainable recycling of depletable resources."

In this analysis, Alternative 2 would fulfill the responsibilities of our generation as trustee of the environment because all park resources would be preserved. Yellowstone impacts would only be seen for the life of this plan—3 years—and all resource impacts are moderate or less (and only for soundscapes, and public and employee health and safety). Alternative 2 would also ensure for all Americans safe, healthful, productive, and aesthetically and culturally pleasing surroundings more so than Alternative 1, under which few people would get to experience Yellowstone in winter. Alternative 2's provisions for commercial guiding and BAT technology would assure safe and healthful surroundings, as well. Alternative 2 would provide for a much wider range of uses of the environment than Alternative 1, which would only allow visitors to enter the park on foot, ski, or snowshoe. The visitation limits of Alternative 2, along with the BAT use and mandatory guiding, would preserve Yellowstone and Grand Teton's cultural, historic, and natural heritage. While Alternative 1 would also provide for this, it would not provide a diversity of individual choice, for most visitors would find it impossible to enjoy park amenities. Neither alternative would consume park resources, but Alternative 1 would not allow most people to enjoy Yellowstone's amenities because the parks would be effectively closed.

In sum, Alternative 2 in this EA balances the preservation of nature with human visitation better than does Alternative 1, and so Alternative 2 is the environmentally preferred alternative according to the criteria stated above. While Alternative 1 would certainly preserve nature, it would hardly allow any people to experience the sights of Yellowstone and Grand Teton. Alternative 2, in short, achieves the two halves of the NPS mission better than Alternative 1 does.

Table 2-4: Summary and Comparison of Alternatives

	Alternative 1: No Action	Alternative 2: Continue Recent Use Levels
General Description	Recreational oversnow vehicle access would cease in all 3 parks	Allows for levels of snowmobile and snowcoach use approximating the past several winters.
Daily Snowmobile Limits in Yellowstone	Snowmobiles prohibited	318 Snowmobiles/day: West-160; South-114; East-20; North-12; Old Faithful-12
Daily Snowmobile Limits in Grand Teton National Park and the John D. Rockefeller, Jr. Memorial Parkway	Snowmobiles prohibited	50 snowmobiles/day: 25 on Grassy Lake Road and 25 on Jackson Lake
Snowmobile Guide Requirements	Snowmobiles prohibited	Commercial guides required for all snowmobiling visitors in Yellowstone; not required in Grand Teton or on the Grassy Lake Road in the Parkway (but required from Flagg Ranch to Yellowstone's South Entrance)
Best Available Technology Requirements for Snowmobiles	Snowmobiles prohibited	All must be BAT in Yellowstone. In GTNP, all snowmobiles on Jackson Lake must be BAT, but not those on Grassy Lake Road
Maximum Group Size	Snowmobiles prohibited	11 with one guide
Use of YNP Side Roads by Snowmobiles	Snowmobiles prohibited	Washburn Overlook and Freight Road: snowcoach only. Firehole Canyon Drive, Canyon North Rim Drive and Riverside Drive: open in afternoon to snowmobiles. Lake Butte and Canyon South Rim: open to snowmobiles. Virginia Cascades: non-motorized only.
Daily Snowcoach Limits in YNP and Snowcoach BAT	Snowcoaches prohibited	78 Snowcoaches per day: West-34, South-13, East-2, Old Faithful-16,

	Alternative 1: No Action	Alternative 2: Continue Recent Use Levels
		North-13. All are encouraged to meet snowcoach BAT.
Road Grooming	No road grooming for visitors	Road grooming would be done for visitor use.
Non-motorized use in YNP (no changes planned for GTNP)	Allowed subject to Winter Severity Index	Allowed subject to Winter Severity Index
Estimated maximum number of daily vehicle passengers in YNP	None	636 via snowmobile (2 passengers per machine) + 936 via snowcoach (estimated at 12 per coach)

Table 2-5: Summary and Comparison of Impacts

	Alternative 1: No Action	Alternative 2: Continue Recent Use Levels
Wildlife	Negligible impacts because no oversnow motorized visitor use would be permitted.	Negligible to minor direct, short-term, and adverse impacts, due to moderate levels of visitor use (with possible moderate effects on swans and eagles). Guiding would minimize most such effects.
Soundscapes	Minor impacts because no oversnow motorized visitor use would be permitted but administrative use and sound from West Yellowstone would continue.	Negligible to moderate direct, short-term, and adverse impacts, due to audibility and maximum sound levels in Yellowstone; effects in Grand Teton and the Parkway would be minor.
Socioeconomic environment	Impacts would range from beneficial, negligible to major, adverse, resulting from direct and indirect actions. All would be long-term and regional, and are due to the termination of oversnow visitor use.	Negligible, beneficial to minor adverse, long-term and regional, because oversnow visitor use would continue at current levels, but at levels reduced over historic levels.
Air Quality	Negligible, direct, adverse, and lasting for the duration of this plan, because no oversnow motorized visitor use would be permitted in Yellowstone. In Grand Teton and the Parkway, effects would be long-term, negligible, direct, and adverse.	Negligible, direct, adverse, and lasting for the duration of this plan because BAT technologies and strict visitor limits will limit emissions in Yellowstone. In Grand Teton and the Parkway, effects would be long-term, negligible, direct, and adverse.
Public and Employee	Moderate, adverse, short to long-term, and direct effects on	Moderate, adverse, direct, and long-term impacts for both visitors and

	Alternative 1: No Action	Alternative 2: Continue Recent Use Levels
Health and Safety	employees due to rougher roads and possible high snowmobile noise exposure levels; effects on visitors would be negligible.	employees due to possible high snowmobile noise exposure levels and avalanche danger at Sylvan Pass but mitigated in several ways in Yellowstone. In Grand Teton, risk levels would be expected to be less, so effects there are predicted to be minor, direct, adverse, and long-term.
Visitor Access and Circulation	In Yellowstone, effects would be major, adverse, direct, and long-term impacts to most visitors due to termination of oversnow vehicle access; the minority of the public that desires reduced or eliminated snowmobile access would experience beneficial, major, direct, and long-term impacts. In Grand Teton and the Parkway, effects would be long-term, direct, minor, and adverse because access to Jackson Lake and Grassy Lake Road would cease.	In Yellowstone, effects would be minor, long-term, adverse (or beneficial for those who wish to see fewer snowmobiles in the parks), and direct because all current routes would be open to oversnow (both snowmobiles and snowcoaches) vehicle travel, including the East Entrance road/Sylvan Pass. In Grand Teton and the Parkway, effects would be long-term, direct, minor, and beneficial because access to Jackson Lake and Grassy Lake Road would continue.
Visitor Experience	In Yellowstone, effects would be major, adverse, long-term, and direct due to the closure of most park roads to oversnow vehicle travel. In Grand Teton and the Parkway, effects would be direct, long-term, minor, and adverse, due to closure of park roads to snowmobiles, although some visitors might characterize the effect as beneficial for the same reason.	In Yellowstone, effects would be minor, adverse, long-term, and direct because visitation would be possible (enabling enjoyment of wildlife, scenery, clean air and silence), but limited, and roads could be rough. In Grand Teton and the Parkway, effects would be long-term, direct, beneficial, and minor, because OSV visitation would remain possible; however, some visitors might characterize the effect as adverse for the same reason.

Table 2-6: How Each Alternative Meets Project Desired Conditions and Objectives

Desired Conditions and Objectives (from *Purpose and Need*).	Alternative 1: No Action	Alternative 2: Continue Recent Use Levels
Visitors have a range of appropriate winter recreation opportunities from primitive to developed. Winter recreation complements the unique characteristics of each landscape within the ecosystem.	Does not meet objective	Meets objective
Recreational experiences are offered in an appropriate setting; they do not take place where they will irreparably impact air quality, wildlife, cultural areas, the experiences of other park visitors, or other park values and resources.	Meets objective	Meets objective
Provide the public with some degree of certainty about how winter use will be managed in the parks for an interim period in Yellowstone.	Meets objective	Meets objective
Provide a structure for winter use management in the parks for an interim period in Yellowstone.	Meets objective	Meets objective
Provide an interim winter use plan in Yellowstone, pending court decisions and NPS response that will have no significant adverse effects on park resources or values.	Meets objective	Meets objective
High quality facilities are provided in parks to support the need for safety and enhanced visitor experiences.	Meets objective	Meets objective
Conflicts among user groups are minimal.	Meets objective	Meets objective
Visitors know how to participate safely in winter use activities without damaging resources.	Meets objective	Meets objective
Oversnow vehicle sound and emission levels are reduced to protect employee and public health and safety, enhance visitor experience, and protect natural resources.	Meets objective	Meets objective

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CHAPTER 3: AFFECTED ENVIRONMENT

Introduction

This chapter describes the environmental conditions of the area that could be affected by the alternatives being considered. This description is intended to present only the information necessary to provide a basis for understanding and comparing the impacts, both beneficial and adverse, of the alternatives presented in *Environmental Consequences*. As such, data and analyses are commensurate with the importance of the impacts. The importance of the impact is reflected largely by its relationship to a major issue, as presented in *Purpose and Need*.

The 2007 FEIS made comparisons to both the historic conditions prevailing in the parks in the 1990s as well as to the current conditions prevailing more recently. For this document, though, the baseline conditions ARE the current conditions (for soundscapes, existing ambient conditions), so comparisons with historic conditions will not be made systematically. Rather, the baseline will be considered the average use occurring in the last five winters: 240-300 snowmobiles per day and about 25-35 snowcoaches per day.

Supplementary information or greater detail regarding the topics in this section may be found in an appendix or in a separate document incorporated by reference. Necessary citations about where such materials may be found are presented with each individual topic. New information, where it exists, is presented in a separate section under each impact topic.

Wildlife

The affected environment for impacts to wildlife is generally limited to activities that occur within the parks, as discussed below. Some discussions include possible impacts to wildlife on adjacent lands or in the GYA.

Regulatory and Policy Overview

Wildlife and wildlife habitats are highly valued park resources and are addressed as such in the Organic Act. All policy statements regarding the conservation of park resources and values therefore apply to wildlife. Avoidance of unacceptable impacts (NPS 2006: 1.4.7.1) is notable in this regard, as it applies to all park resources and values. Park managers must not allow uses that would cause unacceptable impacts: i.e., those which would impede the attainment of desired conditions for natural resources, or diminish opportunities for current or future generations to enjoy and be inspired by those resources.

As regards biologic resources, NPS Management Policies provide general principles for managing wildlife, including restoration and preservation dictates. In particular, the management policies state, “The Service will successfully maintain native plants and animals by preserving and restoring the natural abundances, diversities, dynamics, distributions, habitats, and behaviors of native plant and animal populations and the communities and ecosystems in which they occur” (NPS 2006: 4.4.1). Further emphasis is placed on the management of threatened or endangered species: “The Service will survey for, protect, and strive to recover all species native to national park system units that are listed under the Endangered Species Act” (NPS 2006: 4.4.2.3).

The general Management Policies wildlife directive is consistent with the North American Wildlife Conservation Model (NAWCM), which is the model utilized by the NPS and most (if

not all) federal and state agencies managing wildlife. That model stipulates that fish and wildlife belong to all North American citizens, and that those resources are to be managed in such a way that their populations will be sustained forever. Clearly, the emphasis on this model and in the Management Policies is on managing wildlife at the population level, although certain laws (such as the Endangered Species Act and the Migratory Bird Act) do require emphasis on individuals in special situations.

The NPS's snowmobile regulation, 36 CFR 2.18, provides that snowmobile use is not to "disturb wildlife or damage park resources." That does not mean that any disturbance of an individual animal precludes snowmobile use. That regulation does not create a new or different standard of wildlife management along snowmobile routes, but simply ensures that normal NPS wildlife management standards are met, that no unacceptable conditions are present, and that no impairment is suffered. As NPS noted in 1982 when promulgating that provision, "by conforming the regulation dealing with route designation to existing Service policy, this revision will provide a greater degree of Servicewide uniformity" (47 *Federal Register* 11598, March 17, 1982). NPS later used nearly identical language in its regulation on bicycle use, 36 CFR 4.30 (allowing designation of bicycle routes if they "will not disturb wildlife or park resources"), explaining that "the use of bicycles is allowed in park areas under the same basic conditions as are motor vehicles" and that "certain limitations on their use are necessary and appropriate in the interest of public safety, resource protection and the avoidance of visitor conflicts."

NPS thus applies the same basic wildlife management principles to snowmobile use, other motor vehicle use, bicycle use, and other uses in the park. Those principles are primarily *population-based*. In other words, the provision against disturbance of wildlife is consistent with NPS's efforts to manage at the population level. This is not to indicate that NPS views disturbance to individual animals as acceptable as long as a wildlife population is not disturbed; rather, NPS sees a *small* amount of disturbance to individual animals as acceptable and unavoidable (to allow visitation to occur) so long as the wildlife population is *not* disturbed, that no unacceptable conditions are present, and that impairment is avoided. Indeed, it is arguably impossible to allow any human visitation without at least a small level of disturbance to individual animals.

Overall, NPS's goal is to minimize human impacts and avoid significant effects from disturbance to abundances, diversities, dynamics, distributions, habitats, and behaviors of wildlife populations and the communities and ecosystems in which they occur, pursuant to 36 CFR § 2.18 and Management Policies 4.4.1. This concern is a major reason NPS has required commercial guides for all snowmobiling visitors in the past five years: guides help to minimize the effects to individuals that previously unguided snowmobiling caused (Taber 2006).

New Research and Monitoring

In the last few years, several new studies have investigated the interrelationship between wildlife and winter recreationists in YNP. Several of these studies are summarized in Appendix C. Four of the studies (Borkowski et al. 2006, Bruggeman et al. 2007, Bruggeman et al. 2006, and White et al. 2006) were part of a collaborative effort between the NPS and Montana State University-Bozeman to investigate the potential effects of winter recreation on wildlife. This section also includes some general or summary remarks about these studies and others investigating the relationship between recreationists and wildlife in the winter. Additionally, a recent study conducted by Drs. Cormack Gates and Brad Stelfox resulted in an April 2005 report "The Ecology of Bison Movements and Distribution in and Beyond Yellowstone National Park: A Critical Review with Implications for Winter Use and Transboundary Population

Management." This study, commissioned by the NPS, is commonly known as "the Gates Report," and is summarized in Appendix C. The entire report is available at http://www.nps.gov/yell/parkmgmt/gates.htm. Along with studies performed previously, these studies represent the state of knowledge and full sweep of scholarly perspective on bison distribution and demography, especially in Yellowstone National Park. It is this comprehensive collection of literature, published and unpublished, upon which the analysis of effects regarding wildlife in this EA is based.

In most cases, monitoring indicates that animals respond to threats by directing their attention toward the potential threat, a response that can be characterized as "vigilance." If the animal perceives a more serious and immediate threat, it may elevate its response, choosing an "active" response. Depending on the situation, this may be either travel away from the threat (generally walking away from it), taking flight away from it (generally running), or defense/attack (Borkowski et al. 2006; White et al. 2006). In most situations, the more energy expended in responding to a threat, the less energy the animal has for winter survival (Parker et al. 1984; Cassirer et al. 1992).

Table 3-1 compares the wildlife responses to motorized winter recreation as analyzed in two of the most comprehensive wildlife studies from this era. The studies illustrate that the majority of wildlife response to human recreationists were either no response (the animal shows no response to the people or OSVs) or a vigilance response (generally, the animal directs its attention toward the people or OSVs without moving – a response considerably less energy-intensive than active response, which include walking or running away from the human or OSV or—very rarely—charging).

Table 3-1: Wildlife Responses to Human Recreationists

Study[a]	% No Visible Response[b]	% Vigilance Response	% Active Responses
Borkowski (2006)	Bison: 80% Elk: 49% Swans: 57% Bald eagle: 17% Coyotes: 39%	Bison: 12.5% Elk: 44.3% Swans: 32.5% Bald eagle: 72.8% Coyotes: 36.7%	Bison: 7.1% Elk: 8% Swans: 10% Bald eagle: 10.5% Coyotes: 23.8%
White et al. 2006	Bison: 80% Elk: 48% Swans: 57% Bald eagle: 17% Coyotes: 39%	Bison: 12% Elk: 44% Swans: 33% Bald eagle: 73% Coyotes: 37%	Bison: 7% Elk: 7% Swans: 10% Bald eagle: 10% Coyotes: 24%

[a] These two studies used somewhat different methods and grouped responses differently. Borkowski 2006 included data from Jaffe et al. 2002, and White et al. 2006 used data from Davis et al. 2004 and White et al. 2004.

[b] No response means the animal did not respond in any visible way to the human or OSV. Vigilance response means the animal directed its attention at the OSV, but did not otherwise move. Active response means the animal walked or ran away or charged the human or OSV.

Certain factors help to explain the varying responses between wildlife groups. The likelihood and intensity of responses increased substantially if animals were on or near roads, groups of wildlife were smaller, the animals were approached by humans, or the animal movements were

impeded or hastened by vehicles. For example, 60% of encounters between bison and OSVs occurred when bison were traveling on groomed roads. Specifically regarding bald eagles, the fact that they begin nesting during the OSV season may account for their high percentage of vigilant behavior responses compared to some other species.

These studies are based in part upon wildlife monitoring data gathered by the NPS (in a collaborative effort with Montana State University-Bozeman) during the winter seasons from 1999 through 2006 (wildlife monitoring in winter has continued since and is discussed below). Human disturbance did not appear to be a primary factor influencing the distribution and movements of the wildlife species studied. The risk of vehicle-related mortality from snowmobiles was quite low and observed behavioral responses were apparently short-term changes that were later reversed. Bison, elk, and swans in YNP used the same core winter ranges during the past three decades despite large winter-to-winter variability in cumulative exposure to OSVs. There was no evidence that snowmobile use during the past 35 years adversely affected the demography or population dynamics of bald eagles, bison, elk, or trumpeter swans (Borkowski et al. 2006; White et al. 2006) (no data was available for coyotes). Wildlife monitoring reports are available on the NPS website at: http://www.nps.gov/yell/parkmgmt/winterusetechnicaldocuments.htm

As mentioned, wildlife monitoring has continued since the completion of data gathering for these studies in 2006, finding slightly lower wildlife responses to motorized winter use than the Borkowski and White studies summarized above (such responses could be within the range of natural variability, as they are not statistically significant). Biologists summarizing the wildlife monitoring program for the winter of 2007-08, which had an average daily use of 294 snowmobiles and 35 snowcoaches, found the following:

> Overall, the responses of all wildlife species observed to oversnow vehicles and associated humans were as follows: 70% of the observed responses by groups of wildlife were categorized as no apparent response, 21% look/resume, 4% travel, 4% attention/alarm, and 1% flight. Wildlife responses to motorized winter use were slightly lower for most species than in previous winters, with the "no apparent response" and "look-and-resume" categories accounting for greater than 91% of the bison, elk, and swan observations…. Comparing wildlife responses between snowmobiles and snowcoaches, during interactions wildlife responded 28% to snowmobiles and 21% to snowcoaches [these are vigilance and active responses added together]. However, wildlife responses greater than look/resume occurred during 7% of the interactions with snowmobiles and 10% with snowcoaches (McClure and Davis, 2008: 10; see Davis 2007 for a summary of the previous winter's wildlife monitoring).

In general, situations such as snowmobilers inadvertently or intentionally chasing animals on roadways, or birds taking flight as visitors approach too closely, are viewed by NPS as unacceptable. These situations are largely eliminated by the requirements to utilize commercial guides and/or snowcoaches (Taber 2006). Some such situations may still occur, which is one of the reasons NPS provides regular patrol efforts on winter roadways and educates guides and outfitters on proper touring behavior. Overall, NPS utilizes the guidance in its *Management Policies* (section 1.4.7.1) in determining what are unacceptable impacts on wildlife individuals and populations. For example, NPS will not tolerate situations wherein oversnow vehicle/wildlife conflicts result in unsafe conditions (another reason commercial guides and snowcoach drivers are important for winter visitation).

Existing Condition: Ungulates of Concern

*Bison and Elk (*Bison bison *and* Cervus elaphus*)*

Yellowstone is the only place in America in which bison have persisted in the wild since European colonization. Bison management in the GYE has progressed through several phases since the park's inception, including intensive husbandry operations, herd control, 'natural regulation' policy, and hunting (when the animals leave the park). This long and complex history is summarized in Gates et al. 2005.

Long-term data indicate that the YNP bison population has steadily increased from the cessation of herd control in 1966 to the modern era. Since 1980, the population has fluctuated between about 2,000 and 5,000 animals, with the 2008 late summer population estimated at about 3,000 animals. Generally, bison occur in two large herds within YNP, the Central and Northern. The Central herd usually summers in Pelican and Hayden Valleys, progressively moving west into the Firehole, Madison, and Gibbon river valleys as winter snow depths increase. The Northern herd summers in Lamar Valley and on the Mirror Plateau, wintering in the Lamar Valley and over to Mammoth and Gardiner, Montana. The two herds intermingle in summertime. In the last 20 years, bison movement ecology has changed and evolved in response to population-level dynamics (Gates et al. 2005, Fuller et al. 2007a, Coughenour 2005, Taper et al. 2000), leading to changes in movement from the central interior portions of Yellowstone to the northern portions of the park, regardless of winter use (Gates et al. 2005, Fuller et al. 2007a, Coughenour 2005). For example, pulses of bison movement during winter from the central to the northern portion of the park may have begun by 1982 (Coughenour 2005, Fuller et al. 2007a), but became more prevalent and included more bison after 1996 (NPS, unpublished data).

The increase in bison populations in the last 40 years has occurred simultaneous with a substantial increase in OSV recreation. Between 1968 and 2004, the number of winter visitors traveling in oversnow vehicles increased from 5,000 to nearly 100,000 people. Much of this increased use was in the west-central region of YNP, where bison are common. Since 2004, the number of winter visitors has fallen to between 50,000 and 60,000.

Since 1966, management removals at (or near) the park boundary and winter severity have been the main causes of bison mortality. The risk of transmission of brucellosis—a contagious bacterial disease—from bison to cattle and the economic cost associated with this risk have prompted the development of various bison management plans in the last twenty years. Starting in the mid-1980s, federal and state agencies negotiated a series of management agreements to manage bison moving outside the park, culminating in a Final Environmental Impact Statement/Plan for bison management in 2000. These management measures included hazing bison back into the park, capture and slaughter of bison that repeatedly leave the park, culling of bison by agency personnel, and hunting of bison outside the park.

In the wild, older bison and calves typically will die during major episodes of winter stress, low forage availability, and higher bison densities. Their carcasses are scavenged by many species, including mammals, birds, and insects, and thus play an important role in the ecology of the park (NPS 1998). Bison carcasses are especially important as a high-quality protein source for species of concern such as grizzly bears, bald eagles, and gray wolves (Swensen et al. 1986; Green et al. 1997; Smith et al. 1998).

Before the implementation of mandatory guiding, conflicts between OSV users and wildlife were common. Rangers were frequently dispatched to the scene of wildlife-visitor conflicts to

direct traffic and to ensure the safety of both visitors and wildlife. Another commonly observed situation occurred when snowmobiles drove into the middle of a group of bison, thus aggravating the group and increasing the danger from running animals that had no escape. According to one ranger, many of the snowmobilers that were cited for off-road violations claimed that they left the road in an attempt to evade or otherwise go around bison. Rangers noted that these and other unsafe and harassing behaviors occurred despite the availability of safety information that included recommendations for interacting with animals on the roadway. They attributed these behaviors largely to inexperienced snowmobilers, some of whom lacked the patience to wait for animals to cross or exit the roadway (Dimmick 2002, Dimmick 2003).

The implementation of mandatory guiding has substantially reduced this problem. Guides are trained in where wildlife are likely to occur in the parks and in how to pass wildlife on the roadways with a minimum of the de facto harassment that previously occurred. Guides provide enforcement of park travel regulations, including especially the speed limits and restrictions against off-road travel (Taber 2006). Because guides are trained in part by the NPS, they can also provide guidance to their clients on how to observe wildlife responsibly, such as by limiting observation time and the distance with which such groups approach wildlife. Such human behaviors can help to mitigate the fact that wildlife tend to alter their behaviors more around larger groups than around small groups. These same behaviors can help to minimize disturbance to wildlife individuals while avoiding completely disturbance to wildlife populations.

The groomed road system of YNP and its possible effect(s) on bison population dynamics have been the source of much debate. Some authors have suggested that groomed roads directly contribute to increasing bison abundance and observed changes in distribution by providing energy-efficient travel corridors. These authors assert that because the groomed roads are packed and easier than untracked snow to travel upon, bison selectively choose these routes. By saving energy in this manner, they believe bison populations have grown and their distribution throughout YNP has been altered. Such road use by bison is argued to be particularly important during stress-induced, exploratory dispersal, and that without an intended destination, exploratory travel is likely to occur on the energy-efficient, plowed or snow-packed roads (Meagher 1989; Meagher 1993; Meagher 1998; Taper et al. 2000; see also the discussions of Meagher's research in NPS 2000b: 143-147, NPS 2003: 117-120; and NPS 2004b: 80-81).

In more recent years, however, an increasing number of scientists have concluded that groomed road use by bison is less important to their population dynamics than other, natural factors. These scientists have found that bison "neither seek out nor avoid groomed roads" (Bjornlie and Garrott 2001:560) and point to lack of supporting evidence for the energy-efficient travel corridor, or Meagher, hypothesis (Cheville et al. 1998; Wagner 2006). Specifically, bison use their own trails more than groomed OSV routes or plowed roads and travel only short distances upon groomed routes (Bjornlie 2000; Kurz et al. 2000; Bjornlie and Garrott 2001). Additionally, the energy costs of adverse interactions with OSVs could potentially offset any energetic benefits that bison would achieve in on-road travel (Bjornlie and Garrott 2001). There are strong indications that historic population growth and range expansion in the central bison herd was driven primarily by biotic factors as opposed to the groomed roads (Coughenour 2005; Gates et al. 2005; Fuller et al. 2007a and b; and Bruggeman 2008a, b, and c). This is very similar to what occurred in one of the few other places where a free-ranging population of bison was observed during expansion, the Mackenzie Bison Sanctuary in the Northwest Territories. After people introduced bison to this area in 1963, bison range expansion was found to be proportionate to their population growth (Larter and Gates 1990), just as several scientists argue has occurred in Yellowstone (Meagher 1993, 1998; Taper et al. 2000; Coughenour 2005, Gates et

al. 2005, Fuller 2006). In summary, many authors note that while individual bison may experience temporary adverse effects due to interactions with people, the animals appear not to be harmed overall and their population as a whole is thriving (Hardy 2001, Bruggeman 2006, Borkowski et al. 2006, White et al. 2006). Several lines of evidence suggest road grooming has not changed population growth of bison relative to what may have been realized in the absence of road grooming (Gates et al. 2005), or that if growth rates were affected, bison populations would have achieved current population levels eventually on their own (Coughenour 2005).

This understanding differs from the Meagher hypothesis (summarized above). The Meagher hypothesis was never rigorously tested to evaluate support in the data, and cannot be today because detailed information on bison travel patterns and pathways from marked or radio-collared bison was not collected during the period of major range expansion by bison (the 1980s and early 1990s) and the potential influence of groomed roads was not experimentally tested at that time. The only data available are akin to snapshots in time of bison distributions and trails, taken from aerial surveys and opportunistic ground observations, which collectively are insufficient for inferring specific movement patterns or evaluating the mechanism(s) causing observed changes in distribution. Bison now use travel corridors along portions of roads that connect these foraging areas and, as a result, these travel corridors may persist whether or not roads are groomed (Gates et al. 2005, Bruggeman 2006). It is unrealistic and unattainable to design studies now that can retrospectively answer the question of whether road grooming has led to fundamental changes in the Yellowstone bison population and distribution. For that reason, recent bison research efforts have focused on gaining insights into how road grooming and other factors currently affect bison travel.

Overall, the best available evidence regarding road grooming and bison distribution and demography suggests that (1) observed changes in bison distribution were likely consequences of natural population growth and range expansion that would have occurred with or without snow-packed roads (Bjornlie and Garrott 2001, Coughenour 2005, Gates et al. 2005, Bruggeman 2006); (2) road grooming did not change the population growth rates of bison relative to what may have been realized in the absence of road grooming (Gates et al. 2005, Bruggeman et al. 2006, Fuller 2006, Wagner 2006); (3) there was no evidence that bison preferentially used groomed roads during winter (Bjornlie and Garrott 2001, Bruggeman et al. 2006); (4) road segments used for travel corridors appeared to be overlaid on what were likely natural travel pathways (Gates et al. 2005, Bruggeman 2006); (5) bison use of travel corridors that include certain road segments would likely persist whether or not roads were groomed (Gates et al. 2005, Bruggeman 2006); and (6) bison and elk behaviorally responded to oversnow vehicles and associated human activities, but human disturbance was not a primary factor influencing their distribution (Bruggeman 2006, Borkowski et al. 2006, White et al. 2006). These findings were made carefully and with considerable objectivity using all the data available and the collective ecological knowledge represented in the scientific literature.

Obvious in this discussion is again the difference between effects on individuals and effects on a wildlife population. As stated previously, the NPS remains concerned about effects on individual bison and seeks to minimize the effects upon them as individuals. It is clear, though, that an increasing consensus exists among wildlife biologists that Yellowstone's bison population is healthy and affected primarily by natural forces, not by human activity. Such an interpretation is consistent with the North American Wildlife Conservation model, which is predicated on wildlife resources being managed in such a way that their populations will be sustained forever. Thus, some individual effects may be tolerable while effects on a population may be quite different or nonexistent.

For example, some bison individuals are clearly disturbed, but that percentage remains minor—less than 10% for the species analyzed—and their populations are thriving and abundant (even increasing without regard to oversnow vehicle numbers). Debate continues as to whether bison distribution in Yellowstone has been affected by winter use and associated road grooming—but their numbers, even after harsh winters such as 2007-08, are abundant (the growth rate of Yellowstone's bison population fluctuates over time, but increases 10-13% per year on average). Further, the NPS has developed various types of study designs and statistical approaches to evaluate three overriding uncertainties: 1) what is the influence of snow and terrain on bison movements; 2) what are the drivers of bison migration, re-distribution, and demography; and 3) what are the effects of road grooming on bison use of travel corridors?

Studies addressing another aspect of the controversy regarding winter recreation in Yellowstone, the behavioral responses of bison and elk to snowmobiles and snowcoaches, indicated these species behaviorally responded to oversnow vehicles and associated human activities with increased vigilance, travel, and occasionally flight or defense (Borkowski et al. 2006, White et al. 2006), but at relatively low levels. However, responses were less frequent and of lower intensity compared to other areas, suggesting there is a certain level of habituation to oversnow vehicles. There was some evidence bison and elk were displaced approximately 60 meters away from roads with historic oversnow vehicle numbers, most of which was unguided (Aune 1981, Hardy 2001). However, human disturbance did not appear to be a primary factor influencing their distribution and movements, suggesting behavioral responses and apparent avoidance of humans in the vicinity of the road were apparently short-term changes that were later reversed. Factors influencing resource availability—including snow pack, population density, and drought—provided the primary impetus for variability in the distribution, movements, and foraging behavior of bison during winter (Bruggeman 2006). Similarly, Messer (2003) reported the distribution of elk in central Yellowstone during winter was primarily influenced by snow mass and heterogeneity.

The best available evidence supports the hypothesis that *individual* bison (and other wildlife) are sometimes disturbed, but monitoring has not detected any moderate or greater adverse effects to natural abundances, diversities, dynamics, distributions, habitats, and behaviors of populations.

Regarding bison ecology and management in GTNP, the bison population of the Jackson Hole area has consistently grown since 1990, increasing at annual rates between 10-14%. Elk population estimates for the National Elk Refuge from 1999 to 2004 have been approximately 20% above U.S. Fish and Wildlife Service (USFWS) objectives (NPS 2007b). Hunts have been utilized to decrease bison and elk numbers and maintain prescribed population goals in the Jackson Hole area. The US Fish and Wildlife Service (National Elk Refuge) and the National Park Service (Grand Teton National Park) have released a joint Bison and Elk Management Plan and EIS (NPS 2007b). The primary purpose of that document is to address supplemental feeding programs and other management alternatives for these populations. Although the report does not address winter recreation impacts, the ecology, management history, and current status of the GTNP bison herd are thoroughly discussed on pages 144-150. This discussion represents the most current information on GTNP bison and is hereby incorporated by reference.

Like bison, elk were once widespread in North America. Elk are today the most abundant ungulate species in the GYA with an estimated 50,000 to 60,000 elk in eight to ten separate herds (USFWS 1994). The northern YNP elk herd, the largest in the GYA, summers throughout the park and surrounding mountains and winters primarily in the Northern Range area between the Northeast Entrance and Gardiner, Montana, and continuing about twenty miles down the

Yellowstone River Valley (to the northwest of Gardiner). Other elk herds that summer in the park include the Madison-Firehole, Gallatin-Madison, and Gallatin Range herds, which occur primarily on the west sides of YNP. East of YNP are the Clark's Fork, North Fork-Shoshone, and Carter Mountain herds, and south are the Jackson Hole, Targhee, and Sand Creek herds. Some of the Jackson Hole herd summers in YNP's southern portions (Clark 1999).

YNP's elk population has fluctuated between 15,000 and 30,000 since 1980. Recently, numbers of elk in the northern herd have dropped substantially, with the likely causes being predation by grizzly bears and wolves, moderate human harvests of antler-less elk, substantial winter-kill in 1997, and possible drought-related effects on pregnancy and survival (Vucetich et al. 2005, White and Garrott 2005, Eberhardt et al. 2007). However, the elk herd remains abundant.

Like bison, the non-migratory central Yellowstone elk herd has been exposed to some of the highest OSV levels in the parks, yet that OSV use has had little detectable effect upon the elk population. For example, from 1968 to 2004, population estimates for the central herd elk fluctuated around a dynamic equilibrium of approximately 500 elk (Garrott et al. 2005) (during this period the number of winter visitors grew from about 5,000 to over 100,000). The annual survival of adult female elk in this population exceeded 90% and calf:cow ratios indicated healthy recruitment prior to wolf recolonization of the Madison-Firehole-Gibbon drainages in 1998 (Garrott et al. 2003).

Elevation, topography, weather, vegetation, and escape cover determine elk habitat. Elk generally forage on grasses followed in preference by browse species and conifers (Clark 1999). Summer range is extensive and reflects vegetative productivity. Winter range is more limited and is determined by lower elevation and snow depth. Thermal areas with snow-free vegetation or shallow snow are important winter habitats for elk along the Madison, Firehole, and Gibbon Rivers (NPS 1990), a connection that has long been noted (Craighead et al. 1973). Researchers continue to note the importance of thermal areas for the central elk herd in particular. Over-winter survival depends heavily on thermal areas that reduce snow accumulations (Ables and Ables 1987).

Because of natural mortality, elk, like bison, play an important role in the ecological processes of the YNP area. Over 90% of the diet of most GYA wolves consists of elk, and grizzly bears are influential predators of young elk (Swensen et al. 1986; Green et al. 1997; Smith et al. 1998; Barber et al. 2005).

As with bison, members of the public have expressed concern about the effects that winter recreation may have upon YNP's elk, although there is less concern about the effects of winter recreation upon elk distribution, probably because elk range has remained stable during the period in which winter recreation became prevalent in YNP. Studies show that elk do not use the groomed roadways as travel corridors to the extent that bison do. Like bison, however, while *individual* elk appear to be occasionally disturbed by oversnow vehicle travel, the elk *population* has shown no discernible decrease due to human recreational use or groomed roadway OSV travel (Hardy 2001; Bjornlie 2000; White et al. 2006).

Regarding elk ecology and distribution in GTNP, the Draft Bison and Elk Management Plan and EIS referred to earlier contain a detailed discussion of the ecology, management history, and current status of the Jackson Hole elk (see pages 118-143 of that document). Elk in the Jackson Hole area utilize state feed grounds, private land, the National Elk Refuge, US Forest Service lands, and GTNP. This document represents the most current information on elk in GTNP and is hereby incorporated by reference.

Habituation, which may be present in both bison and elk, occurs when an animal learns to refrain from responding to repeated stimuli that are not biologically meaningful (Eibl-Eibesfeldt 1970). Wildlife may become conditioned to human activity when the activity is controlled, predictable, and not harmful to the animals (Schultz and Bailey 1978; Thompson and Henderson 1998). Several studies in YNP suggested bison and elk habituate to winter recreation activities to some extent, especially during winters with greater visitation (Aune 1981; Hardy 2001; Borkowski et al. 2006). However, animals still responded to closer-proximity interactions and/or unpredictable disturbances. Evidence of habituation on daily and seasonal time scales has been reported in elk, bison, and white-tailed deer studies, and suggests that regular, predictable activity patterns by recreationists may reduce the potential for adverse effects to wildlife (Richens and Lavigne 1978; Hardy 2001). For instance, the estimated odds of no response relative to a vigilance response by bison increased 1.04 times with each 1000 OSV increase in the cumulative OSV numbers for a winter (White et al. 2006). Elk, however, seem to show the opposite trend: the estimated odds of a vigilance response relative to no response increased 1.03 times with each 1000 OSV increase in the cumulative OSV numbers.

Wildlife monitoring data for 2002-2003 and 2003-2004 show that 80% and 79% of documented active responses by bison and elk were caused by snowmobiles and approximately 20% by snowcoaches, which were 6% and 17% of the observed interactions for those years. However, the odds of bison and elk actively responding to OSVs were greater if a snowcoach was present. This suggests that when snowcoaches are present at an interaction with ungulates, they might elicit a higher level of behavioral response than snowmobiles. The estimated odds of an active response by bison increased 1.5 times for each additional snowcoach, higher than the 1.1 times increase when multiple snowmobiles are present (White et al. 2005; White et al. 2006; Borkowski et al. 2006).

Human activities that result in displacement of animals from parts of their home range may be considered a form of habitat fragmentation. For example, increased human access into elk winter range by roads may reduce the overall scale and effectiveness of elk habitat and lead to increased harassment and energetic stress (Picton 1999). Aune (1981) noted that elk were displaced within 60 meters from trails and roads and that wildlife developed crepuscular patterns in response to winter recreation activity in Yellowstone's Madison, Firehole, and Gibbon River valleys. Hardy (2001) reported that elk in the same area may have been displaced from suitable roadside habitat along the busiest winter road in the park (West Yellowstone to Old Faithful) in part due to high volumes of OSVs. However, Hardy (2001: viii) also stated that "[d]espite varying responses to increasing winter visitation since the late 1970s, bison and elk winter in the same area each year." Thus, displacement observed in these studies was relatively localized and did not translate to large-scale patterns of habitat avoidance. During controlled experiments at the Starkey Experimental Forest and Range in Oregon, elk appeared to make short-term changes in distribution when responding to simulated recreational ATV activity, possibly selecting for refuge areas not viewable from roads, but appeared to return to their pre-disturbance locations when the disturbance ceased (Preisler et al. 2006). In the context of a severe winter, however, Dorrance et al. (1975) and Aune (1981) point out that even short-term habitat displacement can be detrimental to wildlife survival.

Consequently, White et al. (2006) concluded that human disturbance is not the primary factor influencing the distribution and movements of elk and bison in the parks in winter. Specifically regarding central Yellowstone elk and bison distribution, snowpack characteristics (such as mass and heterogeneity) and the factors influencing resource availability (snow pack, population density, and drought) are the primary influences upon herd distribution,

movements, and foraging behavior in winter (Cheville et al. 1998; Bjornlie 2000; Kurz et al. 2000; Bjornlie and Garrott 2001; Gates et al. 2005; White et al. 2005; Fuller et al. 2007b; Bruggeman 2006; Wagner 2006).

Existing Condition: Threatened and Endangered Species

*Canada Lynx (*Lynx canadensis*)*

A study of lynx in YNP was conducted from 2001-2004, representing the most area-specific lynx data available to date (Murphy et al. 2006; Murphy et al. 2005). Three lynx were detected using DNA methods, all of which were east of Yellowstone Lake. This area also had the highest and second highest indices of snowshoe hares and red squirrel, respectively, which form a large percentage of lynx diets (Koehler and Aubry 1994; Sunquist and Sunquist 2002). The authors note that lynx in other areas of the park could have escaped detection, but state that ". . . lynx are apparently limited to the East Sector . . ." Lynx have not been recently detected during surveys of GTNP (Pyare 2001).

Lynx can be sensitive to roads traversing their habitat, although traffic volumes on such roads must generally exceed 2,000 to 3,000 vehicles per day (Apps 2000). They are also sensitive to high road densities, may be killed by traffic on roads, and may be affected by human facilitation of access to their habitat for other competing predators (or predators which may prey upon them) (Ruediger et al. 2000). Lynx have been struck on 2- and 4-lane roads in Colorado, Canada, and Alaska (Staples 1995, Gibeau and Huer 1996, Halfpenny et al. 1999, Murphy et al. 2006). However, lynx activity in relative proximity to roads does not necessarily translate into increased mortality risk for lynx. A Canada lynx translocated from British Columbia to Colorado in 2003 successfully crossed major highways, including I-90 near Livingston, Montana, while en route back to Canada during 2004 (T. Shenk, pers. comm.) and there have been no confirmed strikes in the GYA through 2003 (Halfpenny et al. 1999; Murphy et al. 2006).

*Gray Wolf (*Canis lupus*)*

Although wolves within the Yellowstone area are classified as a nonessential, experimental population, they are managed within the parks as a threatened population. Trends of wolf abundance in the parks have increased since their reintroduction to YNP in 1995, and wolves began to appear in GTNP in 1997. Wolf numbers continued to increase until 2003, when density-dependent natural factors unrelated to OSV use, possibly including disease, caused declines in YNP. Wolves occur throughout the parks, currently numbering about 171 in YNP in 11 packs with about 350 distributed throughout the GYA. Wolf densities are highest in areas frequented by ungulates in the winter, such as Yellowstone's northern range, where their densities are some of the highest in the world. During winter, the packs of YNP's northern range are exposed to more human activity than any other wolves in the parks, although OSV use does not occur in that area of the park. The most visible pack on the northern range for several years, the Lamar Peak Pack, reached a high of 31 wolves in 2001.

Winter road monitoring crews have observed wolves only rarely in six winters of monitoring (never more than eight times per winter), with a total of just twelve sightings involving OSV-wolf interactions. Wolf tracks were frequently seen on the roads by winter wildlife monitoring crews and collared wolves were known to be in the Madison, Firehole and Gibbon drainages during road surveys (signals are monitored by NPS staff and MSU researchers). Wolves have also been documented traveling and making nocturnal kills during winter in developed areas of YNP. Their distribution does not seem to be affected by OSV use in the parks (Smith et al. 2005, Smith 2006). Wolves den in April, after the winter use season in the parks has ended.

Creel and others, in a study of wolves in Yellowstone, Voyageurs, and Isle Royale national parks, found that increased stress hormone levels, and therefore physiological stress, were correlated to OSV usage on short and annual scales. Despite the difficulties in quantifying physiological stress, the authors noted that, even given the known detrimental effects of elevated stress hormone levels, they found "no evidence that current levels of snowmobile activity are affecting the population dynamics of [wolves] in these locations" (Creel et al. 2002). Once again, it is clear that biologists note a difference between individual and population disturbance and see little if any population disturbance.

Existing Condition: Other Species of Concern

*Bald Eagle (*Haliacetus leucocephalus*)*

Since their original listing as an endangered species in 1967, bald eagles have made a remarkable comeback nationwide, and were removed from the ESA in August 2007. They occur throughout the parks, most commonly near unfrozen rivers or lakeshores. The parks have a substantial resident population of eagles. Resident eagles may migrate short distances in the parks in winter to be near open water and their population expands with the addition of migratory eagles (an increase of up to 45% in some years). Nest building by bald eagles occurs between October and April, with actual nesting beginning in mid February. Incubation occurs for 35 days with hatching taking place in late March. Most nests are near bodies of water, in large trees (Stangl 1999; Swensen et al. 1986; Alt 1980). In 2005, YNP had 34 nesting pairs of bald eagles. In 2006, adult bald eagles numbered 24 in GTNP, and there were an unknown number of fledglings born during the summer in nine active nests. Grand Teton has twelve bald eagle territories (Terry McEneaney and Kerry Murphy personal communication with M. Yochim 2006).

Based on the wildlife monitoring NPS has performed in YNP in the last several years, bald eagle responses to OSVs and human activity there were categorized as 17% "no response," 64% "look/resume," 9% "attention/alarm," and 10% being either "travel" or "flight." Last winter, responses were substantially lower, with 59% being "no visible response," 23% being "look-resume," 2.3% being "alarm-attention," and 16% being "flight." Biologists, after noting that the majority of these sightings were at a prominent nesting site on the West Entrance Road, attributed the more recent lower response rate to two factors: 1) in the last two winters, eagles nested lower in the nest and were not as visible to travelers; and 2) a focused effort by NPS employees to educate guides about the potential disturbance they may be having on the eagles meant guides were more sensitive to their effects on the eagles (McClure and Davis 2008; Davis 2007).

Similar to other species, the estimated odds of behavioral responses by bald eagles interact with covariates such as distance from road, interaction time, human behavior and habitat. The odds of observing no response relative to a movement response were 4 times greater for each 100-meter increase in distance from the road (with a threshold value of 250m). The odds of observing a vigilance response were 60 times greater for each 1-minute increase in interaction time. The odds of a movement response were 5 times greater when humans approached on foot. In terms of habitat, the odds of a vigilance response relative to no response were 54 times greater when eagles were in burned forest as opposed to meadow habitat. The estimated odds of observing a movement response compared to no response by bald eagles during 2003 to 2006 were 1.3 times greater for each additional snowmobile and 4.2 times greater for each additional snowcoach (White et al. 2006; White et al. 2005).

Some of the eagle nesting period coincides with the oversnow recreational season in the parks, creating a risk that displaced birds might have less foraging time and be less successful raising

offspring. However, nesting success and numbers of fledgling bald eagles in YNP increased during a period of intense OSV use (1987 to 2005) and were not correlated with cumulative OSV traffic. Additionally, the pair of bald eagles nesting within 55 meters of the heavily-used West Entrance Road of YNP successfully fledged young eaglets.

Grizzly Bears (*Ursus arctos horribilis*)

Grizzly Bears are found throughout YNP, most of GTNP, and the entire Parkway. Currently, biologists estimate their population to be between 431 and 588 in the Yellowstone ecosystem. Because their population has been increasing for at least 15 years, along with their range, the USFWS removed them from the endangered species list in April 2007. During the period of that increase, winter OSV visitation fluctuated between 70,000 and 100,000 visitors (the latter being the maximum visitation seen in the parks in winter).

While bears hibernate in winter, they could be disturbed during hibernation and their late fall and early spring activities by winter use. In fall, grizzlies are in hyperphagia, an annual life phase in which they gorge themselves on any and all available foods in preparation for hibernation, but especially whitebark pine nuts, if they are available. By the end of November, about 90% of all grizzlies are denned. Dens are often located on north slopes between 6,500 and 10,000 feet (averaging 8,100 feet), usually near whitebark pine and/or subalpine fir (McNamee 1984; Judd et al. 1986). In spring, boars are the first to emerge from hibernation, sometimes as early as mid-February. Subadults and cubless sows are next, and sows with cubs are the last to emerge, usually by mid-April. Ungulate carrion (especially elk and bison) are the most important spring foods for bears, with lesser amounts of early spring vegetation (such as that found in thermal areas) and over-wintered whitebark pine nuts if they are available (Mattson et al. 1991; Mattson et al. 1992).

Some concern has been expressed that grizzly bears may be adversely affected by the removal of bison carcasses from the ecosystem due to brucellosis risk management actions occurring at the park boundaries. However, it appears that such removal has little if any effect upon the bear population. As mentioned above, grizzlies in the Yellowstone area were recently removed from the threatened and endangered list of the Endangered Species Act. Second, even in the absence of road grooming a substantial number of bison would be removed annually, as modeled in the Gates study. Finally, other recent studies have found that one of the most important food sources for Greater Yellowstone grizzlies is whitebark pine nuts (Felicetti et al 2003).

Because grizzlies are in hibernation in the winter and because most of their dens are away from the parks' road systems where all OSV use occurs, winter recreation has little potential to disturb them. Wildlife-proof garbage holding facilities for interior locations (including Old Faithful Snowlodge) are provided as part of the regularly-occurring park operations. Moreover, the grizzly bear population has been increasing even during the period of peak winter visitation, confirming that winter recreation, under any of the rules governing winter use in the last thirty years, has disturbed them little, if at all. Consequently, the discussion of the effects of winter use upon grizzly bears is not carried forward.

Wolverines (*Gulo gulo*)

The wolverine is an uncommon, medium-size (6–18 kg) carnivore that is circumpolar in distribution and one of the least understood mammals in the world. In fact, all current understanding of wolverines is based upon less than twenty North American field studies, only three of which have occurred in the 48 contiguous United States. From this extremely limited information, scientists believe that wolverines typically inhabit remote areas north of the 40th

parallel, with the most southerly and easterly breeding population likely in the GYA. In the contiguous 48 United States, they seem to inhabit boreal forest, montane forest, and alpine habitats. They seem especially attracted to rocky areas and talus slopes at or near timberline. They have extremely large ranges (100–1500 km^2) and travel very long distances; daily movements exceeding 35 km are not unusual. They typically exist at very low densities (0.1–2.5 individuals per 100 km^2). In the western portion of the GYA, for example, average home ranges of wolverine were 700 km^2 for adult females and 1300 km^2 for males. Sub-adult animals also travel long distances when leaving their natal territory. Dispersal movements in excess of 200 km have been documented. Wolverines eat mammal carrion, ungulates such as mountain goats (*Oreamnos americana*), and small and mid-size prey such as mice (*Peromyscus* sp.), voles (*Microtus* sp.), snowshoe hares (*Lepus americanus*), and porcupines (*Erethizon dorsatum*). They den in late winter, often in rocky areas (Copeland and Murphy 2005, Inman et al. 2003, Copeland 1996, Banci and Harestad 1988; Banci and Harestad 1990; Gardner et al. 1986, Magoun and Copeland 1998; Magoun and Valkenburg 1983; and Hornocker and Hash 1981).

Reflecting the state of general knowledge about wolverines, very little is known about the animal in the parks or surrounding area. They are believed to be widely distributed, but at low densities, in mountainous areas of the GYA. The YNP database includes 182 sightings (1887–2004) of wolverines or their tracks, although these sightings are of varying qualities. Between 1990 and 2005, researchers saw one wolverine and documented five tracks in the park or vicinity.

Prompted by elevated public concern about the welfare of the wolverine, the NPS and USFS began the Absaroka-Beartooth Wolverine Project in January 2006. The project intends to clarify the wolverine's dependence on habitats in YNP and surrounding National Forest lands by studying wolverine distribution and movements, habitat and food associations, and population indices such as survival rates, birth rates, and dispersal movements. The project also hopes to clarify the wolverine's relationship with other carnivores in the Yellowstone ecosystem.

Two wolverines were trapped and instrumented in the winter of 2005-2006, one of which was near Sylvan Pass (Wolverine Project Update, spring 2006). This point on the East Entrance Road is the highest road in the parks currently open to OSV use (about 8500 feet). Therefore, the closest OSV traffic to possible wolverine denning habitat (which is often rocky terrain above 8000 feet) occurs at the pass (Landa et al. 1998; Banci and Harestad 1990). It is also the closest OSV route to recent, confirmed wolverine presence in the parks.

Banci and Harestad (1990) suggested that adequate year-round food supplies (especially ungulate carrion) may be more important to wolverine than particular types of topography or plant associations. Sylvan Pass is not considered highly productive given its high elevation and snow cover; this could result in the vicinity near Sylvan Pass being utilized less than surrounding areas that support elk and provide winter-kill resources. The less often that wolverines utilize the landscape in proximity to the pass itself, the less they would be subject to impacts from OSV use.

Human disturbance has been indicated as the cause of den abandonment for wolverines (Copeland 1996; Myberget 1968; Pullianian 1968). However, Magoun and Copeland (1998) indicated that snow melt may be a contributing factor in vacating dens, as female wolverines in arctic Alaska did not appear disturbed by human activity.

*Trumpeter Swans (***Cygnus buccinator***)*

YNP has both a resident and a migratory trumpeter swan population. About 14 swans are resident in the park, with autumn migratory populations numbering as high as 500. Resident

trumpeter swans display strong fidelity to breeding areas and nest sites, and winter habitat is generally associated with areas of ice-free, open water. Trumpeters are long-lived and slow to reproduce. Nesting attempts in YNP have ranged from two to ten annually. In 2006, three nest attempts were made, compared to three in 2005, four in 2004, and three in 2003. Swan populations in the parks may be dependent on immigration from the Centennial Valley to the west (McEneaney 2006; Olliff et al. 1999).

Swan presence in the parks decreases as winter weather reduces areas of open water. The nesting period for these birds does not occur until OSV traffic has ceased. A site located along the Madison River, less than 100 meters from YNP's heavily used West Entrance Road, has been a traditional swan nesting area for decades and at least 23 cygnets have fledged from this site since 1983, making it one of the more productive nesting areas in YNP.

Based upon the winter wildlife monitoring NPS has performed in YNP from 2002-2006, trumpeter swan responses to OSVs were characterized as 57% "no response," 21% "look/resume," 12% "attention/alarm," 9% "travel," and 1% "flight" (White et al. 2006; Borkowski 2006). In the last two winters, visible swan response rates have dropped in intensity, averaging 90% "no visible response," 5% "look-resume," 3% "travel," and 2% "alarm-attention" last winter (McClure and Davis 2008). Similar to other species, the estimated odds of behavioral responses by swans interacted with covariates such as distance to road, interaction time, and human behavior. For example, the odds of observing no response relative to a movement response were eight times greater for each 100-meter increase in distance from the road. Each 1-minute increase in interaction time increased the odds of a movement response relative to no response by 1.2 times. The odds of observing a movement response from swans were three times greater when humans approached on foot. Finally, the estimated odds of observing a movement response compared to no response by trumpeter swans during the same period were 1.1 times greater for each additional snowmobile (White et al. 2006; Borkowski 2006).

Resident populations of swans are considered vulnerable in YNP and the GYA. The number of resident adult/subadult and cygnet trumpeter swans in YNP has decreased between 1961 and 2005. Swans have decreased regionally throughout the GYA during the past several decades, including previously productive areas such as Montana's Centennial Valley. Swans in the GYA are especially vulnerable to population declines due to their low abundance, slow reproduction, and predation from grizzly bears and bald eagles. These factors also indicate that any improvements to trumpeter swan numbers in the parks will necessarily be slow (McEneaney 2006; Olliff et al. 1999).

While decreases in reproductive rates have been detected in other birds exposed to increased recreational activity, it is unlikely that poor production across the GYA has resulted from OSV use in YNP. Swans generally return to their breeding territories between February and late May, with young hatching in late June when OSV traffic is no longer a presence in the parks (Stalmaster and Kaiser 1998; Steidl and Anthony 2000; Gonza´lez et al. 2006; Olliff et al. 1999).

Coyotes and Ravens (*Canis latrans *and* Corvus corax*)

Coyotes are abundant, successful and highly adaptable predators in the GYA. They are common in all habitats below 8000 feet, and can utilize higher elevations seasonally (Gehman et al. 1997). Before wolf reintroduction, it was found that coyote densities on Yellowstone's Northern Range ranged as high as 1 animal/ km^2 in open grasslands and shrub habitats. In the years immediately following wolf reintroduction, coyote numbers in the Lamar Valley declined by as much as 33% (Crabtree and Sheldon 1999). In 2003, Switalski (2003) found that coyotes in the Lamar Valley

responded by adapting their activity budgets to increase vigilance behavior and spent less time resting when they were in wolf territories, compared to when they were outside wolf territories.

Coyote behavior differs from many other species in that they sometimes actively seek out interactions with winter recreationists, primarily in an attempt to obtain food. Coyotes are of interest in the winter use debate precisely because of this kind of behavioral adaptability.

Prior to the implementation of mandatory guiding, some visitors responded to coyote begging behavior by providing food, reinforcing the animal's tendency to approach humans in an effort to obtain food. The advent of mandatory guiding in YNP has mostly eliminated this problem, as guides are trained to prevent their clients from encouraging coyote begging behavior. Coyotes have been considerably less likely to seek out or receive human food since 2003 (Taber 2006).

Ravens are a species that also seek out human food. Ravens do not so much beg food from people as seek to obtain food that humans have left in an unguarded situation. Prior to the institution of mandatory guiding, ravens typically found food that snowmobilers had left in the storage compartment under snowmobile seats. The advent of mandatory guiding has virtually eliminated this problem wildlife behavior, as guides are careful to prevent their clients from leaving food in the compartments while away from their machines (Taber 2006).

Other Species

Moose (Alces alces)

In YNP, moose occur at low densities. Although no population estimates exist for them, recent studies indicate a population decline in areas where landscape-level fires (including the 1988 fires) have affected old-growth lodgepole pine winter range. Potential changes in deciduous vegetation, especially willows (Salix spp.) in riparian areas may also affect moose winter foraging and population levels (Tyers and Irby 1995). Future population trends are uncertain and may vary due to habitat conditions, exposure to predation, and human influences (Tyers 1999).

In GTNP, moose were rare or absent before about 1912, but were numerous by 1950. During the mid-l960s, 200 to 250 moose were year-round residents of the valley areas in the park and the adjacent Buffalo Valley. This segment of the Jackson moose population increased from 700 to 900 during winter when moose migrated onto winter range from other areas inside and outside the park. The parkwide population during summer is unknown, but most moose that summer within the park probably remain for the winter (NPS 1995).

Moose that spend the summer at high elevations move downslope to river bottoms and sagebrush flats in the winter, where they are abundant and highly visible. Areas that provide important winter habitat include the Willow Flat, Hermitage Point area, Buffalo Valley, and the Snake and Gros Ventre River corridors. All or portions of these areas are closed to winter use to protect wintering moose and other wildlife.

Moose are widespread in the parks and in the northern Rockies. Additionally, there is no evidence that their population or distribution has been affected by winter recreation. Consequently, the discussion of impacts upon them is not carried forward.

Bighorn Sheep (Ovis canadensis)

Bighorn sheep were historically found throughout the western mountains of North America. However, populations have dramatically declined throughout their range. These declines are associated with competition with livestock, introduction of disease, hunting, and loss of habitat

during settlement of the West. In YNP, the bighorn sheep population ranges from 240 to 325 and winter ranges are located exclusively in the northern part of the park (Legg 1998).

In GTNP, bighorn sheep are found in isolated bands at high elevations along the western park boundary and among the major peaks.

Because there are no OSV routes through bighorn sheep winter range, the discussion of impacts upon bighorn sheep is not carried forward.

Reptiles, Amphibians, and Fish

Winter recreation does not appear to have any direct impacts to reptiles, amphibians, fish, aquatic invertebrates, and other aquatic resources. Water pollution caused by toxins in the snowpack was a concern historically, but has been dismissed as an impact topic due to the reduced emissions from BAT snowmobiles (see Water Quality under Topics Dismissed from Further Analysis). For that reason and because these species hibernate or are inactive in winter, the discussion of impacts upon them is not carried forward.

Soundscapes

The affected environment for impacts to the natural soundscape is generally limited to activities that occur within the parks, as discussed below.

Regulatory and Policy Overview

An important part of the NPS mission is to preserve or restore the natural soundscapes associated with units of the National Park System. The 2006 NPS Management Policies defines the "natural ambient sound level" as "the environment of sound that exists in the absence of human-caused noise," and considers this to be the "baseline condition, and the standard against which current conditions in a soundscape will be measured and evaluated" (NPS 2006: 8.2.3) (however, in *Environmental Consequences,* comparisons are made against existing ambient conditions because the monitoring information upon which analysis was based included all ambient sounds—such as other human-caused sounds like exhaust fans and voices—some of which obscured the sound of OSVs). Further, the NPS "will restore to the natural condition wherever possible those park soundscapes that have become degraded by unnatural sounds (noise), and will protect natural soundscapes from unacceptable impacts" (NPS 2006: 4.9). Although "park visitors also expect sounds … associated with people visiting their parks (such as children laughing, park interpretive talks, motors in cars and motorboats)", NPS's 2006 Management Policies direct that "the Service will take action to prevent or minimize those noises that adversely affect the visitor experience or that exceed levels that are acceptable to or appropriate for visitor uses of parks" (NPS 2006: 8.2.2).

The NPS Organic Act of 1916, as amended, was clearly promulgated before the advent of oversnow vehicles, air tour overflights, and other motorized recreational vehicles or pursuits that have become commonly used by the public. The act was written and enacted in an environment in which it was clear that the American people wanted places to go that were undisturbed and natural and which offered a retreat from the rigors and stresses of everyday life. Consistent with the spirit of the Organic Act, a variety of other laws have since been enacted to address the specific issue of sound or noise in the national parks, beginning with the Grand Canyon National Park Enlargement Act of 1975, which explicitly recognized "natural quiet as a value or resource in its own right to be protected from significant adverse effect." Natural quiet is construed to mean natural sound conditions, which the NPS uses as one baseline for

determining impacts in an analysis such as this. The law requires that the NPS and FAA find a way to manage air tours in a way that substantially restores natural quiet to the park. With overflights continuing to have significant adverse effects on natural quiet and visitor experience in the parks, Congress passed the National Parks Overflight Act of 1987, directing the NPS (and the USFS) to study the impacts of such flights. The resultant NPS study clearly expressed the existing and potential impacts from a variety of sound sources on the "natural quiet" or natural soundscape resource of the parks. Largely resulting from the Report to Congress mandated by the Overflights Act, Congress passed the Air Tour Management Act of 2000. The ATMA requires the NPS and the FAA to study and develop air tour management plans for each park with air tours.

Given the legislative history and the references throughout NPS regulations and management policies, inappropriate sound or noise is clearly an issue to be addressed when considering a proposal for use and enjoyment of the national parks. Natural quiet, or natural sound conditions that would prevail without human presence, is an appropriate baseline from which to gauge the impacts of human use. It is within the purview of an NPS decision-maker, by law and policy, to determine the allowable departure from natural sound conditions that would be experienced in providing for human enjoyment of a park.

New Research and Monitoring

Systematic soundscapes monitoring has been conducted since the winter of 2003-2004 for YNP and GTNP. This effort is the basis for characterizing existing soundscape conditions herein. The primary purpose of acoustical monitoring has been to measure the impact of snowmobile and snowcoach sound on the parks' natural soundscape. The reader is referred to recent monitoring reports (Burson 2008a, 2007, 2006, 2005, and 2004) for more detailed and additional information on park soundscapes. Two recent short-term studies (Ambrose et al. 2006, and reproduced in the appendix of the 2006 monitoring report, and another effort discussed in Burson 2008a) used specialized low noise instrumentation to determine how low sound levels can be in Yellowstone; both studies found very, very quiet conditions at times (see the next section for more discussion of these studies). Often, the lowest minimum sound levels were below the range (noise floor) of the standard instrumentation for many hours of the day in the monitoring studies. Including these efforts, the best available information has been used to describe the natural ambient soundscape as the basis for assessing relative impacts of OSVs. The monitoring reports referenced above are available on the YNP website, http://www.nps.gov/yell/parkmgmt/winterusetechnicaldocuments.htm.

Prior to 2003, much more limited monitoring occurred on the soundscapes of Yellowstone and Grand Teton, thus it is difficult to draw comparisons from existing conditions to historic conditions based on monitoring. The following section describes the existing soundscapes of the parks, based on monitoring from the last several winters.

Existing Soundscape Condition

During the winter, the natural soundscapes of the parks could generally be described as either quiet or windy, but in fact are highly variable in both space and time. Sound-producing physical processes such as geothermal activity, wind and water, and especially biological processes such as animal vocalization depend heavily on location and time of day.

Natural soundscapes vary from the high peaks of the Teton Range to the banks of cascading rivers and streams to the middle of Yellowstone Lake. Weather conditions can be calm, but are often windy, especially in the afternoons. Howling wind and blowing snow of blizzards during

the winter can dominate the natural soundscape. Rushing streams, waterfalls, and rivers create a constant high to moderate sound level that masks nearby natural sounds in those areas. Geothermal areas have intermittent gurgling, hissing, rushing, and eruptive sounds. Croaking ravens are a regular daytime companion; soft calls from chickadees and other small passerines mingle with the harsh notes of nutcrackers and magpies. Gray Jay vocalizations contrast with red squirrel chatter in forested areas. Sounds associated with branches and trees rubbing against each other and popping sounds from wood freezing and thawing during very cold periods are commonly audible within the forested areas of the parks. Near larger bodies of water, the groaning and popping sounds of frozen lake waters accompany temperature fluctuations. The depth of night and early morning are often silent, broken only by the hoot of a distant owl or the howls of wolves.

Sound is measured in decibels, with A-weighted decibels or dBA expressing the relative sound level as perceived by the human ear. For this measure, sounds at low and high frequencies are reduced, compared with unweighted decibels (dB), where no correction is made for acoustic frequency. The decibel scale is logarithmic, meaning a 10 dBA increase in sound source level represents a tenfold increase in sound energy and causes an approximate tenfold increase in the area in which it can be heard. Table 3-2 provides a listing of common sounds and includes some actual sounds monitored in the parks. The threshold of healthy human hearing is near 0 dBA.

Table 3-2: Decibel Levels of Commonly Known Sound Sources[1]

Sound	Noise Level (dBA)	Effect
Jet Engines (near)	140	
Shotgun firing	130	Threshold of pain begins around 125 dB
Jet takeoff (100-200 ft.)	130	
Rock concerts (varies)	110-140	
Oxygen torch	121	
Discotheque, Boom Box	120	Threshold of sensation begins around 120 dB
Thunderclap (near)	120	
Stereo (over 100 watts)	110-125	
Symphony orchestra, chainsaw	110	Regular exposure to sound over 100 dB of more than one minute risks permanent hearing loss.
Turbo-prop aircraft (200 ft.)	110	
Pneumatic drill, jackhammer	110	
Jet flyover (1000 ft.)	103	
Electric furnace area	100	No more than 15 minutes of unprotected exposure recommended for sounds between 90–100 dB
Garbage truck, cement mixer	100	
Farm tractor	98	
Newspaper press	97	
Subway, motorcycle (at 25 ft.)	88	Very annoying

[1] Table adapted from the National Institute on Deafness and Other Communication Disorders at http://www.nidcd.nih.gov/health/hearing/ruler.asp

Lawnmower, food blender	85-90	85 dB is the level at which hearing damage (8 hrs.) begins
Recreational vehicles, TV	70-90	
Diesel truck (40 mph at 50 ft.)	84	
Average city traffic, garbage disposal, Motorcycle with modified exhaust (45 mph at 100 ft.)	80	Annoying; interferes with conversation; constant exposure may cause damage
Dishwasher, washing machine	75-78	
Vacuum cleaner, hair dryer, 2-stroke snowmobile (30mph at 50 ft.)	70	Intrusive; interferes with telephone conversation
4-stroke snowmobile (30 mph at 50 ft.), Automobile (45 mph at 100 ft.)	60	
Quiet office, conversation, croaking raven flyover (at 100 ft.)	50-60	Comfortable hearing levels are under 60 dB
Refrigerator humming, Snake River (at 100 ft.)	40	
Whisper, broadcasting studio, Snake River (at 300 ft.)	30	Very quiet
Rustling leaves	20	Just audible
Normal breathing	10	
Yellowstone winter backcountry	0	Threshold of hearing

Some of the quietest sound levels measured in natural environments have been recently documented during the winter in YNP (Ambrose et al. 2006; Burson 2008a). In 2006, Ambrose et al. documented very low sound levels (below 6.5 dBA) on and near Sylvan Lake on the Fishing Bridge to East Entrance Road during February 2006. Two short-term studies the following February documented sound levels: as low as 0.7 dBA near Craig Pass in Yellowstone and 6.5 dBA at the base of the Teton Range in Grand Teton (Burson 2008b). Clearly, the soundscapes of the parks can be extremely quiet at times—at the very threshold of human hearing.

Winter soundscapes in the absence of non-natural sounds can be particularly quiet, much more so than summertime, for two primary reasons. First, there is more natural sound in spring, summer, and fall. Insects and migratory birds are present in these seasons; they create a chorus of natural sound (with birds, especially around dawn). Deciduous trees are leafed out, creating a rustling whenever wind blows. Creeks and rivers are flowing more vigorously and are not frozen or entrenched within walls of snow. In late summer and fall, bison are bellowing and elk bugling. Second, winter has a widespread sound absorption material present in the form of snow on both trees and the ground. However, non-natural sounds, when present, propagate sound farther in the cold, dense air and during the common temperature inversions of winter than they do in the warm, thinner air of summer (Burson 2008b).

Compared to summer, human activity in winter can be reduced as well, at least in those areas of the parks less accessible in winter than in summer. Human-generated sounds, including non-motorized activities like skiing, are superimposed upon the natural soundscapes. Motorized winter-use related sounds are loudest and most common near developed areas and travel corridors.

Snow-covered groomed roads share many of the same acoustic properties of plowed roads. The percent time that vehicles are audible depends in part upon their numbers on any given day. Vehicle type and speed largely determine the maximum sound levels. Grooming machines are generally the loudest, but relatively infrequent, producers of sounds on groomed routes. They

generally operate during the evening and the night when other OSVs are usually not present. Plowing activity can occur anytime during the day or night, but wheeled traffic occurs primarily during the daylight and early evening hours.

More specifically, sounds from road activity can easily propagate over one mile and much farther depending on the type of vehicle and the weather conditions. Sound levels are highest immediately adjacent to the road, but the percent time audible is often as high farther from the road corridor due to the additive effects of multiple vehicles separated along the travel corridor. In recent winters, all types of OSVs (recreational snowmobiles and snowcoaches and NPS, concession, and contractor administrative snowmobiles and snowcoaches) were often audible over 50% of the 8 am to 4 pm period along the busiest corridor (West Yellowstone to Old Faithful) and between 25% and 40% along the next busiest route (Flagg Ranch to Old Faithful) (Burson 2008a). On less traveled corridors, OSVs were generally audible less than 25% of the day. Maximum sound levels are often over 70 dBA immediately adjacent to the travel corridor, 40 dBA at 1000 feet, and still audible but below natural ambient levels at one mile and beyond.

Developed areas include warming huts (only operated during the day), entrance stations or departure locations such as Flagg Ranch, and destination locations such as West Thumb and Old Faithful. The soundscapes of these areas vary from intermittent OSV sounds and human voices to constant utility sounds from exhaust fans and heating systems. The largest developed area, Old Faithful, has many facilities for staff and winter visitors. In addition to visitors arriving and departing on OSVs there are many administrative OSVs in use. The lowest sound levels in these locations depend on the proximity to the utility sounds of these facilities; the highest sound levels depend on the distance from the OSV routes. All types of OSVs were audible between 60-70% of the period 8 a.m. to 4 p.m. during the last several winter seasons at Old Faithful near visitor facilities. The average percent time audible of OSVs was about 30% during the day for the winters of 2004-05 and 2005-06 along the boardwalk in the transition zone beyond Old Faithful Geyser in the Upper Geyser Basin. This compares to about 50-60% over the same two winters within the developed area of West Thumb Geyser Basin, where visitor facilities consist of just one or two buildings that are closer to the nearby groomed travel corridors. Within Grand Teton OSV sounds are greatest at Flagg Ranch, the launching area for snowcoach and snowmobile trips into Yellowstone. During 8 am to 4 pm OSVs were audible an average of 28% of the time during the winter of 2003-2004. At the next busiest area, OSV on Jackson Lake used by anglers were audible for less than 4% of the day.

The natural soundscape is often uninterrupted in park backcountry areas beyond the effects of travel corridors and developed areas. Although human-caused sounds may extend beyond four miles, areas beyond two miles usually have very low sound levels of OSV sounds and only during certain atmospheric conditions. For example, monitoring at Shoshone Geyser Basin, over 5 miles from the nearest road, last winter found OSVs audible anywhere from 0% to 47% of the day, averaging 18% of the day (at that distance, it was impossible to discern whether snowmobiles, snowcoaches, or both were responsible for the sound). Conversely, at the Lone Star geyser area, one mile from the nearest road, audibility levels were much lower than Shoshone Geyser Basin (only 3-4% audible), illustrating that terrain and local geyser activity can influence a site's soundscape dramatically (Burson 2008a).

In addition to the sounds related to the winter use activity, aircraft sounds are often audible and at sound levels that range from very quiet to levels that mask other sounds. High commercial jets, research flights of low flying propeller planes, sounds of corporate and general aviation aircraft and medical rescue helicopters are audible from less than 10% of the day to over 20% depending on the location. At the Fern Lake backcountry monitoring site in Yellowstone,

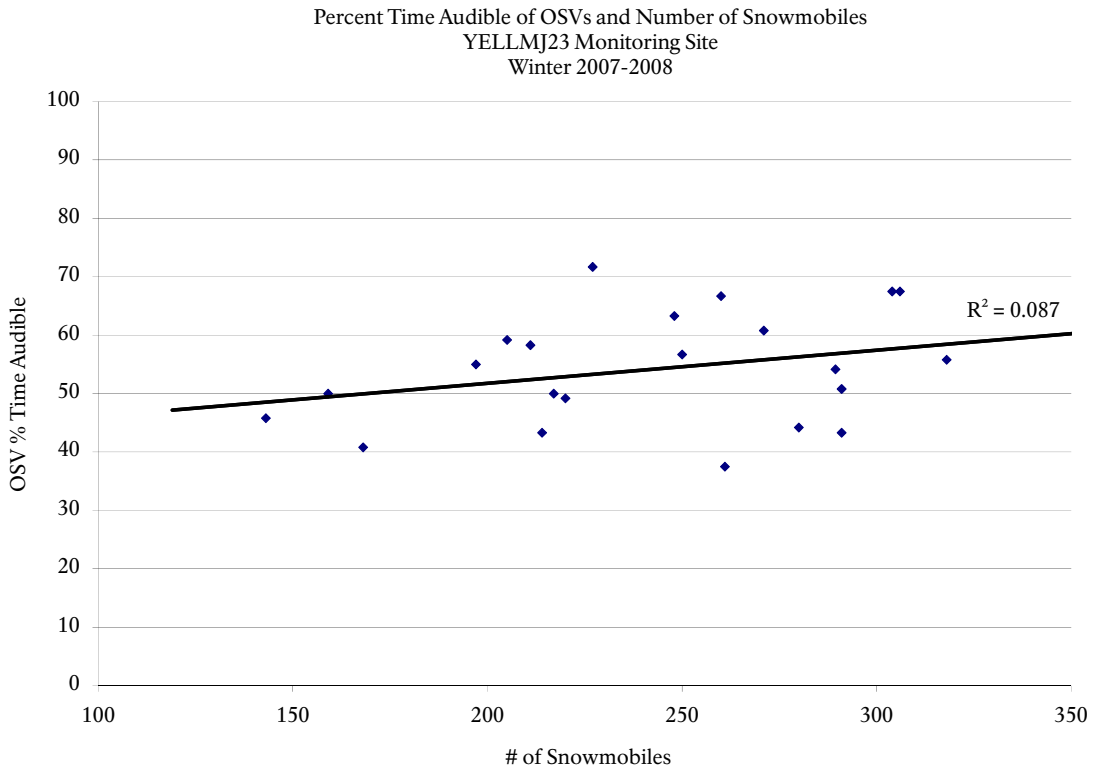
aircraft noise was audible 5-10% of the day. In GTNP, the percent time audible and sound levels generally increase at locations closer to the Jackson Hole Airport.

Detailed Monitoring Data for Old Faithful and Madison Junction

The acoustic data set collected pursuant to the winter use planning efforts is one of the most extensive such sets for national parks in existence. These data illustrate that the parks' soundscapes are highly variable over time, both in minutes and seasons. Current soundscape statistics do not fully explain this inherent variability. For example, as Figure 3-1 below indicates, total recreational snowmobile entrance counts explain only a small portion of the variance in OSV audibility at the Madison Junction monitoring site: less than 9% (of course, OSV presence must determine audibility to some degree). The R-squared value on the chart is the explanatory value of the correlation plotted on the graph. If the plotted values were a perfectly straight line, then the R-squared value would be 1.0, indicating that the line explained all variance in the values—there was a perfect correlation between the X and Y values on the chart. The more scattered the values on the graph, the lower the R-squared value and the poorer the explanatory relationship between the values on the X and Y axes of the graph.

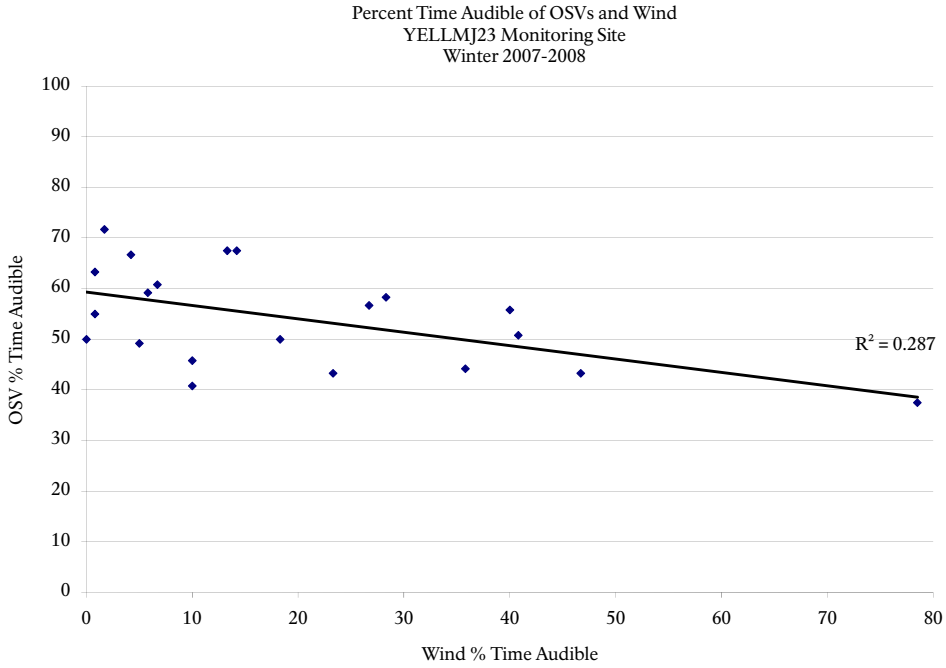
This counter-intuitive finding has several explanations. The exact number of oversnow vehicles passing this monitoring site is not known; only entrance station totals of recreational vehicles are available. Not all the snowmobiles entering the park pass this site; the percentage on any given day that do may vary substantially. Also, the number of snowcoaches, while substantially fewer than the number of snowmobiles, varies daily and contributes varying amounts of OSV sound to audibility. Administrative access contributes about 21% the percent time audible along travel corridor sites such as Madison Junction, thus contributing to the lack of relation between recreational snowmobile use and audibility. Many other variables may act to mask OSV audibility, including wind, wildlife sounds, the sound of the Madison River, humans talking, etc. OSVs vary in how they are grouped and how they pass the monitoring site. As OSV numbers increase, group size may increase rather than number of groups. Some days may find most OSVs tightly clustered together, where other days may find them more spread out. The former condition would decrease audibility; the latter, increase it (both under typical conditions). Number of groups has a larger influence on OSV audibility than does number of OSVs.

Figure 3-1. The daily number of parkwide recreational snowmobiles entering Yellowstone and OSV audibility at Madison Junction 2.3 monitoring site.



Interestingly, the presence or absence of wind at this site plays a greater role in determining OSV audibility, as Figure 3-2 below indicates. Other factors, described above, influence audibility, though correlations for others are not known.

Figure 3-2: The percent time wind and OSVs are audible at Madison Junction 2.3 monitoring site.



Audibility can also be viewed in different ways. For the last four planning efforts in the parks, audibility has been measured by the percent of time between 8:00 a.m. and 4:00 p.m. in which OSVs are audible at a given point. The focus of previous travel corridor analyses has been on a monitoring site near Madison Junction (see the section below, for example). The busiest travel corridor in winter, monitoring there revealed that OSVs were audible about 54% of the 8-hour day (using those days with 318 and fewer parkwide recreational snowmobiles per day entering all four oversnow entrances). When the period of analysis is expanded to coincide with the 7:00 a.m. to 9:00 p.m. time frame when the roads are open to the public, OSV audibility at this site drops to an average of 45% (with 318 and fewer parkwide recreational snowmobiles per day). If one restricts the period of analysis to the busiest hour of the day, 9:00 a.m. to 10:00 a.m., audibility rises to 81%; it falls to 31% during the slow noon hour. Another road corridor monitoring site, Grant Village/Lewis Lake (on the South Entrance Road), averaged 37% from 8:00 a.m. to 4:00 p.m. (calculated with 557 and fewer parkwide recreational snowmobiles). When audibility is averaged across all road corridor monitoring sites, a figure of 43% results (for 318 and fewer parkwide recreational snowmobiles). This exercise illustrates that one's selection of monitoring site(s), OSV numbers, and periods of analysis can greatly influence the final figure for percent time audible. Table 3-3 illustrates the range of audibility figures, depending on one's selection of monitoring site(s) and periods of analysis.

Table 3-3: Audibility is partly a function of monitoring site and period of analysis.

Site(s)	Period of Analysis	Audibility
Madison Junction	12:00 noon to 1:00 p.m.	31%
Madison Junction	7:00 a.m. to 9:00 p.m.	45%
Madison Junction	8:00 a.m. to 4:00 p.m.	54%
Madison Junction	9:00 a.m. to 10:00 a.m.	81%
Grant Village/Lewis Lake	8:00 a.m. to 4:00 p.m.	37%
All travel corridor monitoring sites in Yellowstone	8:00 a.m. to 4:00 p.m.	43%

Although sounds from OSVs are audible within a relatively small portion of the parks' total acreage, they are concentrated to a large degree around travel corridors and park attractions and affect the areas most accessible to the vast majority of park visitors. Most areas used by winter visitors seeking solitude and quiet are within two miles of travel corridors. Remote backcountry areas that are largely free of non-natural sounds are beyond the reach of most visitors because of the distances involved and the arduous nature of winter backcountry travel. For these reasons, the following discussion will focus on developed area and road corridor soundscapes (as noted above, though, backcountry areas have variable audibility, and as the soundscapes discussion in *Environmental Consequences* will make clear, the NPS seeks to protect backcountry soundscapes and those in the frontcountry).

During the 2007-2008 winter use season, the focus for acoustic monitoring was on three Yellowstone sites representative of high-use developed areas and travel corridors: Old Faithful Weather Station, a point 2.3 miles west of Madison Junction, and the Grant Village/Lewis Lake point (one mile north of the Heart Lake Trailhead). Short-term monitoring was also conducted at three sites representative of transition zones and backcountry areas: Shoshone Geyser Basin (discussed above), on the Delacy Creek Trail, and on the Mary Mountain Trail.

At the three developed area and travel corridor sites, acoustic measurements were collected from December 19, 2007 to March 9, 2008 (the entire winter use season) to monitor the natural soundscape. The average parkwide daily use by OSVs at these monitoring sites during the season was about 294 snowmobiles and 35 snowcoaches. Results for Old Faithful Weather Station (Figures 3-3 and 3-4) and near Madison Junction (Figures 3-5 and 3-6) are provided and discussed in more detail below to illustrate data for each management zone. Acoustic data from previous years may be found in the soundscape monitoring reports on the NPS website for comparison (see http://www.nps.gov/yell/parkmgmt/winterusetechnicaldocuments.htm).

Although on average snowmobiles were audible for more time than snowcoaches, snowcoaches in general had higher sound levels, especially at higher speeds. The overall impact on the natural soundscape from OSVs was similar to previous winter seasons. The number of OSVs that entered the park last winter was similar to that from the previous winter. Consistent with acoustic data collected during previous winter seasons, the sound level and the percent time OSVs were audible remained substantially lower than during the 2002-03 winter use season, the last season in which non-BAT snowmobiles were permitted in Yellowstone (those machines had on average 5 dBA higher sound levels than do BAT snowmobiles). Besides the change from two-

to four-stroke engine technology, the reduced sound and audibility levels were also explained by fewer snowmobiles than during 2002-03 and the guided group requirements.

Soundscapes sound level monitoring data include all sources of sound while audibility monitoring data include all sources of OSV sounds; these are measured and compared against the goals identified in the 2007 FEIS. One contribution to the overall impact on the natural soundscape is administrative OSV travel. Importantly, and as described below, monitoring results indicate that administrative vehicles clearly contribute to soundscapes impacts: although administrative snowmobiles operated by NPS, concession, and contractor employees comprise 6-17% of the individual snowmobiles, they are heard 29% of the time during an 8 a.m. to 4 p.m. period (Burson 2008a). Many are operated individually, rather than in groups, and they include some non-BAT administrative snowmobiles (as many as 99 in 2004, although that number has likely dropped by as much as 50%).

Conditions in the Old Faithful Area

Acoustic data were collected at the Old Faithful Weather Station site in 2007-2008 for the fifth winter. The monitoring site is adjacent to the west parking lot used by all snowmobiles and snowcoaches entering and leaving the Old Faithful area. It is also close to both the Ranger Station and Snow Lodge, both of which produce mechanical sounds 24 hours per day. Old Faithful Geyser is approximately 2600 feet from the monitoring site. For these reasons, the site is not representative of what a visitor might hear while enjoying the geyser. Instead, it is more representative of what a visitor might hear at a moderately-sized or large resort. The monitoring data described below for the Upper Basin site or the West Thumb developed area are more representative of what a visitor walking one of the boardwalks at Old Faithful or observing the geyser would hear.

Within the developed area at Old Faithful, the average daily percent time audible for snowmobiles and snowcoaches was 68% (Fig. 3-5). OSVs were audible on a daily (8:00 a.m. to 4:00 p.m.) basis consistently between 60% and 80% of the time; Figure 3-4 illustrates the typical audibility by hour. For the last four winters, average OSV audibility at Old Faithful has varied only from 67% to 69%, consistently remaining below the audibility threshold from the FEIS for developed areas (though 2 of the 27 days analyzed last winter did exceed this 75% threshold). Contractors accounted for 9% of the total number of groups and 4% of the total number of snowmobiles audible in the Old Faithful area during observations over the last four winters. The wind bars in Figures 3-3 to 3-6 indicate the percent time wind is audible.

Figure 3-3. The percent time audible for snowmobiles and snowcoaches, and wind by date at Old Faithful Weather Station, Yellowstone National Park from 8 a.m. to 4 p.m., 19 December 2007 to 8 March 2008.

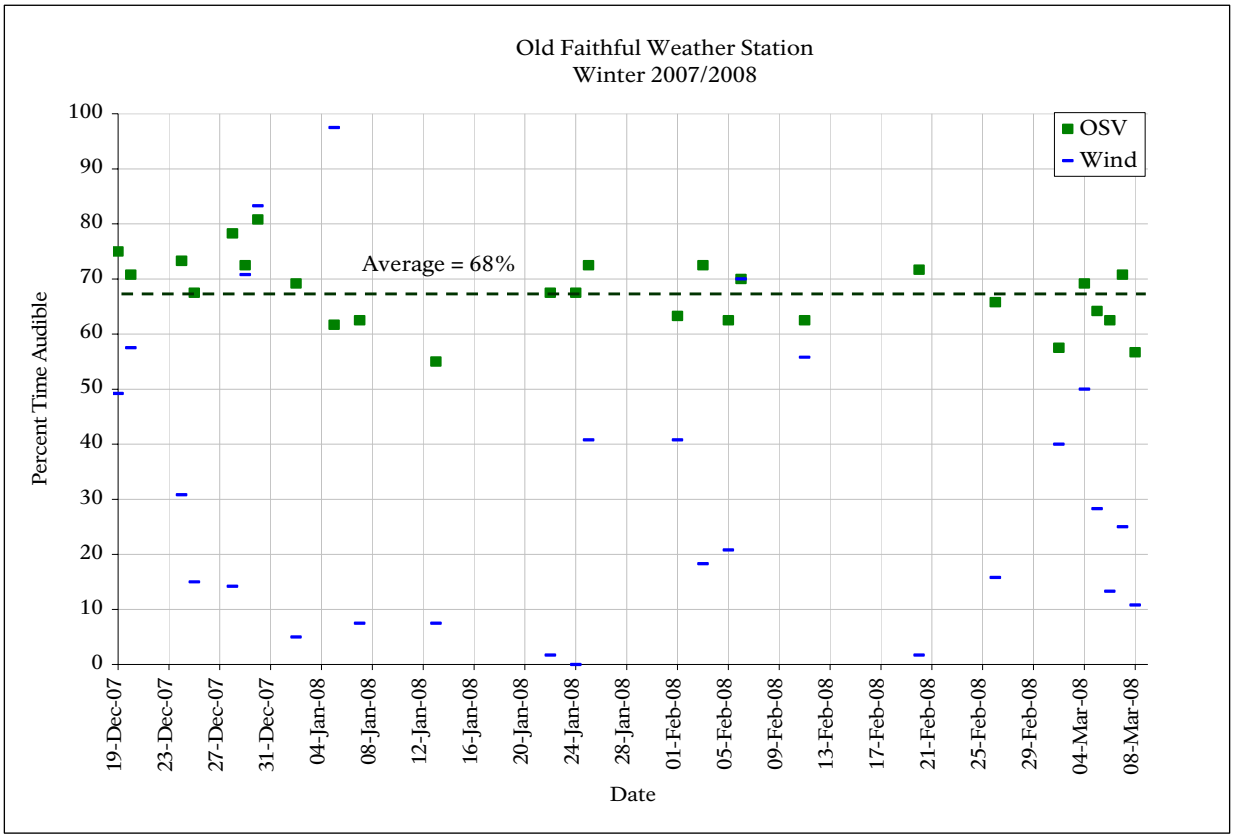
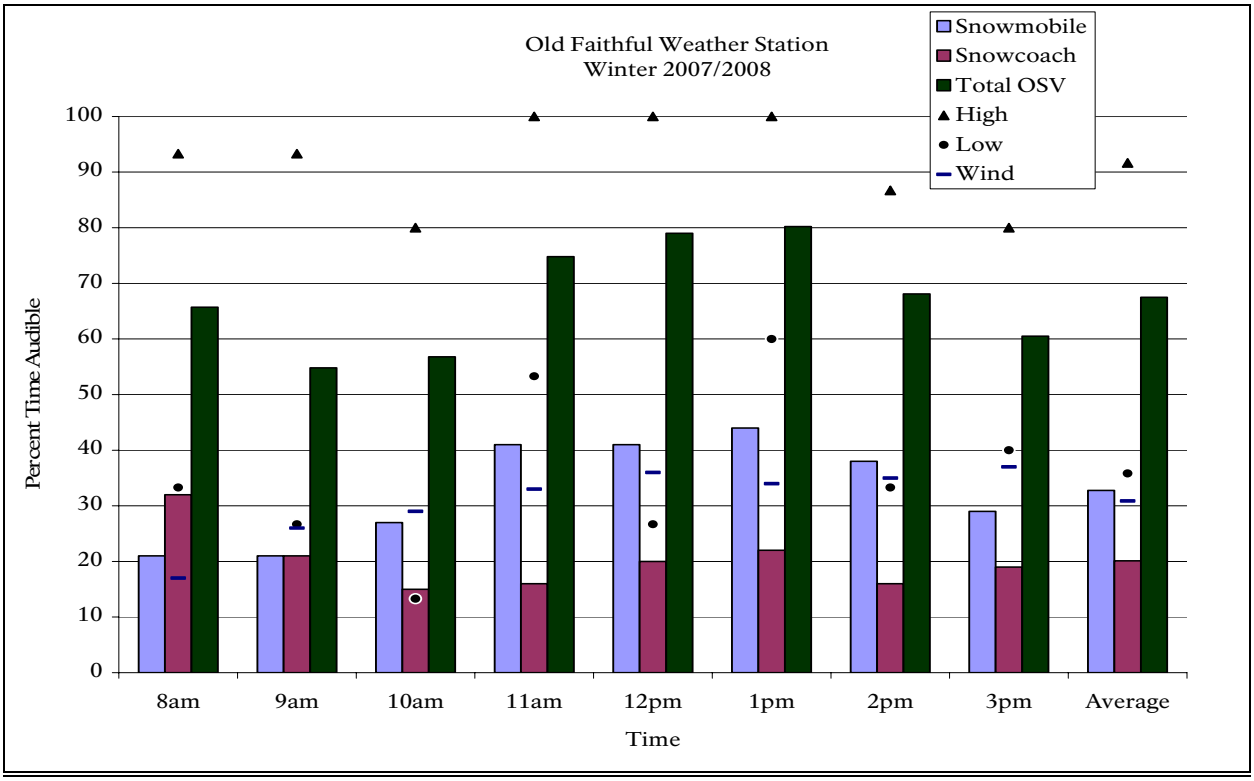


Figure 3-4. The average percent time audible by hour (8 am-4 pm) of snowmobiles (left light blue bar), snowcoaches (middle maroon bar), and combined category (right dark green bar), and high and low OSV values at Old Faithful Weather Station, Yellowstone National Park from 8 a.m. to 4 p.m., 19 December 2007 to 8 March 2008.



Note: Original figure is in color; printing costs precluded use of color. The reader may obtain the color version at http://www.nps.gov/yell/parkmgmt/winterusetechnicaldocuments.htm.

In the winters of 2004-05 and 2005-06, acoustic data were also collected at a location in the developed area of the Old Faithful Upper Basin. This monitor was located adjacent to a boardwalk within a popular thermal area about 1800 feet (1/3 mile) from the nearest motorized route. The data from this site provide a useful comparison to data collected at the Old Faithful Weather Station (about 2600 feet (1/2 mile) away, and much closer to vehicular traffic and visitor buildings). At the Upper Basin site, the sounds of wind and thermal features such as nearby geysers and steam vents often masked distant sound of OSVs. The percent time OSVs were audible at the Upper Basin was 35% compared to 68% at the Weather Station. OSVs that were audible at the Upper Basin sites were often approaching or departing the Old Faithful area along the roads leading north or south and were not within the developed area itself, where the weather station site records most OSVs traveling to and through the developed area. Clearly, even this small a distance (1/3 mile) can have a substantial effect on audibility. At West Thumb Geyser Basin, audibility of OSVs was between that of the two Old Faithful sites, at about 56%.

Madison Junction to West Yellowstone Travel Corridor

The Madison Junction 2.3 monitoring site was located 100 feet off the West Entrance Road 2.3 miles west of Madison Junction in a travel corridor management zone. Acoustic data were collected over the entire winter use season during 2007-08 (for the third complete winter). Snowmobiles and snowcoaches (including administrative travelers) were audible for an average

of 53% of the time during the winter use season last year (Fig. 3-7), with the percent time audible for 15 (56%) of 27 days analyzed exceeding 50%. Commercially guided snowmobiles account for about 70% of groups and about 94% of individual snowmobiles along travel corridors (Burson 2008a). It is important to remember that about 21% of the audibility at this site is attributable to administrative snowmobiles; when that portion is removed, audibility levels at this site fall to about 46%.

The bimodal distribution (Fig. 3-6) reflects the pulse of OSVs in the morning on the way to Old Faithful and in the afternoon on the way back to West Yellowstone. This figure also shows that many of the OSVs cannot be distinguished as a snowmobile or a snowcoach. This indicates that many OSVs were audible over long distances because those operating nearby can usually be identified.

Figure 3-5. The average percent time audible by date of snowmobiles and snowcoaches, and wind at 2.3 miles (3.7 km) west of Madison Junction along the West Entrance Road Yellowstone National Park, 19 December 2007-8 March 2008.

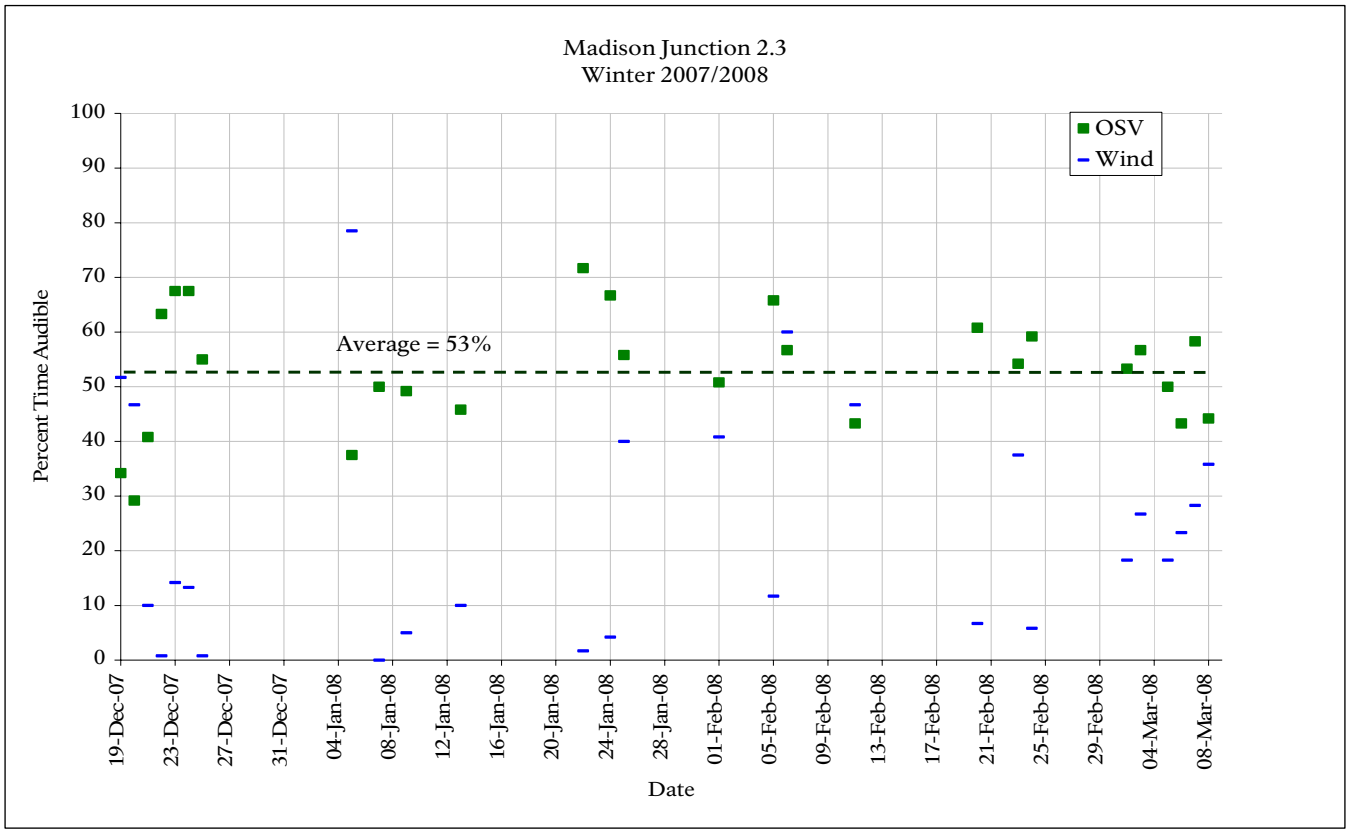
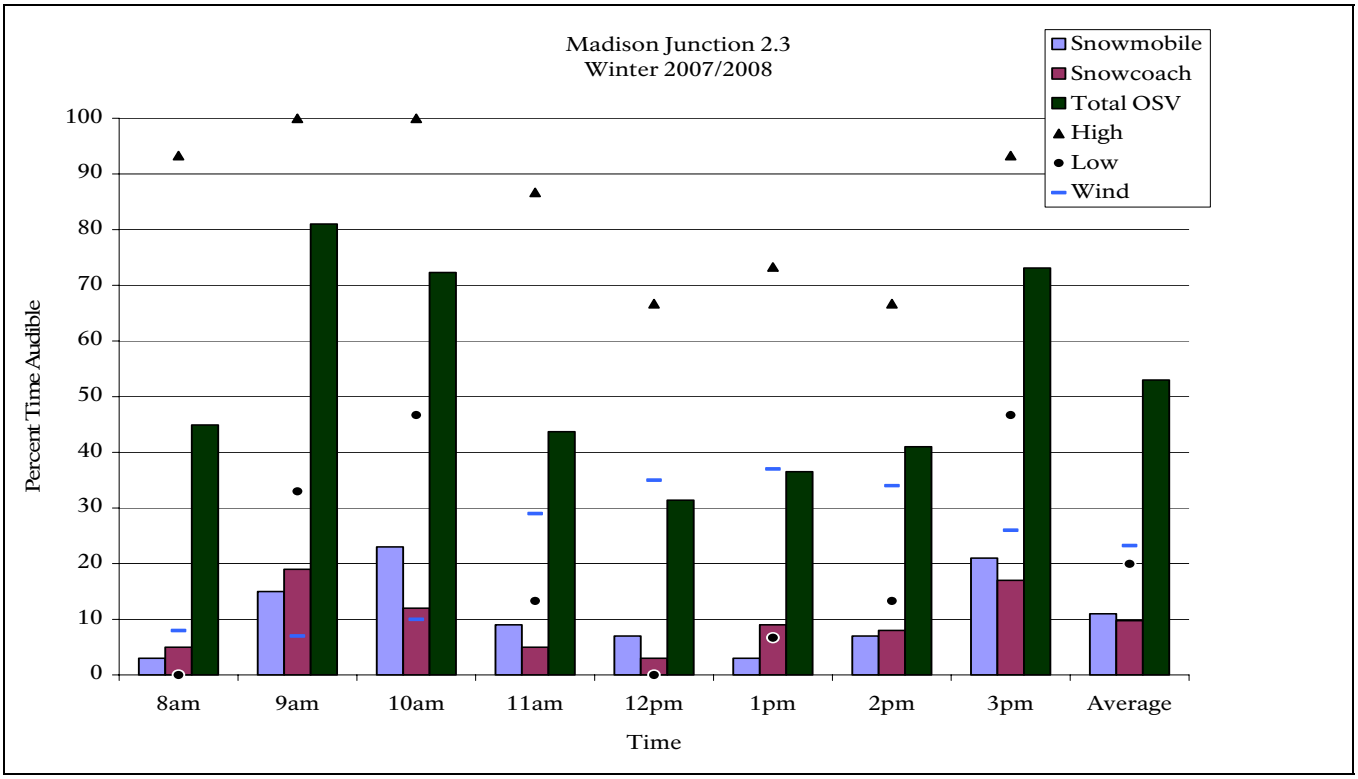


Figure 3-6. The average percent time audible by hour (8 am-4 pm) of snowmobiles and snowcoaches, and high and low OSV values at 2.3 miles (3.7 km) west of Madison Junction along the West Entrance Road Yellowstone National Park, 19 December 2007- 8 March 2008.



Backcountry areas

In the winter of 2006-07, soundscapes monitoring was done (for the entire winter) at Fern Lake, a site about 8 miles from the nearest OSV route. No OSV sounds were audible there all winter; the only non-natural sounds sources were aircraft. Jets and propeller planes were audible on average for 6% of the period 8 a.m. to 4 p.m. during the winter use period. Wind, snowfall, ducks, magpies, ravens, geese, and other birds were frequently audible and several coyotes and wolves were recorded. Overall, the area was consistently very quiet with few loud events; daytime periods had higher sound levels than nights, which had less wind, fewer bird vocalizations, and aircraft (Burson 2008a).

Last winter, sound monitoring was done for one week at Shoshone Geyser Basin, about 5.5 miles from the nearest road. There, the soundscape was defined by wind, geothermal activity, and distant OSV sounds. OSVs were audible as much as 47% of the day, averaging 18% (Burson 2008a). When the administrative component of this audibility is removed, the average audibility drops to about 14%.

Sound Level Analysis

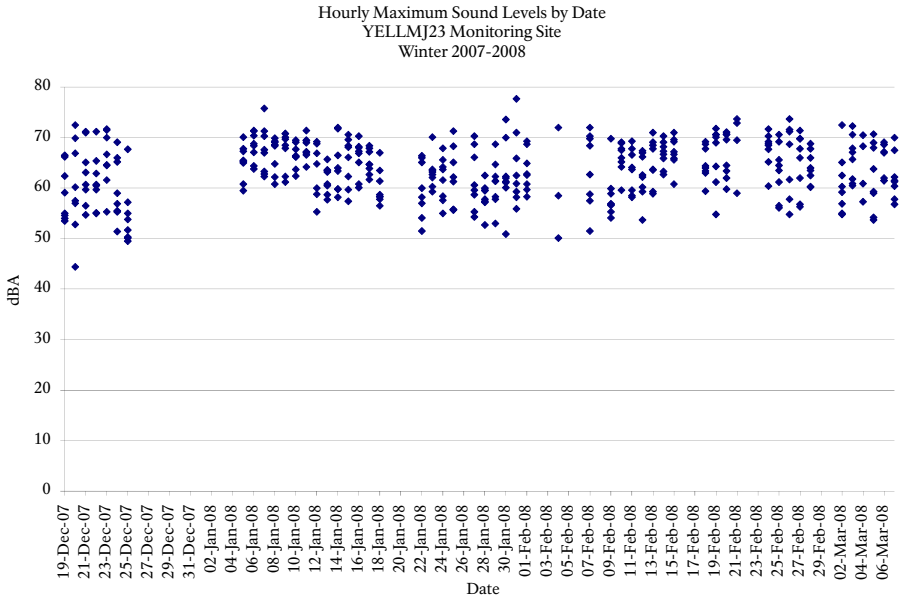
At the Old Faithful Weather Station site, the maximum sound levels were determined by OSVs on all but the windiest days when the wind created spurious readings from microphone overload. The lowest sound levels (measured at 22 dBA) were determined by the nearly constant utility sounds (exhaust and heating fans) from the Snow Lodge and Old Faithful Ranger Station.

In contrast, at the Old Faithful Upper Basin site, both the minimum and maximum sound levels were largely determined by natural thermal activity, gurgling and sputtering at low levels and

erupting geysers at the higher levels. Footsteps on the nearby boardwalk, people's voices, and wind in the trees also contributed to the sound levels documented. Construction activity at the Old Faithful Inn 1,100 feet away also was audible at low sound levels. OSVs were often audible and contributed to the soundscape, but only at intermediate and lower sound levels.

Consistent with previous seasons, the sound levels from OSVs at Madison Junction 2.3 occasionally exceeded the Temporary Plan maximum sound level impact definition threshold (70 dBA) during the hours of the measurement day (8 a.m. to 4 p.m.) in 2007-2008. The total duration of those exceedances averaged less than 1 minute per day, or less than 1% of the eight hour day. The 102 measured exceedances between December 2007 and March 2008 were attributed to the following types of vehicle: 94 snowcoaches, 4 snowmobiles, and 4 groomers. Figure 3-7 displays the hourly sound level peak by date (described in the figure title as "LMax") for all analyzed days of the 2007-08 season. Exceedances of 70 dBA violate the NPS's adaptive management threshold; most of these exceedances were due to high-stack Bombardiers.

Figure 3-7: Daily hourly maximum sound levels at Madison Junction 2.3.



The Grant Village/Lewis Lake monitoring site had more loud events than the Madison site. The majority of these maximum sound levels were from snowcoaches. Snowcoaches traveled at maximum cruising speeds passed this monitoring site, thereby generating higher sound levels. Of 233 exceedances, 216 were snowcoaches (96%), 15 snowmobiles (6%) and 2 groomers (1%). At night, this site was extremely quiet, but by day wind increased the natural sound levels.

Grand Teton National Park and the Parkway

Soundscapes monitoring data were also collected for Grand Teton National Park and the Parkway over the last several winters. Aside from the snowmobile and snowcoach tours departing Flagg Ranch for trips into Yellowstone, oversnow vehicle use in Grand Teton and the

Parkway has consisted of snowmobiles used by ice fishermen on Jackson Lake, snowmobilers traveling between the Targhee National Forest and Flagg Ranch on the Grassy Lake Road, and snowmobilers using the CDST. Since the 2004-2005 winter season, snowmobile use on Jackson Lake has averaged less than three per day (with a peak day of 15 in 2008), use of the CDST has averaged less than 15 snowmobiles per entire season, and use of the Grassy Lake Road averaged 2-3 per day.

Monitoring data was collected for Jackson Lake at several sites in 2005 and 2006. At Catholic Bay, 13 days of data collection in the January – March 2005 period resulted in snowmobiles being audible 0.5% of the time. At Cow Island, 17 days of data in February-March 2005 yielded 3% time audible, and 24 days of data collection over the period December 2005 – March 2006 resulted in less than 1% time audible (a total of 7 snowmobiles were heard). Four days worth of data collection at Colter Bay landing in February-March 2005 resulted in 3% time audible.

For Grassy Lake Road, 14 days of data during January-March 2005 yielded 6% time audible, some of which is believed to be from snowmobiles staging for trips into Yellowstone at Flagg Ranch.

Socioeconomics

The affected environment for socioeconomic impacts includes the parks, as discussed below. In addition, the economy of the GYA is described at three different levels: a state level (Idaho, Montana, and Wyoming), a county level (Fremont County in Idaho, Gallatin and Park Counties in Montana, and Park and Teton Counties in Wyoming), and a community level (Cody, Jackson, and Wapiti, Wyoming, and West Yellowstone, Montana).

Regulatory and Policy Overview

Economic and social values are fully entwined through the regulatory and policy environment of the National Park Service. The context for this discussion, and for public perception of socioeconomic values, lies in the debate about Organic Act purposes of public enjoyment and conservation of park resources and values. Appropriate forms of visitor enjoyment, including those that promote health and personal fitness, emphasize recreation that is consistent with park protection, including interpretation and contemplation of and understanding of the purposes for which a park was established. The NPS is committed to providing appropriate, high quality opportunities for visitors, and will maintain an atmosphere that is open and accessible to every segment of American society (NPS 2006: 8.2).

NPS managers have a strict mandate to protect park resources and values, a responsibility to manage all park uses, and when necessary, an obligation to regulate their amount, kind, time, and place (NPS 2006: 8.1). Appropriate visitor activities (NPS 2006: 8.1.1) are allowable when they have been determined to be consistent with the protective mandate. Any economic values associated with such use are effectively limited to what is appropriate and allowable.

The inevitable disagreements about what is appropriate or allowable are to be addressed by the NPS in seeking cooperative conservation beyond park boundaries (NPS 2006: 1.6) and the process of civic engagement (NPS 2006: 1.7). The former policy grows out of an understanding that parks are integral parts of larger regional environments. In order to protect park resources, the NPS is to work cooperatively with others to anticipate, avoid, and resolve potential conflicts, and address mutual interests in the quality of life for community residents. This includes matters such as compatible economic development and resource and environmental protection.

Cooperative conservation activities are vital in establishing relationships that will benefit the parks and fostering decisions that are sustainable. Civic engagement encourages effective two-way communication with the public, wherein the NPS will learn from the communities it serves while conveying the full meaning and relevance of park resources and values.

The series of policy statements set out in the 2006 NPS Management Policies section 8, Use of the Parks, refines these concepts. Policies set out in section 10, Commercial Visitor Services, are circumscribed by section 8 as they relate to visitor activities (NPS 2006).

Existing and Historic Socioeconomic Condition

Economy of the Greater Yellowstone Area

As discussed above, the affected economic environment is described at three levels (that description relies on IMPLAN modeling; see *Environmental Consequences*, Socioeconomics, for a description of the model). These three levels allow the reader to understand the magnitude of the impacts (both absolutely and relatively) at multiple stages. These were also the levels used in analysis in the previous EIS (NPS 2000b), SEIS (NPS 2003), EA (NPS 2004b), and EIS (NPS 2007a) for winter planning. The four communities at the local scale (Cody, Jackson, Wapiti, and West Yellowstone) provide the reader a representative example of the possible effects at the city or town level. Also, these communities have been previously identified as most likely to be affected by changes in winter use policies.

Visitors also use other gateway communities or areas. For example, skiers and snowboarders at Big Sky, Montana often spend part of their winter trip taking a snowmobile or a snowcoach tour into Yellowstone. Similarly, Livingston, Cooke City, and Gardiner, Montana are important gateway communities to Yellowstone's North and North East Entrances. Dubois, Wyoming is a gateway community to both Yellowstone and Grand Teton. Driggs and other Idaho communities west of Teton Pass are gateways to Grand Teton. Other geographic areas, within the counties or states, but outside the communities can also be affected the winter use alternatives. The effects on these smaller areas may be masked even at the zip code level of analysis that occurs with IMPLAN modeling, but will be represented through qualitative discussions.

Table 3-4 presents the relative sizes of the economies of the six geographic areas analyzed (the three-state area, the five-county area, and the four individual communities). The range of total economic output among these areas ranges from $166 billion annually in the three-state area to $10 million in the Wapiti, Wyoming area. This range suggests that a change in visitor activity that is generally small in the context of the three-state area has the potential to be substantial in the context of the much smaller economy of West Yellowstone. However, as noted below, this does not mean that individuals and businesses in the area have not been affected by changes in visitor activities. Some businesses that relied specifically on snowmobile access have reported being adversely affected. Others have noted that their ability to retain highly qualified, year-round workers has been diminished (Ecosystem Research Group 2006). For comparison, using 1999 IMPLAN data, the estimated total economic output of the three states was $125 billion; five counties, $6.4 billion; Cody, Wyoming, $800 million; Jackson, Wyoming, $1.2 billion; and West Yellowstone, $113 million. From 1999 to 2003, the economies grew by 33%, 48%, and 33%, respectively. Employment in 1999 for the three states was 1,651,000 jobs; five counties, 103,000 jobs; Cody, 11,414 jobs; Jackson, 17,687 jobs; and West Yellowstone, 2,177 jobs. From 1999 to 2003, output grew between 33% and 51%; however, Cody's output only grew 15%. For employment, the various areas grew between 6 and 15%; however, Cody lost about 6% of its jobs between 1999 and 2003.

Table 3-4: Economic Output and Employment Levels for the Greater Yellowstone Area, 2003

Geographic Area	Total 2003 Output [a]	Total 2003 Employment [b]
Three-State	$166,318,000,000	1,750,137
Five-County	$9,547,000,000	115,822
Cody, WY	$917,000,000	10,705
Jackson, WY	$1,860,000,000	20,302
West Yellowstone, MT	$167,000,000	2,333
Wapiti, WY	$10,300,000	112

[a] Includes direct, indirect, and induced output
[b] All jobs, both full and part time. The analysis area at the community level is by zip code, thus the area may not correspond with city limits.

Recent Trends in Park Visitation

This analysis estimates changes in total visits to the three park units in the GYA by people who are from outside the area. The estimated regional economic impacts discussed in *Environmental Consequences* consider impacts to the GYA that are associated with the different winter management alternatives considered, including limits to the use of snowmobiles and snowcoaches within the parks.

Previous estimates of changes in GYA visitation in response to changes in winter use policies relied primarily on visitor surveys to predict future policy impacts (Duffield and Neher 2000; RTI International 2004). The current analysis, however, benefits from several years of data collected during periods of varying winter use visitation levels. These sources of observed data allow the current analysis to incorporate trends in winter economic activity to supplement predictions based on visitor survey responses. Visitation data for the parks is presented in Visitor Access and Use in this chapter.

Recent Trends in the Greater Yellowstone Area Economy

Analyses for previous winter use planning efforts in the parks have predicted that restrictions on some types of winter use (snowmobiles primarily) would be at least partially offset by winter visitors still recreating in the GYA but utilizing other recreational opportunities outside of the parks. As a general example, it was predicted that restricting access to the parks for some uses, such as snowmobiling, could lead to offsetting increases in use of other GYA recreational opportunities, such as snowmobiling in the national forests.

As shown later in this section, however, there have been noteworthy declines in both snowmobile visits and total winter visitation to YNP in the past six years. An examination of key tourism-targeted tax collections in the GYA counties bordering the parks provides information on the degree to which the economies of these counties and communities are economically dependent on park winter visitation.

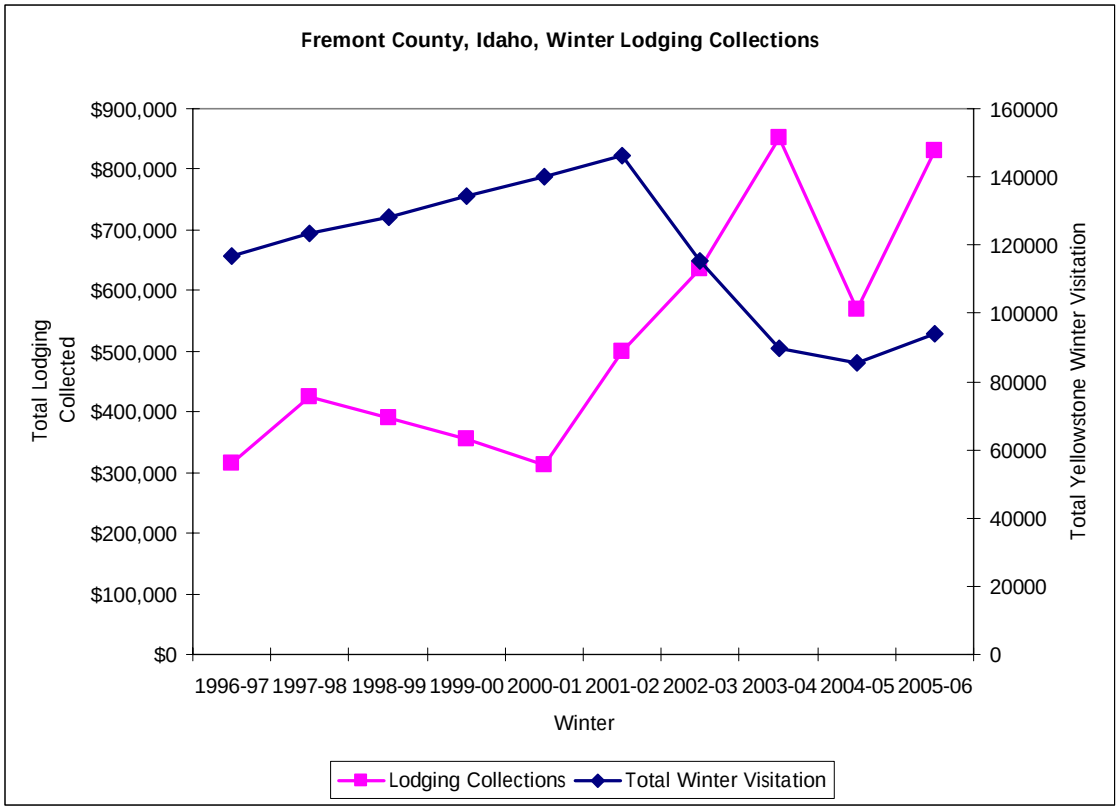
Table 3-5 and Figure 3-8 present winter lodging collections for Fremont County, Idaho. In general, during the period of time when winter visitation to YNP was decreasing (2002-2003 through 2005-2006), winter lodging tax collections in Fremont County trended upwards—opposite of YNP visitation trends. Fremont County winter lodging tax collections in 2005-2006 were over double the level seen in the four years prior to 2002 (and the management changes

that began in 2003). Winter lodging taxes in Fremont County seem to more closely match the statewide 16.7% growth in lodging tax that occurred during the same period (Otter 2007).

Table 3-5: Fremont County, Idaho, Winter Lodging Tax Collections Compared with Yellowstone National Park Winter Visitation, 1996-1997 through 2005-2006 (Idaho State Tax Commission 2006).

	Total Lodging Sales					
Winter Season	Dec	Jan	Feb	Mar	Total for Winter	YNP Winter Visitation (OSV and wheeled)
1996-97	$42,442	$44,183	$83,866	$143,806	$314,297	116,882
1997-98	$204,652	$34,754	$114,365	$71,945	$425,716	123,225
1998-99	$93,591	$55,816	$180,620	$59,299	$389,326	128,057
1999-00	$76,263	$70,473	$112,822	$96,865	$356,423	134,326
2000-01	$80,688	$58,952	$101,676	$71,411	$312,727	139,880
2001-02	$123,261	$76,855	$144,869	$155,416	$500,401	146,425
2002-03	$61,374	$131,383	$239,068	$204,393	$636,218	115,304
2003-04	$246,769	$107,345	$406,135	$92,864	$853,113	89,626
2004-05	$116,323	$4,661	$335,441	$112,605	$569,031	85,224
2005-06	$221,627	$261,024	$236,964	$111,201	$830,816	94,206

Figure 3-8: Comparison of Fremont County, Idaho, Winter Lodging Collections and Yellowstone National Park Winter Visitation, 1996-1997 through 2005-2006



Note: Original figure is in color; printing costs precluded use of color. The reader may obtain the color version at http://www.nps.gov/yell/parkmgmt/winterusetechnicaldocuments.htm.

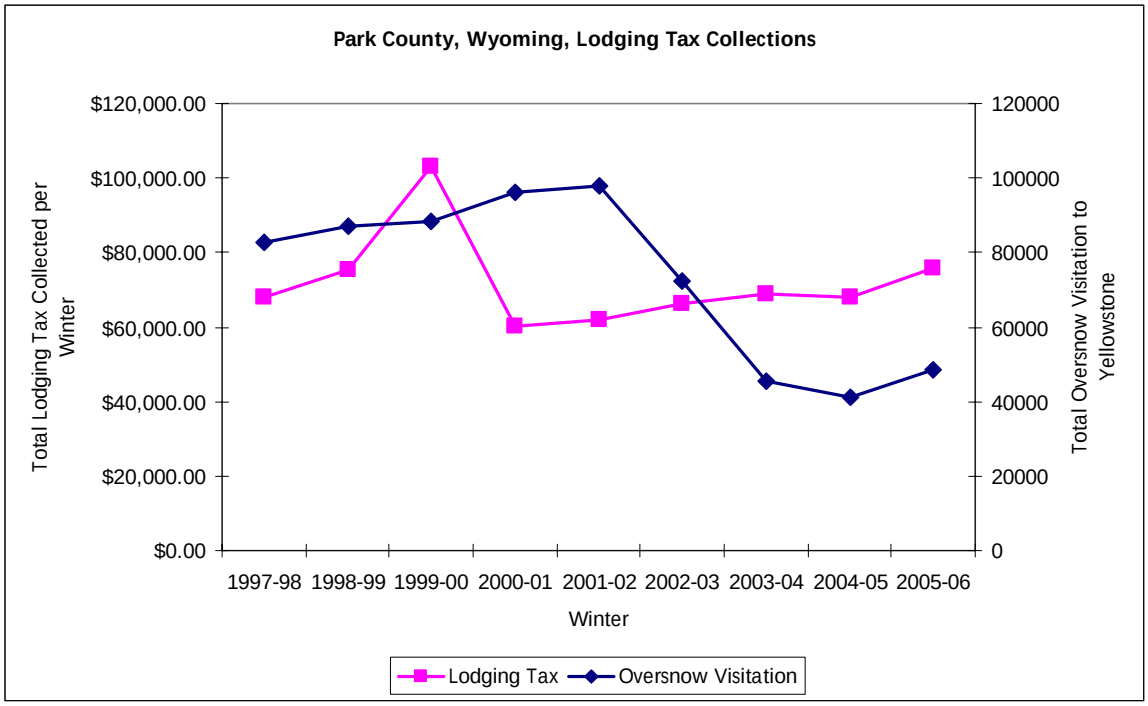
Table 3-6 and Figure 3-9 present similar winter lodging tax collection information for Park County, Wyoming, on the east side of YNP. The main community in Park County is Cody. However, Park County includes the northern portion of YNP, including the Mammoth Hot Springs Hotel, which is open during the winter (Snow Lodge, at Old Faithful, is in Teton County, Wyoming). This table shows both total OSV visitation levels for YNP and total winter lodging tax collections for the county. As is the case in Fremont County, winter lodging tax collections did not follow the decrease in YNP OSV visitation during 2002-2006. The Mammoth Hot Springs Hotel accounts for 41% of the Park County lodging tax in the winter.

Table 3-6: Park County, Wyoming, Winter Lodging Tax Collections, in Tax Year Dollars, Compared with Yellowstone National Park Oversnow Visitation, 1997-1998 through 2005-2006*

Winter Season	Dec	Jan	Feb	Mar	Total for Winter	YNP OSV Visitation
1997-98	$33,155	$8,498	$13,458	$12,965	$68,075	82,731
1998-99	$24,258	$9,523	$12,509	$29,218	$75,509	87,050
1999-00	$59,379	$14,971	$10,617	$18,184	$103,151	88,270
2000-01	$20,467	$9,384	$16,200	$13,955	$60,006	96,156
2001-02	$26,971	$9,477	$12,352	$13,072	$61,872	98,038
2002-03	$27,486	$14,217	$10,417	$14,256	$66,376	72,560
2003-04	$28,765	$12,527	$9,455	$18,090	$68,837	45,535
2004-05	$27,841	$13,210	$13,313	$13,556	$67,919	41,291
2005-06	$20,520	$21,382	$20,532	$13,244	$75,679	48,689

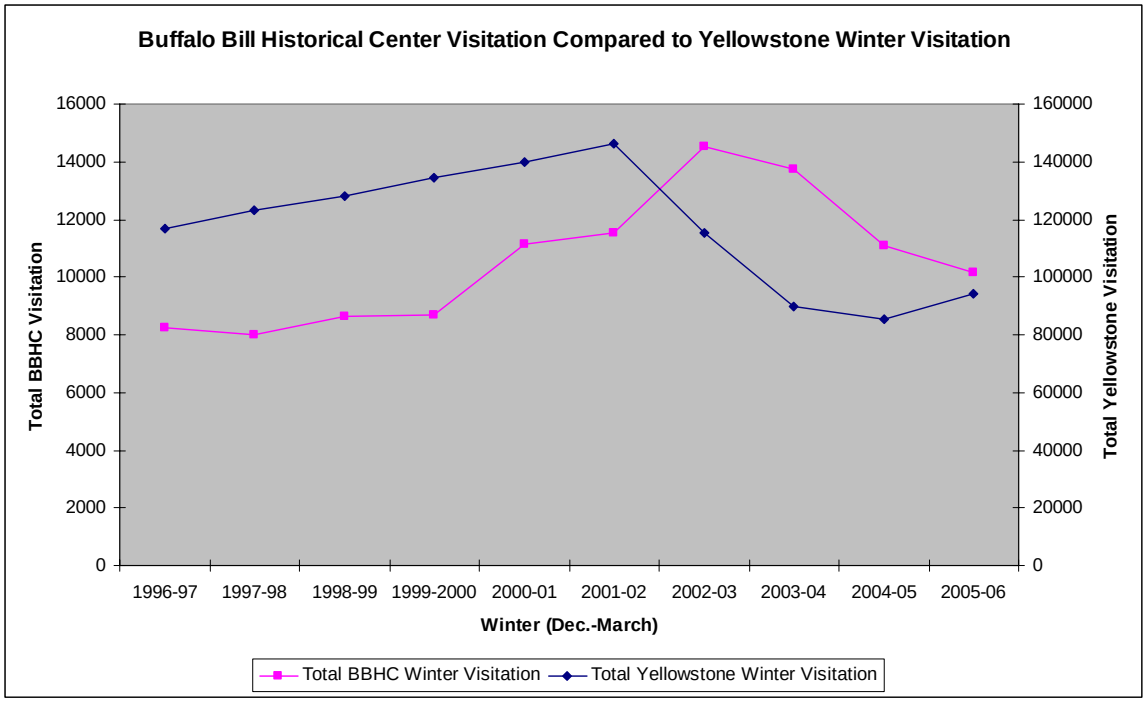
*The report, "Economic Trends in the Winter Season for Park County, Wyoming" by David T. Taylor (Taylor 2007) presents different winter lodging tax information (excluding December and lagged 2-months) for 5 of the 9 years presented above. However, the general lodging tax trends (without regard to inflation – see text below) are the same in both reports.

Figure 3-9: Comparison of Park County, Wyoming, Winter Lodging Tax Collections, and Yellowstone National Park Oversnow Visitation, 1997-1998 through 2005-2006



The recent lodging and tax data for Fremont and Park counties indicate that declines in snowmobile entries into YNP in particular, and in winter visitation in the park in general, have not detectably impacted the overall winter tourist economy in the counties as measured by monthly lodging tax collections. This is despite the fact that the economies of these counties are relatively small. However, one of the stronger relationships between winter use in the parks and a local entity is with the Buffalo Bill Historic Center (BBHC) in Cody, Wyoming. As the following graph (Figure 3-10) indicates, overall Yellowstone winter visitation and BBHC winter visitation seem to move together.

Figure 3-10: Comparison of Buffalo Bill Historic Center (BBHC) winter visitation with and Yellowstone National Park overall winter visitation (wheeled and oversnow), 1996-1997 through 2005-2006



Two other adjoining counties, Gallatin County in Montana (including Bozeman) and Teton County in Wyoming (including Jackson) have relatively large economies where even substantial changes in YNP and GTNP winter visitation would not be detectable. For example, the observed change in visitation at the south entrance in response to the Temporary Winter Use Plan might have an expenditure impact on the order of $4 million per year. By comparison, the five county GYA economy (largely driven by Gallatin and Teton counties) was on the order of $6 billion in 1999 and in 2003 (the most recent IMPLAN data available) had grown to about $9 billion. Similarly, impacts from changes in the parks' winter visitation levels for the three-state economy would not be detectable.

However, the relative size of the county economies does mask likely individual changes that have occurred. Some individual businesses have indicated a considerable reduction in their winter operations. Other employment patterns have changed (all-year work for some employees is no longer available) as a result of changing visitation patterns (Ecosystem Research Group 2006).

Parenthetically, for the north entrance gateway of Gardiner, Montana (Park County), almost all winter use is wheeled vehicle entries. Neither the Temporary Winter Use Plan (NPS 2004b) nor the 2007 FEIS had a noticeable effect on visitation through this entrance. Visitors there are destined for Mammoth Hot Springs and sites such as the Lamar Valley in the park's northern range (which are both in Park County, Wyoming) or other YNP locations or to recreate in and around Cooke City, Montana (which is in Park County, Montana).

Another indicator and change in the winter economy is wildlife viewing in Yellowstone. A 2004-2006 year-round survey looked at the economic effects of wolf watching and wolf presence to Yellowstone visitors. Winter visitors, who constitute about 3.1% of the annual visitation to Yellowstone, contribute about $1.3 million to the 17-county economy just related to wolf presence in Yellowstone. This is about 5.8% of the total annual $22.5 million direct spending impact of wolf watching to the 17-county economy (Duffield, Neher, and Patterson 2006).

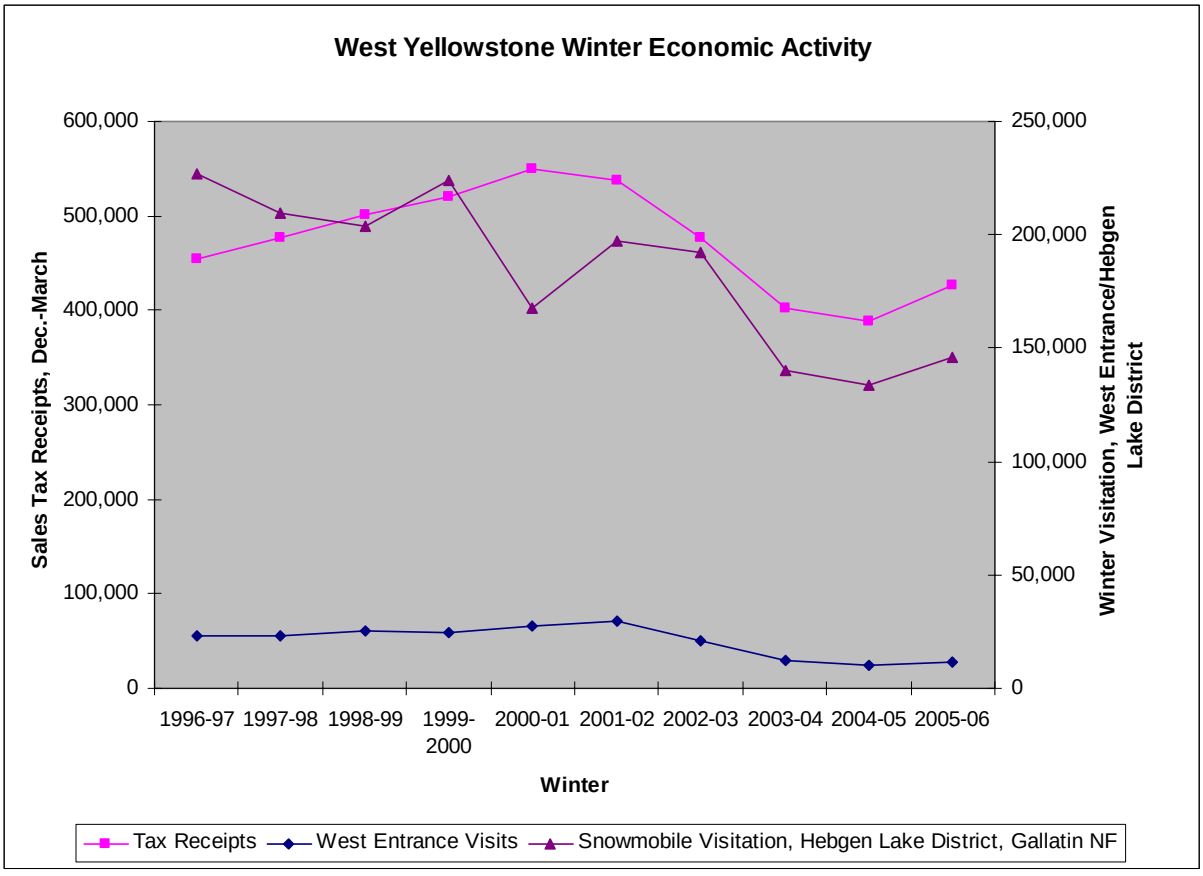
The lodging tax information at the county level in tables 3-5 and 3-6 is as reported by the respective states and does not include an inflation factor. That is, lodging costs typically increase as a result of inflation, thus lodging tax revenue (which is a percent of the cost of lodging) will also increase. When inflation is included, the inflation-adjusted tax revenue may be lower, even though the tax dollars stay the same or increase (Taylor 2007). A variety of inflation estimates exist, such as the national consumer price index (CPI), the core consumer price index (which excludes food and energy), the consumer price index for all urban consumers in the west (CPI-U), the consumer price index for urban wage earners and clerical earners in the west (CPI-W), and Monthly Average Daily Room Rates (U.S. Department of Labor 2007; Taylor 2007). The NPS chooses to present lodging tax information without an inflation adjustment since there are a variety of possible indices, but notes through the reference to Taylor 2007 that such adjustments can be made. Also, another similar report examining tourism in Wyoming (Dean Runyan Associates 2006) and cited by Taylor 2007 does not (except for one table in a 71-page report) take into account inflation.

The remaining major gateway community for YNP and GTNP is West Yellowstone, at the west entrance to YNP. Table 3-7 provides time series data for this entrance, shown graphically in Figure 3-11. Included in the table are winter resort tax collections for the town of West Yellowstone, winter entries through the west entrance to YNP, and winter snowmobile visits to the Hebgen Lake District of the Gallatin National Forest, which abuts the town to the west. Unlike the cases of Park and Fremont Counties, discussed above, it is clear that in response to reductions in winter park visits through the west entrance in 2002-2003 through 2005-2006 and in response to reduced forest visits, resort tax collections also fell. It should be noted that the decline was not in proportion to the decrease in west entrance visits. Specifically, comparing average levels for the four years immediately before and after management changes (2002-2003 through 2005-2006 to the four years immediately preceding this period) shows that while park visitation fell 48.5% on average, winter tax collections only fell 19.7%. However, Montana's statewide lodging tax grew 17% during the same time period. The nearly 20% reduction in tax revenue is more striking in light of the statewide increase and perhaps a better indicator of the relative impact of the recent decrease in winter park visitation on West Yellowstone (Otter 2007).

Table 3-7: West Yellowstone Winter Resort Tax Collections, Hebgen Lake District Snowmobile Use, and Yellowstone West Entrance Winter Visits, 1989-1990 through 2005-2006

Winter Season	West Yellowstone Winter Resort Tax Collections	Gallatin National Forest Hebgen Lake District Snowmobile Use	Yellowstone National Park West Entrance Winter Visits
1996-97	$455,035	226,555	56,212
1997-98	$476,508	209,420	54,859
1998-99	$500,473	203,759	59,928
1999-00	$520,566	223,726	58,154
2000-01	$549,182	167,512	66,302
2001-02	$536,996	197,190	70,371
2002-03	$476,037	191,847	49,703
2003-04	$401,664	139,991	28,880
2004-05	$388,222	133,858	24,510
2005-06	$425,933	146,128	28,243

Figure 3-11: West Yellowstone Winter Resort Tax Collections, Hebgen Lake District Snowmobile Use, and Yellowstone West Entrance Winter Visits, 1996-1997 through 2005-2006



The observed data for West Yellowstone resort tax collections and west entrance visits were used to estimate a linear regression model explaining tax levels as a function of west entrance visits for a time series of the December through March winter months for the 1989-1990 through 2005-2006 winters. This estimated model explains a substantial proportion (73.2%) of the variation in winter resort tax collections. The model indicates a $5.26 increase in tax collections for each west entrance visit. Since the tax rate is 3%, this implies $175.33 of taxable expenditures in West Yellowstone for each park visit. The model also implies that in 1989-1990, some other factor accounted for a substantial share of resort tax collections. This could possibly be snowmobile use on the adjacent national forest lands, as discussed below.

Table 3-7 and Figure 3-11 also present data for snowmobile use on the Hebgen Lake District of the Gallatin National Forest. This district includes many miles of groomed snowmobile trails that are accessible primarily from the West Yellowstone area. What these data show is that in the last three winters, snowmobile use on this national forest area adjacent to West Yellowstone has declined at the same time park visits through the west entrance declined. Causation, though, is complicated by the short time series and a drought and relatively low snow pack in recent years, including the winter of 2004-2005. In any case, these data suggest that restrictions on snowmobile access at the west entrance have not led to noticeable increased use on the adjacent national forest.

National forest snowmobile use data were also obtained for the Ashton/Island Park Ranger District of the Caribou-Targhee National Forest (Davis, Jenkins, and Angell 2006). The ranger district is generally in Fremont County, Idaho. Many of the trails on this district are also accessed by visitors staying at West Yellowstone. The most complete data are for counters at Twin Creek, Red Rock, Flagg Ranch, and Big Springs for 2003 to 2006. Total use for these counters for the winter seasons of 2002-2003 through 2005-2006 was 29,893, 34,412, 40,993, and 39,781, respectively. These data show an increase for the most recent two years, but combined with the Hebgen Lake data there is still a substantial decline in total national forest snowmobile use on these two districts. The increase for the Ashton/Island Park District may be due to better counts of use, and the sense of district staff is that use is actually down. The trailheads on the district most used by snowmobilers staying at West Yellowstone are Big Springs and Twin Creek. Data for these trailheads are summarized in Table 3-8, and show an increase in 2004-2005 and 2005-2006.

Table 3-8: Ashton/Island Park Ranger District Snowmobile Use, Trailheads Used by West Yellowstone Visitors, 2002-2003 through 2005-2006

Winter	Twin Creek Trailhead	Big Springs Trailhead	Total
2002-03	9,991	14,025	24,016
2003-04	10,305	11,589	21,894
2004-05	14,181	20,313	34,494
2005-06	12,093	20,232	32,325
Source: Davis, Jenkins, and Angell 2006.			

Data for selected trailheads in the Bridger-Teton are shown in Table 3-9. The CDST-Togwotee and the Gros Ventre trailheads are most likely to show influences from park winter use management. These data show no clear trend, but use is either approximately stable or slightly down. The best long-term data for the Bridger-Teton are for Grey's River trailhead. The use at this trailhead is shown in Table 3-10 for 1996-1997 to 2004-2005. The trend is up, but this is not likely related to park winter use management, but rather regional population growth, including the Idaho Falls and Salt Lake City areas. The Greater Yellowstone Coordinating Committee has undertaken a winter use monitoring strategy on the six national forests adjoining YNP. One objective of this work was to answer the question of whether restrictions in snowmobile use in national parks result in changes in snowmobile use on national forests. Currently five-year summaries of the findings from monitoring snowmobile use in the GYA are being evaluated. Preliminarily, it appears that use on the forests has not increased in response to changes in park winter use policy, but the interpretation is complicated by recent drought conditions.

Table 3-9: Bridger-Teton National Forest Snowmobile Use, CDST-Togwotee and Gros Ventre Trailheads, 1998-1999 through 2003-2004

Winter Season	CDST-Togwotee Trailheads	Gros Ventre Trailhead	Total
1998-99	186	165	351
1999-00	231	122	353
2000-01	167	152	319
2001-02	165	142	307
2002-03	153	118	271
2003-04	118	230	348
Source: Bridger-Teton National Forest summary of winter use monitoring 1999-2004.			

Table 3-10: Bridger-Teton National Forest Snowmobile Use, Grey's River Trailhead, 1996-1997 through 2004-2005

Winter Season	Gray's River Trailhead
1996-97	7,956
1997-98	9,025
1998-99	8,897
1999-00	no data
2000-01	8,716
2001-02	9,906
2002-03	no data
2003-04	10,066
2004-05	9,230
Source: Susan Marsh, pers. comm. 2006.	

However, a major caveat is that winter visitor surveys on the national forests are not extensive. Additionally, it is possible that changes in park winter use have led to increases in other types of GYA winter use. Relative to total winter recreation in the GYA, the fraction affected by current park winter use policies is rather small. For example, downhill ski use at Big Sky and Jackson Hole Ski Area (not to mention Bridger Bowl, Red Lodge, Snow King, and Grand Targhee) has reached record levels in the last few years. While the key issue for this analysis is the change in GYA winter recreation visits (and expenditures) as a function of park winter use policy, it is difficult to collect reliable aggregate data for these statistics. The most relevant and comprehensive data are visitor use in the parks.

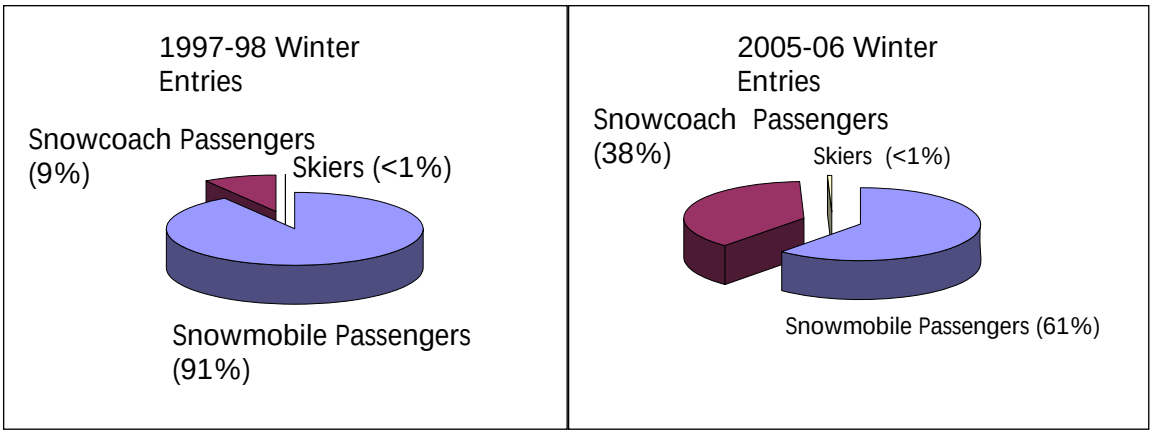
The primary conclusion from Table 3-7 and Figure 3-11 is that even in West Yellowstone, a community located at a park entrance and with an economy heavily dependent on tourism spending, changes in park winter use management may impact local economic activity but the economy is not wholly dependent on winter park snowmobile access. Among other activities, snowmobiling on the adjacent national forests is also important for the West Yellowstone economy.

That hypothesis was tested by estimating a second linear regression model of winter West Yellowstone tax receipts, this time including snowmobile counts in the Hebgen Lake District as an explanatory variable in addition to YNP west entrance winter visits. In this model, both park visits and forest visits are statistically important factors explaining tax receipts. Additionally, this model now accounts for most if not all of the resort tax collections. The results strongly support the hypothesis that, in addition to YNP west entrance visits, snowmobiling on the adjacent national forests is also important for the West Yellowstone economy (Duffield and Neher 2006).

Of the five regional economic areas examined in this analysis, only for the gateway community of West Yellowstone is there a detectable impact on the relevant area's economy from winter use in Yellowstone (and that on the surrounding national forests). These results are consistent with the predicted impacts from the socioeconomic impacts section of the FSEIS (NPS 2003), where the authors noted that measurable impacts from changes in winter use policy in the parks would only be found in the community of West Yellowstone.

Figure 3-12 shows a comparison of the YNP west entrance use distributions for the winter of 1997-1998 (before winter use policy changes), and 2005-06 (after changes). Clearly, the distribution of use between snowmobiles and snowcoaches has changed substantially in the wake of the temporary winter use plan. Prior to these changes, snowmobile visitors made up about 91% of west entrance visits; currently 61% of these visits are by snowmobile. Snowcoach use has increased from 9% of west entrance use to 38%. In 2004-2005, which was a year with low snow pack in the West Yellowstone and Old Faithful areas, snowcoach and snowmobile use were approximately equal.

Figure 3-12: Comparison of West Entrance Use Distribution, 1997-1998 vs. 2005-2006



It is notable that winter access by autos, recreational vehicles and buses, all of which in a normal winter is through the north entrance, has been relatively stable. This seems to indicate that visitors are not substantially substituting access between entrances in response to changes in winter use management. Also, because access through the west, south, and east entrances to YNP is all oversnow under current and historic management, there does not seem to be a shift in access modes between cars and OSVs. To conclude, the main changes with respect to visitor use levels brought about by current park management are the reduction in total snowmobile use and the substitution within motorized oversnow use from snowmobiles to snowcoaches. The latter has steadily increased the last five winters.

Air Quality and Air Quality-Related Values

The affected environment for air quality impacts and air quality-related values is the parks, as discussed below. Additionally, some discussion of air quality and related values for the town of West Yellowstone, Montana is relevant because of its proximity to the west entrance to Yellowstone, and because air quality monitoring data is available from that location.

Regulatory and Policy Overview

YNP and GTNP are classified as Class I areas under the Federal Clean Air Act. This air quality classification is to provide protection against air quality degradation in national parks and wilderness areas. The Clean Air Act defines mandatory Class I areas as national parks over 6,000 acres, wilderness areas over 5,000 acres, and national memorial parks over 5,000 acres designated as of the date of the Act. The Parkway is a Class II area but is managed as a Class I area according to NPS policy. As required by the visibility protection provision of the Clean Air Act, additional procedural requirements apply when a proposed source has the potential to impair visibility in a Class I area (40 CFR 52.27 (d)). See NPS 2006: 4.7.1 Air Quality, included in Appendix A.

Both Wyoming and Montana have, pursuant to the Clean Air Act provisions, adopted air quality standards that are more stringent for some pollutants than provided in the Federal Standards (known as the National Ambient Air Quality Standards). While it is clear that the Clean Air Act delegates jurisdiction for enforcement of air quality standards to conforming states, it is equally clear that the act gives federal land managers the affirmative responsibility to protect air quality and air quality related values (including visibility). The federal land manager, in this case the NPS, has the authority and jurisdiction to administer some provisions of the Clean Air Act,

particularly the non-degradation standard for Class I air, and to manage activities within their jurisdictions that either affect, or have the potential to affect, air quality or associated values.

As required by the Clean Air Act and its amendments, the Environmental Protection Agency has established primary and secondary National Ambient Air Quality Standards (NAAQS) for six major air pollutants: carbon monoxide (CO), nitrogen dioxide (NO2), ozone (O3), particulate matter (PM10 and PM2.5), sulfur dioxide (SO2), and lead. The NAAQS of primary concern for this analysis (CO, PM10 and PM2.5) are shown in Table 3-11.

CO is a colorless, odorless, and poisonous gas produced by incomplete burning of carbon in fuels. When CO enters the bloodstream, it reduces the delivery of oxygen to the body's organs and tissues. Health effects may include impairment of visual perception, manual dexterity, learning ability, and performance of complex tasks; headaches and fatigue; or respiratory failure and death. PM includes dust, dirt, soot, smoke, and liquid droplets from sources such as power plants, vehicles, construction activity, fires, and windblown dust. PM can either be emitted directly from such sources or formed in the atmosphere through secondary reactions or condensation. Health effects from PM emissions include reduced lung function, long-term risk of increased cancer rates, and the development or aggravation of respiratory problems. Hydrocarbons (HCs, which are not regulated by the Clean Air Act but do have other regulatory standards) include air toxics or hazardous air pollutants such as benzene, formaldehyde, and 1,3 butadiene (note that monitoring for particulates captures many hydrocarbons).

The primary standards protect public health, and represent levels at which there are no known major effects on human health. The secondary standards are intended to protect the nation's welfare, and account for air pollutant effects on soil, water, visibility, materials, vegetation, and other aspects of the environment. Therefore, aside from being national standards, both primary and secondary standards have applicability to air quality in national parks. The secondary standards are directly related to the protection of a wide variety of park resources. For CO, PM10 and PM2.5, the primary and secondary standards are the same. Data from air quality monitoring studies are summarized, relative to the standards, in Tables 3-12 to 3-15, below.

Table 3-11: National Ambient Air Quality Standards

Pollutant	Primary		Secondary	
	PPM (parts per million)	ug/m^3 (micro-grams per cubic meter)	PPM	ug/m^3
Carbon Monoxide (CO)				None
Maximum 8-Hour Concentration[a]	9			
Maximum 1-Hour Concentration[a]	35			
Maximum 1-Hour Concentration (Montana)[a]	23			
Respirable Particulates (PM10)				
Annual Arithmetic Mean[b]		50		Same as Primary
Maximum 24-Hour Concentration[a]		150		

Respirable Particulates (PM2.5) Annual Arithmetic Mean[c] Maximum 24-Hour Concentration[d]		 15 65		Same as Primary

Notes:

[a] Not to be exceeded more than once per year.

[b] To attain this standard, the 3-year average of the weighted annual mean PM10 concentration at each monitor within an area must not exceed 50 ug/m^3.

[c] To attain this standard, the 3-year average of the weighted annual mean PM2.5 concentrations from single or multiple community-oriented monitors must not exceed 15.0 ug/m^3.

[d] To attain this standard, the 3-year average of the 98th percentile of 24-hour concentrations at each population-oriented monitor within an area must not exceed 65 ug/m^3.

PPM = parts per million; ug/m^3 = micrograms per cubic meter

Source: 40 CFR 50—National Primary and Secondary Ambient Air Quality Standards

New Research and Monitoring

A variety of recent air quality research and monitoring contributes to this section. Dr. Gary Bishop and others from the University of Denver conducted winter emissions measurements in YNP that involved the collection of emissions data from in-use snowcoaches and snowmobiles in February 2005 and February 2006. Results from the work indicate that while most snowcoaches have lower emissions per person than two-stroke snowmobiles, the snowcoach fleet could be modernized to reduce unnecessary carbon monoxide (CO) and hydrocarbon (HC) emissions. Vans and coaches with efficient fuel-injected engines and catalytic converters can be nearly as clean as modern wheeled passenger vehicles. This supports both snowmobile BAT and the development of snowcoach BAT (scheduled to be implemented in 2011) (Bishop et al. 2006, Bishop et al. 2007).

Monitoring conducted in YNP by the State of Montana and the NPS Air Resources Division in the past several winters for CO and PM2.5 indicates that concentrations of both pollutants have stabilized at levels well below the national standards—about 20% of the national standards (Ray 2008). Because many hydrocarbons occur as particulates and because monitoring for hydrocarbons is quite complex, monitoring is done instead for particulates (thereby capturing many particulates). The NPS has also done extensive testing for air toxics, which include many hydrocarbons; see the Health and Safety section. Lower ambient concentrations of both pollutants are primarily attributable to the Best Available Technology used in today's snowmobiles as well as the lower numbers of them. Summer traffic with wheeled-vehicles contributes a smaller amount of CO and PM than winter activity by snowmobiles and snowcoaches (Ray 2005; Ray 2006; Ray 2007; Ray 2008).

Existing and Historic Conditions

In recent years, the NPS has conducted winter air quality monitoring in the Old Faithful developed area at YNP. Meteorological, gaseous, and particulate variables were monitored continuously. The Montana Department of Environmental Quality (DEQ) also collects meteorological, gaseous, and particulate data at a monitoring station at the West Entrance to YNP.

Air quality monitors for CO and PM2.5 are located at both the West Entrance and Old Faithful. A long term trend for CO is provided in Figure 3-13 and for PM in Figure 3-14 below; both figures indicate snowmobile numbers as well. Tables 3-12 through 3-15 below provide a summary of the monitoring results for these locations. Since monitoring began in 1998 for CO and in 2002 for PM2.5 at YNP, measured pollutant concentrations have steadily decreased, consistent with the snowmobile technology emission requirements of the last five years and the decrease in number of snowmobile visits. At the West Entrance, the highest measured 8-hour average CO concentrations have gone from a near NAAQS exceedance of 8.9 parts per million (ppm) in the 1998-1999 winter season to 1.6 ppm in 2007-2008 (Ray 2008). At Old Faithful, the highest measured 8-hour average CO concentrations have declined from 1.2 ppm in the 2002-2003 winter season to 0.4 ppm in 2007-2008.

The highest measured 24-hour average PM2.5 concentrations at the West Entrance have declined from 15 micrograms per cubic meter (ug/m^3) in the 2002-2003 winter season to 9.5 ug/m^3 in 2007-2008. At Old Faithful the highest measured 24-hour average PM2.5 concentrations have declined from 37 ug/m^3 in the 2002-2003 winter season to 8.1 micrograms per cubic meter in 2006-2007 (Ray 2007). These monitored maximum values demonstrate a distinct trend of improvement in winter pollutant concentrations in YNP. Since the implementation of BAT requirements for snowmobiles and the reduction in snowmobile numbers, winter air quality in Yellowstone has been pristine.

In addition to snowmobile and snowcoach emissions, an important driver of air quality is meteorological conditions. Days where inversions occur, with little or no wind, tend to facilitate the accumulation of pollution in areas where snowmobiles and snowcoaches congregate, such as the West Entrance. This phenomenon was illustrated on the two days during the 2003–2004 season in which the highest CO concentrations were observed. On December 23, 2003, a 1-hour CO concentration of 6.3 ppm was observed at the West Entrance at 5:00 p.m., with only 143 snowmobiles entering the park's West Entrance on that day. On February 12, 2004, 181 snowmobiles entered the West Entrance, and a 1-hour CO concentration of 3.1 ppm was observed. By contrast, the West Entrance's busiest day during the 2003–2004 season, with 307 snowmobiles, had a maximum 1-hour CO concentration of 1.5 ppm. Such variability—which is still producing peaks well below the NAAQS—is still the norm; the winter of 2007-08 saw a 1-hour CO peak at the West Entrance of 6.1 ppm and 0.9 ppm at Old Faithful.

The winter of 2007-2008 saw an increase in CO at West Entrance; the cause is unclear. Snowmobile numbers were down slightly, while snowcoach numbers were up. A particularly strong inversion may have contributed. Construction activities were going on during the winter at the new station and a propane heater was running nearby, either one of which could have influenced the readings at this site.

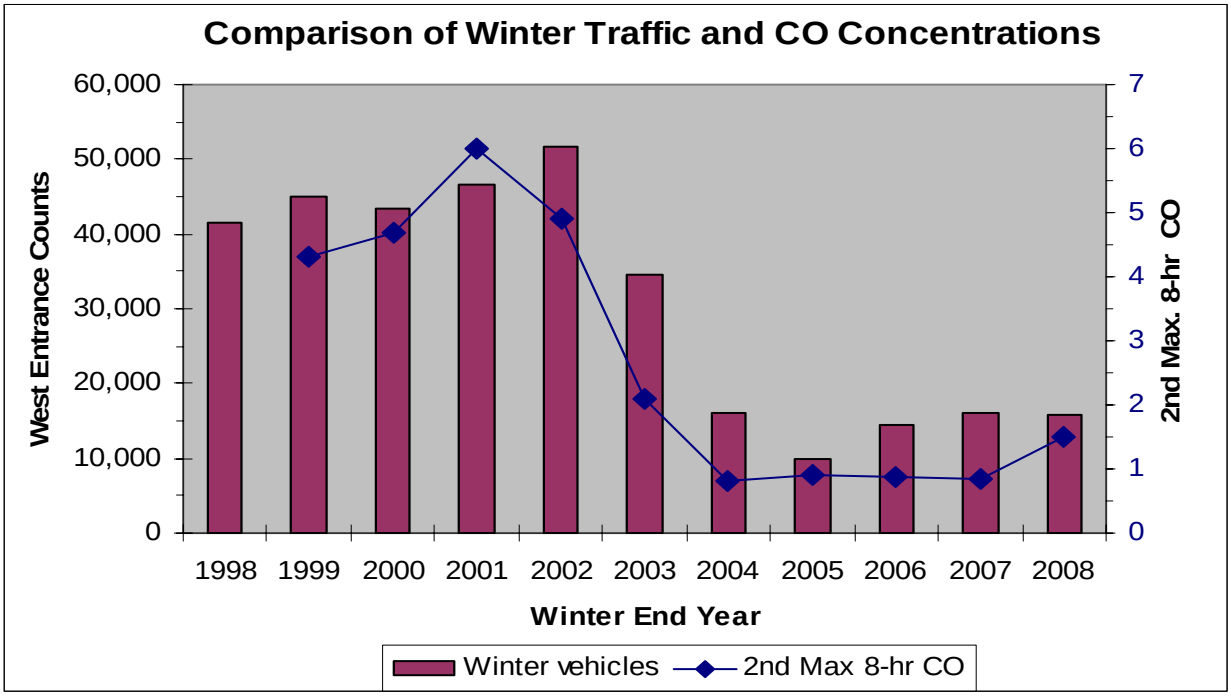
For comparative purposes, spring and fall CO concentration averages are the regional background concentrations of 0.17 ppm, while summer levels are always less than 2 ppm (Coefield 2002; Ray 2008). Other than certain high CO levels measured in fall 2007 and spring 2008 that may have been related to the reconstruction of the park's entrance station adjacent to the West Entrance monitoring site, almost all CO values measured at the West Entrance through March 2008 that exceed 3 ppm are associated with OSV traffic (though such levels are still well below the NAAQS). Higher particulate levels are often observed in summer, but these are a reflection of wildfire smoke blowing into Yellowstone, not the summer traffic (Ray 2008).

Historically, two-stroke snowmobiles were the source of the vehicle emission and health-related complaints in YNP. Two-stroke engines providing a high power/weight ratio were the typical

power plant used in such vehicles. These engines produce relatively high emissions of CO, unburned hydrocarbons (HC), and fine particulate matter (PM2.5) compared to modern automobile engines and they incorporate little pollution control equipment. During the 2003–2004 season, two-stroke snowmobiles were largely replaced in YNP by four-stroke snowmobiles meeting the BAT requirements for HC and CO, which are a 90% reduction in HC and a 70% reduction in CO emissions as compared to two-stroke snowmobiles. Since then, all recreational snowmobiles have had to meet the BAT requirements. This change, combined with an overall reduction in snowmobiles from previous years and use of ethanol-enhanced fuels, has led to the marked reduction in ambient pollution levels. As noted previously, winter air quality in Yellowstone for the past four winters has been excellent.

Impacts on air quality secondarily have impacts on human health and the quality of visitor experience. Such impacts are reflected in analyses under their respective headings.

Figure 3-13: Trends in Second Maximum 8-Hour CO Level and West Entrance Annual Snowmobile Visitation.



Note: Original figure is in color; reproduction costs precluded use of color. The reader may obtain the color version at http://www.nps.gov/yell/parkmgmt/winterusetechnicaldocuments.htm.

Figure 3-14: Trends in the 98th percentile of daily PM2.5 and West Entrance traffic since 1998.

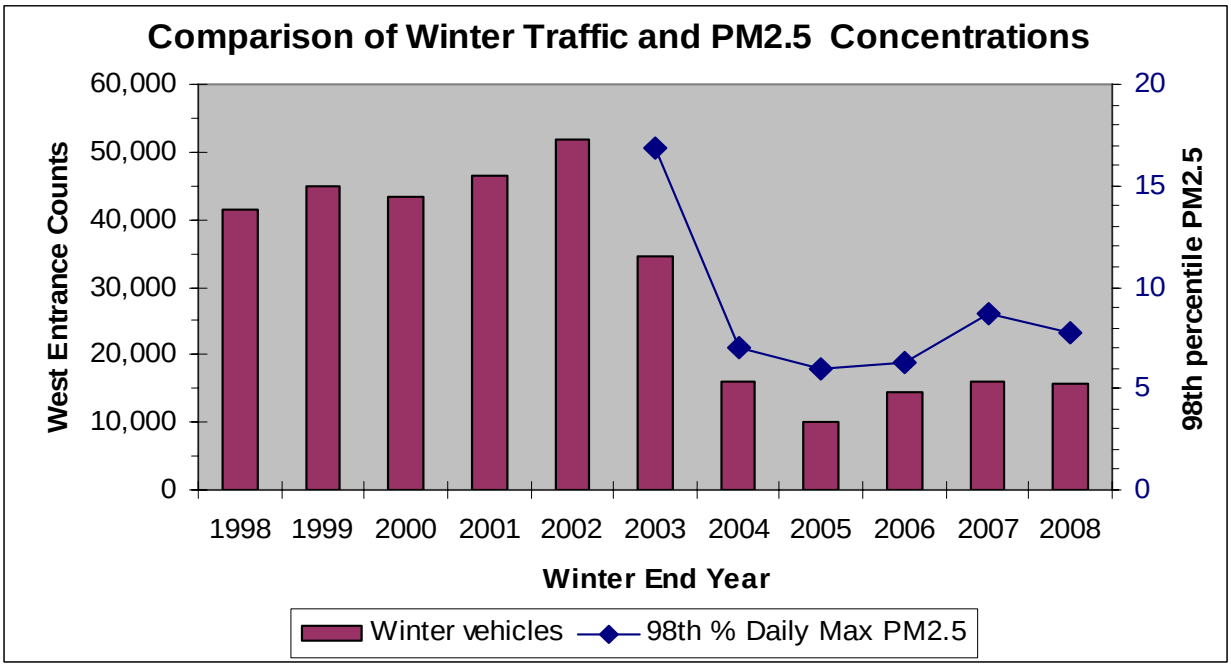


Table 3-12: Carbon Monoxide Concentration, in parts per million (ppm), 2002-2003 through 2007-2008, Old Faithful.

Winter Season Statistic	Winter 2007-08	Winter 2006-07[a]	Winter 2005-06	Winter 2004-05	Winter 2003-04	Winter 2002-03
Max 1-hr	0.9	0.9	1.6	1.6	2.2	2.9
% of Std	2%	3%	4%	4%	6%	8%
Max 8-hr	0.4	0.4	0.5	0.8	0.9	1.2
% of Std	5%	4%	6%	7%	10%	13%
Average	0.19	0.27	0.18	0.12	0.26	0.24
90th percentile	0.24	0.19	0.26	0.29	0.5	0.5

[a] The visitor parking and the monitoring station moved because of construction at Old Faithful (Ray 2007). Standards are provided in Table 3-11: the standard for Max 1-hr is 35 ppm, and for Max 8-hr is 9 ppm.

Table 3-13: Carbon Monoxide Concentration, in parts per million (ppm), 2002-2003 through 2007-2008, West Entrance.

Winter Season Statistic	Winter 2007-08	Winter 2006-07[a]	Winter 2005-06	Winter 2004-05	Winter 2003-04	Winter 2002-03
Max 1-hr	6.1	3.7	2.1	2.8	6.4	8.6
% of Std	17%	11%	6%	8%	18%	25%
Max 8-hr	1.6	0.8	0.9	1.0	1.3	3.3
% of Std	18%	9%	10%	11%	14%	37%
Average	0.23	0.19	0.23	0.24	0.26	0.57
90th percentile	0.4	0.27	0.40	0.43	0.5	1.3

[a] The visitor parking and the monitoring station moved because of construction at Old Faithful (Ray 2007). Standards are provided in Table 3-11: the standard for Max 1-hr is 35 ppm, and for Max 8-hr is 9 ppm.

Table 3-14: PM2.5 in micrograms per cubic meter (ug/m3), 2002-2003 through 2007-2008, Old Faithful

Winter Season Statistic	Winter 2007-08	Winter 2006-07	Winter 2005-06	Winter 2004-05	Winter 2003-04	Winter 2002-03
Max 1-hr	32	20	56	38	151	200
Max Daily (24-hr)	8.1	6.6	9	6	16	37
98th percentile	5.8	6.4	9	9	9	21
% of Std	17%	18%	13%	14%	14%	33%
Average	3.2	3.3	3.5	4.0	4.9	6.9

Source: Ray 2008. Standards are provided in Table 3-11: To attain the PM2.5 standard, the 3-year average of the 98th percentile of 24-hour concentrations at each population-oriented monitor within an area must not exceed 65 ug/m^3, the NAAQS standard. Note that the visitor parking and the monitoring station moved because of construction at Old Faithful.

Table 3-15: PM2.5 in micrograms per cubic meter (ug/m3), 2002-2003 through 2007-2008, West Entrance.

Winter Season Statistic	Winter 2007-08	Winter 2006-07	Winter 2005-06	Winter 2004-05	Winter 2003-04	Winter 2002-03
Max 1-hr	44	40	44	21	29	81
Max Daily (24-hr)	9.5	8.8	7	6	8	15
98th percentile	7.8	8.7	6	6	7	17
% of Std	22%	25%	10%	9%	11%	26%
Average	2.6	2.1	1.9	2.9	4.0	8.2

Source: Ray 2008. Standards are provided in Table 3-11: To attain the PM2.5 standard, the 3-year average of the 98th percentile of 24-hour concentrations at each population-oriented monitor within an area must not exceed 65 ug/m^3, the NAAQS standard.

Public and Employee Health and Safety

The affected environment for impacts to public and employee health and safety is limited to activities that occur within the parks, as discussed below.

Regulatory and Policy Overview

The Occupational Safety and Health Administration (OSHA) provides limits for air pollution and noise exposure, as presented in this section. Additionally, as noted in footnotes 7-9, other organizations such as The National Institute for Occupational Safety and Health (NIOSH) conduct research on occupational diseases and injuries and recommend standards or guidelines. Also, by policy, the National Park Service is committed to providing the safest possible environment for employees and the general public.

The 2006 NPS Management Policies (NPS 2006: 8.2.5.5) states "the Service will work to identify public health issues . . . in the parks and to conduct park operations in ways that reduce or eliminate these hazards. Park managers will pursue these goals with technical assistance provided under the auspices of a Service-wide public health program." The policies (NPS 2006: 8.2.5.1) also recognize agency limitations for eliminating hazards while continuing to strive to identify and prevent injuries from recognizable threats to the health and safety of persons by applying nationally accepted codes, standards, engineering principles and guidance provided in various Directors' Orders. Further, the NPS will reduce or remove known hazards and apply other appropriate measures including closures, guarding, signing, or other forms of education. In doing so, preferred actions are to be those having the least impact on park resources and values. Finally, the policies (NPS 2006: 4.8.1.3) note that naturally occurring geologic processes, which the NPS is charged to preserve, can be hazardous to humans. Included in such hazards are landslides and avalanches. The NPS must strive to understand and minimize potential impacts to visitors and staff. Superintendents are to examine the feasibility of phasing out, relocating or providing alternative facilities for developments subject to hazardous processes.

In the last ten years, the NPS (both nationally and in Yellowstone) has become very concerned about providing safe work environments for all employees. In part, the agency's concern was heightened after the Occupational Health and Safety Administration (OSHA) found over 600 safety violations in Yellowstone in 1997. Yellowstone's injury rate was two to three times as high as even that of industries known to be risky, such as oil and gas drilling. In response to this problem, Yellowstone partnered with OSHA to improve employee safety. With OSHA's assistance, the NPS has improved workplace safety, an improvement reflected in an overall drop in employee injuries. The NPS remains committed, as does the Department of the Interior, to providing safe work places, with a goal of no lost time accidents for its employees. This was emphasized by Secretary Kempthorne in May 2007 when he said it was no longer "business as usual" for employee health and safety programs in the Department of the Interior (Bomar 2007a; Bomar 2007b; Office of the Secretary 2007; YNP 2005; NPS 2004a; USDI 2000).

New Research and Monitoring

In 2008, employee health and safety monitoring occurred, and the report (actually a memorandum) found no concerns with air pollutants or toxics, but did find a concern with employee exposure to snowmobile noise while riding a snowmobile for a full day (Industrial Hygienist 2008). The author recommended continued monitoring and evaluation of exposure to noise for employees who ride a snowmobile for a significant amount of their work shift.

Additional new work relative to avalanche control in Yellowstone includes a March 2007 report "Avalanche Hazard Assessment and Mitigation" and an August 2007 Operational Risk Management (ORM) Assessment (both of which are available on the winter use website at: http://www.nps.gov/yell/parkmgmt/winterusetechnicaldocuments.htm).

The *Affected Environment* air quality and natural soundscapes sections also include recent monitoring data and analyses.

Existing and Historic Conditions

Although conditions are substantially improved from historic periods of peak snowmobile use in the parks, some health and safety concerns remain. These include personal and occupational exposure to noise and air contaminants and avalanche hazard mitigation. Air quality and soundscapes are monitored in the park throughout the year. Personal exposure has been monitored in both summer and winter during 2005 and 2006 and in winter 2007-08. Information about each of these health and safety issues is addressed here. Avalanche control operations are also reviewed below. Past concerns relative to vehicular traffic, winter driving and difficult road conditions have largely been mitigated with the implementation of commercial guiding and operational processes.

Personal and Occupational Exposure to Contaminants

Air Quality

Numerous occupational air quality studies have been conducted at YNP, focusing on the West Entrance, which is the busiest winter access point to the park. Some of these studies, conducted when unlimited two-stroke machines were allowed, indicated concerns regarding employee health safety and health, particularly on days with atmospheric inversions. Since snowmobiles entering the West Entrance are now primarily Best Available Technology (BAT) with reduced numbers, exposure levels to a variety of chemicals have dropped appreciably.

The major objective of these studies was to evaluate NPS employee exposure to particulate matter, air contaminants, and noise emitted by snowmobiles. The studies were performed

during anticipated peak levels of snowmobile use in an attempt to obtain worst-case measurements during winter use work activities. Most sampling was completed during the busiest winter weekends in the parks (the Martin Luther King three-day weekend and the President's Day three-day weekend). It should be noted that a new West Entrance station was completed in the winter of 2007-2008. The new facility has a modern heating-ventilation system that was intended to assist with the historic exposure issues at the entrance. Thus some of the results obtained prior to this last winter would not be applicable to the current station configuration.

In 1997, personal exposure measurements for carbon monoxide were conducted at the West Entrance (Radtke 1997). The 8-hour, time-weighted average[2] for carbon monoxide was between 2 and 4 parts per million (ppm). The OSHA permissible exposure limit[3] is 50 ppm and the threshold limit value[4] is 25 ppm. The more restrictive 8-hour National Ambient Air Quality Standard[5] is 9 ppm. The study concluded that carbon monoxide did not appear to be an important hazard for employees at the West Entrance.

In 2000, OSHA conducted personal and area sampling for benzene, gasoline, formaldehyde, and carbon monoxide in Yellowstone. They concluded that exposures were below permissible exposure limits and threshold limit values, except for exposure to benzene, formaldehyde, and carbon monoxide which exceeded the NIOSH recommended exposure limit[6] for one employee at the West Entrance express lane.

A 2001 study included personal exposure monitoring for respirable particulate matter, carbon monoxide, and benzene. The study recorded an average benzene level of 0.035 ppm, and an average overexposure of 0.029 ppm to benzene (Kado et al. 2001). The minimum risk level[7] standard for benzene is 0.006 ppm for intermediate-duration inhalation exposures (15-364 days/year).

In 2004, occupational exposures to aldehydes, VOCs, respirable particulate, carbon monoxide, and noise were evaluated. This study concluded that concentrations of all airborne contaminants were well below current standards and recommended exposure limits (IHI Environmental 2004). By this time, the majority of snowmobiles entering Yellowstone were Best Available Technology; since then, all visitor snowmobiles are.

A 2005 study evaluated exposures at the West Entrance for aldehydes, volatile organic compounds, total hydrocarbons, elemental and organic carbon, oxides of nitrogen, carbon monoxide, and respirable particulate matter. All employee exposures to the above air contaminants and noise were below OSHA permissible exposure limits and other recommended exposure limits. During this study, a ventilation survey was performed in kiosks A and B at the West Entrance. The survey showed that both kiosks were under strong positive pressure. At the

[2] TWA- time weighted average, an allowable exposure concentration averaged over a normal 8-hour workday or a 40-hour workweek.
[3] PEL- permissible exposure limit set by OSHA; the concentration of a substance to which most workers can be exposed without adverse effect based on an 8-hour TWA exposure.
[4] TLV- threshold limit value, guideline set by the American Conference of Governmental Industrial Hygienists (ACGIH) referring to airborne concentrations of substances and representing conditions under which nearly all workers may be repeatedly exposed, day after day, without adverse effect.
[5] National Ambient Air Quality Standards (NAAQS) are designed to include protection for sensitive populations including children, asthmatics, and the elderly.
[6] REL- recommended exposure limit set by NIOSH for an 8- or 10-hour time-weighted-average exposure.
[7] MRL- minimal risk level set by The Agency for Toxic Substances and Disease Registry (ATSDR); estimate of daily human exposure to a hazardous substance at or below which that substance is unlikely to pose a measurable risk of harmful (adverse), non-cancerous effects over a specified duration of exposure.

time of the survey both kiosks were achieving slightly over one air exchange per minute with the window open 30 inches (Spear and Stephenson 2005).

Spear, Hart, and Stephenson conducted a similar study in 2006 (Spear et al. 2006). While there were some minor variances, the 2006 report confirmed employee exposures to be below all current standards set by regulatory agencies except for two of thirteen benzene samples. Although these two samples were close to an order of magnitude less than the samples obtained before conversion to BAT snowmobiles in 2004 (see the discussion of 2001 findings above; Kado et al. 2001), they appeared to be above the MRL for chronic-duration (365 days/year) inhalation exposure, 0.003 ppm for benzene, and for intermediate-duration exposure, 0.006 ppm. Taking note of the two samples, the authors explained that these appearances were deceptive: "The benzene samples with concentrations of 0.0072 ppm and 0.0086 ppm are above the intermediate-duration inhalation exposure of 0.006 ppm, but below the acute duration inhalation exposure of 0.009 ppm. However, both of these were short term samples taken to minimize dilution effects and thereby obtain a better idea of potential worst case exposures." In reality, the two samples were not intermediate-duration inhalation or chronic-duration exposure samples, which would have had to exceed 0.006 ppm for fifteen days or 0.003 ppm for 365 dyas/year, respectively, for a problem to be evident. They were short-term samples, and even at that, were far from the PEL of 1.0 ppm. Spear, Hart and Stephenson found no correlation between VOC concentrations and the number of vehicles entering during their 2005 and 2006 studies; there were less than 250 snowmobile entries on the days with higher benzene exposures. They concluded, "both mean concentrations are well below the MRL for benzene" (Spear et al. 2006).

Confirming their finding—that benzene is not a major concern for employee health and safety—was an air toxic assessment performed last winter by the Department of the Interior's Office of Occupational Health and Safety in conjunction with the Yellowstone Safety Office. The Office conducted an exposure assessment of West Entrance Station employees to carbon monoxide, hydrocarbons, aldehydes, and noise levels. According to the memorandum summarizing the results of this assessment, "All results for all volatile organic compounds, aldehydes, and carbon monoxide were well below the occupational exposure limits and in most cases were below the detection limits of the analytical method. Results of volatile organic compounds showed most were below detection limits with the relative highest exposure being to benzene which was approximately 2% of the PEL" (Industrial Hygienist 2008). Clearly, although benzene is present in measurable quantities, those levels are so low that they are barely detectable and are far below the short-term, intermediate, and chronic exposure limits for employees. For these reasons, there has been no need for NPS to take remedial action on benzene.

Formaldehyde is another pollutant for which Spear and Stephenson (2005) and the Office of Occupational Health and Safety (Industrial Hygienist 2008) tested. Spear and Stephenson took four 8-hour time-weighted averages for formaldehyde, producing results varying from 0.008 ppm to 0.011. In all cases, the measurements were well below the 8-hour time-weighted recommended exposure limit (REL) of 0.016; the highest such reading was still less than 2/3 of the REL. As with benzene, Spear and Stephenson concluded that the formaldehyde did not pose a risk to public health. Last winter, the Office of Occupational Health and Safety also tested for formaldehyde, finding two calculated 8 hour time-weighted averages at Kiosk 1 of 0.017 and 0.023 ppm (of 7 total kiosk samples). Although these measurements were well below the OSHA PEL of 0.75 ppm and the ACGIH TLV of 0.3 ppm, they did exceed the NIOSH REL of 0.016 ppm. NIOSH REL's are recommended best management practices to ensure exposure will not impact public health. NIOSH REL's are recommendations by NIOSH scientists based on

science-based recommendations (animal and human studies), not legal standards—so, unlike the OSHA PEL's, agencies are not required to adhere to RELs. Nonetheless, the NPS has taken measures to reduce levels of air contaminants by installing new entry kiosks with ventilation. Furthermore, the agency remains concerned about the formaldehyde readings and will continue health and safety monitoring at the West Entrance in future winters to ensure formaldehyde does not pose a risk to the public and NPS employees.

For all emissions, levels are well below federal safety levels; monitoring and adaptive management will continue. Tables 3-16 through 3-20 below reflect average sample exposure sets gathered starting with the 1997 study. Five contaminants of concern – benzene, formaldehyde, acetaldehyde, particulates, and 1,3-butadiene – are shown.

Table 3-16: Average Benzene Levels

Sample Description	Kiosk A	Kiosk B	Kiosk C	Regulatory limit
Kado et al. 2001 – average of 666 two-stroke sleds through west entrance	0.035 parts per million (ppm) (kiosk not noted)			1 ppm (OSHA PEL) 0.1 ppm (NIOSH REL) 0.5 ppm (ACGIH TLV)
OSHA 2000 – 976 two-stroke sleds through west entrance	0.02 ppm	0.0087 ppm	0.1118 ppm	
IHI 2004 – average of 220 sleds, primarily four-strokes through west entrance	0.0031 ppm	0.0033 ppm	Not used during 2004	
Spear and Stephenson 2005 – average of 180 sleds, primarily four-strokes through west entrance	0.0035 ppm	No personal samples taken	Not used during 2005	
Spear, Hart, and Stephenson 2006 – average of 216 sleds, primarily four-strokes through west entrance	0.00325 ppm	No personal samples taken	Not used during 2006	
Office of Occupational Health and Safety (Industrial Hygienist 2008)	Below detection limits			

Table 3-17: Average Formaldehyde Levels

Sample Description	Kiosk A	Kiosk B	Kiosk C	Regulatory limit
Kado et al. 2001 – average of 666 two-stroke sleds through west entrance	Did not sample for 8 hour TWA 0.072 ppm for 170 minute sampling period, kiosk not noted			0.75 ppm (OSHA PEL) 0.016 ppm (NIOSH REL) 0.3 ppm (ACGIH TLV)
OSHA 2000 – 976 two-stroke sleds through west entrance	0.000 ppm	0.000 ppm	0.0332 ppm	
IHI 2004 – average of 220 sleds, primarily four-strokes through west entrance	0.0023 ppm	0.0028 ppm	Not used during 2004	
Spear and Stephenson 2005 – average of 180 sleds, primarily four-strokes through west entrance	0.01 ppm	No personal samples taken	Not used during 2005	
Spear, Hart, and Stephenson 2006 – average of 216 sleds, primarily four-strokes through west entrance	0.009 ppm	No personal samples taken	Not used during 2006	
Office of Occupational Health and Safety (Industrial Hygienist 2008)	0.02 ppm	Below detection limits		

Table 3-18: Average Acetaldehyde Levels

Sample Description	Kiosk A	Kiosk B	Kiosk C	Regulatory limit
Kado et al. 2001 – average of 666 two-stroke sleds through west entrance	Did not sample for 8 hour TWA 0.024 ppm for 170 minute sampling period, kiosk not noted			200 ppm (OSHA PEL) 25 ppm (ACGIH C)
OSHA 2000 976 two-stroke sleds through west entrance	Did not sample for acetaldehyde			
IHI 2004 – average of 220 sleds, primarily four-strokes through west entrance	0.002 ppm	0.002 ppm	Not used during 2004	
Spear and Stephenson 2005 –	0.0065	No	Not	

Sample Description	Kiosk A	Kiosk B	Kiosk C	Regulatory limit
average of 180 sleds, primarily four-strokes through west entrance	ppm	personal samples taken	used during 2005	
Spear, Hart, and Stephenson 2006 – average of 216 sleds, primarily four-strokes through west entrance	0.0063 ppm	No personal samples taken	Not used during 2006	
Office of Occupational Health and Safety (Industrial Hygienist 2008)	Below detection limits	Below detection limits		

Table 3-19: Average Particulate Levels

Sample Description	Kiosk A	Kiosk B	Kiosk C	Regulatory limit
Kado et al. 2001 – average of 666 two-stroke sleds through west entrance	0.1 mg/m^3 (kiosk not noted)			5.0 mg/m^3 (OSHA PEL) 5.0 mg/m^3 (NIOSH REL) 3.0 mg/m^3 (ACGIH TLV)
OSHA 2000 – 976 two-stroke sleds through west entrance	None taken	None taken	None taken	
IHI 2004 – average of 220 sleds, primarily four-strokes through west entrance	0.0236 mg/m^3	0.046 mg/m^3	Not used during 2004	
Spear and Stephenson 2005 – average of 180 sleds, primarily four-strokes through west entrance	0.017 mg/m^3	No personal samples taken	Not used during 2005	
Spear, Hart, and Stephenson 2006 – average of 216 sleds, primarily four-strokes through west ent.	0.031 mg/m^3	No personal samples taken	Not used during 2006	

Table 3-20: Average 1,3-Butadiene Levels

Sample Description	Kiosk A	Kiosk B	Kiosk C	Regulatory limit
Spear, Hart, and Stephenson 2006 – average of 216 sleds, primarily four-strokes through west entrance	0.0025 ppm	No personal samples taken	Not used during 2006	1 ppm (OSHA PEL) 2 ppm (ACGIH TLV)

Noise Exposure

Noise exposure was measured for both snowmobile riders and employees working at the West Entrance in studies conducted between the years 1997 through 2008. The exposure measured noise from all sources, including snowmobiles and other equipment. One way to measure employee exposure to noise, as below, is to compute the eight-hour Time-Weighted Average (TWA) of their exposure to noise, with hearing protection required when the TWA is above 85 dBA.

In 1997, personal exposure measurements for noise were conducted at the West Entrance. The 8-hour time-weighted average for the noise samples ranged from 70.9 dBA[8] to 82.0 dBA. These levels are below the action level[9] of 85 dBA and the OSHA permissible exposure limit of 90 dBA. The study concluded that noise did not appear to be a major hazard for employees at the West Entrance (Radtke 1997).

A 2000 OSHA study conducted personal and area sampling for noise. The study concluded that exposures were below permissible exposure limits and threshold limit values, but the express lane employee was overexposed to the ACGIH action level for noise of 85 dBA. The only noise overexposures to West Entrance employees occurred when two-stroke machines were allowed.

In 2004, occupational exposure to noise was evaluated with the conclusion that exposure did not exceed recommended limits. In 2005, another study at the West Entrance concluded that noise exposures were below OSHA permissible limits and other recommended maximum exposure levels (Spear and Stephenson 2005).

A recent study found that employee noise exposures at the West Entrance averaged 60.6 dBA for the winter 2004-2005 and 65.2 for the following winter, or 3.5% and 5.5% of the allowable noise exposure, respectively. Peak 8-hr TWAs for those two winters were 75 and 80dBA, or 12.5% and 26.0% of the allowable exposure respectively (Jensen and Meyer 2006). Clearly, while employees are exposed to some noise, those exposures are well within safeguards. However, when riding a snowmobile, employees may be exposed to TWAs approaching the action level of 85 dBA. For example, the Office of Occupational Health and Safety (Industrial Hygienist 2008) found that an employee was exposed to a TWA of 84.5 dBA in 2008.

Overall, since the change to four-stroke technology, employee exposure at the West Entrance has been below 85 dBA. Snowmobile rider exposure levels have also decreased with the use of four-stroke technology, but rider exposure levels remain over the OSHA action level when operated for more than four hours. Noise exposure while riding on snow machines can be controlled with standard ear plugs. All commercially available NIOSH-rated foam plugs provide

[8] dBA- A-weighted decibels, an expression of the relative loudness of sounds in air as perceived by the human ear, sounds at low frequencies are reduced, compared with unweighted decibels, in which no correction is made for audio frequency.

[9] American Conference of Governmental industrial Hygienists (ACGIH) Action Level- the noise level (85 dBA), calculated as an 8-hour TWA, at which OSHA requires exposed employees be included in the Hearing Conservation Program.

enough attenuation to protect employee hearing. For YNP, an estimated exposure of 77 dBA for 8 hours when wearing earplugs falls within acceptable exposure limits set forth by OSHA, NIOSH, and ACGIH.[10]

The OSHA hearing conservation standard (29 CFR 1910.95) states that employee exposures should not exceed the peak, or maximum level of sound, of 115 dBA for more than 15 minutes. OSHA also recommends that employees never be exposed to impulsive or impact noise that generates sound levels greater than 140 dBA. No noise sampling in the parks has indicated a maximum exposure above 115 dBA.

Average and maximum exposure levels at the West Entrance are summarized in Tables 3-21 and 3-22 below.

Table 3-21: Average Personal Exposure to Sound Levels

Sample Description	Kiosk A	Kiosk B	Kiosk C	Rider Average
Radtke 1997 – no snowmobile count taken, mostly two-stroke sleds through west entrance	70.9 dBA	Not sampled in 1997	Not sampled in 1997	Not sampled in 1997
OSHA 2000 – 976 two-stroke sleds through west entrance	72.1 dBA	75.2 dBA	88.3 dBA	93.1 dBA riding two stroke snowmobile
IHI 2004 – average of 220 sleds, primarily four-strokes through west entrance	62.9 dBA	68.8 dBA	Not used during 2004	82.4 dBA riding four stroke snowmobile
Spear and Stephenson 2005 – average of 180 sleds, primarily four-strokes through west entrance	60.6 dBA	Not sampled in 2005	Not used during 2005	85.5 dBA riding four stroke snowmobile
Spear, Hart, and Stephenson 2006– average of 216 sleds, primarily four-strokes through west entrance	71.3 dBA	71.0 dBA	Not used during 2006	Not used during 2006
Office of Occupational Health and Safety (Industrial Hygienist 2008)	68.4 dBA	69.5 dBA	Not used during 2008	84.5 (only 1 measurement)
Dosimeter settings set to evaluate compliance with OSHA Hearing Conservation Amendment (threshold = 80 dB; exchange rate = 5 dB Criterion Level = 90 dB; Time Constant = slow). Results are 'A-weighted.'				

[10] The lowest noise reduction rating (NRR) given to foam ear plugs used in the park is 23. To estimate noise exposures to people wearing any given set of ear plugs, the following equation is used: Workplace noise level [(dBA) – (NRR – 7 dB)/2] = Estimated exposure (dBA). For Yellowstone: [85 dBA – (23 – 7dB)/2] = 77 dBA.

Table 3-22: Maximum Exposure to Sound Levels

Sample Description	Kiosk A	Kiosk B	Snowmobile Riders
IHI 2004 – average of 220 sleds, primarily four-strokes through west entrance	114.0 dBA 108.3 dBA 106.6 dBA 89.6 dBA 106.8 dBA 97.8 dBA	112.5 dBA 112.8 dBA 108.3 dBA 103.8 dBA 108.3 dBA	110.3 dBA 111.6 dBA
Spear, Hart, and Stephenson 2006 – average of 216 sleds, primarily 4 strokes through west entrance (P) Denotes personal sampling; (A) Denotes area sampling	109.0 dBA (P) 96.0 dBA (A) 105.0 dBA (A) 114.0 dBA (P) 112.0 dBA (A) 109.0 dBA (A) 110.0 dBA (P) 104.0 dBA (A) 111.0 dBA (A)	113.0 dBA (P) 94.0 dBA (A) 110.0 dBA (A) 108.0 dBA (P) 96.0 dBA (A) 107.0 dBA (A)	

2005-2006 Summer and Winter Comparison

A common misperception is that the many more automobiles entering the park during summer months contribute more pollutants than do snowmobiles. Although the historic number of snowmobiles entering YNP during the winter (66,619) was, on average, a factor of 16 lower than the number of automobiles entering the park annually (1,075,295), snowmobile emissions equaled or exceeded total annual emissions for CO and HC from other mobile sources (i.e., cars, RVs, buses and snowcoaches). Prior to the implementation of BAT requirements, the contribution from snowmobiles to the total annual HC emissions ranged from 68-90%; to the total annual CO emissions, 35-68% (NPS 2000a).

Although BAT snowmobiles typically use modern computer controlled engines, they lack catalytic converters and therefore produce more emissions than automobiles. Nevertheless, current winter air quality conditions are excellent due to the implementation of BAT requirements, which represent emissions reductions of 90% for hydrocarbons and 70% for carbon monoxide compared to historic two-stroke snowmobiles. Lower overall numbers of snowmobiles also contribute to the improved air quality. Several monitoring efforts have been conducted to determine variances in summer and winter pollutant and exposure levels; these results are summarized below and indicate that total winter emissions are now close to total summer emissions. Ray (2005-2008) presents year around ambient air quality monitoring results at the West Entrance and Old Faithful. In addition, as noted above, inversions play an important role in winter pollution levels.

Employee exposure evaluations were performed July 5-6 and 11-12, 2005 at Yellowstone's West Entrance Station kiosks A and B. On average, 400 vehicles per day passed through kiosk A and B during the sampling time period. The noise and air sampling performed in the summer were collected in the same kiosks and the analyses were conducted using the same methods as the Yellowstone Winter Use Personal Exposure Monitoring study. The winter samples were collected at the West Entrance on January 15-17, 2005 and February 19-21, 2005. The comparison results are summarized below:

Noise - The average personal exposure in kiosks A and B for the summer was 57.75 dBA. The average noise level in kiosks A and B for the winter was 43.6 dBA. Both average noise levels were below the OSHA PEL.

Carbon Monoxide – The average carbon monoxide level in summer was near 0 ppm with a spike of 765 ppm. Entrance station employees observed CO levels above NIOSH limits when either a motorcycle or older, inefficient vehicle idled at the gate. None of the time-weighted averages exceeded exposure limits. The average carbon monoxide level in the winter was 0.95 with the maximum peak of 33.6 ppm.

Aromatic Hydrocarbons – The summer levels were less than the limit of detection. Nine out of ten winter samples were below the limit of detection. One winter sample showed a toluene level of 0.73 ppm. The OSHA PEL for toluene is 200 ppm for an 8 hour TWA.

Respirable Particulates – Both winter and summer samples were below the limit of detection.

Nitrogen Dioxide – The results showed exposures for summer 2005 to be 0.03575 ppm and 0.0978 ppm in the winter 2005. Both are well below the OSHA PEL of 5 ppm.

Volatile Organic Compounds – All results for both the summer and winter were well under all established exposure levels.

Formaldehyde – The winter study results were below the limits of detection. The summer results had two samples above the NIOSH recommended exposure limit of 0.016 ppm. The highest level detected was 0.024 ppm during summer sampling.

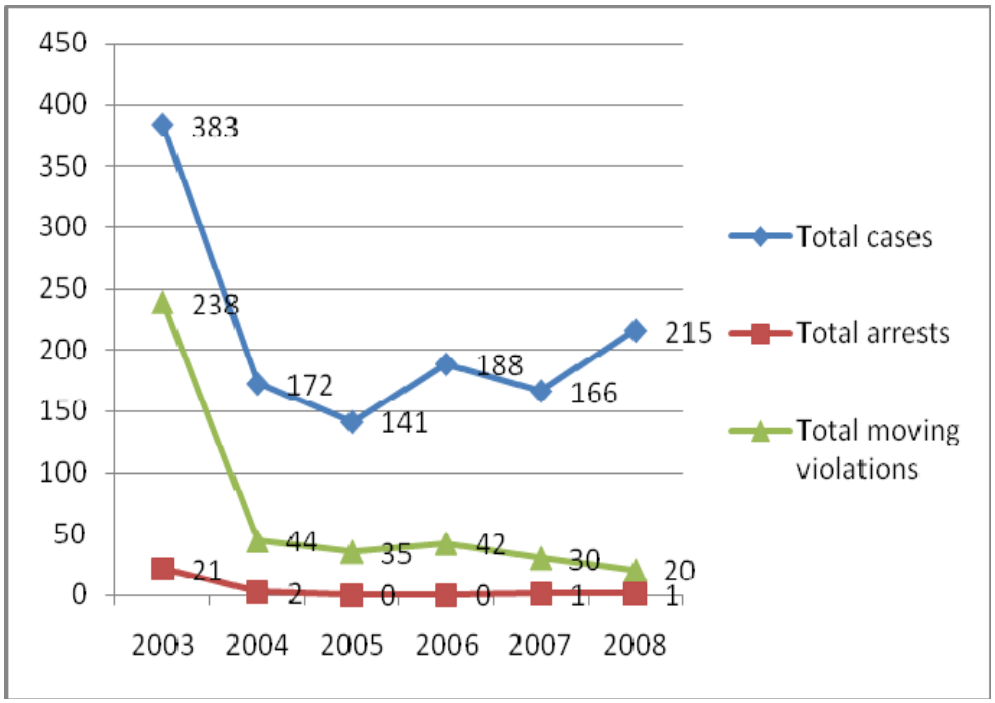
Law Enforcement Statistics

Since the winter of 2003-2004, all snowmobilers have been led by commercial guides. As shown in Figure 3-15, this has had a positive effect on visitor health and safety. Some visitors to Yellowstone have never ridden a snowmobile, and commercial guides can help teach them how to safely travel through the park. Commercial guides are experts at snowmobiling and/or snowcoach driving in Yellowstone and know the conditions associated with such travel. All commercial guides are trained in basic first aid and CPR. In addition to first aid kits, they often carry satellite or cellular telephones and radios for emergency use. They also carry shovels and equipment necessary to respond to avalanches and to vehicles that may need to be pulled from a soft road shoulder. Commercial guides use a "follow-the-leader" approach, stopping often to talk with the group. They lead snowmobiles single-file through the park, using hand signals to pass information down the line from one snowmobile to the next. Signals are effectively used and warn group members about wildlife and other road hazards, indicate where to turn, and when to turn the snowmobile on or off.

Figure 3-15 illustrates the declining number of law enforcement cases since the implementation of mandatory commercial guiding. After adjusting for reduced numbers, moving violations are down 92% from 2002-2003 to 2007-2008 (20 total that winter), total cases are down 44%, and there have been only one or two arrests each of the past five winter seasons as compared to 21 in

2002-2003 (72,560 OSV visitors in 2002-2003 and 53,764 OSV visitors in 2007-2008). Regarding 2008 and the increase in case incidents from the previous winter, the increase was attributed to more medicals and better reporting by field staff, not an actual increase in law enforcement situations.

Figure 3-15: Winter Law Enforcement Statistics, January 1-March 15, 2002-2003 through 2007-2008.



Avalanche Hazard Mitigation in Yellowstone National Park

Avalanche control at Sylvan Pass has long represented a safety concern to the National Park Service. The original winter use plan EIS (2000), the Supplemental Environmental Impact Statement (2003), the Temporary Winter Use Plan EA (2004), and the Winter Use Plan FEIS (2007) all clearly identify the significant avalanche danger on Sylvan Pass, and the danger has been well known for many years. There are approximately 20 avalanche paths that cross the road at Sylvan Pass. They average over 600 feet of vertical drop, and the East Entrance Road crosses the middle of several of the paths, putting travelers at risk of being hit by an avalanche. NPS employees must cross several uncontrolled avalanche paths to reach the howitzer used for discharging those avalanches, and the howitzer is at the base of a cliff prone to both rock-fall and additional avalanche activity (the howitzer cannot be moved without compromising its ability to reach all avalanche zones). Duds (artillery shells that do not explode on impact) occur and exist on the slopes, presenting year-round hazards to both employees and visitors, both in Yellowstone and the Shoshone National Forest. Natural avalanches can and do occur, both before and after howitzer use. Using a helicopter instead of a howitzer also is a high risk activity because of other risks a helicopter contractor would have to incur, as identified in the Operational Risk Management Assessment (ORMA) (NPS 2007c).

Although there has not been a serious incident at the pass in the 30+ years of avalanche control activity, an NPS employee lost his life traveling to the pass to check on conditions to determine if the pass was safe to open, and several close calls have occurred. During the 2007 FEIS

process, the additional, independent work by avalanche expert Bob Comey (Comey 2007) and the ORMA (into which several avalanche experts, including Mr. Comey, had direct input) reinforced that the past ways of doing avalanche control (through howitzer or helicopter) pose an unacceptably high risk to NPS employees. The ORMA indicated that travel to the pass area for assessment or mitigation action is a dangerous aspect of the operation. These reports also identified options describing how avalanche mitigation could be conducted in safer ways.

In the 2007-2008 winter, the NPS used a combination of helicopter and howitzer dispensed explosives in support of forecasting to determine if safety criteria could be met for the pass to be open. In the 2007-2008 winter, snowpack was about 120% of average, nine avalanche mitigation operations were completed (3 via helicopter and 6 using the howitzer), and the pass was fully closed 10 days and parts of 16 additional days (out of a total of an 82 day winter season). The NPS updated its operational procedures to make it clear that the pass would not be open unless safety criteria were met, and in the professional judgment of park managers, operations could be conducted within acceptable levels of risk. Area staff may use whichever tool is the safest and most appropriate for a given situation, with the full understanding that safety of employees and visitors comes first. Employees in the field make the operational determination when safety criteria have been met and operations can be conducted with acceptable levels of risk. The NPS will not take unacceptable risks. When safety criteria have been met, the pass will be open; when they have not been met, the pass will remain closed.

Historically, Sylvan Pass has been closed for several days during the winter to allow avalanche management to occur. That is, the pass has almost never been open for the entire season. Most reasonable avalanche mitigation techniques would result in the pass being closed for at least some days in the winter to conduct avalanche mitigation.

Use levels have always been relatively low on Yellowstone's East Entrance. Even during the highest winter use years in the 1990s, total use for the season rarely exceeded 5,000 people, less than 5% of Yellowstone's total winter visitation. Visitor access over Sylvan Pass is solely for recreational purposes. The East Entrance road is not a major highway, a commerce route, or a railroad. Other avalanche mitigation programs in this country are focused on routes with far higher traffic volume and economic value, often including high value interstate commerce.

Other avalanche areas also exist in Yellowstone (for example, the Talus Slope on the South Entrance road). None of the rest of these locations approaches the size and number of avalanche chutes that exist at Sylvan. However, all are monitored though use of regional avalanche forecasting and observation of local conditions. As with Sylvan Pass, if safety criteria are not met, these areas would also be closed, and appropriate avalanche operations would be conducted.

Severe Weather Conditions

According to industry standards established by the American Conference of Industrial Hygienists, all non-essential work should stop at a temperature of -25° Fahrenheit (F) if there is a 20 mile per hour wind. With no noticeable wind, the temperature at which non-essential work should cease is -45° F. Travel by snowmobile may produce wind-chill factors of 40 degrees.

Current Yellowstone employee procedures state that snowmobile travel is not advised for non-essential work at temperatures below -20° F. Non-essential work includes activities such as travel to meetings, training, and other administrative travel; avalanche control procedures; interpretive programs and roving interpretation; resource monitoring; research fieldwork, etc.

Temporary park closures may be enacted as necessary to provide for the safety of the public and employees during severe weather.

Visitor Access and Circulation

The affected environment for impacts to visitor access and circulation is generally limited to activities that occur within the parks, as discussed below. Some discussions include impacts to visitor access and circulation at, or from, various park entrances.

Regulatory and Policy Overview

Enjoyment of park resources and values by the people of the United States is part of the fundamental purpose of all parks. The NPS is committed to providing appropriate, high quality opportunities for visitors, and will maintain an atmosphere that is open and accessible to every segment of American society (NPS 2006: 8.1.1, 8.2, 8.2.2, 8.2.3, and 8.2.3.2).

Visitor access is constrained to uses that are appropriate to the purpose for which the park was established, and which can be sustained without causing unacceptable impacts. Visitor activities that may be enjoyed are those that are appropriate, inspirational, educational, and healthful, and that will foster an appreciation for park resources and values. Unacceptable impacts from visitor activities would include those that create an unsafe or unhealthy environment for visitors or employees and that would unreasonably interfere with the atmosphere of peace and tranquility, park programs, or other appropriate uses. The potential impact on park natural soundscapes is a key concern with respect to recreational activities whose appropriateness is being evaluated. Park managers are to take action to prevent or minimize noises that adversely affect visitor experience or that exceed levels that are acceptable for visitor use. This applies to the use of motorized equipment, including modes of access to the parks. Where motorized use is appropriate and necessary, the least impacting equipment, vehicles, and transportation systems should be used, consistent with public and employee safety.

Snowmobile access to and in park units is regulated under 36 CFR § 2.18, which states in part, "snowmobiles are prohibited except where designated and only when their use is consistent with the park's natural, cultural, scenic and aesthetic values, safety considerations, park management objectives, and will not disturb wildlife or damage park resources."

Regional Access

Yellowstone National Park is located in the northwestern corner of Wyoming, with 3% of the park extending into Montana and 1% into Idaho. The park is within Teton and Park Counties in Wyoming, Park and Gallatin Counties in Montana, and Fremont County in Idaho. Grand Teton National Park is located in west central Wyoming, immediately south of YNP and the Parkway. It is bounded on the south by the National Elk Refuge. Between the two parks is the John D. Rockefeller, Jr. Memorial Parkway, administered by GTNP. Highway infrastructure facilitating access to the two park units is readily apparent and will not be discussed here.

Park Roadways, Trails, and Winter Facilities

Snowpack Variability

Considerable variability occurs in snowpack development in Yellowstone and Grand Teton National Parks over the span of many years. In order to establish realistic opening and closing dates for use of oversnow vehicles on park roads, it is important to understand this variability. Weather data from several weather stations were recently analyzed to determine various threshold values of snow water equivalency (SWE) needed to sustain oversnow vehicle travel.

Historical opening data indicate that about 1.5 inches SWE is needed to open the oversnow roads to the public. This amounts to about 380 – 460 mm or 15 to 18 inches of cumulative snowfall (Farnes and Hansen 2005).

Snowpack on some of the park road system is more critical than in other areas. Specifically, snowpack at Madison Junction (the lowest point on Yellowstone's Lower Loop route) dictates when the road can be opened between West Yellowstone and Old Faithful and West Yellowstone to Norris Junction and Canyon. Spring closure dates closely match the date at which snowpack becomes isothermal (same temperature throughout the snowpack), which is the beginning of spring melt. Mid-winter melt can be a problem for maintaining snow on the roadways (Farnes and Hansen 2005).

Yellowstone National Park

Yellowstone roads are maintained for many purposes, including touring and sightseeing, accessing trailheads, and park management. During the winter, most park roads are closed to wheeled vehicular traffic with the exception of Highway 191, which provides access between West Yellowstone and Bozeman, Montana, and the park road from Gardiner to Mammoth to the Northeast Entrance (Cooke City). These roads provide the only wheeled vehicle access through the park during the winter, and are used by many visitors to view wildlife or access trailheads for cross-country skiing, snowshoeing, and/or hiking. All told, the NPS plows a total of 58 miles of primary road between Gardiner and Cooke City, with the State of Montana plowing the 20 miles of Highway 191 within YNP's northwest corner.

Oversnow vehicular travel is allowed on many other park road segments, with the exception of Dunraven Pass between Tower and Washburn Hot Springs overlook, which was closed to all recreational winter vehicle travel in the 1980s due to avalanche danger. Where OSV travel is allowed, the roads are groomed. Grooming begins when there is adequate snow cover and is accomplished using a tracked vehicle equipped with a blade on the front and a packer wheel and drag at the rear. The road segments from the West Entrance to Old Faithful are usually groomed every night. Most other sections are usually groomed every other day or night. All told, the NPS grooms 193 miles of OSV routes in YNP. Figure 1-1 (in *Purpose and Need*) displays the various YNP road segments with mileages.

About 30 miles of trails are groomed for non-motorized uses in Yellowstone. These trails include the Blacktail Plateau Drive, Bunsen Peak Road, Upper Terrace Drive, North Canyon Rim trail, Lone Star Geyser, the Upper Geyser Basin Trail, the Barns Trails, and some other trails in the Old Faithful areas. The portion of the Dunraven Pass Road from Tower Junction past Tower Falls to the top of the Chittenden Road is also groomed for skiing.

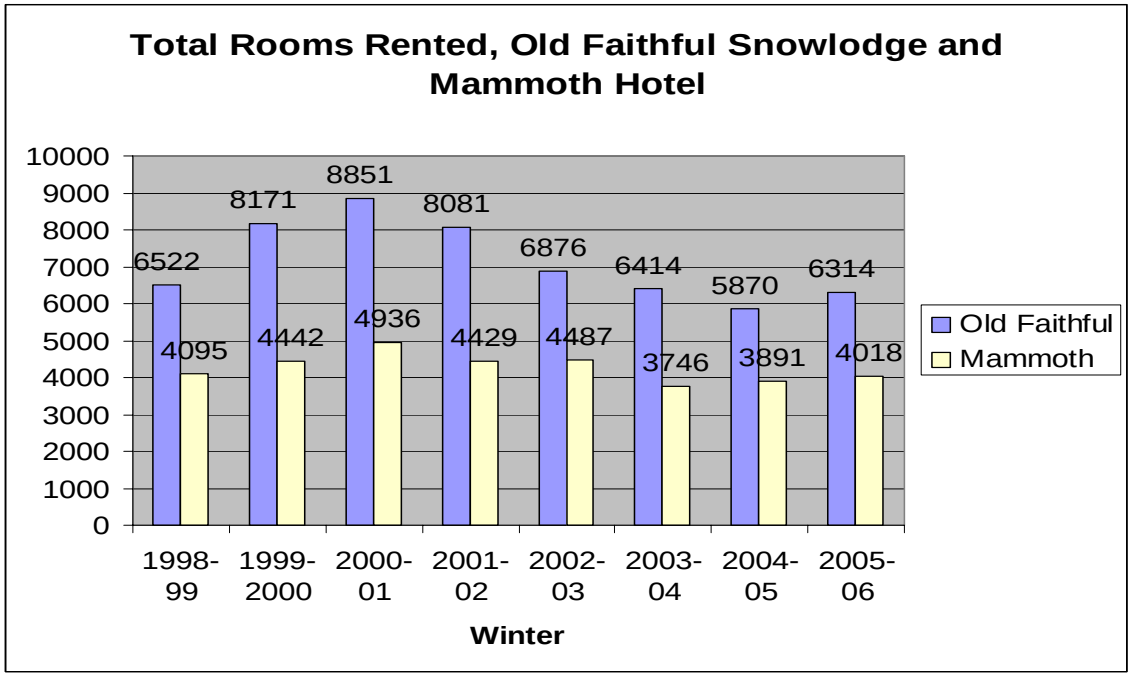
Staging areas, or points of access, for oversnow routes into the park are an important logistical component of the winter visitor experience. They typically include a parking area with appropriate signing and may have restrooms and other facilities. The staging areas for snowmobile and snowcoach trips into YNP are near Mammoth Hot Springs in the north, at Pahaska Teepee in the Shoshone National Forest near the East Entrance, at Flagg Ranch near the South Entrance, and in West Yellowstone near the West Entrance.

Warming huts in YNP are located at Mammoth, Canyon Village, Indian Creek, Fishing Bridge, Madison, and West Thumb. A new warming hut has been approved for Norris, but has not been constructed. The Canyon Village and Madison warming huts are in need of replacement. The Old Faithful warming hut was removed as part of the Old Faithful Visitor Education Center construction project and temporarily replaced with yurts, pending a decision on a long-term

warming hut. Warming huts at Mammoth, Madison, Fishing Bridge, and Canyon Village have small snack bars or vending machines. NPS interpreters or volunteers staff some of the huts and answer questions and provide information and various forms of assistance to visitors. Winter use fueling facilities are available at Old Faithful, Fishing Bridge, Mammoth, and Canyon Village.

Winter lodging facilities in YNP provide a total of 228 rooms with 448 beds. Winter lodging facilities are available at Mammoth Hot Springs Hotel and Old Faithful Snow Lodge. Figure 3-16 shows the total number of rooms rented per winter at the two hotels for the past eight years. As one would expect, business at the two hotels has generally paralleled the rises and falls in overall YNP visitation. In addition to the above lodging facilities, Yellowstone Expeditions operates six yurts plus a dining/community yurt and kitchen yurt near Canyon Village. The yurt camp logged 1,214 user days[11] during the winter of 2005-2006. In addition, the park issued 87 backcountry camping permits during the same time period.

Figure 3-16: Total Rooms Rented per Winter at Yellowstone Hotels, 1998-1999 through 2005-2006



Grand Teton National Park and the Parkway

The roadway system within GTNP and the Parkway consists of regional highways that pass through the parks and park roads that provide access to visitor destinations. In winter, some roads are plowed and maintained for motor vehicles, while others are closed to vehicles but may be used by non-motorized users, like cross-country skiers (See Figure 1-2 in *Purpose and Need*).

In addition to roads that are maintained for use by automobiles, routes that have historically been designated for snowmobile use included the Continental Divide Snowmobile Trail (CDST), the Grassy Lake Road, and numerous short segments that allow access to adjacent public and private lands and to inholdings within Grand Teton. The CDST is a long-distance snowmobile trail that traverses much of northwest Wyoming between Lander and Grand Teton

[11] The number of daily visitors summed over the entire season.

National Park, and since the mid-1990's a portion of the trail has been located alongside routes U.S. 26/287 and U.S. 89/191 in Grand Teton and the Parkway, providing access to the South Entrance of Yellowstone. The route also provided a connection to the Grassy Lake Road, which extends 7.6 miles between Flagg Ranch and the west boundary of the Parkway, connecting to an extensive network of snowmobile trails on the Caribou/Targhee National Forest. Snowmobiles are also allowed on the frozen surface of Jackson Lake to provide access for ice fishing.

Cross-country and backcountry skiing are popular activities at GTNP. In recent years, the NPS has groomed the unplowed Teton Park Road between the Taggart Lake Trailhead parking area and Signal Mountain Lodge for cross-country skiing. Grooming schedules have been variable, between one and three times per week. Skiers and snowshoers also enjoy trips into the park's backcountry, ranging from an easy 2-3 hour ski to Taggart Lake to multi-day ski mountaineering trips deep into the Teton Range.

Jackson Lake is located at the base of the Teton Mountain Range within Grand Teton National Park, and according to the Wyoming Department of Game and Fish (WDGF) is considered to be the most important lake trout fishery in the Snake River drainage of northwestern Wyoming. Stocking of Jackson Lake by WDGF has varied over time, with the majority of effort on improving the lake trout and Snake River cutthroat trout fisheries. Historically, the majority of winter anglers used snowplanes and snowmobiles to access Jackson Lake. More recently, anglers have used BAT snowmobiles for such access.

Flagg Ranch is the primary staging area for oversnow trips into YNP via the South Entrance, or for trips by snowmobile, ski, or snowshoe along the Grassy Lake Road. Flagg Ranch currently offers a convenience store, gasoline, and restrooms in winter. Snowmobile and snowcoach companies going into YNP's South Entrance stage their fleets at Flagg Ranch, utilizing portions of the main parking lot. No maintenance facilities are available except for a limited amount of garage space for the Flagg Ranch concessioner.

Few other visitor facilities are available during the winter within GTNP or the Parkway. The headquarters visitor center at Moose is open daily from 8 a.m. to 5 p.m., and the entrance stations at Moose and Moran are also staffed daily. Triangle–X Ranch provides a limited amount of overnight lodging. Dornan's, a privately owned inholding at Moose, provides dining, groceries, gasoline, and visitor information.

Modes of Transportation

Snowcoach Visitation

Snowcoaches have been used in YNP since the mid-1950s, well before snowmobiles first arrived on the scene in the early 1960s. Businesses in surrounding communities, especially West Yellowstone, have run touring enterprises based exclusively on providing snowcoach tours. Many of the first snowcoaches were manufactured by the Bombardier Company of Valcourt, Quebec, Canada. Bombardier ceased production of the vehicles in the 1980s (although the assembly line remains intact).

Since that time, Yellowstone-area businesses have used primarily 15-passenger vans that have been converted to run on snow-covered roads with track and ski assemblages. While such snowcoach conversions were initially prone to breakdowns, their operators have improved their reliability through stronger transmissions, better maintenance, and alternative track and/or ski combinations. Some van conversion snowcoaches are accessible to the handicapped. Most coaches now have double-paned or vented windows that resist fogging in the cold winter air.

Snowcoach operation and speed depend upon a variety of conditions, especially weather and snow conditions. Under most winter conditions, however, they can maintain speeds of 20 to 30 miles per hour.

In 2003, the NPS signed contracts with 14 businesses authorizing them to operate a specified number of snowcoaches for tours of YNP for 10 years. A total of 78 snowcoaches are currently authorized to operate in YNP, and the total visitor capacity of the snowcoach fleet is approximately 936.

Snowmobile Visitation and Commercial Guiding

Snowmobiles were first used in YNP in 1963. At that time, they were somewhat unreliable machines. However, manufacturers continually made improvements to them, and thousands of visitors entered YNP by snowmobile by the 1980s. Businesses in surrounding communities, especially West Yellowstone, have run touring enterprises based exclusively on providing snowmobile tours and rentals. Along with improvements to their reliability, manufacturers also made the machines more comfortable throughout this same era, equipping them with hand warmers and seat warmers. In the 2000s, manufacturers also debuted four-stroke machines, which substantially reduce emissions and somewhat reduced (and certainly changed the quality of) snowmobile sound.

Since the winter of 2003-2004, all snowmobilers have been required to use commercial guides in YNP, and all snowmobiles since the winter of 2004-2005 have had to be Best Available Technology (BAT) machines, which use newer technologies (primarily four-stroke engines) to reduce air and noise emissions (most snowmobiles the winter of 2003-2004 were also BAT machines). Guides are not required in GTNP, but BAT machines are required on Jackson Lake. Guided snowmobile service is available from a total of 22 different companies at the various park entrances.

Winter Visitation Data

Prior to the winter of 2002-2003, winter visitation to YNP was primarily by snowmobile, with 62% of all winter visitors touring the park in that manner (a daily average of 795 snowmobiles). Another 29% of visitors toured via automobile (or bus or RV) in the northern part of YNP, with 9% of park visitors taking a snowcoach into YNP (a daily average of about 15 coaches, which accommodated up to fifteen passengers). While cross-country skiers were not separately counted in entrance statistics (they are still not), about 20% of winter visitors (otherwise counted as visitors using either wheeled or oversnow transport) cross-country ski at some time during their stay in YNP (Littlejohn 1996).

However, beginning with the winter of 2002-2003 – prior to any change in winter access – a substantial drop in snowmobile visitation began. For the last five winters (2003-2004 through 2007-2008), snowmobile numbers have averaged between 240 and 300 per day (a 72% decline between 2001-2002 and 2004-2005). Several factors likely account for this change. The ongoing litigation during the winter of 2003-2004 brought a great deal of confusion about whether the parks were even open and what modes of transportation were allowed in them. The winters of 2002-2003 and 2004-2005 brought warmer and drier than normal conditions, making it impossible to open YNP roads according to schedule and necessitating the closure of some before the official end of the winter season. Some private snowmobile owners have been reluctant to rent best available technology machines and have chosen not to visit the parks. Finally, the requirement to use commercial guides discouraged some visitors from touring the parks.

More recently, snowmobile visitation has begun to increase, and snowcoach visitation has been increasing even more, suggesting that some who would otherwise snowmobile may be taking snowcoach tours instead. Snowmobile visitation has increased 31% over the winter of 2004-2005. These increases have been due partly to good snowmobiling conditions in those winters as compared to the winter of 2004-2005. During the same time period (2001-2002 to 2007-2008), the number of visitors touring YNP by snowcoach rose 72.0%, increasing from 25 to 35 coaches per day (with ridership averaging about 8 passengers per coach). For the winter of 2007-2008, 42 percent of OSV passengers in YNP traveled by snowcoach, with about 58 percent traveling by snowmobile (these figures exclude those traveling by wheeled vehicle).

Throughout this time period, visitation by automobile (and bus and RV) has remained stable, with a general upward trend (the 10-year average is over 40,000 visitors) of people enjoying YNP's northern area by wheeled vehicles.

Although oversnow visitation to YNP is still below that of the 2001-2002 winter and previous winters, it has risen 30% over the winter of 2004-2005 (the winter with the lightest use in recent years). Not only did better snow conditions encourage this increase, but efforts by the NPS and regional businesses and governments to advise people that the parks remain open assisted as well.

Figure 3-17 shows the three most common forms of winter visitation (automobile, snowcoach, and snowmobile) over the last ten winters. The drop in snowmobile visitation and concurrent increase in snowcoach visitation are evident, as is the consistency of automobile visitation to the Northern Range area of YNP. However, Figure 3-18 suggests that some variability in winter visitation is typical when visitation trends are viewed in a 20-year time frame. Figure 3-19 illustrates the daily patterns of snowmobile use in 2007-2008. In 2007-2008, 29 of 82 days exceeded 318 snowmobiles (and another 10 days were between 300 and 318 snowmobiles).

Figure 3-17: Yellowstone Winter Visitation by Mode of Travel, 1998-1999 through 2007-2008 (December to March each winter)

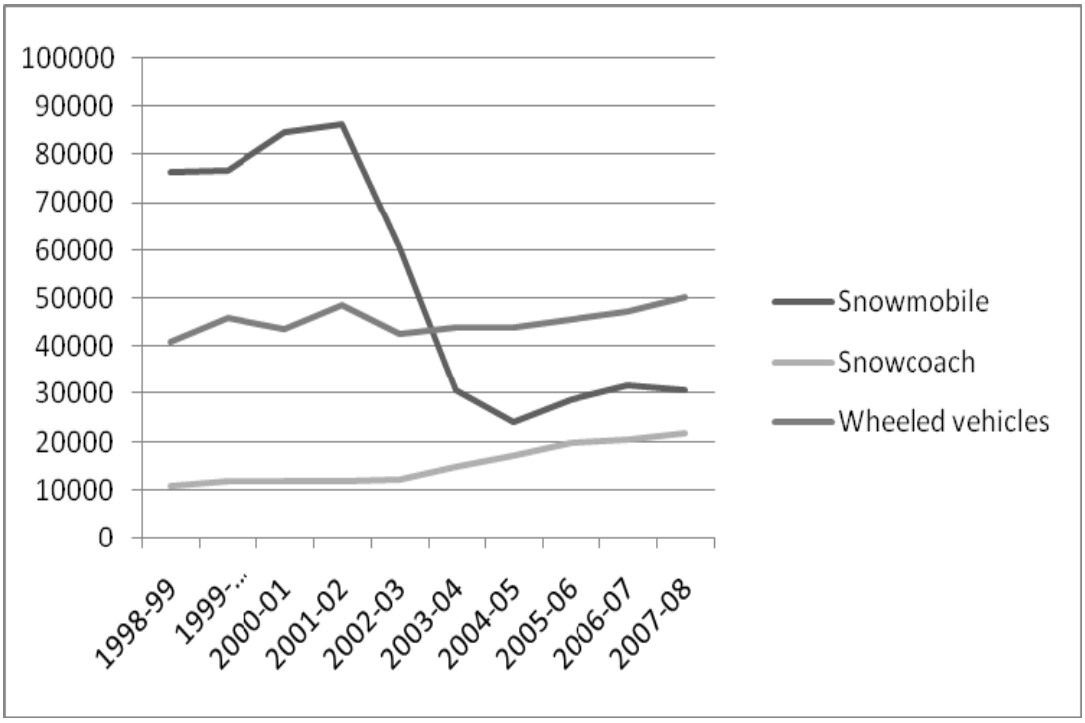


Figure 3-18: Total Yellowstone Winter Recreation Visitation, 1989-1990 through 2007-2008.

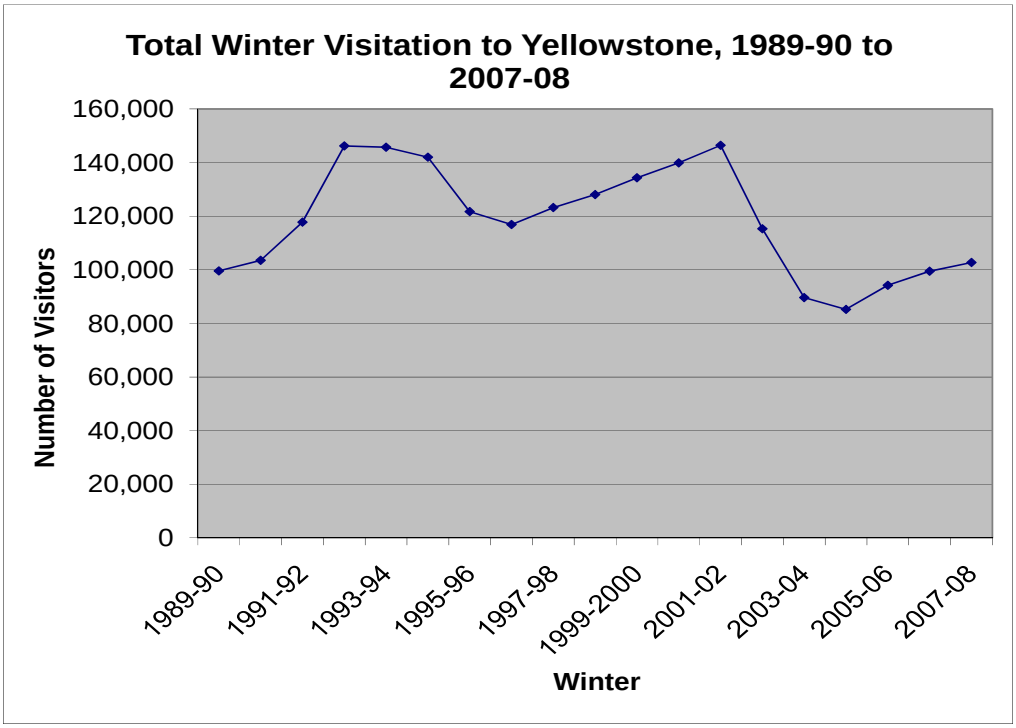


Figure 3-19: Daily Yellowstone Snowmobile Use, 2007 – 2008 Winter Season.

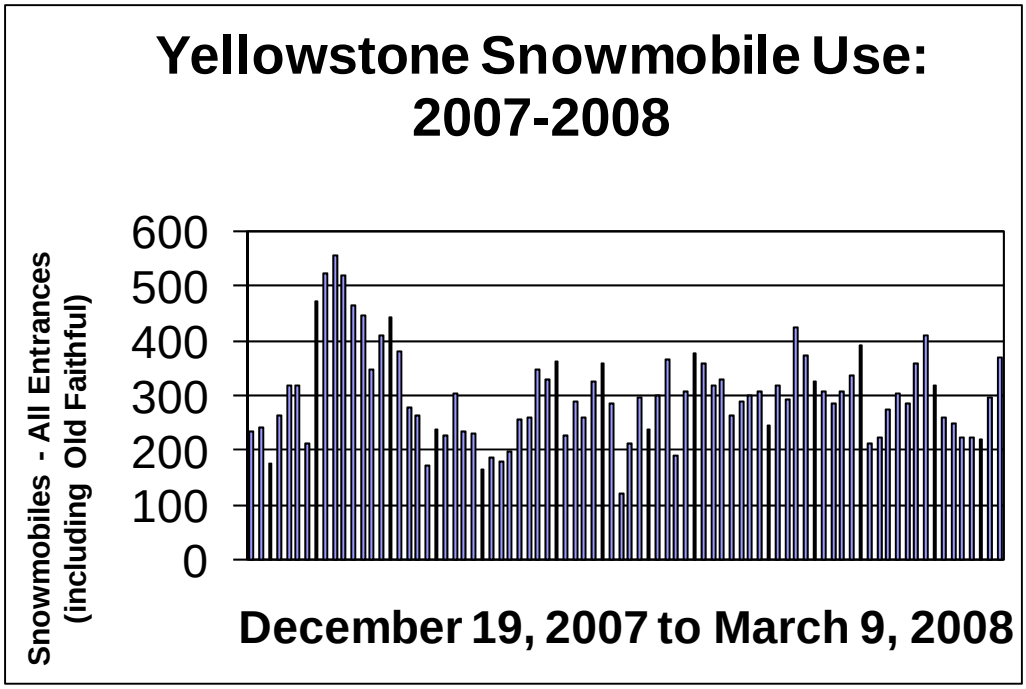


Table 3-23: Mode of Winter Arrivals in Yellowstone National Park, 1997-1998 through 2007-2008

Winter Season	Number of Visitors Entering the Park						Total Visitors[b]
	Auto	RV	Bus	Snow-mobile	Snowcoach	Skiers[a]	
1998-1999	36,450	90	173	76,271	10,779	446	124,209
1999-2000	37,872	140	747	76,571	11,699	351	127,380
2000-2001	43,036	138	3,071	84,473	11,683	389	142,790
2001-2002	47,750	215	417	87,206	11,832	307	147,727
2002-2003	41,666	278	796	60,406	12,154	322	115,622
2003-2004	42,643	181	1,141	30,437	14,823	438	89,663
2004-2005	42,639	138	1,153	24,049	17,218	468	85,665
2005-2006	44,136	92	1,288	28,833	19,856	271	94,476
2006-2007	45,519	144	1,658	31,805	20,350	289	99,675
2007-2008	48,404	104	1,667	31,420	22,344	261	99,975
Average Last 10 winters	43,012	152	1,211	53,147	15,274	354	112,718
% of Total Visitors	38%	0.1%	1%	47%	13.6%	0.3%	100%
Average Last 5 Winters	44,668	132	1,381	29,309	18,918	345	93,891
% of Total Last 5 Winters	47.6%	0.1%	1.5%	31.2%	20.1%	0.4%	100%

[a] This only includes visitors who ski through a park entrance; it does not reflect the total number of people who ski while visiting Yellowstone. Visitor surveys indicate about 20% of visitors ski in the park (Littlejohn 1996).

[b] These figures may double-count visitors entering the north entrance, because those visitors enter the park by automobile but also may take a snowmobile or snowcoach tour further into Yellowstone. For the same reason, percentages may not add to 100%.

Examining visitation by entrance, the North Entrance is the busiest in the winter because it is open for automobile travel. About half of YNP's visitors enter there. The West Entrance is the next busiest, with about 33% of YNP's winter visitors. The South Entrance accounts for 16% of park visitation, with the East Entrance admitting 0.5%. The Northeast Entrance is not staffed in the winter, since Cooke Pass is not currently plowed (and all traffic at the Northeast Entrance has already passed through the North Entrance). Table 3-24 provides average use levels for the last 5 winters in Yellowstone.

Nine out of ten visitors entering YNP through its North Entrance do so via wheeled vehicle. The primary attractions for them are Mammoth Hot Springs, the diversity and abundance of wildlife between Gardiner and the Northeast Entrance, access to Cooke City, and cross-country skiing

and snowshoeing across the northern portion of YNP. Some are also destined for the Cooke City area to snowmobile on national forest lands.

Table 3-24: Average use last 5 winters in Yellowstone.

Winter	Average Snowmobile Numbers	Average Snowcoach Numbers	Notes
2003-2004	259	24	Last winter of unguided; does not include Old Faithful entries
2004-2005	239	25	First winter of temporary plan; does not include Old Faithful entries
2005-2006	256	30	Does not include Old Faithful entries
2006-2007	299	34	Includes Old Faithful entries
2007-2008	294	35	Includes Old Faithful entries
Average of these 5 winters	269	30	Old Faithful entries averaged 11 per day in 2007-2008

Visitation to Grand Teton and the Parkway takes several different forms, as shown in Table 3-25. Most winter visitation in GTNP and the Parkway has and continues to be via wheeled vehicles. As the table demonstrates, visitation has remained relatively constant, although visitation to the CDST has dropped substantially in the past few winters. The use of snowplanes was prohibited in 2002. Also evident is the popularity of cross-country skiing in GTNP and the Parkway.

The column labeled "Parkway Snowmobile" includes snowmobiles departing Flagg Ranch for the South Entrance of YNP, as well as those using the Grassy Lake Road, although the vast majority of use shown in that column consists of snowmobiles bound for YNP. During the winter seasons of 2004-2005 and 2005-2006, use of the Grassy Lake Road amounted to 241 and 143 snowmobiles respectively (combined east and westbound for the entire season), although use in previous years was somewhat higher with an estimated average of 25 or less per day. The next column indicates snowmobile use on the CDST; most or all of these visitors traveled through both GTNP and the Parkway. The column labeled "GTNP Snowmobile" includes snowmobile use in GTNP, excluding use of the CDST. Prior to the winter season of 2002-2003, this included use of the Teton Park Road and the Potholes area, but it currently only includes use of Jackson Lake since the Teton Park Road and Potholes are no longer open for snowmobile use. The last column in the table indicates total recreation visits to the park, such as visitors who are only sightseeing or otherwise not participating in skiing or snowmobiling.

Table 3-25: Winter Use by Activity in Grand Teton and the Parkway, 1997-1998 through 2007-2008

Winter Season	Parkway Snow-mobile	CDST Snow-mobile	GTNP Snow-mobile	GTNP Snow-plane	Parkway Skiing	GTNP Skiing	Total Recreational Visitors (including visitors in wheeled vehicles)
1998–1999	17,160	1,639	3,436	851	1,149	4,242	180,367
1999–2000	23,400	1,329	4,800	1,091	1,581	5,687	223,944
2000–2001	31,011	1,307	2,618	1,148	1,987	4,774	211,700
2001–2002	26,401	2,006[d]	3,421	1,299	1,842	7,346	217,999
2002–2003	23,062	1,752[d]	2,305	0[a]	2,099	7,007	227,964
2003–2004	9,217	139	1,939	0	1,389	8,000[b]	186,871
2004-2005	7,351	11	149	0	1,775	6,751	174,840
2005-2006	10,161	17	268	0	1,456	9,843	174,250
2006-2007	11,710	14	287	0	997	11,197	192,379
2007-2008	12,444	11	309	0	1,315	13,005	187,813
Average	17,192	n/a[c]	n/a	n/a	1,559	6,615	197,813

Source: Data obtained from NPS visitation records.

[a] Snowplanes were prohibited from GTNP beginning with this winter season.

[b] Exact count is unavailable; this figure represents a best estimate.

[c] No average given for CDST because use has been highly variable.

[d] Estimate based upon previous average percentage of Parkway users.

Visitor Experience

2007-2008 Visitor Survey

The most recent visitor survey was conducted in winter 2007-2008 in Yellowstone at the Old Faithful area by the University of Montana and included separate surveys and interviews to provide managers with a better understanding of the roles of natural soundscapes and bison interactions in the experiences of oversnow winter visitors and the effectiveness of guiding (Freimund et al. 2008). Two separate surveys of visitors occurred (along with interviews) in the Old Faithful area, with one survey focused on soundscape-related topics and the other on bison questions. This profile information is a summary from both surveys.

Although 26% of visitors were from the three states of Montana, Idaho, and Wyoming, 45% were from a variety of states all across the United States (in descending order, Georgia, Colorado, Texas, Florida, Virginia, New York, Ohio, Washington, Pennsylvania, California and South Carolina). International visitors were 5% of those surveyed. Seventy three percent had a college degree and 43% had some graduate education or advanced degree. The average age of visitors was about 50 (47 in one survey; 51 in the other). Although 35% grew up on a farm, in a rural setting or small town (fewer than 5,000 people) and 65% of those surveyed grew up in

small or medium cities or major metropolitan areas, only 26% of those surveyed now live in rural or small town settings. Seventy-four percent live in small or medium cities or major metropolitan areas. Their activities (which were not exclusive) were: snowcoach touring (57%), snowmobiling (41%), cross country skiing (26%), and snowshoeing (25%).

Soundscapes Results

The soundscapes survey and in-depth interviews suggest that winter visitors to Old Faithful agree that Yellowstone is a place for natural quiet, to hear natural sounds and a quiet place. There was less agreement that Yellowstone is a place free of motorized noise. The opportunity to experience natural sounds was perceived to be important to both the value of Yellowstone and the visitors' experience (by 89% of visitors). There were some differences in the degree to which respondents supported the idea that Yellowstone is a place for natural quiet, to hear natural sounds. Visitors who participated in snowmobiling or snowcoach touring were somewhat less likely to agree that the Yellowstone is a "place free of motorized noise" (33% and 55%, respectively) as compared to skiers and snowshoers (both about 66%).

Eighty-one percent of the respondents indicated that the natural sounds had a positive effect on their experience and 83% were somewhat or very satisfied with their experience of natural sounds. Seventy-one percent of the visitors suggested they found the level of natural sound they desired for half or more of the time they desired it. Eighty-seven percent of the respondents were "very satisfied" with their overall experience and the remaining thirteen percent were "satisfied."

Respondents were asked about their support for a variety of management actions "to protect opportunities to experience natural sounds." Requiring best available technology, continuing to require guides, limiting the total number of snow machines in the park per day and limiting group sizes to 11 per guide were strongly supported by a minimum of sixty-eight percent of the respondents. Closing the roads to all over snow vehicles or to snowmobiles only was opposed or strongly opposed by 77% and 59%, respectively, of the respondents. Plowing the roads for automobile access was strongly opposed by seventy-one percent of the respondents and opposed by another nine percent.

In-depth interviews illustrate that the natural soundscape assists in providing a deep connection to nature that is restorative and even spiritual for some visitors. Natural sounds influenced respondent's motivation to visit Yellowstone and were an unexpected yet significant part of the experience for over a third of the interviewees. All interviewees indicated that the natural sounds are part of what makes the park special. Interviewees mostly accept mechanical sounds in the park, especially near developed areas, and they generally wanted some time in their experience to be quiet and natural (Freimund et al. 2008).

Bison Results

The bison survey results suggest that the opportunity to view bison remains an important part of the winter experience for visitors to Yellowstone National Park (71% of visitors described it as very to extremely important). Also, visitors overwhelmingly (87%) find this aspect of their Yellowstone winter experience very satisfying.

By the time visitors arrive at Old Faithful, most have seen bison on 6-8 different occasions. During these viewing opportunities, 99% of the visitors have at least one encounter in which bison appeared not to react to humans in a significant way. Conversely, 21% of visitors have witnessed an encounter where the bison were hurried, took flight, or acted defensively (the three most intense bison responses examined in the survey). And overall, visitors

overwhelmingly (>72%) appraised both the bison human interactions they witnessed and the park setting as a whole as "very" appropriate/acceptable.

There does appear to be a relationship between the nature of the interaction and visitor appraisals of those interactions. When asked to appraise the human bison interaction they witnessed where the bison showed the most significant response, those seeing the most intense responses from bison (hurried, took flight, or were defensive) are more likely than expected to describe the bison in the specific incident as agitated (37% compared to 2% for the group of visitors for which "no response" from bison was observed). They also are more likely to describe bison in the park overall as stressed (32% compared to 4% for the group of visitors for which "no response" from was bison observed). They are more likely to describe the bison overall as somewhat to very dangerous (56% versus 33%). Further, there is a relationship between the intensity of bison response to humans witnessed in a particular interaction and normative judgments about acceptability/appropriateness of those specific interactions: as a group, those who witness the most intense bison response are less likely to find them "very" acceptable/appropriate and more likely to say "somewhat" inappropriate. Even so, the majority (72-78%) of the 21% of visitors who witnessed the most intense bison responses described the incidents as "somewhat" to "very" acceptable/appropriate.

Primary activity (skiing/snowshoeing versus snowmobiling versus snowcoach touring) does not appear to have a strong or consistent influence on appraisals of specific human bison interactions. However, it does exert more of an influence on overall appraisals of bison in Yellowstone as a whole. The two most notable differences had to do with the appraisals "stressed/peaceful" and "dangerous/safe". Snowmobilers were more likely to say the bison were "very" peaceful (67%) than were skiers/snowshoers (26%) while skiers/snowshoers were more likely to say bison were "somewhat" stressed (26% compared to 6% of snowmobilers). On the dangerous/safe dimension, 60% of skiers/snowshoers rated bison as either "very" or "somewhat" dangerous compared to 53% of the snowmobilers saying bison were "very" or "somewhat" safe.

Finally, differences in appraisals resulting from type of community in which visitors currently reside and "wildlife values" specifically for bison as measured in the survey were explored, but these factors were not found to be significant influences (Freimund et al. 2008).

Guiding Results

The guide portion of the survey was conducted through interviews with guides in the Old Faithful developed area. Because of the type of survey, generalizations cannot be made from the results, but some themes are evident. The idea of the guide as a mentor, one who is focused on transmitting and interpreting information, is reflected in many of the comments of the guides interviewed during the course of this research. The guides themselves were interested in learning about the park and enhancing visitors' experiences by attaching meaning to what they were seeing through interpretation and education. In this way, the guide's role as an interpreter is then one of communicating information in such a way as to produce a visitor who is mindful of the destination, willing to learn and broaden their perspective by understanding Yellowstone and its unique landscape. As a wilderness "servicescape," Yellowstone has service providers such as snowmobile and snowcoach guides who are charged with the responsibility of ensuring that visitors' impacts on the environment are minimized first, even at the expense of visitors' needs and wants. As such, guides are communicating the wilderness values held within Yellowstone to their clients, exerting influence on how their clients interpret their own experiences. Therefore, the guides, some consciously, are conveying ideas of preservation of

the park to their clients. The result of this could be a reshaping of visitor attitudes towards environmental protection and encouraging environmentally responsible behavior. The discussion of changes in client attitudes is particularly salient here as many snowmobile and even a few snowcoach guides noted that a good portion of visitors who started out the day thinking they did not need a guide were, at the end of the day, appreciative of what they learned about the park. Also of relevance is the possibility that the people attracted to having a winter-visitor experience in Yellowstone are those who share the same environmental values as are portrayed through park policies. These issues are, however, speculative and would require further research in order to determine if the anecdotal information by the guides does in fact coincide with what the visitor is experiencing (Freimund et al. 2008).

Previous Survey Results

A variety of other winter surveys have been conducted since the late mid-1990s. In January to March 2005 and 2006, the University of Montana surveyed 266 snowcoach passengers on YNP tours originating in West Yellowstone, Montana. The most commonly listed reasons for visiting YNP in winter included viewing wildlife during that season, seeing the "winter wonderland image," and seeing geothermal activity in winter. Being surveyed at the end of their tour, passengers strongly agreed that their tour provided them with an appreciation of nature, an educational experience, a sense of wonderment, and relaxation. They strongly disagreed that their snowcoach experiences were either uncomfortable or a disappointment (Nickerson et al. 2006).

In addition to the 2006 survey, a number of reports looked at visitors from the mid-1990s through 2003, and found that in terms of demographics, winter visitors to YNP came primarily from western states. Specifically, about a third came from four local states (Montana, 20%; Wyoming, 6%; Idaho, 6%; and Utah, 6%), while another 10% came from the Upper Midwest (Minnesota, Wisconsin, and Michigan). As expected, the country's more populous states were also home to many visitors, even though those states are more distant from YNP (California, 5%; Florida, 5%; New York, 3%; Texas, 4%; and Washington, 4%). The 2006 snowcoach and 2008 surveys found very similar results. GTNP receives more local visitation, with almost half of those surveyed coming from Wyoming.

These studies also found that winter visitors are relatively more educated (88% had some college or a degree) and wealthy (71% earned more than $60,000 per year in 2003 dollars) than the general population. Snowcoach passengers in the 2006 survey were primarily professionals, health care workers, or retired, with 42% of them earning over $100,000 annually. The majority of visitors were employed and married, and the average age of visitors was in the mid-40s. While 70% of snowmobile riders were male, the gender ratio of non-snowmobilers was about even. More than half of all visitors were touring with family groups (57%), with most of the remainder touring with friends (45%--some traveled with both friends and family, which is why the percentages add to greater than 100%). Almost a third purchased packaged tours. The snowcoach survey found the average group size to be 4.4.

For most visitors, a winter visit to the parks is a multi-day, multi-destination, and often multi-activity experience. In YNP, 55% of the sample indicated that the primary activity on their trip was riding a snowmobile without a guide (by contrast, all snowmobile and snowcoach riders now must take guided tours). Downhill skiing outside the parks was the next most popular primary activity (17% of the sample). In GTNP, 62% of those sampled chose cross-country skiing as their primary activity, and downhill skiing was again the second most popular primary activity (14% of the sample). In the YNP sample, 15% were on day trips compared to 40% in the

GTNP sample. Visitors on multi-day trips – which averaged five days – to both parks spent more time outside the parks than inside the parks during their trips (the average was 1.5 days in the parks). About 70% of YNP visitors stopped at Old Faithful while in Yellowstone. Again, the 2006 snowcoach passenger survey reported very similar findings about the typical visitor vacation to the Yellowstone area.

Visitors also answered a question on where they stayed and how many nights they stayed there. Almost half of the respondents spend time in West Yellowstone (usually over three nights), 20% stayed in Jackson (an average of over four nights), 11% in Big Sky (almost six nights), 13% in Gardiner (about two nights), and 12% at either Old Faithful Snow Lodge or Mammoth Hot Springs Hotel, the two open hotels inside YNP (about two nights at either).

Finally, the 2003 survey participants were asked to name one thing they would change about their trip. In YNP, 41% said they would not change anything about their trip, 20% of non-snowmobile riders said they would have liked fewer snowmobiles in the park, and 14% of snowmobilers wanted smoother snow on the roads. At Taggart Lake, 60% of the sample would not change anything about their trip.

A programmed creel survey was conducted by the Wyoming Department of Game and Fish on Jackson Lake during the 2005 winter season. According to the survey, between January and April, an estimated 1,549 anglers spent 8,036 hours on the ice. The total angler estimate was down 73% from the 1996 estimate of 5,816 anglers. Lake trout dominated the creel and were caught at a rate of 0.32 per hr, below the WDGF management objective of 0.5 lake trout per hour. The estimated catch rate for all trout was 0.34 per hour, half of the 1996 estimate of 0.68 fish per hour. Snake River cutthroat trout and brown trout *Salmo trutta* were incidental to the creel. Hatchery-reared lake trout comprised 11% of the total creel.

Winter Operations

The NPS, park concessioners, contractors, researchers, and other duly permitted parties depend on snowmobiles and snowcoaches for their administrative functions. These uses of the parks are not within the purpose and need, but are within the scope of analysis in this EA because as shown in the analysis for some impact topics, such as soundscapes, winter operations have an effect. Likewise, these uses are not part of the decision to be made relative to this plan. The affected environment for winter operations in the parks is discussed below.

Regulatory and Policy Overview

Administrative use of oversnow vehicles (OSVs), as described above, is addressed by the following policy and guidance (see also Appendix A):

- EO 11644 (Use of Off-Road Vehicles on the Public Lands, section 2(3)(B) and (C))
- Management Policies 2006, section 8.2.3
- February 17, 2004, memorandum from Assistant Secretary, Fish and Wildlife and Parks, to Director, National Park Service
- 36 CFR 1.2 (d)

EO 11644 and the relevant policies shown are presented in full in Appendix A. Also in Appendix A, the 2004 memorandum is duplicated. In essence, because administrative use of oversnow vehicles can adversely impact park resources and values, it is to be limited to the level necessary for management of public use, to conduct emergency operations, construction, and

resource protection activities that cannot be accomplished by other means. Also, it is intended that NPS leads by example through the use of BAT snowmobiles and snowcoaches.

NPS and Concessions Employees

Approximately 75 permanent and seasonal NPS employees plus their family members currently over-winter in the interior of Yellowstone National Park (this is a decrease of about 20 employees since 2001). Additionally, Xanterra Parks & Resorts stations approximately 150 employees in the interior during the winter season, almost exclusively at Old Faithful. These NPS and Xanterra employees not only provide critical law enforcement, interpretive, and guest services to winter visitors, but they also maintain and protect Yellowstone's natural and cultural resources. For example, some employees clear accumulating snow from the park's historic buildings, including National Historic Landmarks such as the Old Faithful Inn and the Fishing Bridge, Madison, and Norris museums.

Some of the employees living in Yellowstone's interior occupy a unique environment, for they have no wheeled vehicle access to their homes. Their only access to groceries, supplies, and medical care is by oversnow vehicles (OSVs). Almost nowhere else in the United States, outside Alaska, are whole communities of people living and working in an oversnow environment such as the interior of Yellowstone National Park (YNP). Grand Teton National Park (GTNP) has no such snow-bound employees, although some inholdings are only accessible by OSV.

Other NPS and concessions employees, as well as permitted researchers and authorized contractors, conduct similar work and personal activities by OSV. Park guides and outfitters are also authorized to use non-BAT snowmobiles and snowcoaches in the park for administrative access to repair or tow disabled vehicles. Northwestern Energy and Qwest employees use non-BAT machines to access utility systems off the groomed roads.

While most permanent interior NPS employees own personal snowmobiles, most interior-based concessions employees do not. As of about 4 winters ago, there were approximately 89 NPS employee-owned and 10 concession employee-owned snowmobiles in Yellowstone. At that time, most were non-BAT. Since then, the NPS increased its administrative fleet and allowed employees to use government BAT snowmobiles to accomplish personal errands (groceries, medical appointments, etc). This has reduced use of non-BAT employee owned snowmobiles (though many still own their non-BAT snowmobiles). For those considering the purchase of a snowmobile, the NPS is encouraging them to purchase BAT snowmobiles in anticipation of such a requirement beginning in the 2011-2012 season.

Guests of any employees are encouraged to utilize best available technology (BAT) OSVs when authorized to enter the park. Permitted researchers are required to utilize BAT vehicles as a condition of their permit. Any newly issued contracts that require a contractor to travel via OSV to conduct their work in the parks (for example, a construction project) include a BAT requirement. Older contracts may not include this requirement.

The majority of the NPS administrative OSV fleet in YNP and GTNP is now BAT. For the 2005-2006 season, YNP had 131 snowmobiles in its administrative fleet, of which 87% met BAT requirements. All non-BAT vehicles (13 turbo four-stoke, and six two-stroke snowmobiles) are needed for specialized use, such as law enforcement (boundary patrol, search and rescue) and other administrative purposes on a limited basis where the heavier weight and lower horsepower of current BAT machines do not perform adequately.

In addition to administrative snowmobiles YNP operates 32 other oversnow vehicles. These include ten groomers, two snowcoaches, and assorted pickups, vans and utility vehicles, ambulances, and fire engines.

Thus on a typical winter day, between 50 and 75 non-BAT administrative snowmobiles may be operating in the park in addition to visitor recreational BAT snowmobiles. As described in the soundscapes reports (Burson 2008a), using attended logging, administrative vehicles of all types comprise 21-26% of all audibility.

The NPS transports goods and materials to support winter operations via some of these OSVs. Although all fuel and larger goods are transported to interior locations by wheeled vehicle before the start of the winter season, during the course of the winter, additional supplies are conveyed via OSV to support park personnel accomplishing their work in the winter. Other OSV uses include resource monitoring, personal use, and concession support.

Visitor Fuel Consumption by Mode of Transportation

Fuel usage and cost is an issue for the NPS, guides and outfitters, as well as visitors. Consequently, an analysis of the fuel that would be consumed under different winter modes of transportation was completed. This analysis assumed that 100 visitors would enter the park via the West or South entrances and that all visitors took the same 70-mile roundtrip tour, that both their choice of transportation modes and ridership per vehicle replicated current conditions, and the ratio of which entrance such visitors chose would be the same as the average for the last four years, which is 2/3 to the West Entrance and 1/3 to the South Entrance.

Seventy miles is the average distance of the most common tour taken from those two entrances, the round-trip tour to Old Faithful. At the West Entrance, an average of 61% of visitors have chosen to tour Yellowstone by snowmobile the last four years, with the other 39% choosing snowcoaches. At the South Entrance, the respective percentages are 73% and 27%. For wheeled vehicle access in the winter (an alternative considered but rejected in this EA), all visitors entering the West Entrance were assumed to travel by bus (assuming the road from there to Old Faithful were plowed). For vehicle ridership, an average of 1.3 persons have ridden each snowmobile and 8.0 each snowcoach for the past four years, and an average of 20 people were assumed to ride each bus.

Average oversnow vehicle fuel efficiencies were computed using the data obtained by Bishop et al. 2006 and Bishop et al. 2007. Average snowmobile fuel efficiency was found to be 25.1 mpg, a simple average of the three snowmobiles tested by Bishop et al. in those two reports. The snowcoach average used was 3.43 mpg, an average of the nine gasoline-fueled and two diesel-fueled coaches tested by Bishop et al. over the two years. The average wheeled bus fuel efficiency used for this analysis was 9 mpg, an average of the 6 mpg that Xanterra full-size buses get, the 9 mpg that NPS's new yellow buses get, and the 12 mpg that Xanterra's 15-passenger vans get (assuming that the commercial wheeled vehicles would be split evenly between these three different kinds of vehicles).

Using these assumptions, 100 visitors taking a 70-mile tour of Yellowstone would use 229 gallons of fuel under the provisions of Alternative 2. Visitors touring by snowcoach-only (an alternative considered but rejected in this EA), would consume the most fuel, 255 gallons. Visitors touring by a mix of wheeled vehicles (again, a concept considered but rejected in this analysis) on the park's west side, and a mix of snowcoaches and snowmobiles on the east and south sides, would consume less than half as much fuel as those touring via any other alternative, 100 gallons, reflecting the efficiency of mass transportation vehicles.

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