CHAPTER I: PURPOSE AND NEED

1.1 Introduction

This Final Environmental Impact Statement (FEIS) is prepared in accordance with Council of Environmental Quality (CEQ) Regulations at 40 CFR Part 1500 and National Park Service policy (DO 12) for implementing the National Environmental Policy Act (NEPA). The necessity for this FEIS derives from court decisions regarding the adequacy of earlier environmental documents and decisions developed for the same purpose and need, as described in this chapter. The purpose of this FEIS is to remedy inadequacies identified in these decisions regarding previous winter plans and to provide a plan for long-term winter use activities.

This chapter sets the framework for the alternatives and the analysis of their effects by explaining the purpose and need for action and the issues associated with it. Chapter II presents the alternatives that are intended to meet the purpose and need for action, as well as alternatives that were considered and dismissed. Chapter III describes the conditions, existing or otherwise, for park resources and values that are likely to be affected by the alternatives for winter use management. With Chapter III descriptions representing a basis for comparison, Chapter IV presents the potential impacts or changes that may result from each alternative. Information about the preparers of this document and cooperating agencies or other coordination efforts is contained in Chapter V. Supplementary information is contained in appendix material.

1.1.1 History

A brief history of the NPS winter use planning effort to date is provided here. A more detailed history and timeline may be found in Appendix B.

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.[1]

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

[1] These changes (increased visitation and the CDST) 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 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.[2]

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.[3]

The 2000 ISMA Lawsuit

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).[4] 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.[5] 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

[2] In a separate matter, the Bluewater Network in January 1999 petitioned the National Park Service to ban snowmobiles throughout the National Park System, based on their effects on air and water quality, wildlife, and public health and safety. The NPS provided a final response to this petition in February 2004 (see U.S. Department of the Interior Memorandum in Appendix A).

[3] Following publication of a proposed rule and the subsequent 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.

[4] The suit named the Secretary of the Interior and the Director of the National Park Service as defendants. Subsequently, the State of Wyoming intervened on behalf of the plaintiffs. The lawsuit asked for the decision to ban snowmobiles, as reflected in the ROD, to be set aside.

[5] In order to provide the time necessary to complete the SEIS, the NPS subsequently delayed its previous snowmobile phase-out by one year, as published in the *Federal Register* on November 18, 2002. This "delay rule" provided for phase-out beginning in the 2003–2004 winter season.

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.[6]

D.C. District Court Action on the 2003 Decision

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.[7]

Wyoming District Court Action on the 2000 EIS and ROD

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 EA and Plans of 2004

Because the agency had 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).

[6] The remaining 20% were to be non-commercially guided. Other operational restrictions were also put in place.

[7] These provisions were pursuant to the "delay rule" promulgated November 18, 2002.

The temporary plan was in effect through the 2006–2007 winter season, during which time the NPS prepared this new long-term winter use plan and EIS for the parks. This new long term winter use plan is 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 will not be allowed after the 2006-2007 winter season pursuant to the 2004 regulations.

Court Action on the Temporary Winter Use Plans

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. The court upheld 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 is pending. 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.

1.2 The Purpose and Need for Action

The purpose of this winter use plan/EIS is to provide a framework for managing winter use activities in Yellowstone and Grand Teton national parks and the John D. Rockefeller, Jr. Memorial Parkway. The goal of the plan is to provide park visitors with a range of appropriate winter recreational opportunities, while ensuring that these activities do not lead to unacceptable impacts or the impairment of park resources and values. This purpose is underpinned by laws, regulations and policies that direct national park management. The most pertinent laws, regulations and policies relating to winter use are presented in Appendix A.

The intent of a plan is to achieve, as well as practicable, a set of desired conditions or goals. The existing conditions, for purposes of this planning effort, are the historic conditions that existed prior to the last four winters of managed use. Because those conditions led to impairment of park soundscapes, wildlife, air quality, and visitor experience, they clearly indicated a need for change. Thus, the term "historic conditions" is used in this document to describe the conditions that existed during the nearly twenty years of largely unmanaged snowmobile use in the parks.

This FEIS addresses the historic conditions by developing a winter use plan. The historic conditions, compared to the desired conditions, illustrate the need for action, or the need for a winter use plan.

Desired and historic conditions are juxtaposed in the following table. Throughout the several winter use planning efforts undertaken by the NPS since 1990, the planning goals and existing conditions have remained essentially the same. They are restated here in a way that articulates each condition as a discrete topic, for ease in analysis. The desired conditions have been updated in light of the 2006 *Management Policies*.

It is important to note that winter visitation levels and modes of access to the parks have changed since the implementation of managed winter use in 2003. Part of the function of this FEIS is to determine, as well as possible, whether recent conditions (for the winters of 2003–

2007) have improved or not, relative to the historic condition. Discussions in Chapter III of this FEIS are intended to illustrate both historic resource conditions and current conditions determined by monitoring, as a backdrop to the potential effects of new alternatives.

Also, in response to the D.C. District Court, the FEIS addresses a number of concerns regarding the winter use Supplemental EIS. These include road grooming and bison movement, compliance with NPS mandates, and the effectiveness of mitigation measures. In response to the Wyoming District Court, the FEIS addresses a number of concerns regarding the 2000 EIS. These include snowcoaches, public and cooperating agency involvement, and guiding.

Table 1-1: Desired Versus Historic Conditions for Winter Use Planning

Desired Conditions	Historic Conditions
Visitor Access	
Visitors have access to a range of appropriate activities for enjoyment of the park resources and values during the winter. Appropriate winter recreation is that which does not cause unacceptable impacts on unique characteristics of winter settings within the parks, while permitting their enjoyment and protection. Appropriate activities are those which promote understanding of the purposes for which the parks' resources are being preserved, and those which promote the health and personal fitness of the general public.	Access for personal motorized use via snowmobile increased greatly since the beginnings of the winter program, while access for "quiet" winter use decreased in relation to it. Snowmobile use, in historic numbers, is inconsistent with winter park landscapes that uniquely embody solitude, quiet, undisturbed wildlife, clean air vistas and the enjoyment of these resources by those engaged in non-motorized activities.
Visitor Experience	
Visitors experience high quality winter activities with a sense of appreciation and enjoyment that is consistent with the condition for visitor access. Recreation experiences enhance the enjoyment of park resources and values, while protecting the experiences of other park visitors. Conflicts among user groups are minimal. Reduced oversnow vehicle sound and emission levels enhance the visitor experience. Visitors participate in winter use activities without damaging resources.	A variety of winter use conflicts have been identified involving the relationship between users and among different user groups. Each of these conflicts affects how people experience the parks. At destination facilities and trails open to both motorized and nonmotorized users, the latter express dissatisfaction with the sound, odor, and number of snowmobiles as affecting the solitude, quiet, and clean air that people expect to enjoy in the parks.
Health and Safety	
High quality facilities, programs and operations provide a safe and healthful environment for visitors and employees. The safety and health of persons will be ensured by identifying and preventing potential injuries from recognizable threats. Known hazards are reduced or eliminated. Visitors know how to participate safely in winter use activities, and they equip themselves for doing so. Reduced oversnow vehicle sound and emission levels protect the health and welfare of employees and visitors.	The level of snowmobile accidents, unsafe users, inherent winter risks, and conflicts between users is a public safety concern. The parks have documented health hazards from oversnow vehicle emissions and noise for both employees and visitors.
Park Resources and Values	
Park resources and values are protected from impairment by preventing unacceptable impacts. Reduced oversnow vehicle sound and emission levels protect air quality, natural soundscapes, and other resources that are dependent on those qualities. Impacts to wildlife are mitigated, and effective wildlife habitat is protected.	Sound and exhaust emissions from oversnow vehicles affect air quality, visibility, and natural soundscapes. Oversnow vehicle travel causes harassment and other unintended impacts on wildlife, especially at times when wildlife species are highly vulnerable to natural stressors.

1.3 Incorporation by Reference

Under CEQ regulations, agencies are to reduce excessive paperwork as part of performing NEPA analysis.[8] The body of literature and scientific study for the winter use program is exceedingly voluminous. This body of work, including recent studies or study updates performed for this particular FEIS, lends itself to incorporation by reference. Materials that contain relevant information and are therefore incorporated by reference include, but are not limited to the following. These documents are available for public review at http://www.nps.gov/yell/parkmgmt/winterusetechnicaldocuments.htm.

- Air Resource Specialists, Inc., "Final Air Quality Modeling Report, Snowmobile and Snowcoach Emissions," 2006 (revised Aug. 23, 2007, and including July 24, 2007 "Addendum Air Quality Modeling Report, Snowmobile and Snowcoach Emissions").
- "Modeling Sound Due To Over-Snow Vehicles in Yellowstone and Grand Teton National Parks," October 2006.
- John Duffield and Chris Neher, "Regional Economic Impact Analysis for Yellowstone and Grand Teton National Parks and John D. Rockefeller, Jr. Memorial Parkway, Winter Use Draft Environmental Impact Statement," Aug. 30, 2006.
- National Park Service, "Sylvan Pass Operational Risk Management Assessment: Draft Report of Results and Initial Interpretation, Aug. 6-8, 2007 Workshop in Gardiner, Montana," Aug. 24, 2007.
- U.S. Fish and Wildlife Service (National Elk Refuge) and the National Park Service (Grand Teton National Park) joint Draft Bison and Elk Management Plan and EIS (in progress) (this report, only, found at http://www.nps.gov/grte/parkmgmt/planning.htm).
- Shan Burson, "Natural Soundscape Monitoring in Yellowstone National Park December 2005-March 2006," 6 Sept. 2006.
- Shan Burson, "Natural Soundscape Monitoring in Yellowstone National Park, December 2006-March 2007," Draft, 21 June 2007.
- John D. Ray, "Winter Air Quality Study 2005-2006," January 2007.
- P.J. White, Troy Davis, John J. Borkowski, Robert A. Garrott, Daniel P. Rinehart, and D. Craig McClure, "Behavioral Responses of Wildlife to Snowmobiles and Coaches in Yellowstone," Oct. 17, 2006.
- C. Cormack Gates, et al., "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," 2005 (referred to as the "Gates Report").
- Robert A. Garrott and P.J. White, "Evaluating key uncertainties regarding road grooming and bison movements," May 23, 2007.
- Bob Comey, "Avalanche Hazard Assessment and Mitigation Report," March 30, 2007.
- Philip E. Farnes and Katharine Hansen, "Historical Snow Water Equivalent and Temperature Data for Oversnow Vehicle Travel Areas in Grand Teton and Yellowstone National Parks," September 2005.

[8] 40 CFR §1500.4(j) Incorporation by Reference: (§1502.21) cutting down on bulk without impeding agency and public review of the action. The incorporated material is cited in the sections to which it applies. The materials are available for inspection by interested parties, concurrent with the FEIS itself.

- Gary A. Bishop, Ryan Stadtmuller, and Donald H. Stedman, "Portable Emission Measurements of Snowcoaches and Snowmobiles in Yellowstone National Park," January 2007.
- Gary A. Bishop, Daniel A. Burgard, Thomas A. Dalton, and Donald H. Stedman, "In-use Emission Measurements of Snowmobiles and Snowcoaches in Yellowstone National Park," January 2006.
- Procedures for Oversnow Vehicle Best Available Technology (2005).

1.4 Scope of Analysis: Range of Alternatives Considered

The scope of analysis determines the range of alternatives to be considered. The 2000 EIS evaluated seven alternatives for managing winter use. As required by the June 29, 2001, settlement agreement with ISMA and the State of Wyoming, the 2003 SEIS focused on new information and additional public comment. Three additional alternatives allowing continued snowmobile use were considered, as well as an alternative allowing only snowcoaches (the "no action" alternative). The temporary EA focused on analyzing the environmental impacts of six winter use alternatives. This EIS evaluates a full range of seven alternatives for managing winter use in Yellowstone and Grand Teton national parks and the John D. Rockefeller, Jr. Memorial Parkway. Maps of these parks are included below in Figures 1-1 and 1-2. Concepts considered in the range of alternatives are outlined in 1.5.1, 1.5.3 and 1.7 below; alternatives are detailed in Chapter II.

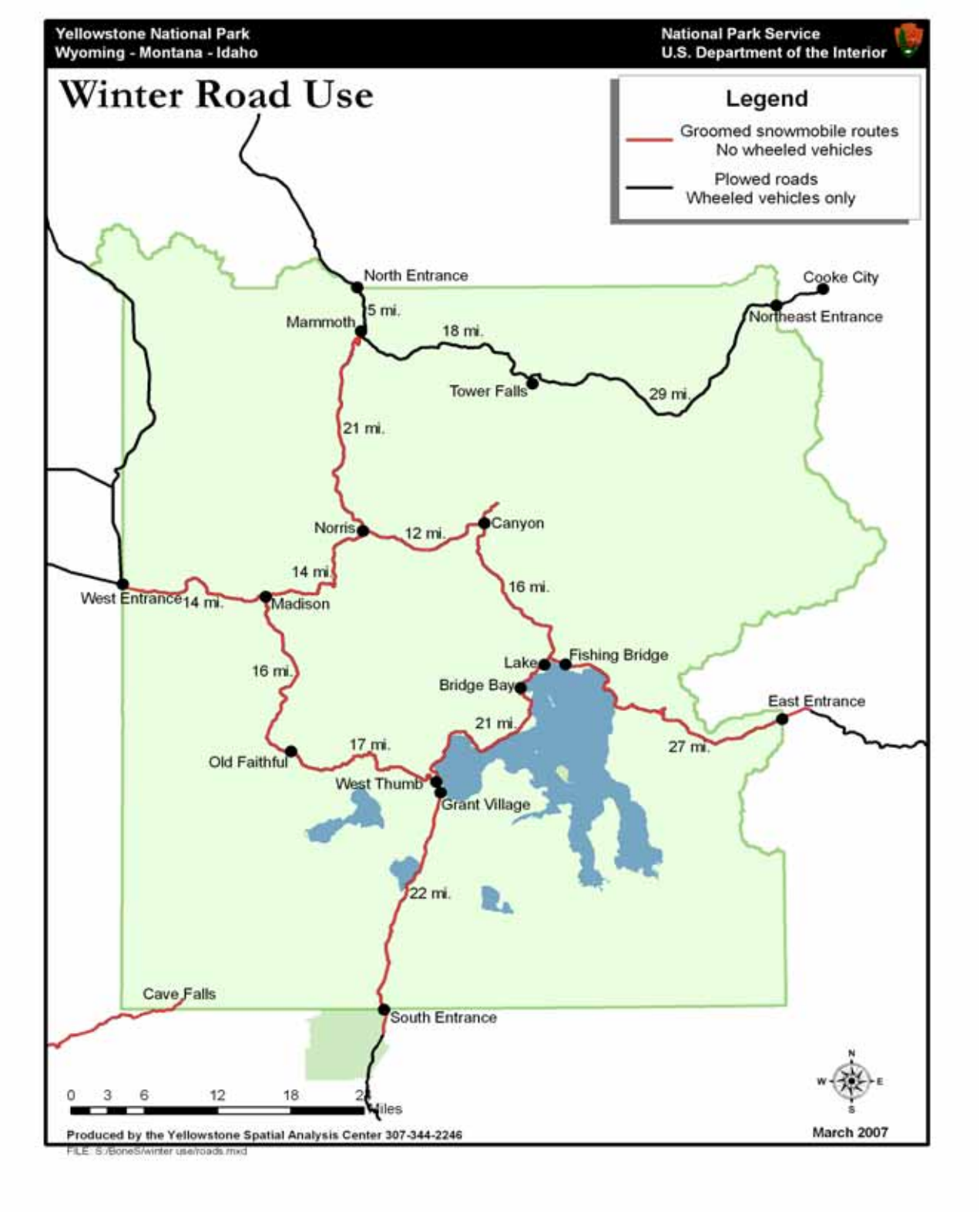


Figure 1-1: Yellowstone National Park.

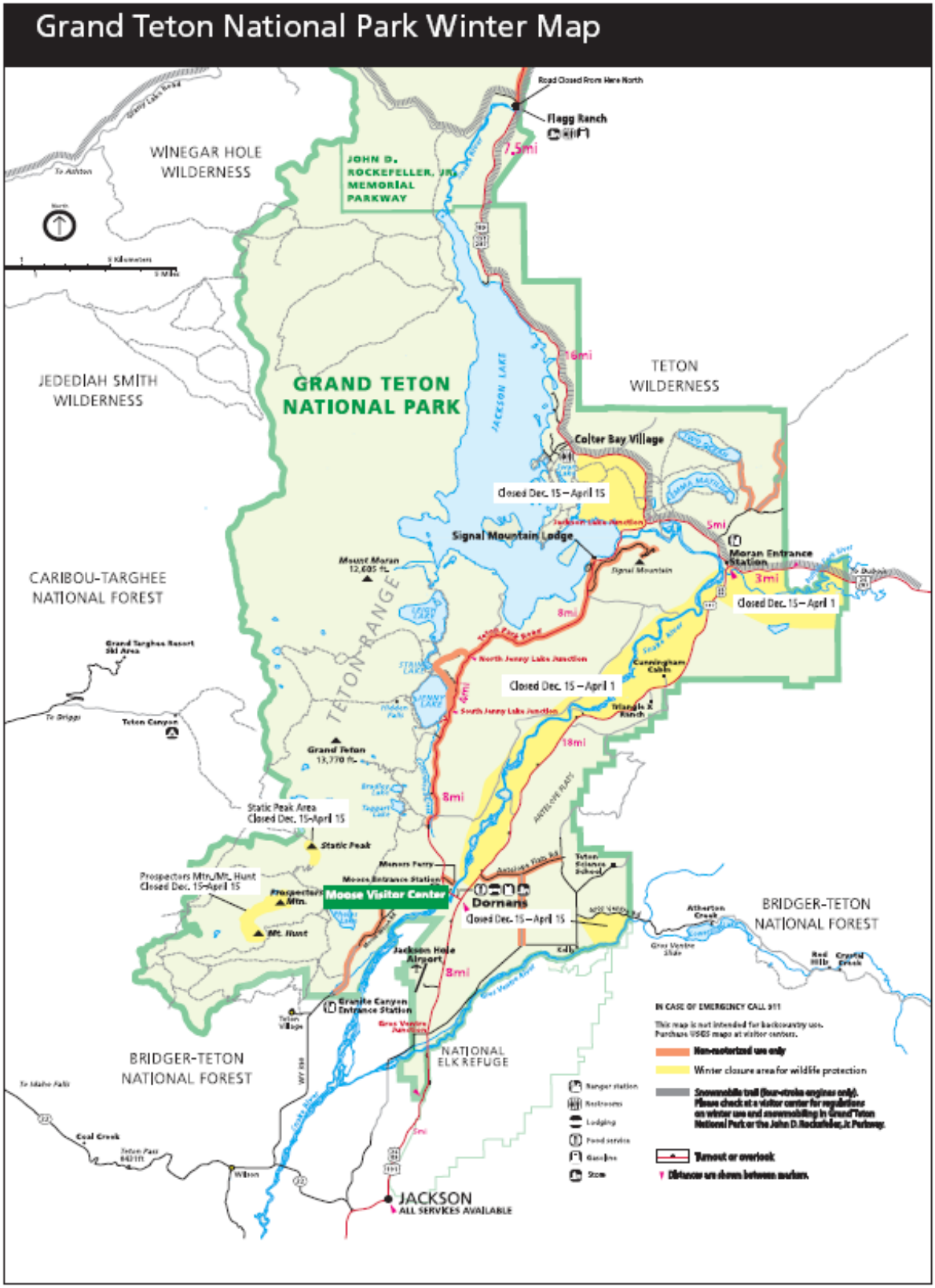


Figure 1-2: Grand Teton National Park and the John D. Rockefeller, Jr. Memorial Parkway.

1.5 Decision to be Made

The scope of analysis for an EIS and the decision to be made as a result of the EIS clearly must be consistent with each other. Both the scope and the decision are to be defined regarding what is to be analyzed and decided, and what is not. This section describes what is and what is not included in the analysis.

1.5.1 What is to be Evaluated and Decided

The decision to be made in this planning and environmental compliance process is the type and extent of public recreational access appropriate to the parks during the winter (winter use). It will be judged upon the alternative and the associated impacts which best meet all the desired conditions defined in the purpose and need for action and addresses associated impacts. Since some desired conditions work at cross-purposes, this means that the decision requires optimizing between recreation activities and protection of resources and values, in accordance with NPS policies. The reader may take special note of the NPS policies on avoiding impairment and visitor use described in Appendix A.

Part of the decision to be made includes the type and extent of restrictions on public recreational snowmobile and snowcoach use, if they are allowed. The decision to be made from this EIS will also consider the conclusions in the 2000 EIS, the 2003 SEIS, the 2004 EA regarding adverse impacts, and the finding in the November 2000 ROD and affirmed in the March 2003 ROD and the 2004 FONSI that the historically unlimited and essentially unregulated snowmobile use constituted an impairment of park resources and values.

For the last three winters, winter use of the parks was guided by a temporary plan and regulations that expired at the end of the winter use season of 2006-2007. In addition, winter use management of the parks over the past several years has been uncertain at times due to the variety of policy changes and court proceedings. This decision for a long-term winter use plan is intended to provide park visitors, local communities, and other stakeholders with assurance that winter use management of the parks will remain fairly stable and predictable over the long-term. Such assurance will facilitate an environment in which visitors can make informed decisions about visiting the parks and allow the tourism-based local communities and businesses to plan and invest with a relative degree of certainty.

Unless a new decision and rule are promulgated by November 2007, areas of the parks previously accessible by recreational snowmobiles and snowcoaches will be accessible only by non-motorized means, because the Temporary Winter Use Plan rules did not authorize motorized use beyond the end of the 2006-07 winter season. Congress could also authorize such motorized uses for the 2007-08 winter season, as it has done for the past three winters (although this possibility is uncertain). While non-motorized winter use of the parks is an important and appropriate recreational activity, relying almost solely on non-motorized means may not best address desired conditions for visitor access and experience. Yellowstone in particular is a large park and distances are significant between features, making much of the park inaccessible for most visitors on skis or snowshoes. Thus, this winter use plan/EIS will analyze an appropriate range of alternatives which provides for both motorized and non-motorized use of the parks and will serve as the basis for a record of decision and rulemaking to guide winter use management over the long-term.

The record of decision based on this EIS will constitute a plan that provides long-term guidance for winter use management in the parks. The preferred alternative, alternative 7, is identified as the proposed action.

1.5.2 Impact Topics Dismissed from Detailed Analysis

The decision to be made 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 EIS. 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 FEIS. 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 precludes most bear activity and, therefore, 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 FEIS. For these reasons, this topic is dismissed from further consideration.

Bald eagles *(Haliaeetus leucocephalus)* are discussed under *Threatened and Endangered Species* 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). Similarly, the effects of plowing on vegetation in the parks (including trees) are considered negligible. For these reasons, and those 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. If not inspected and cleaned before entering the park, oversnow vehicles can be a source of weed propagation along park roads and in developed areas, though 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 EIS.

Exotic Species - Animals

Mountain Goat (Oreamnos americanus)

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. Winter severity and snow depths seem to be leading causes of mortality of mountain goats, affecting availability of winter forage and causing stress, susceptibility to accidents, disease, and parasites (Varley 1999). Nonnative mountain goats have been known to cause adverse effects to vegetation elsewhere. In Yellowstone's northeast corner, ridgetop vegetation cover is lower, and barren areas along alpine ridges are more prevalent in areas with relatively high goat use (Varley 1999; Aho and Weaver 2002; Aho and Weaver 2003). Laundre (1990) also predicted that goats might eventually impact native bighorn sheep populations in Yellowstone National Park. Whitfield (1983) reported that goats might eventually pose a threat to bighorn sheep in Grand Teton National Park. 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.

Bullfrog (Rana catesbeiana)

The introduced bullfrog occurs in the Kelly Warm Spring in GTNP. It is a voracious and prolific predator. Impacts to bullfrogs are not assessed, since the species is considered undesirable in the park's ecological environment.

Energy requirements and conservation potential

Operations for all three park units use energy to maintain park facilities and operate motor vehicles throughout the winter. Such operations would differ very little between alternatives. With the exception of Alternative 3B, all alternatives propose some level of motorized winter recreation. All alternatives with oversnow vehicle use call for use of Best Available Technology (BAT) for both snowcoaches and snowmobiles; for snowmobiles, this requirement has substantially cut snowmobile fuel consumption relative to historic conditions. The effects of those requirements do not vary substantially by alternative.

Alternative 6 would provide for the use of buses and other mass-transit, commercially-driven, wheeled vehicles on the roads between Mammoth Hot Springs and Old Faithful and West Yellowstone. Because such vehicles can accommodate higher passenger numbers than either snowcoaches or snowmobiles, that alternative would substantially reduce the amount of fuel consumed on a per capita basis. See Chapter 3: Park Operations for an analysis of per capita fuel consumed by alternative. It is impossible, however, to predict the number of people who would tour the parks under the various alternatives, making any prediction of total fuel consumption impossible.

Because administrative energy consumption would be similar across alternatives, because all alternatives involving OSV use would require BAT, and because total fuel consumption is impossible to predict accurately, this topic is dismissed from further consideration. As noted, however, per capita fuel consumption estimates are provided in Chapter 3: Park Operations.

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 the alternatives 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 State Historic Preservation Office. 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 FEIS. For these reasons, this topic is dismissed from further consideration.

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

This topic includes a variety of resources, some of which are discussed under separate subheadings in this section. Other topics such as wildlife, air quality, and soundscapes are discussed in Chapters III and IV. The entire range of alternatives evaluated in this FEIS, 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. Consultation and public and agency review of the DEIS did not identify any impacts on sacred sites or Indian trust resources from the range of alternatives considered. Scoping for this EIS did not identify any new issues relative to these 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. See also urban quality and historic and cultural resources section above. 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 Draft Environmental Justice Guidance (July 1996). Therefore, Environmental Justice was dismissed as an impact topic in this EIS.

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.

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

While 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 EIS and will be used in winter operations under any alternative chosen.

This EIS does analyze the impacts of plowing Yellowstone's mid-elevation roads (from Old Faithful to West Yellowstone and Old Faithful to Mammoth, analyzed as part of Alternative 6), which may be a viable adaptive management strategy in response to changing weather patterns.

Furthermore, 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. While 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. The next step in Yellowstone's progressive actions to reduce and improve the environmental footprint of visitor and administrative uses is the development of an Environmental Action Plan with Ecos Climate Solutions beginning in the summer of 2007.

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 EIS are not expected to appreciably differ in their impact on aquatic resources; therefore, this topic is dismissed from further consideration in this EIS.

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 the Plans/FEIS 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 the Final Plans/EIS 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.

Oversnow Vehicles on Jackson Lake and Teton Park Road

This FEIS will not reevaluate certain decisions about the management of winter recreational use that have already been implemented. These decisions include 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, and the prohibition on such use was upheld in June 2007 by the U.S. District Court for the District of Wyoming, ruling upon a challenge to the prohibition by the group Save Our Snowplanes. This group has appealed the court's decision; the appeal has not yet been decided. The prohibition on motorized activities on the Teton Park Road was made before the 2002–2003 season began. Many primarily operational issues, such as nighttime closures and speed limits, will also not be re-evaluated.

Non-Motorized Winter Use Activities

This FEIS 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.

Non-Varying Alternative Measures

The following measures associated with the alternatives are not being reconsidered or reevaluated; they have been accepted as essential underpinnings or explanatory elements of any action alternative. They remain as unvarying parts of the alternatives being considered in this EIS, and are presented in Chapter II.

- Actions and Assumptions Common to All Units
- Actions Specific to Yellowstone and Actions Specific to Grand Teton and the Parkway
- Definitions
- Mitigation
- Monitoring

1.5.3 Disposition of Mandatory Topics

An environmental impact statement must address the impacts of a proposed action for a number of topics, as indicated in the Council on Environmental Quality regulations for implementing NEPA.[9] Further, for each topic, direct, indirect, and cumulative impacts must be disclosed, as well as the context and intensity with which they may potentially occur. Chapter III must introduce the existing condition for each of the topics dealt with in Chapter IV. The topics listed in Table 1-2 below are specified in the regulations and in NPS NEPA guidance (DO 12) as mandatory, but they may be dismissed with rationale.

Table 1-2: Disposition of Mandatory Impact Topics

Topic	Disposition
Possible conflicts between the proposed action and other plans, policies or controls	See 1.9, Other Related Plans and Analyses, and 4.4, Direct, Indirect and Cumulative Impacts on Adjacent Lands, as well as the cumulative impacts discussion for each impact topic in Chapter IV
Energy requirements and conservation potential	See 1.5.2, Impact Topics Dismissed
Natural or depletable resource requirements and conservation potential	See 1.5.2, Impact Topics Dismissed
Urban quality, historic and cultural resources, and design of the built environment	See 1.5.2, Impact Topics Dismissed
Socially or economically disadvantaged populations	See 1.5.2, Impact Topics Dismissed
Wetlands and floodplains	See 1.5.2, Impact Topics Dismissed
Prime and unique agricultural lands	See 1.5.2, Impact Topics Dismissed
Endangered or threatened plants and animals and their habitats	See 3.6, Wildlife, 4.2.5, Effects on Wildlife, and 1.5.2, Impact Topics Dismissed
Important scientific, archeological, and other cultural resources	Some topics such as wildlife, air quality, and soundscapes are discussed in Chapters III and IV. Also see 1.5.2, Impact Topics Dismissed
Ecologically critical areas, Wild and Scenic Rivers, or other unique natural resources	See 1.5.2, Impact Topics Dismissed
Public health and safety	See 3.5, Public and Employee Health and Safety, and 4.2.4, Effects on Public and Employee Health and Safety
Sacred sites and Indian Trust resources	See 1.5.2, Impact Topics Dismissed

1.6 Public Involvement

The public scoping period for this EIS was June 24 – September 1, 2005. The NPS received 33,365 documents commenting on the scope of the EIS. Of these, about 90% were form letters of various kinds, and about 1% contained unique or substantive comments rather than, or in addition to, opinion statements. Comments were received from persons in all U.S. states and territories, as well as from persons and organizations in other countries.

Although this public scoping period was primarily intended to garner comments about the scope of this EIS, many people simply expressed their opinions regarding winter use management in the parks. A detailed report of the public scoping comments is available for

[9] CEQ Regulations at 1508.27.

public review on the NPS website: http://www.nps.gov/yell/parkmgmt/winterusetechnicaldocuments.htm.

Throughout the process, the NPS held roving team meetings with the cooperating agencies, conservation groups, and other interest groups as requested and as available. All told, the NPS held more than fifty such informal meetings at which agency personnel provided briefings on the status of the EIS process and decision-making, answered questions regarding the same, and accepted verbal comments. Additionally, the NPS held three different information fairs and four public hearings on the DEIS. At the information fairs both Yellowstone personnel and various resource experts were available to answer questions, the NPS provided overviews of the status of winter use planning, and NPS personnel accepted verbal comments. At the hearings, NPS personnel accepted verbal comments through a formal public comment period while others were available to answer questions.

In late November 2006, the NPS posted the cooperating agency review draft on its website. While the primary purpose of this posting was to make the review draft available to cooperating agencies for their review, any member of the public was able to download the draft as well. Although the formal public comment period was not open until spring 2007, the NPS accepted any comments that either the cooperating agencies or members of the public provided before that period.

The Draft EIS was on public review from March 27 to June 5, 2007. The NPS received approximately 120,000 documents commenting on the DEIS. A summary of comments and responses is found in Appendix I of the FEIS. The agency also held four public meetings during the Draft EIS comment period, in Cody, Wyoming; West Yellowstone, Montana; St. Paul, Minnesota; and Lakewood, Colorado. The full public comment report is available at http://www.nps.gov/yell/parkmgmt/winterusetechnicaldocuments.htm.

Chapter V contains a summary of public involvement efforts throughout this planning process.

1.7 Major Issues

The purpose of developing alternatives is to compare different plans for resolving issues and their environmental consequences. Based on need and public comment, this section identifies the major issues to be addressed in this EIS. Many of these same issues were critical for evaluating and disclosing impacts in the Final 2000 EIS, the Final 2003 SEIS, and the 2004 Temporary EA. Resources and values associated with major issues are addressed as "impact topics" in Chapter IV of this FEIS.[10]

1.7.1 Social and Economic Issues

Public and cooperating agency comments 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. Affordable access, diversification of gateway community economies, protection of local business opportunities, and a need for additional socioeconomic surveys were all raised as issues, and are addressed in this EIS. Some

[10] An EIS responds to issues that are associated with a proposed action. This is pursuant to CEQ regulations at 40 CFR, notably part 1501.1. An "impact topic" is an NPS planning term for things which are or must be addressed in Chapter IV of an environmental document. It is the function of Chapter I to discuss issues; it is also appropriate to list analysis items as impact topics. Clearly, there should be a relationship between what is at issue and what should be analyzed.

commentors raised concern about potential closure or allocation changes at various entrances. Some desired a balance between resource protection and socioeconomics.

1.7.2 Human Health and Safety

Three primary health and safety issues regarding winter visitor use were identified, and are addressed in this EIS, 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 close proximity.

1.7.3 Wildlife

The impact of snowmobiles, snowcoaches, oversnow vehicle road grooming, and wheeled vehicles/plowed roads on wildlife were identified and are addressed in this EIS, 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 crucial role in the history of winter use planning and associated litigation. Analysis in this EIS is informed by a recent study commonly known as "the Gates Report," other recently published papers, and monitoring results. The information is summarized in Chapter III.

1.7.4 Air Quality

The impact of recreational snowmobile, snowcoach, and/or bus travel on air quality, including emissions, visibility, and air quality-related values, was raised and is addressed in this EIS. The issue is a question of how much pollution emitted by oversnow vehicles (and buses) 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 EIS includes monitoring information, newer studies, and updated model runs using more recent source data for snowcoaches in particular.

1.7.5 Natural Soundscapes

The impact of noise from recreational snowmobile, snowcoach, and bus travel on the natural soundscape was raised and is addressed in this EIS. 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 EIS includes monitoring data collected over the past four years and updated acoustic modeling results.

1.7.6 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 EIS.

1.7.7 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 EIS.

1.8 NPS Mandates

The management of the National Park System and NPS programs is guided by the U.S. Constitution, public laws, treaties, proclamations, Executive Orders, regulations, and directives of the Secretary of the Interior and the Assistant Secretary for Fish and Wildlife and Parks. NPS policy must be consistent with these higher authorities and with appropriate delegations of authority. Pertinent guidance is summarized in Appendix A.

1.9 Other Related Plans and Analyses

As described in the Introduction, there is a long history of winter use planning in the parks. In addition to previous winter use analysis and NEPA processes, the NPS recognizes that this EIS may influence or be influenced by other planning efforts. No known or potential conflicts between the proposed action and other plans, policies or controls have been identified. Following are relevant, recent, and ongoing planning efforts.

Broad trends occurring outside the parks which could have cumulative impacts on this analysis include:

- Population growth in the Greater Yellowstone area (GYA). This area has been experiencing rapid population growth for the last twenty years. Such growth can lead to more demand for recreation (especially snowmobiling, cross-country skiing, and snowshoeing), more recreationists in wildlife habitat, and more resulting impacts upon air quality, soundscapes, economics, and wildlife.
- Suburban & rural land subdivision in the Greater Yellowstone area. The area's population growth is accompanied by rapid suburban and exurban subdivision and human structure development (houses, roads, etc.). While this is related to population growth, rural land subdivision can lead to fragmentation of wildlife habitat and changing recreation geography.
- Changing demographics. Americans, and particularly westerners, have expressed an increasing interest in recreation in the last twenty years (all kinds of recreation, but especially bird watching, hiking, and walking (Cordell 2004)). Such changing demographics can affect the demand for different kinds of recreational activities, at times bringing them into conflict with each other.
- Reduction of public land access. Some trailheads or public land access points are privately owned and can become off-limits to the public when sold. While impossible to predict, such occurrences make access to public lands more difficult and can affect demand for recreation in other areas and visitor access and circulation.
- Improving snowmobile technologies. Snowmobile manufacturers have consistently improved the performance of their machines, enabling some of them to reach ever more remote terrain. Usually off-trail, such kind of travel is prohibited in Yellowstone, but can bring snowmobilers elsewhere into conflict with wildlife and non-motorized users.
- Increasing outfitter/guide activity. Visitors are increasingly utilizing outfitters and guides, especially for skilled or knowledge-based activities like kayaking, wildlife viewing, and photography. This trend can affect wildlife habitat, demand for recreation, economic activity, and other aspects of winter recreation.
- Consolidation of checkerboard lands on the Gallatin National Forest. In the last ten years, the Gallatin National Forest has negotiated several land exchanges which have

consolidated some previously checkerboarded holdings. While this has generally positive effects for most wildlife (because consolidated lands are less subject to development), it has the negative side effect of private land consolidation (especially in the Big Sky area), which has allowed more land subdivision and rural growth to occur there, with consequent effects on wildlife, air quality, socioeconomics, and visitor access and circulation.

- Forest plan amendments for grizzly bear conservation. The U.S. Forest Service has modified all forest plans in grizzly bear habitat areas to assure conservation of the species after it was removed from the threatened and endangered species list of the Endangered Species Act ("delisted"). Generally, such changes will keep ORV access at or below current levels, making it more difficult for the agency to respond to increasing demand for recreation by building new sites or opening new areas, but assuring grizzly bear preservation.
- Northern Rockies lynx amendment to all USFS Forest Plans. These amendments are intended to conserve this species, listed as threatened on the endangered species list. As with the grizzly bear amendments, these changes would keep recreation at or near current levels in occupied lynx habitats to ensure species survival.
- Noxious weed growth. Noxious weeds are a problem throughout the Greater Yellowstone area, although most counties, states, and federal agencies have programs to keep them in check, with varying levels of success. Noxious weeds can impact forage available to big game.
- Whitebark pine reduction. In many years whitebark pine nuts are the most important food source for grizzly bears, but the tree is increasingly vulnerable to death by insect attack and white pine blister rust. Reduction of this species could harm the grizzly bear's long-term survival.
- Timber harvest on national forest lands. Timber harvest on such lands is an ongoing activity in places, although more and more of it entails fuels reduction efforts with only small-diameter timber being taken. Harvesting can affect wildlife species in various ways (depending on their habitat preferences), along with possible economic effects.
- Grazing and mining on federal lands. Grazing will continue to be similar in extent to current levels on USFS and BLM lands but mining is more difficult to predict, but will have to undergo NEPA review. Both can affect wildlife species and economics.
- Prescribed fires and wildfires. Both kinds of fires occur regularly on federal lands in the Greater Yellowstone area and can affect wildlife (to differing degrees, depending on wildlife habitat preferences) and air quality.
- Hunting. Big-game hunting occurs throughout the area surrounding the parks, and is likely to continue. While it affects wildlife, the states manage their hunts in such a way as to sustain wildlife populations. Hunting also affects socioeconomics.
- Oil and gas leasing. Parts of Wyoming and Montana are experiencing record amounts of oil and gas leasing. These can affect regional and local air quality and socioeconomics.
- Motorized visitor use on forest and private lands outside the parks. Such use could affect soundscapes within the parks.
- Urban, industrial, and recreational uses. While such uses are more scattered in the Greater Yellowstone area than elsewhere in the U.S., they do exist and generate air quality impacts.

Proposed or recent *actions* from national parks:

- Construction of new visitor center at Canyon. Yellowstone recently completed a new visitor center at Canyon Village (an on-site replacement of an older facility). This facility may affect socioeconomics.
- Remodeling of Fishing Bridge Visitor Center. Yellowstone recently remodeled its historic visitor center at Fishing Bridge. This facility may affect socioeconomics.
- Construction of Old Faithful Visitor Education Center. Yellowstone is proposing to construct a new visitor center at Old Faithful, on the site of the previous facility, now demolished. This facility could affect socioeconomics, visitor access, and visitor experience.
- Construction of new West Entrance. Yellowstone is constructing a new West Entrance immediately east of the existing facility. This facility could affect socioeconomics, employee and visitor health and safety, and visitor circulation.
- Interagency Bison Management Plan. Completed in 2000, this plan provides management guidance for bison that leave Yellowstone in the winter. This plan affects bison, mainly when they leave Yellowstone.
- Remote vaccine delivery EIS for bison. In progress, this EIS focuses on delivering brucellosis vaccine(s) to bison remotely, and will affect bison management.
- Reconstruction of East Entrance Road (underway), Gibbon Canyon (proposed), Dunraven Pass (first half completed, second half proposed), Canyon rim drives (underway), and Mammoth-Norris road (proposed). These Yellowstone road projects are or will upgrade these road segments to modern standards. They may affect socioeconomics, visitor access and circulation, and wildlife.
- Construction of the Craig Thomas Discovery and Visitor Center, at Moose, Wyoming. Grand Teton National Park has constructed a new visitor at Moose, across the road (south) of the existing facility. This facility could affect socioeconomics and visitor circulation.
- Grand Teton summer transportation plan and proposed pathways. This plan provides management direction for transportation in Grand Teton National Park, including the construction of several miles of bike paths. This plan could affect socioeconomics, wildlife, and visitor access and circulation (such paths would not be open for motorized uses).
- Construction of visitor center at, and visitor access to, the Laurance S. Rockefeller Preserve. Associates of the estate of Mr. Rockefeller have constructed a visitor center at this historic ranch. Such developments could affect visitor access and circulation, wildlife, and socioeconomics.
- Changing winter use plans in the parks and changing restrictions on winter visitor use between 2000 and 2004. These affected visitor access, visitor experience, socioeconomics, soundscapes, air quality, wildlife, and safety.
- Elk and Bison management plan. This plan guides the management of these two species in Grand Teton National Park. In addition to its affects on these two species, it could affect socioeconomics.

Proposed or recent *actions* from surrounding lands:

- Shoshone National Forest plan revision. The USFS is in the process of revising this forest's master plan. It could affect a number of aspects of this EIS's analysis.

- At least two businesses with a substantial number of employees have moved their operations out of Cody in the last decade, including Marathon Oil and part of the mail order operation for Sierra Trading Post. These changes affect the town and county's socioeconomics.
- North Fork (Shoshone River) fuel reduction. Through mechanical means and prescribed fires, this project is attempting to reduce hazardous fuels along the North Fork Shoshone River. It could affect wildlife and air quality.
- Bridger-Teton National Forest plan revision. The USFS is in the process of revising this forest's master plan. It could affect all aspects of this EIS's analysis.
- Construction of natural gas pipeline through Hoback Canyon to serve Jackson. This proposed pipeline would improve natural gas delivery to the Jackson area. It could affect socioeconomics, wildlife, and air quality.
- Reconstruction of Togwotee Pass Highway. The State of Wyoming is rebuilding U.S. 287 over Togwotee Pass. This project could affect wildlife, socioeconomics, and visitor access and circulation.
- Replacement of tram at Jackson Hole Ski Resort. This well-known ski resort is replacing the tram to the summit of Rendezvous Mountain. This project could affect socioeconomics and visitor access to the backcountry of Grand Teton.
- Teton Pathways Master Plan. Teton County is in the process of writing its master plan for non-motorized recreational pathways. This plan could affect air quality, wildlife, socioeconomics, and visitor access and circulation.
- Beaverhead-Deerlodge National Forest travel plan revision. The USFS is in the process of revising this forest's master plan. It could affect a number of aspects of this EIS's analysis.
- Gallatin Travel Plan revision. The USFS recently completed the travel plan for this national forest. It could affect socioeconomics, wildlife, air quality, soundscapes, and visitor access and circulation.
- Possible removal or reopening of the Sleeping Giant Ski Area near Yellowstone's East Entrance. This project could affect recreation opportunities and socioeconomics.
- Reclamation of historic mines above Cooke City. This ongoing project will reclaim 10-20 mines in the New World Mining district. It could affect wildlife (mainly grizzly bears) and winter recreation (the area is popular with snowmobilers and cross-country skiers).
- Gardiner Basin and Cutler Meadows restoration. The USFS and NPS are proposing to restore native plants to these areas. This project could affect wildlife.
- Rendezvous Ski Trail development plan. The USFS and Rendezvous trail managers are revising their trail plan, which would develop, improve, abandon, and/or maintain the cross-country ski trails there. This could affect socioeconomics and visitor access and circulation.
- Beartooth District of Custer NF travel management plan. The USFS is revising the travel plan for this national forest district. It could affect socioeconomics, wildlife, air quality, and visitor access and circulation.
- Proposed coal-fired power plant near Roundup, MT, about 150 miles northeast of Yellowstone. This project proposes to build a large coal-fired power plan near Roundup, MT. Currently mothballed, this project could affect socioeconomics and air quality.

CHAPTER II: ALTERNATIVES

2.1 Introduction

This chapter presents a detailed description of seven alternatives for winter visitor use in Yellowstone National Park, Grand Teton National Park, and the John D. Rockefeller, Jr. Memorial Parkway (the Parkway; collectively, the parks). All of the alternatives considered in this EIS must meet the stated purpose and need for action (see Chapter I). The alternatives are presented in a comparative form and mitigation measures are described. As discussed under the description of the individual alternatives, all seven alternatives meet the purpose and need for this EIS. However, each of the alternatives addresses the elements of the purpose and need in different ways, as described below and in Chapter IV of this EIS. This EIS is intended to provide long-term guidance for winter use management in the parks.

Alternative 1 would continue the current plan, with a few modifications. Alternative 2 would prohibit recreational snowmobiling in the parks in favor of snowcoach access. Alternative 3 would close much of Yellowstone to oversnow travel, leaving only the South Entrance to Old Faithful route open. Alternative 3B, a variation of alternative 3 and described therein, represents the "No Action" alternative. Alternative 4 would allow up to 1,025 snowmobiles per day into Yellowstone and 250 in Grand Teton. Alternative 5 would allow up to 540 snowmobiles per day with some unguided access and variable daily limits. Alternative 6 would provide for a mixture of vehicular access to Yellowstone, including plowing the park's mid-elevation west-side roads for commercial wheeled vehicle travel. Alternative 7 would combine elements of alternatives 1, 5, and others to be the NPS preferred alternative. The environmentally preferred alternative is alternative 3B.

2.2 Formulation of the Alternatives

The alternatives for this EIS were formulated in response to court decisions in Washington, D.C. and Wyoming; scoping comments received on this planning process; comments received on the preliminary alternatives reviewed with the public, stakeholder groups, and cooperating agencies in March and April 2006; and comments received on the Draft EIS from a wide variety of stakeholders. In addition, the alternatives were informed by past winter planning processes and the wide range of ideas that were explored in the 2000 EIS, 2003 SEIS, and 2004 EA. Recent monitoring and studies also provided information that assisted the NPS in developing the alternatives. Each alternative proposed considers a different means of achieving the desired conditions of the parks in the winter while minimizing impacts to park resources.

2.3 Alternatives Dismissed from Further Consideration

Comments received during scoping, at small-group roving team meetings, at two open houses, and during review of the DEIS included suggestions for alternatives or actions within alternatives. Many of these ideas can be found in the seven alternatives considered in detail; others were eliminated from further study. Those ideas eliminated from further consideration and the rationale for those decisions are presented here.

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 and 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. This alternative may not be legally permissible and thus does not meet the purpose and need's criteria for detailed consideration in this EIS. However, this concept was identified in an early range of scenarios for modeling purposes and some initial analysis of it was accomplished. Therefore, comparisons are made throughout this EIS between the alternatives and the historic conditions represented by the 1983 regulations. Thus, the reader can compare the different alternatives with regulated and managed oversnow vehicle use to the historical use levels and vehicle types. In addition, non-BAT machines are considered for the Grassy Lake Road and CDST under alternative 4 and for the Grassy Lake Road in alternative 7.

Allow higher levels of unguided and non-commercially guided snowmobile use.

Scoping and review comments presented suggestions for varying levels of unguided and/or non-commercially guided tours, ranging from 20 to 100 percent. Alternatives 4 and 5 consider 20 and 25 percent non-commercial or unguided snowmobile use. Use above those levels is not considered because of the impact to park resources.

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 EIS. Finally, it is uncertain whether wildlife would learn to pass under the monorail system. If they did not, one of the needs for this EIS would not be addressed.

Plow park roads and allow private vehicles on them.

Alternative 6 considers plowing Yellowstone's mid-elevation, west-side roads but allowing access only via commercial wheeled vehicles rather than privately owned vehicles for several reasons. Commercial drivers/guides would be familiar with winter driving conditions, where many Yellowstone visitors are not familiar with them. Commercial drivers would also be familiar with the locations where wildlife are likely to occur on or near the roadways. Finally, commercial drivers would also provide benefits such as knowledge of current travel conditions or restrictions—some of the same benefits provided by guiding in other alternatives.

An alternative that replicates current actual conditions in winter in the parks.

Although this alternative would meet the purpose and need for the EIS, it is approximated, to some degree, by alternatives 3A and 6, which would allow 250 or 350 snowmobiles daily into Yellowstone, respectively—numbers roughly equivalent to the average daily snowmobile use seen during the winters of 2003-2004 through 2006-2007. This concept was identified in an

early range of scenarios for modeling purposes and some initial analysis of it was accomplished. Therefore, comparisons are made throughout this EIS between the alternatives and current conditions represented by the last few winters.

An alternative providing for mixed snowmobile and snowcoach use, but which promotes the latter.

As with the previous suggestion, this idea would meet the purpose and need for this EIS, and is approximated by alternatives 5, 6, and 7 in this EIS. Alternatives 5 and 7 call for increased snowcoach use with reduced daily limits on snowmobiles. Under these alternatives, more visitation would be possible via snowcoach than by snowmobile. Moreover, alternative 6 would provide for mixed use: snowcoaches, snowmobiles, and commercially-driven wheeled vehicles. Considerably more visitors could tour via wheeled vehicle than both snowcoach and snowmobile combined. Because all visitors on such commercially-driven wheeled vehicles would be guided, this alternative also meets the spirit of this suggestion.

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 EIS. 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).

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 EIS.

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

This EIS 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 EIS and the NPS supports the validity of that study. The prohibition on such use was upheld recently by the U.S. District Court for the District of Wyoming; the plaintiffs have appealed this decision, but the appeal has not yet been decided. Changes to 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 EIS, because it would unnecessarily restrict the range of visitor activities.

Promote cross-country skiing and snowshoeing, and prohibit/discourage motorized use.

This suggestion meets the purpose and need of this EIS, and is addressed in several of the alternatives in this EIS (in particular 3B). As noted above, the NPS has allowed these non-motorized activities on the groomed and ungroomed routes in Yellowstone. The agency also grooms a number of cross-country ski trails in Yellowstone as well as the Teton Park Road in Grand Teton. Under most alternatives, these actions would continue. Establishing a backcountry hut system—suggested by some as part of this idea—could violate provisions of the wilderness recommendation for Yellowstone and Grand Teton national parks; consequently, this particular idea may not be legally possible and would violate the purpose of this EIS because it would be an unacceptable impact upon recommended wilderness. Finally, the large distances involved in traveling to park attractions would allow only a handful of extremely fit people to visit the interior of the parks if motorized access were precluded completely. From an operations perspective, management of the parks in the winter and protection of important cultural resources would be extremely difficult if no oversnow vehicle access were allowed.

If the decision is to close much of the park as under alternative 3A, neither motorized nor non-motorized use would be allowed in the closed areas. Alternative 3B would preclude recreational oversnow vehicle access, but non-motorized access and limited administrative motorized access would continue.

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 EIS.

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, and would violate the purpose of this EIS because such use would constitute an unacceptable impact and/or impairment of park resources. It would also violate the need for this EIS, because such usage would incur greater impacts than the historic use which necessitates this EIS. Finally, 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 Group Limit

Although the analysis for the FEIS included this concept, as well as the suggested group size of 6 snowmobiles, this concept was not adopted. The NPS believes that for those alternatives which allow snowmobile use in the parks, allocating a set number of snowmobile entries per entrance provides guides 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 DEIS suggested the parks allow snowbikes. Snowbikes are modified bicycles with larger, 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 is not an issue.

2.4 The No Action Alternative

Evaluating a "no action" alternative is required in an environmental impact statement. It is usually described as continuing the present management actions. It may set a baseline of existing impacts against which to compare the affects of other alternatives. This helps set a context for determining the relative magnitude and intensity of impacts.

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 are designated for snowmobile and snowcoach use in 36 CFR Part 7 (Sections 7.13, 7.21 and 7.22).

However, under the implementing regulations for the current temporary plan (listed above), the authorization of snowmobile and snowcoach use in the parks expired at the end of the 2006-2007 winter season. Consequently, 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. 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 3B conceptually meets this requirement, because it would eliminate all oversnow access by recreational vehicles. Therefore, it represents the continuation of current management direction and regulation, and is therefore the "no action" alternative.

2.5 Description of Alternatives

2.5.1 Management Zones

For all 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 EIS 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 which 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.

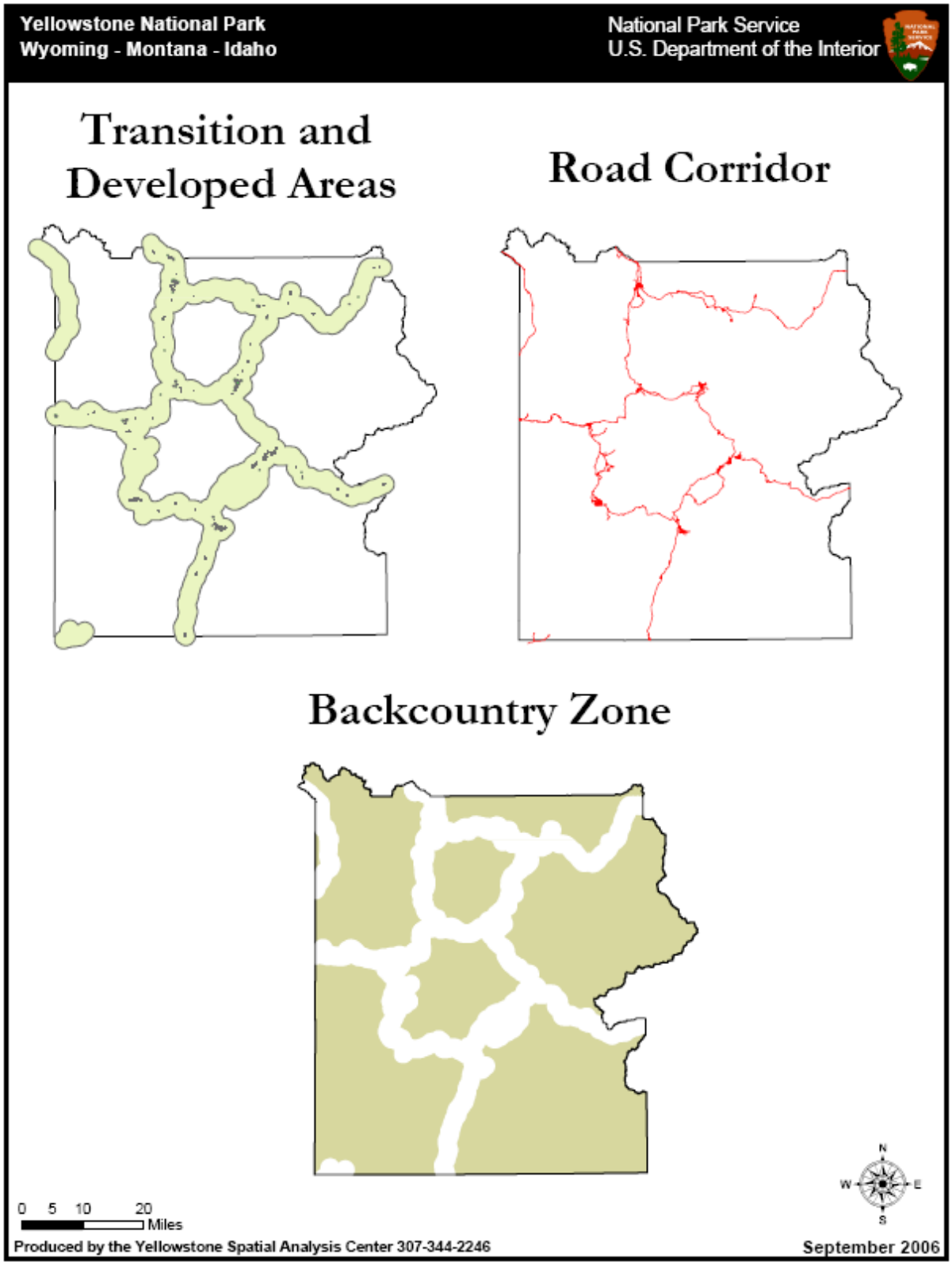


Figure 2-1: Yellowstone National Park Management Zones

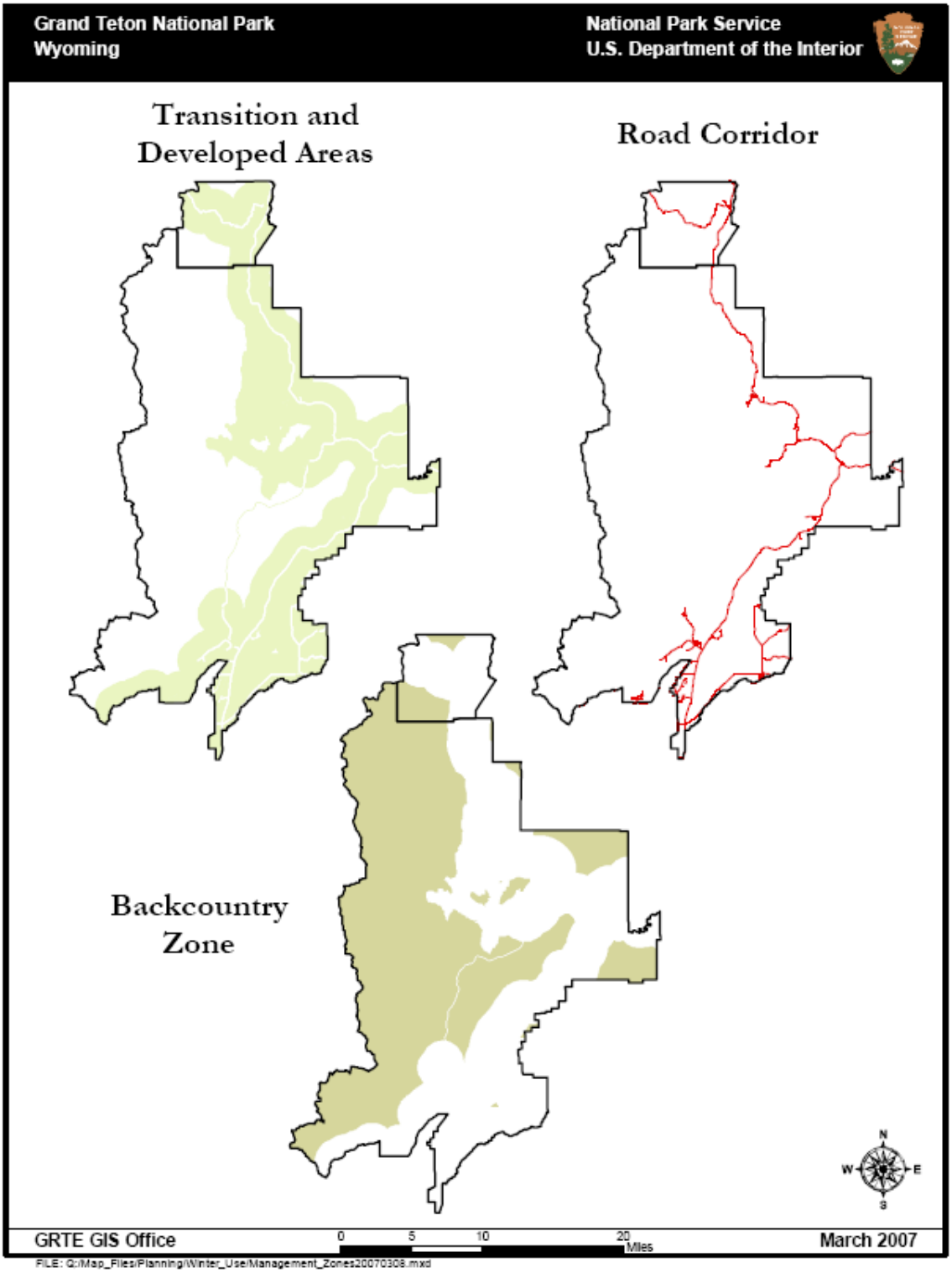


Figure 2-2: Grand Teton National Park Management Zones

2.5.2 Actions and Assumptions Common to all Alternatives

- None of the actions proposed under any alternative preclude closures for safety, resource protection, or other reasons as identified in 36 CFR 1.5 or 2.18.
- In this EIS, 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.
    - **EPA compliant snowmobile:** A model year 2007 or newer snowmobile that meets (or emits lower emissions than) the EPA's most recent emission standard for engine family regulations, or FEL, as described here: HC 100 g/KW-hr and CO 275 g/KW-hr for the model year 2007-2009; HC 75 g /KW-hr and CO 275 g/KW-hr for the model year 2010; and HC 75 g/KW-hr and CO 200 g/KW-hr for the model year 2012 and beyond. There is no noise emission standard according to this definition.
    - **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 which 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 which 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 which may be steered by a ski or skis in contact with the snow. (The EPA definition is: "A vehicle designed to operate outdoors only over snow-covered ground, with a maximum width of 1.5 meters.")
- 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 will become the NPS standard.
- Sand, or an equally environmentally neutral substance, may be used for traction on all plowed winter roads. No salts will be used, and sand is generally spread only in the shaded, icy, or hilly areas of plowed roads. Before spring opening, sand removal operations will continue to be conducted on all plowed park roads.

- All alternatives will continue to implement transition and action plans for accessibility and support the philosophy of universal access in the parks. The NPS will make reasonable efforts to ensure accessibility to buildings, facilities, programs, and services.
- The NPS will 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 will 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 will be developed.
- All of the alternatives allow the non-recreational, administrative use of snowmobiles by park personnel or parties duly permitted under the provisions of 36 CFR 1.2 (d), 1.5, and 1.6. Permitted parties must meet BAT requirements.
- Administrative use of snowmobiles may be supplemented with administrative snowcoaches, subject to available funding. When administrative snowmobiles are necessary, the NPS will generally use BAT snowmobiles. Non-BAT snowmobiles will be permitted for law enforcement, search and rescue, and other administrative purposes on a limited basis. Beginning in the 2011-2012 season, all employee-owned snowmobiles operated in the p arks must meet BAT requirements.
- Contractors, researchers, and other partners working in the parks will be encouraged to use snowcoaches and they will 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 will suffice. In-park use by these parties would not count against daily recreational entry limits.
- Private snowcoaches will not be allowed under any alternative except alternative 4.
- The winter use season will generally last from mid-December to mid-March, except as modified under some alternatives. Actual opening or closing dates for oversnow travel will be determined by adequate snowpack or snow water equivalency.
- The speed limit from the West Entrance to Madison to Old Faithful will be maintained at 35 mph except where set at 25 mph in designated segments to protect wildlife and natural soundscapes, and to enhance visitor safety.
- Motorized travel from 9 p.m. to 7 a.m. will be prohibited except when approved by the superintendent for administrative or emergency purposes, or by special permit for necessary travel. For those alternatives that keep the East Entrance open to through snowmobile and snowcoach travel, the East Entrance will not open until 8 a.m.
- Personal protective equipment will be 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, transceiver) as appropriate.
- 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.

- Depending on when a new decision is made and final regulations promulgated for winter use in the parks, the final regulations may allow a transition period during the first winter of operations for portions of the temporary plan to continue to remain in effect.

2.5.3 Monitoring and Mitigation

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) will 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 will be completed for all actions as required by Council on Environmental Quality regulations (40 CFR 1500–1508).

- A one-year notice will be provided before any such closure would be implemented unless immediate closure is deemed necessary to avoid impairment of park resources.
- A proposed Monitoring and Adaptive Management Program is included in the EIS (See Appendix E). The proposed program is an update of the adaptive management provisions of the SEIS and the December 11, 2003, final rule. Most 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 will continue to have the authority under 36 CFR 1.5 to take emergency actions to protect park resources or values.

Snowmobile Best Available Technology (BAT)

- The superintendents will 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 NPS anticipates that snowmobile manufacturers will conduct research to continually improve sound and emissions in available machines. Information on the full spectrum of pollutant criteria is critical as BAT is implemented to prevent an inadvertent increase in some pollutants. Without continuous improvement, the initial generation of machines may not meet BAT requirements over time, requiring the imposition of other control measures such as reduced snowmobile numbers.
- Once approved, a snowmobile would be certified in Yellowstone as BAT for a period of six years. On Jackson Lake in Grand Teton, a snowmobile would be certified as BAT for six years or 6,000 miles, whichever is greater, not to exceed 10 years regardless of mileage. In the absence of new emissions and sound information, after six years (or 6,000 miles on Jackson Lake) a snowmobile make and model will no longer be BAT-certified and its use will not be allowed in the parks.
- 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 and sound-related components that were originally installed by the manufacturer must be in place and functioning properly. Malfunctioning components must be replaced with the original equipment manufacturer (OEM) component where possible. If OEM parts are not available, aftermarket parts may be used if they are certified not to worsen sound or emission characteristics.
- For alternatives that include continuing the existing snowmobile BAT requirements (1, 3A, 4, 6, and 7), the following standards apply:
    - Snowmobile BAT 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 (snowmobiles available in fall 2004), all snowmobiles must be certified under 40 CFR 1051 to a Family Emission Limit no greater than 15 g/kW-hr for hydrocarbons and 120 g/kW-hr for carbon monoxide. If the procedures of 40 CFR 1051 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 test procedures specified by EPA (40 CFR 1051 and 1065).
    - Snowmobile BAT Sound Requirements
        - Snowmobiles must operate at or below 73dBA as measured at full throttle according to Society of Automotive Engineers 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 procedures as they continue to be modified by SAE.
        - Revisions to testing procedures may be described and implemented per NPS procedures used to certify a snowmobile as BAT.

Snowcoach Best Available Technology (BAT)

- All non-historic snowcoaches must initially meet NPS air emissions requirements. These requirements are the applicable EPA emission standards for the vehicle at the time it was manufactured.
- Beginning in the 2011-2012 season, all snowcoaches must meet BAT air emission requirements, which will be the functional equivalent of having EPA Tier I emissions control equipment incorporated into the engine and drive train for the vehicle class (size and weight) as a wheeled vehicle. The NPS will encourage, through contract and permit, snowcoach guides and operators to equip their snowcoaches with EPA Tier II emissions control equipment for the vehicle class.
- In addition, all critical emission and sound-related exhaust components that were originally installed by the manufacturer must be in place and functioning properly. Malfunctioning components must be replaced with the original equipment manufacturer (OEM) component where possible. If OEM parts are not available, aftermarket parts may be used if they are certified not to worsen emission and sound characteristics. 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 snowcoach's original pollution control equipment is prohibited except for maintenance purposes.

- Beginning in the 2011-2012 season, all snowcoaches must meet a sound emissions requirement of no greater than 73 dBA (testing procedures to be determined). The NPS will encourage, through contract and permit, snowcoach guides and operators to employ snowcoaches that are quieter than this BAT requirement.
- Individual snowcoaches may be subject to periodic inspections to determine compliance with the emission and sound requirements.

Water Resources

- Best management practices will 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, will continue on an as-needed basis. If necessary, best management practices would be implemented.

Wildlife, Including Federally Protected Species and Species of Special Concern

- At periodic intervals when snow depth warrants, routine plowing operations will include laying back roadside snow banks that could be a barrier to wildlife exiting the road corridor.
- NPS personnel will monitor sensitive resources to ensure compliance with area closures.
- The parks will continue to support the objectives of the Greater Yellowstone Bald Eagle Management Plan and the eagle population will continue to be monitored to identify and protect nests.
- Monitoring of wolves will continue.
- Monitoring grizzly bear populations will 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) will be provided as part of regularly-occurring park operations.
- Use of groomed, ungroomed, and plowed surfaces by bison and other ungulates will continue to be monitored.
- Monitoring and protecting trumpeter swan habitats and nests will continue, including the closure of nest sites to public access when warranted.
- Monitoring potential or known winter use conflicts will continue and will result in area closures if necessary to protect wildlife habitat.
- If monitoring indicates that undesirable impacts are occurring, further measures including avoiding, minimizing, rectifying, reducing, or compensating for those impacts will be identified and taken.

Cultural Resources

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

2.5.4 Non-Motorized Use

- Backcountry non-motorized use would continue to be allowed throughout the parks, except where specified otherwise in each alternative.
- Snow road edges may continue to have track set for skiing where feasible.

- About 35 miles of roads are currently groomed for cross country skiing in Yellowstone, as well as about 15 miles of the Teton Park Road in Grand Teton. These are mainly roads currently used by summer vehicles but that are closed to oversnow vehicle travel. These roads may continue to be machine groomed for skiing. Existing and new routes, such as the Virginia Cascades road in Yellowstone, could be evaluated in the future for cross-country ski grooming.

2.5.5 Actions Specific to Yellowstone

- In Yellowstone, the NPS will 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 will continue to be plowed in Yellowstone. Rubber tracked vehicles would not be allowed on these roads.
- Yellowstone's winter season would begin December 15 and close March 15 each year. Early closures (to OSV travel) of the Grand Loop Road from its junction with Upper Terrace Drive to Madison Junction, and the roads from Norris Junction to Canyon and Fishing Bridge Junction would occur to facilitate spring plowing. Depending on snowpack, the actual opening and closing dates for oversnow vehicle travel could be adjusted. To protect the road surface, the NPS may enact temporary vehicle type restrictions (e.g. rubber-tracked vehicles only).
- Cave Falls snowmobile allocations by alternative will not count against Yellowstone's total snowmobile allocations by alternative.
- Sensitive areas within the inner gorge of the Grand Canyon of the Yellowstone and the McMinn Bench bighorn sheep area will continue to be closed to recreational winter use.
- Warming huts may be available for visitor use at Old Faithful, Norris, Madison, Canyon, Fishing Bridge, Indian Creek, Mammoth Terraces, and other appropriate sites.
- NPS employees and their families living in the interior of Yellowstone (and their visitors) may continue to use snowmobiles. This use will not count against daily recreational entry limits and will not be subject to guiding requirements (all employees undergo annual snowmobile training). Subject to available funding, the NPS will provide administrative snowcoaches for employee use and implement programs to replace employee snowmobiles with ones that meet BAT requirements. Beginning in the 2011-2012 season, all employee-owned snowmobiles used in the parks must meet BAT requirements. Visitors to these employees must travel by snowcoach or on BAT snowmobiles.
- 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 their families will be required to use BAT snowmobiles and encouraged to use snowcoaches. Beginning in the 2011-2012 season, all employee-owned administrative snowmobiles must meet BAT requirements. Visitors to these concessioner employees must travel by snowcoach or on BAT snowmobiles. This use will not count against daily recreational entry limits.
- As the NPS formulates its final decision, the agency will implement the research proposal by Robert A. Garrott and P.J. White entitled "Evaluating Key Uncertainties Regarding Road Grooming and Bison Movements" (draft dated May 23, 2007, as posted on the Yellowstone Park website http://www.nps.gov/yell/parkmgmt/winterusetechnicaldocuments.htm). This proposal specifically regards 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 on the same website). Although Garrott and White state explicitly that "it is impossible to retrospectively answer [the question of whether road grooming on the

Madison-Norris Road has led to altered bison movements and distribution] because detailed information on bison travel patterns was not collected prior to road grooming or before bison extended their migratory range and gained knowledge of new foraging areas," and "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," they propose a linked series of experiments that would enable them to gain "insights into how road grooming and other factors currently affect bison travel." 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). After the five years of such data gathering and analysis, they and park staff will consider closing the route to observe bison response, but will not know until the five-year period of data gathering and analysis has finished whether such closure would be likely to yield informative data or conclusions. Such closure would be possible, however, and would likely be a multi-year closure. The NPS would not need to perform further NEPA analysis on this closure because the concept of closing the Gibbon Canyon road was specifically analyzed during modeling for this EIS as an option within alternatives 1 and 7. The discussion of the impacts of implementing such an investigation (assuming a road closure) for the Gibbon Canyon area is included in Chapter IV under each impact topic for alternatives 1 and 7. For these alternatives, the impacts are analyzed assuming the road segment between Madison and Norris is closed to all through motorized oversnow travel. The reader may use the analysis of closing the road segment for alternatives 1 and 7 to understand and gauge the relative magnitude of the change in impacts that might occur if the research project were implemented under other alternatives. The agency would announce the closure using the monitoring program procedures described above. A more complete discussion of Dr. Gates' report, a subsequent workshop with many of the stakeholders concerned with bison management, and the Garrott-White research proposal are in Chapter III under the discussion of wildlife. Other recommendations of the Gates report will be evaluated as part of Yellowstone's bison management program.

2.5.6 Actions Specific to Grand Teton and the Parkway

- In GTNP and the Parkway, the following roads will 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 will remain in effect on the Snake River floodplain, the Buffalo Fork River floodplain, 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 will 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 will continue via paved and plowed routes or via oversnow routes from GTNP.
- Snowmobiles that meet the best available technology requirements will be phased in for administrative use by 2011-2012.
- 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.

2.5.6.1 Continental Divide Snowmobile Trail (CDST)

For alternatives that include continued on-snow use of the CDST, the NPS will monitor and evaluate its use, and consider adaptive management, including potential closure, if use levels do not warrant continued operation. Notice of such opening or closing would be provided by one or more of the methods listed in 36 CFR 1.7(a).

2.5.6.2 Grassy Lake Road

The approximately six-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 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 assume that responsibility itself. 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.

2.6 Alternatives

2.6.1 Alternative 1: Continued Temporary Plan

This alternative would continue the Temporary Winter Use Plan into the future with some modifications. In Yellowstone, 720 snowmobiles per day would be allowed and in Grand Teton and the Parkway, 140 snowmobiles. Generally all snowmobiles in both parks would have to be BAT and all snowmobilers in Yellowstone 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. As of the winter of 2008-2009, Yellowstone's East Entrance Road would be open to snowcoach and non-motorized travel from the entrance to a point about four miles west only (well below Sylvan Avalanche zone). The road segment through the Sylvan Pass area would be open for ski and snowshoe access only, with such access treated as backcountry (i.e. users assume the risks of traveling through the avalanche zone). The East Entrance snowmobile entries (as well as some of those from North and Old Faithful entries) would be reallocated to the West and South Entrances. In Yellowstone, 78 snowcoaches would be authorized to operate.

This alternative addresses the purpose and need for this EIS. Previously unacceptable impacts to air quality, employee and visitor health and safety, wildlife, and the visitor experience would be mitigated and natural soundscape conditions would be improved. Visitor access would be facilitated through managed snowmobile and snowcoach use. However, some winter visitors may be discouraged by the use levels allowed in alternative 1.

Actions and Assumptions Common to All Parks

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

- Snowmobiles starting in the Targhee National Forest and traveling on the Grassy Lake Road to Flagg Ranch would be exempt from BAT requirements (primarily because eastbound snowmobilers may need to obtain fuel at Flagg Ranch or risk running out of it). However, these snowmobiles may not travel further into the Parkway unless they meet BAT requirements and any other applicable requirements.
- Snowmobiles operating on the portion of the CDST between the east boundary of GTNP and Moran Junction would be exempt from both daily entry limits and BAT requirements.
- Snowmobiles using the Cave Falls Road in Yellowstone would be exempt from BAT requirements.

Actions Specific to Yellowstone

- Group Numbers: No more than eight snowmobiles would be permitted in a group with one commercial guide; no more than 17 snowmobiles would be permitted in a group with two commercial guides. Group numbers include the commercial guide sled(s).
- 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).
  - 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 Fishing Bridge Junction to Lake Butte Overlook
  - 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
  - Roads in the developed areas of Madison Junction, Old Faithful, Grant Village, West Thumb, Lake, Fishing Bridge, Canyon, Indian Creek, and Norris
  - East Entrance Road between Lake Butte Overlook and East Entrance (winter 2007-2008, only)
- 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). 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
  - Fountain Flat Road

  - North Canyon Rim Drive, all day
  - Riverside Drive, all day
  - Grand Loop Road from Canyon Junction to the Washburn Hot Springs overlook
  - East Entrance Road from the entrance to a point approximately six miles west
- Guiding Requirements:
  - All snowmobilers in Yellowstone would be required to travel with a commercial guide who is affiliated with a commercial guiding service that is authorized to operate in the park.
  - 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 in the park would be required to have contracts authorizing their operation.

Table 2-1: Yellowstone Daily Snowmobile and Snowcoach Entry Limits, Alternative 1

Entrance*	Commercially Guided Snowmobiles	Commercially Guided Snowcoaches
West Entrance	424	34
South Entrance	256	13
East Entrance	0	0**
North Entrance	20	13
Old Faithful	20	18 (Park-wide)
Total	720	78

* For the winter of 2007-2008 only, the following allocations would be in effect: West Entrance, 400; South Entrance, 220; East Entrance, 40; North Entrance, 30; and Old Faithful, 30.
** Does not include snowcoaches that would be allowed to provide skier / snowshoe shuttles between East Entrance and Sylvan Pass.

- Non-Motorized Access:
  - Backcountry non-motorized use would continue to be allowed throughout the park, 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.
  - Ski and snowshoe use of the South Entrance Road and East Entrance Road would be allowed to continue after the balance of the park's roads close to winter operations (during spring plowing). When spring plowing operations approach the entrances, the roads would be closed to skiing and snowshoeing for safety concerns. Bear management closures of the park's backcountry would not be altered.
- East Entrance Road: The East Entrance Road would remain open for snowmobile and snowcoach access during the winter of 2007-2008, with appropriate avalanche control. As of the winter of 2008-2009, the East Entrance Road would be open only to skiing and snowshoeing (and snowcoach or snowmobile skier/snowshoer drop-offs) from the East Entrance to about four miles west (well below the Sylvan Pass avalanche zone). The balance of the road (Sylvan Pass to Lake Butte Overlook) would be open to ski and snowshoe access only; the road would be considered backcountry, with no motorized winter access. Skiers and snowshoers using the Sylvan Pass area would travel at their own risk. Avalanche control for spring plowing would continue. Snowmobile and snowcoach allocations would be redistributed to other entrances. This road would also be open from the west for snowmobile and snowcoach travel from the Fishing Bridge Junction to Lake Butte Overlook.

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 CDST along U.S. 26/287, from the east boundary of GTNP to Moran Junction, and along U.S. 89/191/287 from Moran Junction to the north boundary of GTNP
    - The CDST along U.S. Highway 89/191/287, from the south boundary of the Parkway north to the Snake River Bridge
    - U.S. Highway 89/191/287, from the Snake River Bridge to the north boundary of the Parkway
    - In the developed area of Flagg Ranch
    - 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 with 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 89/287, from the Snake River Bridge to the north boundary of the Parkway
    - In the developed area of Flagg Ranch
- Guiding Requirements:
    - Snowmobile use in Grand Teton and the Parkway would not require the use of commercial guides; however, the NPS would consider requests to provide commercial guiding services.
    - All snowcoaches operating in the Parkway would have to be operated in accordance with a concessions contract, incidental business permit, or other NPS-issued permit.

Table 2-2: Grand Teton and the Parkway Daily Snowmobile Entry Limits, Alternative 1

Entrance	Snowmobiles
CDST	50
Grassy Lake Road (Flagg-Ashton Road)	50
Jackson Lake	40
Total	140

- Non-Motorized Access:
    - Non-motorized winter use would continue to be managed in accordance with prior decisions and rules. See Section 2.5.6 Actions Specific to Grand Teton National Park.

2.6.2 Alternative 2: Snowcoaches Only

Under alternative 2, the use of snowmobiles would be discontinued. A daily limit would be placed on snowcoach use, BAT requirements for snowcoaches would be implemented (the action common to all alternatives), and Yellowstone's East Entrance Road would be open to skier drop-offs via snowcoach, along with non-motorized travel from the entrance to a point about four miles west only (well below Sylvan Avalanche zone), as of the winter of 2008-2009. The road segment through the Sylvan Pass area would be open for ski and snowshoe access only, with such access treated as backcountry (i.e. users assume the risks of traveling through the avalanche zone). The road would be closed over the pass to all motorized vehicles.

This alternative addresses the purpose and need for this EIS. Previously unacceptable impacts to air quality, employee and visitor health and safety, wildlife, and the visitor experience would be mitigated and natural soundscape conditions would be improved. Visitor access would be facilitated through managed snowcoach use; however, those visitors wishing to access Yellowstone via snowmobile would not be able to do so under alternative 2.

Actions and Assumptions Common to all Parks

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

Actions Specific to Yellowstone

- 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).
    - 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 Fishing Bridge Junction to Lake Butte Overlook, and from East Entrance to a point approximately six miles west
    - Grand Loop Road, from its junction with the East Entrance Road to Canyon Junction
    - Grand Loop Road, from Canyon Junction to the Washburn Hot Springs overlook
    - South Canyon Rim Drive
    - North Canyon Rim Drive
    - Lake Butte Road
    - Firehole Canyon Drive
    - Fountain Flat Road
    - Riverside Drive
    - Roads in the developed areas of Madison Junction, Old Faithful, Grant Village, West Thumb, Lake, Fishing Bridge, Canyon, Indian Creek, and Norris

Table 2-3: Yellowstone Daily Snowcoach Entry Limits, Alternative 2

Entrance	Commercially Guided Snowcoaches
West Entrance	55
South Entrance	25
East Entrance	0
North Entrance	17
Old Faithful	23 (Park-wide)
Total	120

- Non-Motorized Access:
    - Backcountry non-motorized use would continue to be allowed throughout the park, 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.
    - Ski and snowshoe use of the South Entrance Road and East Entrance Road would be allowed to continue after the balance of the park's roads close to winter operations (during spring plowing). When spring plowing operations approach the entrances, the roads would be closed to skiing and snowshoeing for safety concerns. Bear management closures of the park's backcountry would not be altered.

Actions Specific to Grand Teton and the Parkway

- Routes Open to Snowmobile Use:
    - The CDST along U.S. 26/287, from the east boundary of GTNP to Buffalo Fork River. Snowmobiles operating on this section of the CDST would be exempt from BAT requirements.
- 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 89/287, from the Snake River Bridge to the north boundary of the Parkway
    - In the developed area of Flagg Ranch
- Non-Motorized Access:
    - Non-motorized winter use would continue to be managed in accordance with prior decisions and rules. See Section 2.5.6, Actions Specific to Grand Teton National Park.

2.6.3 Alternative 3: Most Road Grooming Eliminated, with No Action

This alternative has two variations or options. The first, 3A, would effectively eliminate most oversnow travel, both motorized and non-motorized, by eliminating most snow grooming. In Yellowstone, the exception would be South Entrance to Old Faithful, which would remain open to snowmobile and snowcoach travel. No visitor or employee administrative OSV travel would be allowed elsewhere in Yellowstone. In Grand Teton, the Grassy Lake Road would remain open for snowmobile travel.

The second alternative, 3B, would go further and eliminate all motorized recreational oversnow activity in both park units, which would be the result if no action were taken. That

is, in the absence of any action on the part of the NPS, the current regulations (published November 10, 2004, 69 *Federal Register* 65348-65366) regarding snowmobile and snowcoach use in the parks would remain in effect. Those rules do not authorize recreational snowmobile and snowcoach access after the end of the winter of 2006-2007 (see 36 CFR 7.13(l) and (3)(ii); 7.13(l)(4)(vii); 7.21(a)(3)(i); 7.21(a)(4)(vii); and 7.22 (g)(3)(ii)). Thus, alternative 3B is the no action alternative. Alternative 3B would allow administrative OSV travel throughout the parks.

Bison use of groomed roads has been identified as a key issue to be evaluated. This alternative (3A) allows full evaluation of the concept of closing much of Yellowstone National Park to both motorized and non-motorized oversnow travel to minimize any potential wildlife disturbance. As such, 3A most specifically addresses the purpose and need related to park resource and values, and bison in particular. Previously unacceptable impacts to air quality, employee and visitor health and safety, wildlife, soundscapes, and the visitor experience would be mitigated. However, only limited visitor access would be allowed through managed snowmobile and snowcoach use from Yellowstone's South Entrance to Old Faithful. The balance of Yellowstone would be closed to oversnow vehicle use, and non-motorized uses would be limited to those trails accessible for winter hiking and groomed ski trails in the area between Old Faithful and the South Entrance and the area between Gardiner and the Northeast Entrance.

The variation of alternative 3 referred to as 3B represents the "no action" alternative, and would close all of Yellowstone's and Grand Teton snow roads to oversnow recreational vehicle travel. For motorized travel, 3B differs from 3A in that the South to Old Faithful road would be closed to recreational oversnow access as would the Grassy Lake road within the Parkway. In Grand Teton, certain short access routes would remain open for snowmobile travel. For non-motorized travel, 3B differs from 3A in that the parks' backcountry would remain open throughout both parks.

Alternative 3A: Most Road Grooming Eliminated

Actions and Assumptions Common to All Parks (3A)

- BAT Requirements: All recreational snowmobiles operating in the parks must meet BAT requirements, except:
    - Snowmobiles starting in the Targhee National Forest and traveling on the Grassy Lake Road to and from Flagg Ranch would be exempt from BAT requirements. However, these snowmobiles may not travel further into the Parkway unless they meet BAT requirements and any other applicable requirements.
    - Snowmobiles operating on the CDST between the east boundary of GTNP and the Buffalo Fork River.

Actions Specific to Yellowstone (3A)

- Group Size: No more than 11 snowmobiles would be permitted in a group, including the commercial guide's sled.
- Routes Open to Snowmobile Use: 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).
    - Grand Loop Road, from Old Faithful to West Thumb
    - South Entrance Road, from the South Entrance to West Thumb
    - Roads in the developed areas of Old Faithful, Grant Village, and West Thumb
- Routes Open to Snowcoach Use: All routes designated for snowmobile use would also be open to snowcoach use. 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).

- Guiding Requirements:
  - All snowmobilers in Yellowstone would be required to travel with a commercial guide.
  - All businesses providing commercial guiding services in the park would be required to have permits authorizing their operation.
  - All snowcoaches operating in the park would have to be operated in accordance with a concessions contract. No private snowcoaches would be allowed.

Table 2-4: Yellowstone Daily Snowmobile Entry Limits, Alternative 3A

Entrance	Commercially Guided Snowmobiles	Commercially Guided Snowcoaches
West Entrance	0	0
South Entrance	250	20
East Entrance	0	0
North Entrance	0	0
Old Faithful	0	0
Total	250	20

- Non-Motorized Access:
  - Backcountry non-motorized use would be limited in Yellowstone to groomed ski routes and boardwalks (including trails accessible from the Mammoth – Cooke City road and from the road between South Entrance and Old Faithful). The balance of the park's backcountry would be closed to non-motorized travel.

Actions Specific to Grand Teton and the Parkway (3A)

- Routes Open to Snowmobile Use: 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 CDST along U.S. 26/287, from the east boundary of GTNP to the Buffalo Fork River
  - U.S. Highway 89/287, from the Snake River Bridge to the north boundary of the Parkway
  - In the developed area of Flagg Ranch
  - Grassy Lake Road, from Flagg Ranch to the west boundary of the Parkway
- 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 89/287, from the Snake River Bridge to the north boundary of the Parkway
  - In the developed area of Flagg Ranch
- Guiding Requirements:
  - Snowmobile use in Grand Teton and the Parkway would not require the use of commercial guides; however, the NPS would consider requests to provide commercial guiding services.

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

Table 2-5: Grand Teton and the Parkway Daily Snowmobile Entry Limits, Alternative 3A

Entrance	Snowmobiles
CDST	0
Grassy Lake Road (Flagg-Ashton Road)	50
Jackson Lake	0
Total	50

- Non-Motorized Access:
  - Non-motorized winter use would continue to be managed in accordance with prior decisions and rules. See Section 2.5.6 Actions Specific to Grand Teton National Park.

Alternative 3B: Oversnow Roads Closed (No Action)

Motorized Use (3B)

- Routes: No recreational snowmobile or snowcoach use would be allowed in any of the parks, except snowmobiles operating:
  - 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.
  - On access routes in Grand Teton described above in Actions Common to All Alternatives (Section 2.5.2).
- 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).
- BAT Requirement: Snowmobiles would not be required to meet BAT or guiding requirements.

Non-Motorized Access (3B)

- 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.

2.6.4 Alternative 4: Expanded Recreational Use

This alternative would expand recreational use of the parks in the winter. It would allow up to 1025 snowmobiles per day in Yellowstone and 250 in Grand Teton and the Parkway. In Yellowstone, all snowmobiles would be BAT and about 75% of snowmobiles would travel on a commercial tour with a commercial guide. About 25% of the daily snowmobile entries would be allocated for either unguided tours or for non-commercial tours with a certified

group leader. In Grand Teton and the Parkway, 250 snowmobiles would be allowed, and a portion of those snowmobiles using the CDST would be EPA compliant.

The rationale for this alternative is that a body of scoping comments called for increased winter use in the parks and called for a portion of the use to be unguided or non-commercially guided. Those commentors believed that the parks could accommodate additional use and that some visitors were excluded from the parks due to the guiding restrictions of the temporary plan.

This alternative addresses the purpose and need for this EIS. Previously unacceptable impacts to air quality, employee and visitor health and safety, wildlife, soundscapes, and the visitor experience would be reduced. Visitor access would be facilitated through managed snowmobile and snowcoach use. However, some winter visitors may be discouraged by the use levels allowed in alternative 4.

Actions Specific to Yellowstone

- BAT Requirement: All recreational snowmobiles operating in Yellowstone must meet BAT requirements. Snowmobiles using the Cave Falls Road would not be required to be BAT.
- Group Size: No more than 11 snowmobiles would be permitted in a group (including the commercial guide's sled, if applicable). The same limit would apply to unguided or non-commercially guided groups.
- 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).
    - 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
    - Grand Loop Road, from Canyon Junction to the Washburn Hot Springs overlook
    - South Canyon Rim Drive
    - North Canyon Rim Drive
    - Lake Butte Road
    - Firehole Canyon Drive
    - Fountain Flat Road
    - Riverside Drive
    - Cave Falls Road, with no BAT or guiding requirement, and a daily entry limit of 75 snowmobiles
    - Roads in the developed areas of Madison Junction, Old Faithful, Grant Village, West Thumb, Lake, Fishing Bridge, Canyon, Indian Creek, and Norris
- Routes Open to Snowcoach Use: All routes designated for snowmobile use would also be 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).

- East Entrance Road: Avalanche management at Sylvan Pass may necessitate unscheduled, temporary closures of the road segment through the pass. Management of the avalanche risk cannot guarantee the pass will be open every day of the winter season. Weather conditions can change quickly and prevent avalanche management from occurring. Other factors may also affect implementation of avalanche management.
- The Operational Risk Management Assessment evaluated a variety of ways to address avalanche issues on Sylvan Pass. The NPS would continue to evaluate which of those options represents the greatest gain and the least risk for keeping Sylvan open in the winter. The NPS has done preliminary cost estimates (all included in Appendix F) on four options: snowsheds, fixed gas systems (Gazex and Avalhex, both described in Appendix H), and fixed-gas/howitzer combination. These systems may require additional NEPA analysis and extensive geotechnical investigations to determine their feasibility.
- Guiding Requirements:
    - All businesses providing commercial guiding services in the park would be required to have permits authorizing their operation.
    - About 25% of the daily snowmobile entries would be allocated for either unguided tours or for non-commercial tours with a certified group leader.
        - Yellowstone could administer the program for unguided tours or non-commercial tours with a certified group leader by issuing one or more management and operations contracts to oversee a reservation and orientation system to help assure that all requirements such as BAT, group size, etc., are met.
        - Unguided Snowmobilers: When they receive their entrance passes, all park visitors on unguided snowmobiles would be required to attend a short presentation on safety, how to minimize impacts to the park, snowmobile riding etiquette, park regulations, and how to avoid disturbances to wildlife. This presentation could be in person or by video. All members of the unguided group would have to present a current certificate of completion of a snowmobile safety course administered by a state, province, Tread Lightly, the American Council of Snowmobile Associations, the Canadian Council of Snowmobile Organizations, or other generally recognized certifying organization.
        - Non-Commercial Tours with a Certified Group Leader: One member of the tour would be certified by the NPS (or NPS designee) to lead a group of snowmobilers. A Yellowstone-specific certification program, such as the SafeRider! program at www.snowiasa.org would be utilized or developed. The group leader would have to present a current certificate of completion of a snowmobile safety course administered by a state, province, Tread Lightly, the American Council of Snowmobile Associations, the Canadian Council of Snowmobile Organizations, or other generally recognized certifying organization.
    - All snowcoaches operating in the park would have to be operated in accordance with a concessions contract or NPS-issued permit. Private snowcoaches must meet BAT and size requirements. The private snowcoach operator must meet the above training/certification requirements.

Table 2-6: Yellowstone Daily Snowmobile and Snowcoach Entry Limits, Alternative 4

Entrance	Commercially Guided Snowmobiles	Unguided or Non-Commercially Guided Snowmobiles	Commercially Guided Snowcoaches	Private Snowcoaches
West Entrance	450	150	46	
South Entrance	188	62	15	
East Entrance	75	25	4	
North Entrance	19	6	16	
Old Faithful	38	12	24 (Park-wide)	
Total	770	255	105	10 (Park-wide)

- Non-Motorized Access:
    - Backcountry non-motorized use would continue to be allowed throughout the park per actions and assumptions common to all alternatives.

Actions Specific to Grand Teton and the Parkway

- BAT Requirement:
    - Snowmobiles traveling on the Grassy Lake Road would be exempt from BAT requirements.
    - Of the snowmobiles authorized to operate on the CDST, 50 would be required to be commercially guided and meet BAT requirements, while 25 unguided EPA compliant machines would be allowed.
    - Snowmobiles operating on Jackson Lake must meet BAT requirements.
    - Snowmobiles operating on that portion of the CDST between the east boundary of GTNP and Moran would be exempt from the BAT, daily entry limits, and commercial guiding requirements.
- 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 CDST along U.S. 26/287, from the east boundary of GTNP to Moran Junction, and along U.S. 89/191/287 from Moran Junction to the north boundary of GTNP
    - The CDST along U.S. Highway 89/191/287, from the south boundary of the Parkway north to the Snake River Bridge
    - U.S. Highway 89/191/287, from the Snake River Bridge to the north boundary of the Parkway
    - In the developed area of Flagg Ranch
    - Grassy Lake Road, from Flagg Ranch to the west boundary of the Parkway.
    - The frozen surface of Jackson Lake for purposes of ice fishing by persons who possess 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 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 the Snake River Bridge to the north boundary of the Parkway
  - In the developed area of Flagg Ranch
- Guiding Requirements:
  - All businesses providing commercial guiding services in the park would be required to have permits authorizing their operation.
  - All snowcoaches operating in the Parkway would have to be operated in accordance with a concessions contract, incidental business permit, or other NPS-issued permit.

Table 2-7: Grand Teton and the Parkway Daily Snowmobile Entry Limits, Alternative 4

Entrance	Commercially Guided Snowmobiles	Unguided Snowmobiles
CDST	50	25
Grassy Lake Road (Flagg-Ashton Road)	0	75
Jackson Lake	0	100
Total	50	200

- Non-Motorized Access:
  - Non-motorized winter use would continue to be managed in accordance with prior decisions and rules. See Section 2.5.7 Actions Specific to Grand Teton National Park.

2.6.5 Alternative 5: New Management Tools and Improved BAT

This alternative would allow up to 540 snowmobiles per day in Yellowstone and 140 in GTNP and the Parkway, with the requirement that all snowmobiles meet improved BAT requirements and about 80% of snowmobiles in Yellowstone travel on a commercial tour with a commercial guide. About 20% of the daily snowmobile entries would be allocated for unguided snowmobiles, which would be required to enter Yellowstone before 10:30 a.m. each day. Alternative 5 also features a seasonal as well as a flexible daily entry limit for snowmobiles in Yellowstone that is only applicable to commercially guided snowmobiles and snowcoaches.

The rationale for this alternative is that it allows some unguided snowmobile access while also evaluating other ways of managing winter use in the parks (using temporal zoning and a seasonal entry limit). This alternative also allows for business flexibility to better meet demand on peak days.

This alternative addresses the purpose and need for this EIS. Previously unacceptable impacts to air quality, employee and visitor health and safety, wildlife, and the visitor experience would be mitigated and natural soundscape conditions would be improved. Visitor access would be facilitated through managed snowmobile and snowcoach use.

Actions and Assumptions Common to All Parks

- All recreational snowmobiles operating in the parks must meet improved BAT requirements, except those traveling the Cave Falls Road in Yellowstone.
- Improved BAT requirements for snowmobiles are:
  - All snowmobiles must achieve a 95% reduction in hydrocarbons and a 75% reduction in carbon monoxide emissions relative to EPA's baseline emissions assumptions for conventional two-stroke snowmobiles. Specifically, beginning with the 2011 model year (snowmobiles available in fall 2010), all snowmobiles

must be certified under 40 CFR 1051 to a Family Emission Limit no greater than 8 g/kW-hr for hydrocarbons and 105 g/kW-hr for carbon monoxide.
    - Beginning with the 2011 model year (snowmobiles available in fall 2010), snowmobiles must operate at or below 72 dBA as measured at full throttle according to Society of Automotive Engineers 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).
- Snowmobiles starting in the Targhee National Forest and traveling on the Grassy Lake Road to and from Flagg Ranch would be exempt from improved BAT requirements (again, so that eastbound operators may obtain fuel at Flagg Ranch if needed). However, these snowmobiles may not travel further into the Parkway unless they meet improved BAT requirements and any other applicable requirements.

Actions Specific to Yellowstone

- Group Size: No more than 11 snowmobiles would be permitted in a group (including the commercial guide's sled, if applicable). The same limit would apply to unguided groups.
- 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).
    - 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
    - Lake Butte Road
    - South Canyon Rim Drive
    - North Canyon Rim Drive, from noon to 9 p.m. only
    - Firehole Canyon 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
    - Roads in the developed areas of Madison Junction, Old Faithful, Grant Village, West Thumb, Lake, Fishing Bridge, Canyon, Indian Creek, and Norris
- 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).
    - 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

        - Fountain Flat Road
        - North Canyon Rim Drive, all day
        - Riverside Drive, all day
        - Grand Loop Road, from Canyon Junction to the Washburn Hot Springs overlook
- East Entrance Road: Avalanche management at Sylvan Pass may necessitate unscheduled, temporary closures of the road segment through the pass. Management of the avalanche risk cannot guarantee the pass will be open every day of the winter season. Weather conditions can change quickly and prevent avalanche management from occurring. Other factors may also affect implementation of avalanche management.
- The Operational Risk Management Assessment evaluated a variety of ways to address avalanche issues on Sylvan Pass. The NPS would continue to evaluate which of those options represents the greatest gain and the least risk for keeping Sylvan open in the winter. The NPS has done preliminary cost estimates (all included in Appendix F) on four options: snowsheds, fixed gas systems (Gazex and Avalhex, both described in Appendix H), and fixed-gas/howitzer combination. These systems may require additional NEPA analysis and extensive geotechnical investigations to determine their feasibility.
- Guiding Requirements:
    - All businesses providing commercial guiding services in the park would be required to have permits authorizing their operation.
    - About 20% of the daily snowmobile entries would be allocated for unguided snowmobiles.
    - Yellowstone could administer the program for unguided snowmobiles by issuing one or more management and operations contracts to oversee a reservation and orientation system to help assure that all requirements such as BAT, group size, etc., are met.
    - When they receive their entrance passes, all park visitors on unguided snowmobiles would be required to attend a short presentation on safety, how to minimize impacts to the park, snowmobile riding etiquette, park regulations, and how to avoid disturbances to wildlife. This presentation could be in person or by video. All members of the unguided group would have to present a current certificate of completion of a snowmobile safety course administered by a state, province, Tread Lightly, the American Council of Snowmobile Associations, the Canadian Council of Snowmobile Organizations, or other generally recognized certifying organization. One example of such a program is the SafeRider! program at www.snowiasa.org.
    - All snowcoaches operating in the park would have to be operated in accordance with a concessions contract. Private snowcoaches would not be allowed.
- Snowmobile Timed Entry Requirements:
    - To protect natural soundscapes and enhance visitor experience, unguided snowmobilers would be required to enter the park by no later than 10:30 a.m. This entry requirement could be adjusted if park roads or entrances were closed due to weather conditions, avalanche control, or other circumstances beyond visitors' control.
    - Because commercially guided snowmobile trips routinely enter the park before 10:30 a.m., they would not have an entry time requirement.
- Flexible Daily and Seasonal Entry Limit:
    - Recognizing that demand varies over the course of the season and that holiday periods create more demand, the daily entry limit for commercial snowmobiles and snowcoaches would be allowed to exceed the entry limits in the table below by 20% (therefore, 518 for commercial snowmobiles and 100 for snowcoaches

would be allowed). These additional vehicles would count against the seasonal limits.

- In addition to the flexible daily entry limit, a seasonal limit would be put into place under this alternative for both commercially guided snowmobiles and snowcoaches. The overall seasonal entry limit for commercial snowmobiles would be 27,540 snowmobiles (calculated by multiplying [85 days/season] x [432 (daily commercial entry limit)] x 75% = total number of snowmobiles allowed per season). Snowcoaches would also have a seasonal limit no higher than 5,291 coaches (calculated by multiplying [85 days/season] x [83 (daily commercial entry limit)] x 75% = total number of snowcoaches allowed per season).

Table 2-8: Yellowstone Daily Snowmobile and Snowcoach Entry Limits, Alternative 5*

Entrance	Commercially Guided Snowmobiles	Unguided Snowmobiles	Commercially Guided Snowcoaches
West Entrance	232	58	34
South Entrance	116	29	10
East Entrance	32	8	2
North Entrance	32	8	15
Old Faithful	20	5	19 (Park-wide)
Total	432	108	83

* These limits, for commercially guided snowmobiles and snowcoaches only, could be adjusted upward by 20% to provide for business flexibility, but all such snowmobile and snowcoach entries would count against the seasonal limit identified above.

- Non-Motorized Access:
  - Backcountry non-motorized use would continue to be allowed throughout the park, 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.
  - Ski and snowshoe use of the South Entrance Road and East Entrance Road would be allowed to continue after the balance of the park's roads close to winter operations (during spring plowing). When spring plowing operations approach the entrances, the roads would be closed to skiing and snowshoeing for safety concerns. Bear management closures of the park's backcountry would not be altered.

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 CDST along U.S. 26/287, from the east boundary of GTNP to Moran Junction. Snowmobiles operating on this portion of the CDST would be exempt from the daily entry limits and BAT requirements.
  - The CDST along U.S. 89/191/287, from Moran Junction to the north boundary of GTNP
  - The CDST along U.S. Highway 89/191/287, from the south boundary of the Parkway north to the Snake River Bridge

  - U.S. Highway 89/191/287, from the Snake River Bridge to the north boundary of the Parkway
  - In the developed area of Flagg Ranch
  - Grassy Lake Road, from Flagg Ranch to the west boundary of the Parkway
  - The frozen surface of Jackson Lake for purposes of ice fishing by persons who possess 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 the Snake River Bridge to the north boundary of the Parkway
  - In the developed area of Flagg Ranch
- Guiding Requirements:
  - Snowmobile use in Grand Teton and the Parkway would not require the use of commercial guides; however, the NPS would consider requests to provide commercial guiding services.
  - All snowcoaches operating in the Parkway would have to be operated in accordance with a concessions contract. Private snowcoaches would not be allowed.

Table 2-9: Grand Teton and the Parkway Daily Snowmobile Entry Limits, Alternative 5

Entrance	Snowmobiles
CDST	50
Grassy Lake Road (Flagg-Ashton Road)	50
Jackson Lake	40
Total	140

- Non-Motorized Access:
  - Non-motorized winter use would continue to be managed in accordance with prior decisions and rules. See Section 2.5.6, Actions Specific to Grand Teton National Park.

2.6.6 Alternative 6: Mixed Use

Alternative 6 would allow wheeled vehicle access to Yellowstone's interior in addition to snowmobile and snowcoach use of some of the park's snow roads. Up to 100 commercially guided wheeled vehicles would be allowed to enter the park daily through the Mammoth Terraces or West Entrance for travel to Old Faithful. Up to 350 BAT and commercially guided snowmobiles would be allowed to use other Yellowstone's roads, along with 40 commercially guided, BAT snowcoaches. Yellowstone's East Entrance Road would be open to skier/snowshoer drop-offs via snowcoach or snowmobile, and non-motorized travel from the entrance to a point about four miles west only (well below Sylvan Avalanche zone); the road would be closed over the pass to all motorized vehicles, as of the winter of 2008-2009. The road segment through the Sylvan Pass area would be open for ski and snowshoe access only, with such access treated as backcountry (i.e. users assume the risks of traveling through

the avalanche zone). In Grand Teton, Jackson Lake and the Grassy Lake Road would be open for snowmobiles, but the CDST would be closed.

This alternative offers the widest variety of ways for visitors to use the parks in the winter, with wheeled vehicles, snowmobiles, and snowcoaches offered. In the mid-elevation, west-side areas of Yellowstone (which receive a moderate amount of snow, more than the Mammoth to Lamar Valley area but less than the park's east and south sides), the alternative allows the decision maker to compare the tradeoffs of plowing roads for commercially-guided wheeled vehicle access versus grooming the same routes as snow roads for oversnow travel.

This alternative addresses the purpose and need for this EIS. Previously unacceptable impacts to air quality, employee and visitor health and safety, wildlife, and the visitor experience would be mitigated and natural soundscape conditions would be improved. Visitor access to the interior of Yellowstone would be facilitated through managed snowmobile, snowcoach, and wheeled vehicle use.

Actions and Assumptions Common to All Parks

- BAT Requirement: All recreational snowmobiles operating in the parks must meet BAT requirements, except:
    - Snowmobiles starting in the Targhee National Forest and traveling on the Grassy Lake Road to and from Flagg Ranch would be exempt from BAT requirements (again, so that eastbound operators may obtain fuel at Flagg Ranch if needed). However, these snowmobiles may not travel further into the Parkway unless they meet BAT requirements and any other applicable requirements.
    - Snowmobiles operating on the CDST from the east boundary of GTNP to the Buffalo Fork River would be exempt from the daily entry limits and BAT requirements.
    - Snowmobiles using the Cave Falls Road in Yellowstone.

Actions Specific to Yellowstone

- Group Size: No more than 8 snowmobiles would be permitted in a group with one commercial guide; no more than 17 snowmobiles would be permitted in a group with two commercial guides. Group numbers include the commercial guide sled(s).
- 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).
    - Grand Loop Road, from Old Faithful 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 Fishing Bridge Junction to its junction with the Lake Butte Overlook Road
    - Grand Loop Road, from its junction with the East Entrance Road to Canyon Junction
    - Canyon Junction to Norris Junction
    - South Canyon Rim Drive
    - Lake Butte Overlook Road
    - North Canyon Rim Drive
    - Cave Falls Road, with no BAT or guiding requirement, and a daily entry limit of 50 snowmobiles

  - In the developed areas of Old Faithful, Grant Village, West Thumb, Lake, Fishing Bridge, Canyon, and Norris

- 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).
  - All routes designated for snowmobile use are also open to snowcoach use.
  - In addition, the following routes are open to snowcoaches:
    - Firehole Canyon Drive (rubber tracked coaches only)
    - Fountain Flat Road (rubber tracked coaches only)
    - Riverside Drive (rubber tracked coaches only)
    - Grand Loop Road, from Canyon Junction to the Washburn Hot Springs overlook
    - East Entrance Road, from the entrance to a point about six miles west
- Roads Open to Commercial Wheeled Vehicle Use: All wheeled vehicles operating on the following road segments in the winter season would be required to be operated by a commercial guiding service, to protect wildlife (commercial drivers would be familiar with areas frequented by wildlife) and visitors (commercial drivers would be more familiar with winter driving than some visitors would be). Rubber tracked vehicles would be allowed on these road segments; because such vehicles could operate on both plowed and groomed roads, tour operators would be able to provide single-vehicle tours of the Lower Loop (multi-modal tours would also be possible, switching to oversnow vehicles at Old Faithful or Norris, as tour operators already do from Jackson, switching to oversnow vehicles at Flagg Ranch).
  - Grand Loop Road, from its junction with Upper Terrace Drive to Norris 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 Old Faithful
  - Roads in the developed areas of Madison, Norris, and Old Faithful
- Guiding Requirements:
  - All snowmobilers in Yellowstone would be required to travel with a commercial guide who is affiliated with a commercial guiding service that is authorized to operate in the park.
  - All snowcoaches operating in the park would have to operate in accordance with a concessions contract. Private snowcoaches would not be allowed.
  - All wheeled vehicles operating in the park on the west-side plowed road segments (that is, from Mammoth to Old Faithful and West Yellowstone, not from Gardiner to Cooke City) would have to operate in accordance with a concessions contract. Private vehicles would not be allowed.
  - All businesses providing commercial guiding services in the park would be required to have permits authorizing their operation.

Table 2-10: Yellowstone Daily Snowmobile, Snowcoach, and Wheeled Vehicle Entry Limits, Alternative 6

Entrance	Commercially Guided Snowmobiles	Commercially Guided Snowcoaches	Commercially Guided Wheeled Vehicles
West Entrance	0	0	75
South Entrance	250	10	0
East Entrance	0	0	0
North Entrance	0	0	25
Old Faithful (and Norris)	100	30	0
Total	350	40	100

- Non-Motorized Access:
    - Backcountry non-motorized use would continue to be allowed throughout the park, 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.
    - Ski and snowshoe use of the South Entrance Road and East Entrance Road would be allowed to continue after the balance of the park's roads close to winter operations (during spring plowing). When spring plowing operations approach the entrances, the roads would be closed to skiing and snowshoeing for safety concerns. Bear management closures of the park's backcountry would not be altered.
- East Entrance Road:
    - The East Entrance Road would be open for snowmobile and snowcoach travel from the Fishing Bridge Junction to Lake Butte Overlook. The East Entrance Road would also be open to skiing and snowshoeing (and snowcoach or snowmobile skier/snowshoer drop-offs) from the East Entrance to about four miles west (well below the Sylvan Pass avalanche zone). The balance of the road (Lake Butte Overlook junction through Sylvan Pass) would be treated as backcountry, with no motorized winter access. Skiers and snowshoers using the Sylvan Pass area would do so at their own risk. Avalanche control for spring plowing would continue.

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 CDST along U.S. 26/287, from the east boundary of GTNP to the Buffalo Fork River. Snowmobiles operating along this portion of the CDST would be exempt from the daily entry limits and BAT requirements.
    - U.S. Highway 89/191/287, from the Snake River Bridge to the north boundary of the Parkway
    - In the developed area of Flagg Ranch
    - Grassy Lake Road from Flagg Ranch to the west boundary of the Parkway
    - The frozen surface of Jackson Lake for purposes of ice fishing by persons with 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 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).
    - Along U.S. Highway 89/191/287, from the Snake River Bridge to the north boundary of the Parkway
    - In the developed area of Flagg Ranch
- Guiding Requirements:
    - Snowmobile use in Grand Teton and the Parkway would not require the use of commercial guides; however, the NPS would consider requests to provide commercial guiding services.
    - All snowcoaches operating in the Parkway would have to be operated in accordance with a concessions contract. Private snowcoaches would not be allowed.

Table 2-11: Grand Teton and the Parkway Daily Snowmobile Entry Limits, Alternative 6

Entrance	Snowmobiles
CDST	0
Grassy Lake Road (Flagg-Ashton Road)	50
Jackson Lake	40
Total	90

- Non-Motorized Access:
    - Non-motorized winter use would continue to be managed in accordance with prior decisions and rules. See Section 2.5.6 Actions Specific to Grand Teton National Park.

2.6.7 Alternative 7: Revised Preferred Alternative

This alternative represents the agency's preferred alternative, which is different from the preferred alternative in the DEIS. The NPS took into consideration analysis of public comment on the DEIS, feedback from public and community meetings on the DEIS, continued review of the 2006 NPS Management Policies, additional monitoring data, reports, analysis, and modeling completed since the DEIS was released.

Alternative 7 strikes a balance between snowmobile and snowcoach use while reducing the daily number of snowmobiles (from that permitted by the DEIS preferred alternative) to better protect park soundscapes and other resources. In Yellowstone, 540 snowmobiles per day would be allowed, and in Grand Teton and the Parkway, 65 snowmobiles would be allowed. Generally all snowmobiles would have to use BAT and all snowmobilers in Yellowstone would have to travel with a commercial guide. The number of snowcoaches allowed into Yellowstone daily would increase (from the DEIS preferred alternative recommendation of 78) to 83. This alternative would also manage several side roads with temporal and spatial zoning to facilitate a variety of uses.

As of the winter of 2008-2009, Yellowstone's East Entrance Road would be open and groomed or tracked for skier/snowshoer drop-offs via snowcoach or snowmobile, and non-motorized travel from the entrance to a point about four miles west only (well below Sylvan Avalanche zone). The road segment though the Sylvan Pass area would be open for ski and

snowshoe access only, with such access treated as backcountry (i.e. users assume the risks of traveling through the avalanche zone). The NPS would cooperate with the States of Wyoming and Montana in their discussions regarding plowing Cooke Pass outside the Northeast Entrance, which would enable year-round wheeled vehicle access from Cody through that gate. Additionally, depending on available funding, the NPS would assist with a two-year marketing partnership with the State of Wyoming (2008-2010) to address changes in access to the East Entrance. The NPS would also coordinate with the Park County Nordic Ski Association and others to ensure continued non-motorized access through the East Entrance and to explore shuttle and tour opportunities. To help offset the change in winter access, the NPS would endeavor to open the East Entrance Road in the spring approximately two weeks earlier than the recent years' schedule (that is, by the 3rd Friday in April rather than the first Friday in May). Such earlier openings will be contingent upon winter snowpack.

Certain elements of the temporary plan would continue for the winter of 2007-2008 to allow sufficient time for snowmobile and snowcoach concessions contract administration and for transition to the new long-term plan. Specifically, for that winter, 720 snowmobiles and 78 snowcoaches would continue to be allowed into Yellowstone and Sylvan Pass would remain open for motorized oversnow vehicle travel.

In Grand Teton National Park and the Parkway, the Continental Divide Snowmobile Trail would be converted to a trailered route between Moran Junction and Flagg Ranch (both private and commercial trailers would be allowed). The NPS would cease maintenance of the CDST as an oversnow vehicle route from the vicinity of Moran Junction to Flagg Ranch, but CDST travelers would be able to trailer snowmobiles between those two points for through trips on the trail. Additionally, snowmobiles on the Grassy Lake Road would not have to meet BAT requirements, allowing two-way travel on this road between Flagg Ranch and the Targhee National Forest. The daily snowmobile limit for the Grassy Lake Road at Flagg Ranch would be 25 snowmobiles, counted at Flagg Ranch. Jackson Lake would be open to snowmobile use for ice fishing access and up to 40 BAT snowmobiles would allowed per day.

This alternative addresses the purpose and need for this EIS. Previously unacceptable impacts to air quality, employee and visitor health and safety, wildlife, and the visitor experience would be mitigated and natural soundscape conditions would be improved. Visitor access would be facilitated through managed snowmobile and snowcoach use.

Actions and Assumptions Common to All Parks

- BAT Requirements: 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, beginning with the winter of 2008-2009. Eastbound snowmobiles may not travel beyond Flagg Ranch unless they meet BAT requirements and any other applicable requirements.
    - Snowmobilers traveling that portion of the CDST between the vicinity of Moran Junction (the exact location will be determined at a later date) and Flagg Ranch would be allowed to trailer their machines to Flagg Ranch. The NPS would no longer maintain this route for oversnow vehicles, beginning with the winter of 2008-2009.
    - Snowmobiles using the Cave Falls Road in Yellowstone would be exempt from BAT requirements.

Actions Specific to Yellowstone

- Group Size: No more than 11 snowmobiles would be permitted in a group, including one commercial guide. Group numbers include the commercial guide sled(s).
- 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).
    - 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 Fishing Bridge Junction to Lake Butte Overlook
    - Grand Loop Road, from its junction with the East Entrance Road to Canyon Junction
    - Lake Butte Road
    - South Canyon Rim Drive
    - North Canyon Rim Drive, from noon to 9 p.m. only
    - Firehole Canyon 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
    - Roads in the developed areas of Madison Junction, Old Faithful, Grant Village, West Thumb, Lake, Fishing Bridge, Canyon, Indian Creek, and Norris
    - East Entrance Road between Lake Butte Overlook and East Entrance (winter 2007-2008, only)
- 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). 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
    - Fountain Flat Road
    - North Canyon Rim Drive, all day
    - Riverside Drive, all day
    - Grand Loop Road from Canyon Junction to the Washburn Hot Springs overlook
    - East Entrance Road from the entrance to a point approximately four miles west
- Guiding Requirements:
    - All snowmobilers in Yellowstone would be required to travel with a commercial guide who is affiliated with a commercial guiding service that is authorized to operate in the park, except for snowmobilers visiting Cave Falls.

- 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 in the park would be required to have contracts authorizing their operation.

Table 2-12: Yellowstone Daily Snowmobile and Snowcoach Entry Limits, Alternative 7*

Entrance**	Commercially Guided Snowmobiles	Commercially Guided Snowcoaches***
West Entrance	300	37
South Entrance	185	12
East Entrance	0	0
North Entrance	35	15
Old Faithful	20	19
Total	540	83

* The numbers of snowmobiles and snowcoaches allocated to a particular entrance may be adjusted (with the park-wide totals not to exceed 540 and 83, respectively), depending on the results of analysis for concession contracts. A change in the number of snowcoaches permitted may not be implemented until new snowcoach contracts are issued (in approximately 2013), depending on need.
** For the winters of 2007-2008 only, the following allocations would be in effect: West Entrance, 400; South Entrance, 220; East Entrance, 40; North Entrance, 30; and Old Faithful, 30.
*** Does not include snowcoaches that would be allowed to provide skier / snowshoe shuttles between East Entrance and near Sylvan Pass.

- Non-Motorized Access:
  - Backcountry non-motorized use would continue to be allowed throughout the park, 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.
  - Ski and snowshoe use of the South Entrance Road and East Entrance Road would be allowed to continue after the balance of the park's 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 not be altered.
  - East Entrance Road: The East Entrance Road would remain open for snowmobile and snowcoach access during the winter of 2007-2008, with appropriate avalanche control. As of the winter of 2008-2009, the East Entrance Road would be open only to skiing and snowshoeing (and snowcoach or snowmobile skier/snowshoer drop-offs) from the East Entrance to about four miles west (well below the Sylvan Pass avalanche zone). The balance of the road (Sylvan Pass to Lake Butte Overlook) would be open to ski and snowshoe access only; the road would be considered backcountry, with no motorized winter access. Skiers and snowshoers using the Sylvan Pass area would travel at their own risk. Avalanche control for spring plowing would continue. This road would also be open from the west for snowmobile and snowcoach travel from Fishing Bridge Junction to Lake Butte Overlook.
  - The NPS is aware that technological changes and improvements in avalanche control may occur. The NPS will continue to evaluate new technologies for their possible application on Sylvan Pass and how the pass might managed for oversnow vehicle travel.

- The NPS will endeavor to open the East Entrance Road two weeks earlier in the spring (by the third Friday in April), depending on the winter snowpack.

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 CDST along U.S. 26/287, from the east boundary of GTNP to Moran Junction
    - Along U.S. 89/191/287 from the Moran Junction vicinity to the north boundary of GTNP and from there to the Snake River Bridge in the Parkway, through the winter of 2007-2008 only. In the winter of 2008-2009, the CDST from Moran Junction to Flagg Ranch will convert to being a trailered snowmobile route connecting with the Grassy Lake Road
    - U.S. Highway 89/191/287, from the Snake River Bridge to the north boundary of the Parkway
    - In the developed area of Flagg Ranch
    - 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 with 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 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 89/287, from the Snake River Bridge to the north boundary of the Parkway
    - In the developed area of Flagg Ranch
- Guiding Requirements:
    - Snowmobile use in Grand Teton and the Parkway would not require the use of commercial guides; however, the NPS would consider requests to provide commercial guiding services.
    - All snowcoaches operating in the Parkway would have to be operated in accordance with a concessions contract, incidental business permit, or other NPS-issued permit.

Table 2-13: Grand Teton and the Parkway Daily Snowmobile Entry Limits, Alternative 7

Entrance	Snowmobiles
Grassy Lake Road (Flagg-Ashton Road)/CDST	25*
Jackson Lake	40
Total	65

* Up to 50 BAT snowmobiles would be allowed on the CDST and 50 on the Grassy Lake Road during the winter of 2007-2008 only. Beginning with the winter of 2008-2009, the CDST would be converted to a trailered route and 25 snowmobiles (no BAT requirement) would be allowed on the Grassy Lake Road.

- Non-Motorized Access:
    - Non-motorized winter use would continue to be managed in accordance with prior decisions and rules. See Section 2.5.6, Actions Specific to Grand Teton National Park.

2.7 The Environmentally Preferred Alternative

The environmentally preferred alternative is that alternative which 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."

Previous winter use planning documents did not include alternatives for completely closing the parks to OSV use; that option has never been considered (although alternative F in 2000 FEIS did consider closure of the west side roads to OSV use, similar to alternative 3A in this document). Designation of the snowcoach-only alternative as environmentally preferred in previous documents, given the range of alternatives considered, effectively optimized resource protection and human use. The snowcoach-only alternative impacted park resources and values the least overall while accommodating human recreational access at then-current levels.

In this analysis, the range of alternatives is different from previous planning documents. The no action alternative, as a consequence of continued management without a new decision, would eliminate the impact-inducing activities associated with motorized over-snow recreation. The clear benefit to the natural environment, relative to all other alternatives, provides the rational for choosing alternative 3B as environmentally preferred.

While noting that visitor use by OSV during the winter in Yellowstone and Grand Teton has been established over time, and that local economies have come to depend on it, it is also true that other snow-dominated park units do not allow large winter motorized recreation programs. For example, significant portions of Isle Royale, Glacier, Yosemite, Mount Rainier, Lassen Volcanic, and Sequoia-Kings Canyon national parks have limited winter vehicle use. Management has chosen to close major portions of these parks in the winter as the most protective measure for these parks to maintain, uninterrupted, natural physical and ecological processes and because of the cost and challenges of keeping roads open.

Given this background and selection criteria, alternative 3B is the environmentally preferred alternative in this EIS. Alternative 3B best preserves the unique historic, cultural, and natural resources in the parks. This alternative yields the least impacts to air quality, wildlife, and natural soundscapes because oversnow recreational vehicle travel would not occur in the parks. This alternative is not as effective in sharing life's amenities as the other alternatives because of the lack of oversnow vehicle access, but the level of resource protection achieved exceeds all other alternatives.

Alternative 1 increases the adverse impacts to air quality, natural soundscapes, and wildlife as compared to 3B, but it also allows for an ample number of visitors to enjoy the parks in the winter via several modes of transportation. Thus, alternative 1 achieves a balance of resources use and sharing life's amenities; however, it does not achieve the level of protection that alternative 3B would be able to reach.

Alternative 2 also increases the adverse impacts to air quality, natural soundscapes, and wildlife as compared to 3B (but less than the impacts of alternative 1), and allows visitors to enjoy the oversnow areas of the park with access via one mode of transportation, snowcoaches. Thus, alternative 2 also achieves a balance of resources use and sharing life's amenities, but less so than alternative 1 because choices of access modes are more limited. Additionally, as described in Chapters III and IV, snowcoaches do create impacts on wildlife, soundscapes, and air quality, and utilize more fuel than other modes of transportation. Alternative 2 also does not achieve the level of protection of alternative 3B.

Alternative 3A increases the adverse impacts to air quality, natural soundscapes, and wildlife as compared to alternative 3B, and visitors would be allowed to enjoy oversnow vehicle access to small portions of the parks. Thus, alternative 3A achieves a balance of resource use and sharing life's amenities, but less so than alternative 1 because access to the parks is much more limited. Also, alternative 3A does not achieve the level of protection of alternative 3B.

Alternative 4 has the most adverse effects to the parks' resources, but it also allows for the most use of the parks. Thus, alternative 4 achieves a balance of resources use and sharing life's amenities; however, it does not achieve the level of protection afforded by the other alternatives.

Alternative 5 increases impacts to air quality, natural soundscapes, and wildlife as compared to 3B, and visitors would be able to enjoy oversnow vehicle access in the parks. Thus, alternative 5 achieves a balance of resources use and sharing life's amenities, but less so than alternative 1 because of the more limited number of entries that are allowed. Also, alternative 5 does not achieve the level of protection of alternative 3B, primarily because of the unguided component.

Alternative 6 increases impacts to air quality, natural soundscapes, and wildlife as compared to alternative 3B, and visitors would be able to utilize the most varied modes of travel to enjoy the park. Thus, alternative 6 achieves a balance of resources use and sharing life's amenities, but does not afford the same level of protection as alternative 3B.

Alternative 7 increases impacts to air quality, natural soundscapes, and wildlife as compared to 3B, and visitors would be able to enjoy oversnow vehicle access in the parks. Thus, alternative 7 achieves a balance of resources use and sharing life's amenities, but less so than alternative 1 because of the more limited number of entries that are allowed. Although alternative 7 does not achieve the level of protection of alternative 3B, it is likely to achieve greater protection than alternative 5 because all use is commercially guided.

2.8 Comparison of Alternatives

Table 2-14, below, summarizes the chief features of each alternative in comparative fashion. Table 2-15 summarizes the direct and indirect impacts of each alternative on park resources and values, and economic impacts.

Table 2-14: Summary and Comparison of Alternatives

	Alternative 1: Continued Temporary Plan	**Alternative 2: Snowcoaches Only**	**Alternative 3: 3A: Most Road Grooming Eliminated 3B: Oversnow Roads Closed (No Action)**	**Alternative 4: Expanded Recreational Use**	**Alternative 5: New Management Tools and Improved BAT**	**Alternative 6: Mixed Use**	**Alternative 7: Revised Preferred Alternative**
General Description	Allows for nearly historic levels of snowmobile use but requires commercial guides. This Alternative mimics the temporary winter use plan currently in place, with three primary changes: 1) snowcoaches must meet Best Available Technology (BAT) standards; 2) daily limit on snowcoaches; and 3) Sylvan Pass would be closed to through travel.	Emphasizes snowcoach access; prohibits recreational snowmobiling. Road grooming would continue. Sylvan Pass would be closed to through travel.	3A: Prohibits road grooming or packing on most road segments in Yellowstone National Park. The road from the South Entrance to Old Faithful would be the only oversnow motorized access route in Yellowstone. 3B: Recreational oversnow vehicle access would cease in all three parks.	Allows for increased snowmobile use, relative to historic numbers. Commercial guides would be required for most snowmobilers; some could also visit the park after completing a non-commercial or unguided guide training course. Sylvan Pass would be open to through travel.	Balances snowmobile and snowcoach access and accommodates some visitors who wish to have an unguided snowmobile experience. Features a seasonal limit as well as a flexible daily limit. Sylvan Pass would be open to through travel	Emphasizes plowing Yellowstone's mid-elevation, west-side roads to allow wheeled commercial vehicle access. Continues to allow oversnow vehicle access through the South Entrance and on the east side of the park. Sylvan Pass would be closed to through travel.	Combines elements of Alternatives 1, 5, and others to balance snowmobile and snowcoach access. Protects park soundscapes better by reducing snowmobile numbers; protects wildlife better and enhances visitor experience by retaining 100% commercial guiding; improves employee and visitor health and safety by closing Sylvan Pass to motorized travel.
Daily Snowmobile Limits in Yellowstone National Park (YNP)	720 snowmobiles per day West - 424 South - 256 North - 20 East - 0 Old Faithful - 20 Cave Falls Road - 50 (no BAT or guiding)	Snowmobiles prohibited Cave Falls Road closed to snowmobiles	3A: South - 250 snowmobiles per day Cave Falls Road closed to snowmobiles 3B: No recreational motorized oversnow access	1,025 snowmobiles per day West - 600 South - 250 North - 25 East - 100 Old Faithful - 50 Cave Falls Road - 75 (no BAT or guiding)	540 snowmobiles/day West - 290 South - 145 East - 40 North - 40 Old Faithful - 25 Cave Falls Road - 50 (no BAT or guiding) Seasonal entry limit implemented.	350 snowmobiles per day South - 250 Old Faithful/Norris - 100 100 commercial wheeled vehicles Cave Falls Road - 50 (no BAT or guiding)	540 snowmobiles per day West – 300 South – 185 North – 35 East – 0 Old Faithful – 20 Cave Falls Road – 50 (no BAT or guiding)

	Alternative 1: Continued Temporary Plan	**Alternative 2: Snowcoaches Only**	**Alternative 3: 3A: Most Road Grooming Eliminated 3B: Oversnow Roads Closed (No Action)**	**Alternative 4: Expanded Recreational Use**	**Alternative 5: New Management Tools and Improved BAT**	**Alternative 6: Mixed Use**	**Alternative 7: Revised Preferred Alternative**
Daily Snowmobile Limits in Grand Teton National Park (GTNP) and the John D. Rockefeller, Jr., Parkway (the Parkway)	140 snowmobiles per day Grassy Lake Road: - 50 Continental Divide Snowmobile Trail (CDST) - 50 Jackson Lake - 40	Snowmobiles prohibited	3A: Grassy Lake Road - 50 CDST - Closed Jackson Lake - Closed 3B: No recreational oversnow vehicle access	250 snowmobiles per day Grassy Lake Road - 75 CDST - 75 Jackson Lake - 100	140 snowmobiles per day Grassy Lake Road - 50 CDST - 50 Jackson Lake - 40	90 snowmobiles per day Grassy Lake Road - 50 CDST - Closed Jackson Lake - 40	65 snowmobiles per day Grassy Lake Road – 25, BAT not required CDST – Converted to trailered route Jackson Lake - 40
Snowmobile Guide Requirements	YNP: 100% commercially guided GTNP and Parkway: Guides potentially allowed, but not required	N/A	3A: YNP: 100% commercially guided GTNP and Parkway: Guides potentially allowed, but not required 3B: No recreational oversnow vehicle access.	YNP: 75% commercially guided; 25% either unguided or non-commercially guided GTNP and Parkway: CDST - 50 commercially guided; 25 unguided Jackson Lake and Grassy Lake Road - unguided	YNP: 80% commercially guided 20% unguided, with brief training Unguided snowmobiles would be required to enter YNP prior to 10:30 a.m. GTNP and Parkway: Guides potentially allowed, but not required	100% commercially guided for both oversnow and wheeled vehicles GTNP and Parkway: Guides potentially allowed, but not required	YNP: 100% commercially guided GTNP and Parkway: Guides potentially allowed, but not required
Best Available Technology (BAT) Requirements for Snowmobiles	YNP: All BAT GTNP and Parkway: All BAT, except snowmobiles originating on Targhee National Forest (NF) using Grassy Lake Road	N/A	3A: YNP: All BAT GTNP/Parkway: All BAT, except snowmobiles originating on Targhee NF using Grassy Lake Road 3B: No recreational oversnow vehicle access	YNP: All BAT GTNP/Parkway: Jackson Lake: All BAT Grassy Lake Road: BAT not required CDST - 50 commercially guided BAT; 25 unguided EPA compliant	Improved BAT for snowmobiles (95% reduction in HC and 75% reduction in CO; not to exceed 72 dBA), except snowmobiles originating on Targhee NF using Grassy Lake Road	YNP: All BAT GTNP and Parkway: All BAT, except snowmobiles originating on Targhee NF using Grassy Lake Road	YNP: All BAT GTNP and Parkway: Jackson Lake: All BAT Grassy Lake Road: BAT not required

	Alternative 1: Continued Temporary Plan	**Alternative 2: Snowcoaches Only**	**Alternative 3: 3A: Most Road Grooming Eliminated 3B: Oversnow Roads Closed (No Action)**	**Alternative 4: Expanded Recreational Use**	**Alternative 5: New Management Tools and Improved BAT**	**Alternative 6: Mixed Use**	**Alternative 7: Revised Preferred Alternative**
Maximum Group Size	8 with one guide; 17 with 2 guides	N/A	3A: 11 with one guide 3B: 0	11 with one guide	11 with one guide	8 with one guide; 17 with 2 guides	11 with one guide
Use of YNP Side Roads by Snowmobiles	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.	Virginia Cascades: non-motorized only All other side roads: snowcoach only	3A and 3B: All closed (there are none on the road from South Entrance to Old Faithful under 3A)	All side roads open to snowmobiles Virginia Cascades: non-motorized only	Same as Alternative 1	Canyon North and South Rim Drives, Lake Butte: open to snowmobiles Firehole Canyon, Riverside Drive, Fountain Freight Road, Washburn Hot Springs: Snowcoach only Virginia Cascades: non-motorized only	Same as Alternative 1
Daily Snowcoach Limits in YNP and Snowcoach BAT	78 snowcoaches per day West - 34 South - 13 North - 13 East - 0 Old Faithful/ Park-wide - 18 All must meet snowcoach BAT	120 snowcoaches per day West - 55 South - 25 North - 17 East - 0 Old Faithful/ Park-wide - 23 All must meet snowcoach BAT	3A: South - 20 All meet snowcoach BAT 3B: 0	115 snowcoaches per day West - 46 South - 15 North - 5 East - 4 Old Faithful/ Park-wide - 35 Private - 10 All must meet snowcoach BAT	83 snowcoaches per day West - 34 South - 10 North - 3 East - 2 Old Faithful/ Park-wide - 34 All must meet snowcoach BAT Seasonal entry limit	40 snowcoaches per day South - 10 Old Faithful/Norris - 30 All must meet snowcoach BAT 100 wheeled commercial vehicles on west side	83 snowcoaches per day West - 37 South - 12 North - 15 East - 0 Old Faithful/ Park-wide - 19 All must meet snowcoach BAT

	Alternative 1: Continued Temporary Plan	**Alternative 2: Snowcoaches Only**	**Alternative 3: 3A: Most Road Grooming Eliminated 3B: Oversnow Roads Closed (No Action)**	**Alternative 4: Expanded Recreational Use**	**Alternative 5: New Management Tools and Improved BAT**	**Alternative 6: Mixed Use**	**Alternative 7: Revised Preferred Alternative**
Road Grooming	Continue road grooming, except Sylvan Pass would be closed. The Madison to Norris road may be closed, depending on the bison-road experiment.	Continue road grooming, except Sylvan Pass would be closed. The Madison to Norris road may be closed, depending on the bison-road experiment.	3A: Only groom South to Old Faithful. All other segments ungroomed and closed to all travel. 3B: No roads groomed for recreational access	Continue road grooming. The Madison to Norris road may be closed, depending on the bison-road experiment.	Continue road grooming. The Madison to Norris road may be closed, depending on the bison-road experiment.	Plow Mammoth to West Yellowstone to Old Faithful. Groom Old Faithful to South to Lake to Canyon to Norris. Sylvan Pass would be closed. The Madison to Norris road may be closed, depending on the bison-road experiment.	Continue road grooming, except Sylvan Pass would be closed beginning in 2008. The Madison to Norris road may be closed, depending on the bison-road experiment.
Non-motorized Use in YNP (no changes planned for GTNP)	Allowed subject to Winter Severity Index; increased use on South and East entrance roads during the spring opening shoulder season.	Same as for alternative 1	3A: Limited to groomed ski routes and boardwalks. Majority of park closed to non-motorized travel. 3B: Allowed subject to Winter Severity Index	Same as for alternative 1	Same as for alternative 1	Same as for alternative 1	Same as for alternative 1
Estimated maximum number of daily vehicle passengers in YNP	Snowmobile passengers - 936 Snowcoach passengers - 624 Total - 1560	Snowmobile passengers - 0 Snowcoach passengers - 960 Total - 960	Snowmobile passengers - 325 Snowcoach passengers - 160 Total - 485	Snowmobile passengers - 1333 Snowcoach passengers - 920 Total - 2253	Snowmobile passengers - 702 Snowcoach passengers - 664 Total - 1366	Snowmobile passengers - 455 Snowcoach passengers - 320 Wheeled vehicle passengers - 2000 Total - 2775	Snowmobile passengers - 702 Snowcoach passengers - 664 Total - 1366

Note that historically, a peak of 2,140 visitors toured Yellowstone daily, and that currently, an average of 570 tour it daily.

Table 2-15: Summary and Comparison of Direct and Indirect Impacts by Resource[1]

Alternative 1	Alternative 2	Alternative 3A/B	Alternative 4	Alternative 5	Alternative 6	Alternative 7
Air Quality and Air Quality Related Values						
Emissions: moderate, short-term and adverse impacts due to CO emissions (6% of historic CO emissions). Visibility: negligible impact	Emissions: negligible, short-term and adverse impacts due to CO emissions (1.2% of historic CO emissions). Visibility: negligible impact	Emissions for 3A: minor, short-term and adverse impacts due to CO emissions (1.9% of historic CO emissions). Visibility for 3A: negligible impact 3B: No emissions or visibility impacts	Emissions: major, short-term and adverse, impacts due to CO emissions (8.9% of historic CO emissions). Visibility: negligible impact	Emissions: negligible to minor, short-term, and adverse impacts due to CO emissions (1.6% of historic CO emissions). Visibility: negligible impact	Emissions: moderate, short-term, and adverse impacts due to CO emissions (3.4% of historic CO emissions). Visibility: moderate, short-term, localize, and adverse impacts due to road sanding operations.	Emissions: moderate, short-term, and adverse impacts due to CO emissions (4.4% of historic CO emissions). Visibility: negligible impact
Health and Safety						
Minor to moderate, short-term, and adverse impacts due to 1) closure of Sylvan Pass; 2) continued use of BAT and guiding requirements; and 3) snowcoach BAT requirements	Minor to moderate, short-term, and adverse impacts due to 1) closure of Sylvan Pass; 2) elimination of snowmobile use; and 3) snowcoach BAT requirements	Minor, adverse and short-term impacts due to 1) closure of Sylvan Pass; 2) continued use of BAT and guiding requirements; 3) snowcoach BAT requirements; and 4) closure of most or all park roads to OSVs and concomitant elimination of noise and contaminant exposure.	Major, long-term and adverse impacts due to 1) continued avalanche control on Sylvan Pass; 2) increase in snowmobile numbers; 3) provision for possible unguided snowmobile use; 4) use of some two-stroke machines in GTNP; and 5) use of BAT snowmobiles and snowcoaches.	Major, long-term and adverse impacts due to 1) continued avalanche control on Sylvan Pass; 2) provision for unguided snowmobile use; and 3) use of BAT snowmobiles and snowcoaches.	Minor to moderate, short-term and adverse impacts due to 1) closure of Sylvan Pass; 2) continued use of BAT and guiding requirements; 3) snowcoach BAT requirements; and 4) plowing of some roads and concomitant reductions in exposure to air toxics, noise, and unsafe touring behavior.	Minor to moderate, short-term, and adverse impacts due to 1) closure of Sylvan Pass; 2) continued use of BAT and guiding requirements; and 3) snowcoach BAT requirements
Wildlife						
Bison and Elk: negligible to moderate, adverse and short-term impacts due to	Bison and Elk: negligible to moderate, adverse and short-term impacts due to	Bison and Elk: negligible to minor, adverse and short-term impacts due to behavioral/	Bison and Elk: minor to moderate, adverse and short-term impacts due to vehicle-caused	Bison and Elk: negligible to moderate, adverse and short-term impacts due to	Bison and Elk: negligible to moderate, adverse and short-term impacts due to	Bison and Elk: negligible to moderate, adverse and short-term impacts due to

[1] Impacts displayed in Table 2-13 are summarized here from the impact topic definitions and analyses in Chapter IV.

Alternative 1	Alternative 2	Alternative 3A/B	Alternative 4	Alternative 5	Alternative 6	Alternative 7
displacement and behavioral/ physiological effects. Wolves: negligible to moderate, adverse and short-term impacts due to displacement, behavioral, and physiological effects. Lynx and Wolverines: negligible, adverse and short-term impacts due to closure of Sylvan Pass. Coyotes and Ravens: negligible, short-term and adverse effects due to provisions for 100% guiding. Bald Eagles and Swans: negligible to moderate, adverse and short-term impacts due to displacement, behavioral, physiological, and demographic effects.	displacement and behavioral/ physiological effects. Wolves: negligible to moderate, adverse and short-term impacts due to displacement, behavioral, and physiological effects. Lynx and Wolverines: negligible, adverse and short-term impacts due to closure of Sylvan Pass. Coyotes and Ravens: negligible, short-term adverse effects due to provisions for 100% guiding. Bald Eagles and Swans: negligible to moderate, adverse and short-term impacts due to displacement, behavioral, and physiological effects.	physiological effects. Wolves: effects would be negligible, adverse and short-term for either alternative 3A or 3B. Lynx and Wolverines: negligible, adverse and short-term impacts due to closure of Sylvan Pass. Coyotes and Ravens: negligible, short-term adverse effects due to provisions for 100% guiding. Bald Eagles and Swans: negligible to minor, adverse, short-term impacts under 3A due to displacement, behavioral, and physiological effects; impacts from 3B would be negligible.	mortality, displacement, behavioral/ physiological and demographic effects. Wolves: minor to moderate, adverse, and short-term impacts due to vehicle-caused mortality, displacement, behavioral, and physiological effects. Lynx and Wolverines: negligible to minor, adverse and short-term impacts due to vehicle-caused mortality, displacement, behavioral, and physiological effects. Coyotes and Ravens: minor, adverse and short-term impacts due to provisions for some unguided access. Bald Eagles and Swans: negligible to moderate, adverse, short-term impacts due to vehicle-caused mortality, displacement, behavioral, physiological and demographic effects.	displacement and behavioral/ physiological effects. Wolves: negligible to moderate, adverse, short-term impacts due to displacement, behavioral, and physiological effects. Lynx and Wolverines: negligible to minor, adverse, short-term impacts due to displacement, behavioral, and physiological effects. Coyotes and Ravens: adverse, minor, and short-term impacts due to provisions for some unguided access. Bald Eagles and Swans: negligible to moderate, adverse, short-term impacts due to displacement, behavioral, and physiological effects.	vehicle-caused mortality, displacement, and behavioral/ physiological effects. Wolves: negligible to moderate, adverse, and short-term impacts due to vehicle-caused mortality, displacement, behavioral, and physiological effects. Lynx and Wolverines: negligible to minor, adverse, short-term impacts due to closure of Sylvan Pass but possible vehicle-caused mortality. Coyotes and Ravens: negligible, short-term, and adverse impacts due to provisions for 100% guiding. Bald Eagles and Swans: negligible to moderate, adverse, and short-term impacts due to vehicle-caused mortality, displacement, behavioral, and physiological effects.	displacement and behavioral/ physiological effects. Wolves: negligible to moderate, adverse, short-term impacts due to displacement, behavioral, and physiological effects. Lynx and Wolverines: negligible, adverse, short-term impacts due to displacement, behavioral, and physiological effects. Coyotes and Ravens: negligible, short-term and adverse effects due to provisions for 100% guiding. Bald Eagles and Swans: negligible to moderate, adverse, short-term impacts due to displacement, behavioral, and physiological effects.

Alternative 1	Alternative 2	Alternative 3A/B	Alternative 4	Alternative 5	Alternative 6	Alternative 7
Natural Soundscapes						
Percent of park area in which non-natural sounds would be audible: moderate, adverse, and short-term impacts (YNP and GTNP). Percent time audible: major (YNP) to minor (GTNP), adverse, and short-term impacts. Maximum sound levels: minor, adverse, short-term (YNP and GTNP).	Percent of park area in which non-natural sounds would be audible: moderate, adverse, and short-term impacts (YNP). Percent time audible: major, adverse, and short-term impacts (YNP). Maximum sound levels: minor, adverse, short-term (YNP). No impacts to GTNP.	Percent of park area in which non-natural sounds would be audible: negligible impacts (YNP and GTNP). Percent time audible: moderate, adverse, and short-term impacts (YNP), negligible to GTNP. Maximum sound levels: negligible impacts (YNP and GTNP).	Percent of park area in which non-natural sounds would be audible: moderate (YNP) to major (GTNP), adverse, and short-term impacts. Percent time audible: major (YNP) to moderate (GTNP), adverse, and short-term impacts. Maximum sound levels: minor, adverse, short-term (YNP and GTNP).	Percent of park area in which non-natural sounds would be audible: moderate, adverse, and short-term impacts (YNP and GTNP). Percent time audible: major (YNP) to minor (GTNP), adverse, and short-term impacts. Maximum sound levels: minor, adverse, short-term (YNP and GTNP).	Percent of park area in which non-natural sounds would be audible: moderate, adverse, and short-term impacts (YNP and GTNP). Percent time audible: moderate, adverse, and short-term (YNP) to negligible (GTNP) impacts. Maximum sound levels: negligible impacts (YNP and GTNP).	Percent of park area in which non-natural sounds would be audible: moderate, adverse, and short-term impacts (YNP and GTNP). Percent time audible: major (YNP) to moderate (GTNP), adverse, and short-term impacts. Maximum sound levels: minor, adverse, short-term (YNP and GTNP).
Visitor Access and Circulation						
Minor, adverse and long-term localized impacts due to closure of Sylvan Pass.	Impacts vary by mode of transportation: major, adverse, long-term impacts to those who prefer snowmobile travel; major beneficial impacts to those who prefer to snowcoach. Minor, adverse, long-term and localized impacts due to closure of Sylvan Pass.	Major, adverse and long-term impacts due to greatly reduced access (3A) or no motorized access (3B).	Negligible impacts due to ample motorized visitor access.	Minor, adverse and long-term impacts due to ample motorized visitor access but restricted limit, although flexible daily limit would provide more access on busy days.	Impacts vary by mode of transportation: moderate adverse to moderate beneficial in Yellowstone (wheeled vehicle access on west side roads; closure of East Entrance to through travel). All impacts would be long-term.	Minor, adverse and long-term localized impacts due to closure of Sylvan Pass.
Visitor Experience						
Minor adverse and long-term impacts, primarily from potentially rough roads and Sylvan Pass closure.	Minor adverse and long-term impacts, primarily from snowcoach slowness, snowcoach ruts, and Grand Teton closures	Major adverse and long-term impacts: decreased opportunities to view wildlife and scenery.	Moderate adverse long-term impacts due to Non-BAT snowmobiles in GTNP, high number of snowmobiles in	Minor adverse long-term impacts (similar to alternative 1) due to safety problems from unguided access and increased OSV	Minor adverse long-term impacts (similar to alternative 1) due to possible crowding at Old Faithful and possible localized	Minor adverse and long-term impacts, primarily from Sylvan Pass closure.

Alternative 1	Alternative 2	Alternative 3A/B	Alternative 4	Alternative 5	Alternative 6	Alternative 7
	for some visitors.		both parks, and safety problems from unguided access.	travel during peak periods which can reduce opportunities for quiet and solitude and clean air.	visibility degradation.	
Socioeconomics[2]						
Compared to 1997-1998 historic use: negligible, adverse to beneficial in the three-state, five-county, Cody and Jackson areas, and negligible adverse to minor beneficial in West Yellowstone. Compared to the no action alternative: negligible beneficial in the three-state, five-county, Cody and Jackson, WY areas, and minor to major beneficial in West Yellowstone.	Compared to 1997-1998 historic use: negligible, adverse to beneficial in the three-state, five-county, Cody and Jackson areas; moderate adverse to negligible beneficial for West Yellowstone. Compared to the no action alternative: negligible beneficial in the three-state, five-county, Cody and Jackson, WY areas and negligible to moderate beneficial for West Yellowstone, MT.	Compared to 1997-1998 historic use: negligible adverse in the three-state, five-county, Cody and Jackson areas and negligible to major adverse for West Yellowstone. Compared to the no action alternative: negligible beneficial in all areas.	Compared to 1997-1998 historic use: negligible, adverse to beneficial in the three-state, five-county, Cody and Jackson areas and negligible adverse to moderate beneficial for West Yellowstone. Compared to the no action alternative: negligible beneficial in the three-state, five-county, Cody and Jackson, WY areas and minor beneficial to major beneficial for West Yellowstone.	Compared to 1997-1998 historic use: Negligible adverse to negligible beneficial in the three-state, five-county, Cody and Jackson areas and negligible adverse to minor beneficial for West Yellowstone. Compared to the no action alternative: Negligible Beneficial in the three-state, five-county, Cody and Jackson areas and minor beneficial to major beneficial for West Yellowstone.	Compared to 1997-1998 historic use: Negligible adverse to negligible beneficial in the three-state, five-county, Cody and Jackson areas and negligible adverse to moderate beneficial in West Yellowstone. Compared to the no action alternative: Negligible beneficial in the three-state, five-county, Cody and Jackson areas and negligible beneficial to major beneficial for West Yellowstone.	Compared to 1997-1998 and 2001-2002 historic use: Negligible adverse to beneficial in the three-state, five-county, Cody (1997-1998 only) and Jackson areas. Negligible adverse to minor beneficial in West Yellowstone. Minor adverse in Wapiti, WY. Compared to 2001-2002 historic use: Negligible adverse in Cody. Compared to the no action alternative: negligible beneficial in the three-state, five-county, Cody and Jackson areas. Minor to moderate beneficial in West Yellowstone. Negligible adverse in Wapiti.

[2] The economic impacts are the IMPLAN outputs as compared to the definition of impacts in Chapter IV. A negligible impact means that the impact is difficult to detect at the state, 5-county, or community level. It does not mean that within any of those three levels adverse (or positive) effects are not occurring. Individual business or geographic-area impacts are discussed in Chapter IV.

2.9 Current and Historical Use Levels

Table 2-16: Current Conditions / Actual Use Levels in Yellowstone National Park (average daily entries) (2005-2006)

Entrance	Commercially Guided Snowmobiles	Commercially Guided Snowcoaches
West Entrance	153	14
South Entrance	89	5
East Entrance	8	1
North Entrance	5	6
Old Faithful	5	3 (Park-wide)
Total	260	29

Table 2-17: Current Conditions / Actual Use Levels in Grand Teton and the Parkway (average daily snowmobile entries) (2005-2006)

Entrance	Snowmobiles
CDST	< 1*
Grassy Lake Road (Flagg-Ashton Road)	<10
Jackson Lake	<10
Total	<20

*Actual use during 2004-2005 and 2005-2006 totaled 11 and 17 snowmobiles, respectively, on the CDST (for the entire winter).

Table 2-18: Historical (Unregulated) Use Levels in Yellowstone National Park (1990s)

Entrance	Snowmobiles (average peak daily entries)	Snowmobiles (average daily entries)	Commercially Guided Snowcoaches (average peak daily entries)	Commercially Guided Snowcoaches (average daily entries for 2000-2006)
West Entrance	947	538	20	12
South Entrance	310	176	7	6
East Entrance	62	35	1	0.2
North Entrance	28	16	5	4
Old Faithful	53	30	7 (Park-wide)	4
Total	1400	795	40	26

Table 2-19: Historical (Unregulated) Use Levels in Grand Teton and the Parkway (1990s)

Entrance	Snowmobiles (average peak daily entries)	Snowmobiles (average daily entries)
CDST	35	25
Grassy Lake Road (Flagg-Ashton Road)	25	25
Jackson Lake	35	25
Total	95	75

CHAPTER III: AFFECTED ENVIRONMENT

3.1 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 Chapter IV. 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 Chapter I.

Due to the history of winter use issues in the Greater Yellowstone Area (see Section 1.1.1 History), and the park units in particular, the affected environment must be portrayed in several contexts. First, the historical condition generally conveyed in the purpose and need for action (Chapter I) is described in greater detail in this section. These conditions necessitate a permanent change in management (a new plan). Second, under the temporary management plan in effect through the winter of 2006-2007, use types and levels were different than they were historically; this has resulted in different resource conditions. Also, under the temporary plan, winter motorized use occurred at a level considerably below authorized level. Therefore, this section also describes the "current conditions" in order to gauge the effects of alternatives evaluated in this EIS.

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.

3.2 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 EIS 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.

3.2.1 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 February 17 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.

3.2.2 NPS Employees and Concessions

Approximately 75 permanent and seasonal NPS employees plus their family members 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 wide array of historic buildings, including National Historic Landmarks such as the Old Faithful Inn and the Fishing Bridge, Madison, and Norris museums.

The employees living in the park'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. Due to their unique situation, using snowmobiles for both work-related and personal use is clearly appropriate under Executive Orders and policy.

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 snowmobiles and snowcoaches in the park for administrative access to repair or tow disabled vehicles. These and other administrative uses are necessary for the parks to carry out their missions in accordance with the NPS Organic Act, and are focused on ensuring the health and safety of visitors and park residents, providing for public enjoyment of the parks, and protecting park resources.

While most permanent interior NPS employees must own a snowmobile as a precondition of employment, interior-based concessions employees do not have such a requirement. Guests of any employees are encouraged (and, as an action common to all alternatives, will be required) to utilize best available technology (BAT) OSVs when authorized to enter the park. Permitted researchers are encouraged (and again as an action common to all alternatives, will be 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) will include a BAT requirement. Older contracts do 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. Other administratively authorized snowmobiles, such as employee-owned snowmobiles, are encouraged to meet BAT requirements (and as an action common to all alternatives, must meet BAT requirements beginning in the 2011-2012 season).

In addition to administrative snowmobiles, YNP operates 38 other oversnow vehicles. These include ten groomers, six snowcoaches, and assorted pickups, vans and utility vehicles, ambulances, and fire engines.

The NPS's goal in Yellowstone is to operate its snowmobiles no more than five winters to minimize repair and maintenance costs and to ensure the health and safety of its employees. Snowmobiles cost an average of $7,660 each. An average of 1,700 miles is put on each snowmobile per winter. The park uses about 23,000 gallons of bio-diesel (primarily for grooming equipment) and about 14,000 gallons of ethanol blend gasoline per winter in its oversnow fleet (average of the winters 2002-03 through 2005-06).

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 such as laundry and luggage service.

Under all alternatives considered in this document, the majority of the NPS winter operations would continue. While some operations would certainly be altered, curtailed, or eliminated under some alternatives, those changes do not represent an impact topic necessary to consider and/or they are considered as part of the other impact topics in this EIS. For example, the impacts of the closure of the majority of park roads to OSV travel and the probable closure of Old Faithful Snow Lodge under Alternative 3 (3A or 3B) all fall within the impact topics considered in this EIS (e.g. air quality, soundscapes, socioeconomics, wildlife, visitor access and circulation, visitor experience, and adjacent lands). Under any alternative, the NPS will alter its operations as needed, and those changes are effectively explained and considered as part of the analysis for each alternative.

3.2.3 Visitor Fuel Consumption by Alternative

Visitors sometimes need to refuel their snowmobiles and snowcoach drivers often refuel their coaches in the parks, making estimates of the fuel storage needed in Yellowstone necessary for park managers. Consequently, an analysis of the fuel that would be consumed under each alternative was completed. To facilitate comparison of fuel utilization between alternatives, this analysis assumed that 100 visitors would enter under the provisions of each alternative, that all visitors entered via the South and West Entrances, that all visitors took the same 70-mile roundtrip tour, and that both their choice of transportation modes and ridership per vehicle replicated current conditions.

One hundred visitors and the fuel they would consume is a number that is easily multiplied to obtain the estimated fuel consumed under each alternative, using the estimated total number of visitors each alternative would accommodate as provided in Table S-3, and 85 days as the average season length. Because relatively few oversnow visitors enter by the East and North gates and because the former would be closed under five of the seven alternatives, this analysis assumed that all visitors would enter by the West and South Entrances and that 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. For alternative 3, all visitors were assumed to enter via the South Entrance because the West Entrance would be closed (the analysis still assumed the 70-mile roundtrip tour to provide the best comparison between alternatives). 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 alternative 6, all visitors entering the West Entrance were assumed to travel by bus because the road from there to Old Faithful would be 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 (the same average used in computing the figures in Table S-3).

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 same nine gasoline-fueled coaches (tested by Bishop et al. over the two years) used to model BAT snowcoach emissions in the air quality modeling for this EIS, along with the two diesel coaches used in the same testing and modeling. The average 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 buses get[1] (assuming, as the modeling did, 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 Alternatives 1, 4, 5, and 7. Alternative 3 would be slightly less at 225 gallons, reflecting the smaller proportion of visitors (relative to those entering the West Entrance under the other alternatives) touring by snowcoach through the South Entrance if that alternative were adopted. Visitors touring by the snowcoach-only provisions of Alternative 2 would consume the most fuel, 255 gallons. Visitors touring by the mix of vehicles in Alternative 6 would consume less than half as much fuel as those touring via any other alternative, 100 gallons, reflecting the efficiency of mass transportation vehicles such as buses and vans in conveying people.

Managers can use this information to derive estimates of the fuel they need to have on hand at the beginning of each winter season at Old Faithful and other park locations to resupply visitor vehicles throughout the winter (gas station tanks generally cannot be refilled once the winter season starts), depending on the provisions of whatever alternative is finally implemented in the park.

3.3 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).

3.3.1 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. The type and level of use to be allowed by NPS, as the steward of these lands, must be constrained to those which would not cause impairment of, or unacceptable impacts on, park resources and values (NPS 2006: 1.5).

[1] Wheeled vehicle mileage figures obtained from Rob Love (vans and large buses), personal communication with Mike Yochim, 2007, and John Sacklin (NPS new yellow buses), personal communication with Yochim, 2007.

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 2006b: 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 2006b: 8.1). Appropriate visitor activities (NPS 2006b: 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 2006b: 1.6) and the process of civic engagement (NPS 2006b: 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 2006b).

3.3.2 New Information Considered in This Analysis

The NPS last analyzed the socioeconomic impacts of winter use management in the Greater Yellowstone Area (GYA) in 2004 (in the Temporary Winter Use Plans EA, NPS 2004b). Since that analysis, new information has become available that is relevant to the present consideration of winter use management alternatives. This new information includes the 2003 IMPLAN data and Mactec et al. (2005), which provide an economic analysis of the costs and benefits of winter use management. Additionally, Global Insight (2005), the Institute for Tourism and Recreation Research (2003), and Wyoming Travel and Tourism (undated) were also considered. Also, a paper on winter economic trends for Park County, Wyoming was received after the DEIS went to press (Taylor 2007). With the exception of Taylor (2007), Mactec et al. (2005) and the 2003 IMPLAN data, this information is too general to provide relevant information for the present analysis.

The economy of the GYA associated with winter use management, taking into account relevant new information, is described in an analysis prepared for the NPS (Duffield and Neher 2006). Between the draft and final EIS, additional economic analysis occurred to address comments. The NPS requested analysis of economic impacts on the Wapiti, Wyoming area (the unincorporated area between Cody, Wyoming and Yellowstone's East Entrance, also referred to as the North Fork of the Shoshone, or the "North Fork"). In addition, the NPS requested a second historic economic baseline (2001-2002) be used. The winter 2001-2002 was considered as another baseline since it represents the winter with the highest winter visitation in recent years (and nearly equal to the peak winters in the early

1990s) (Duffield and Neher 2007). The documents are incorporated by reference into this EIS, and readers are encouraged to refer to specific documents for the technical details of the analysis.

3.3.3 Existing and Historic Socioeconomic Condition

3.3.3.1 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 section 4.3.1 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 2003a), and EA (NPS 2004b) 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 3-1 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 3-1: 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.

3.3.3.2 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 Chapter IV 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 Section 3.8.5 in this chapter.

3.3.3.3 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 in Section 3.8.5, however, there have been noteworthy declines in both snowmobile visits and total winter visitation to YNP in the past four 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 3-2 and Figure 3-1 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 3-2: 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

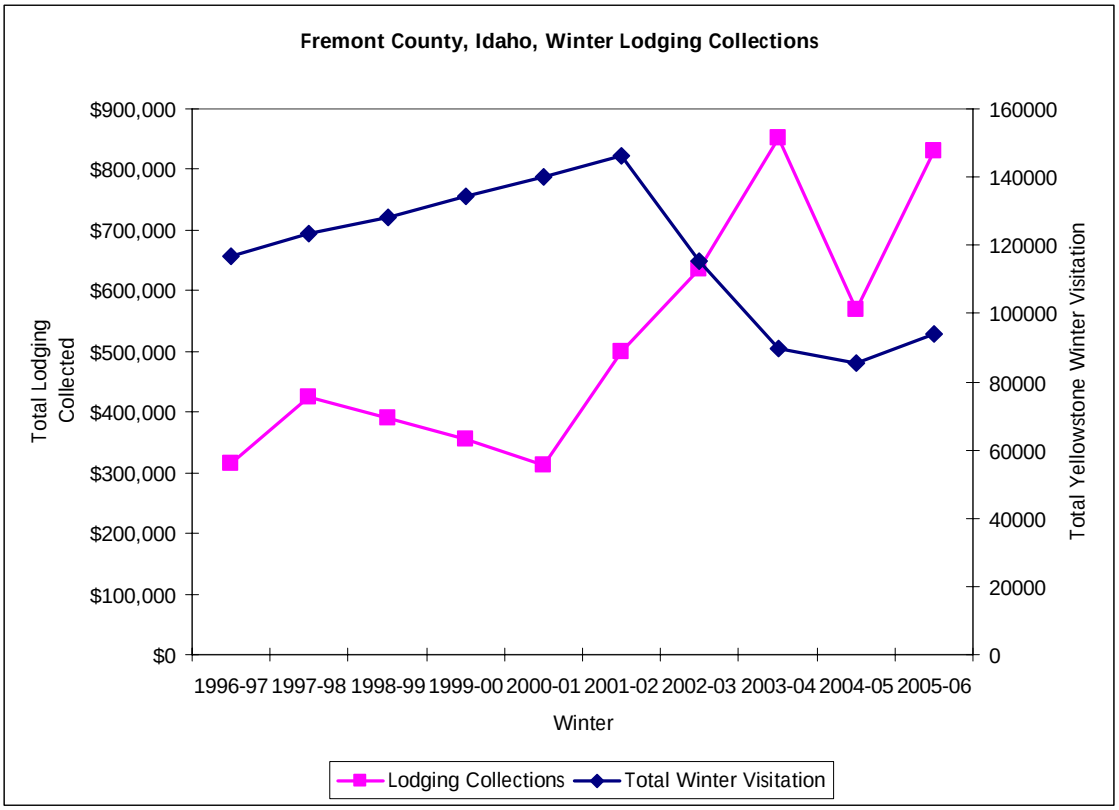


Figure 3-1: Comparison of Fremont County, Idaho, Winter Lodging Collections and Yellowstone National Park Winter Visitation, 1996-1997 through 2005-2006
Note: Original figure is in color; printing costs precluded use of color. The reader may obtain the color version at http://www.nps.gov/yell/parkmgmt/winterusetechnicaldocuments.htm.

Table 3-3 and Figure 3-2 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 3-3: 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.

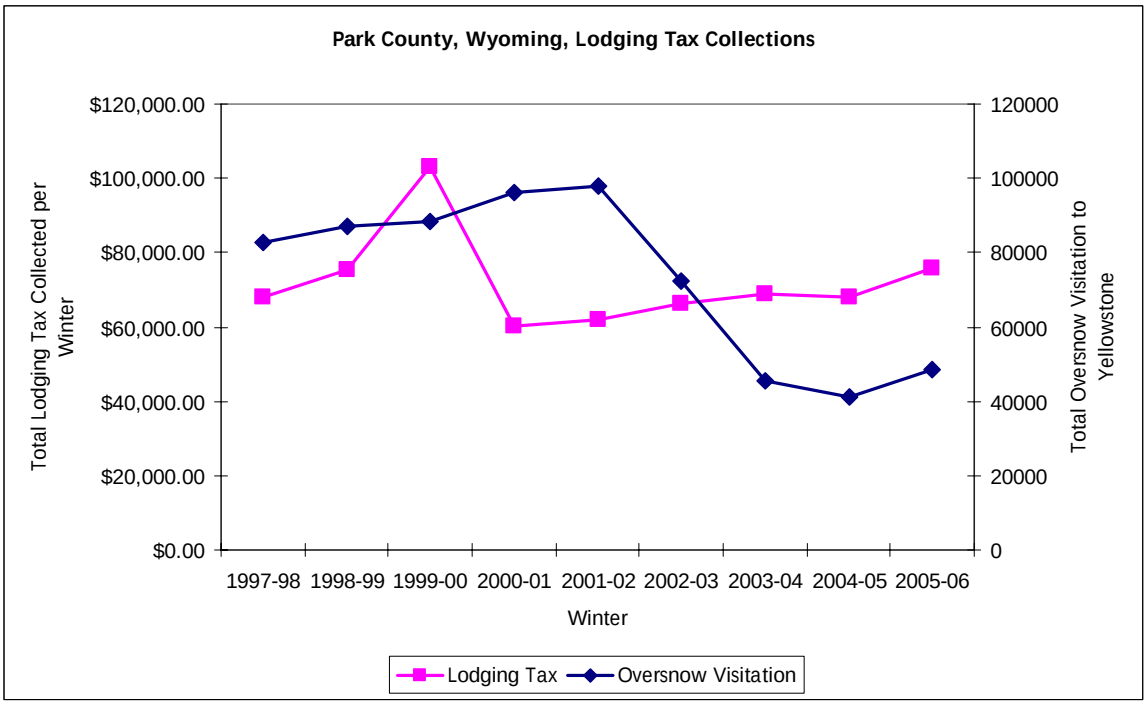


Figure 3-2: Comparison of Park County, Wyoming, Winter Lodging Tax Collections, and Yellowstone National Park Oversnow Visitation, 1997-1998 through 2005-2006

The recent lodging and tax data for Fremont and Park counties (the only lodging tax data provided to the NPS by the cooperating agencies) 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. 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 which 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 and the Temporary Winter Use Plan (NPS 2004b) has not 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, which 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 3-2 and 3-3 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 (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 looking at 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 3-4 provides time series data for this entrance, shown graphically in Figure 3-3. 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 3-4: 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

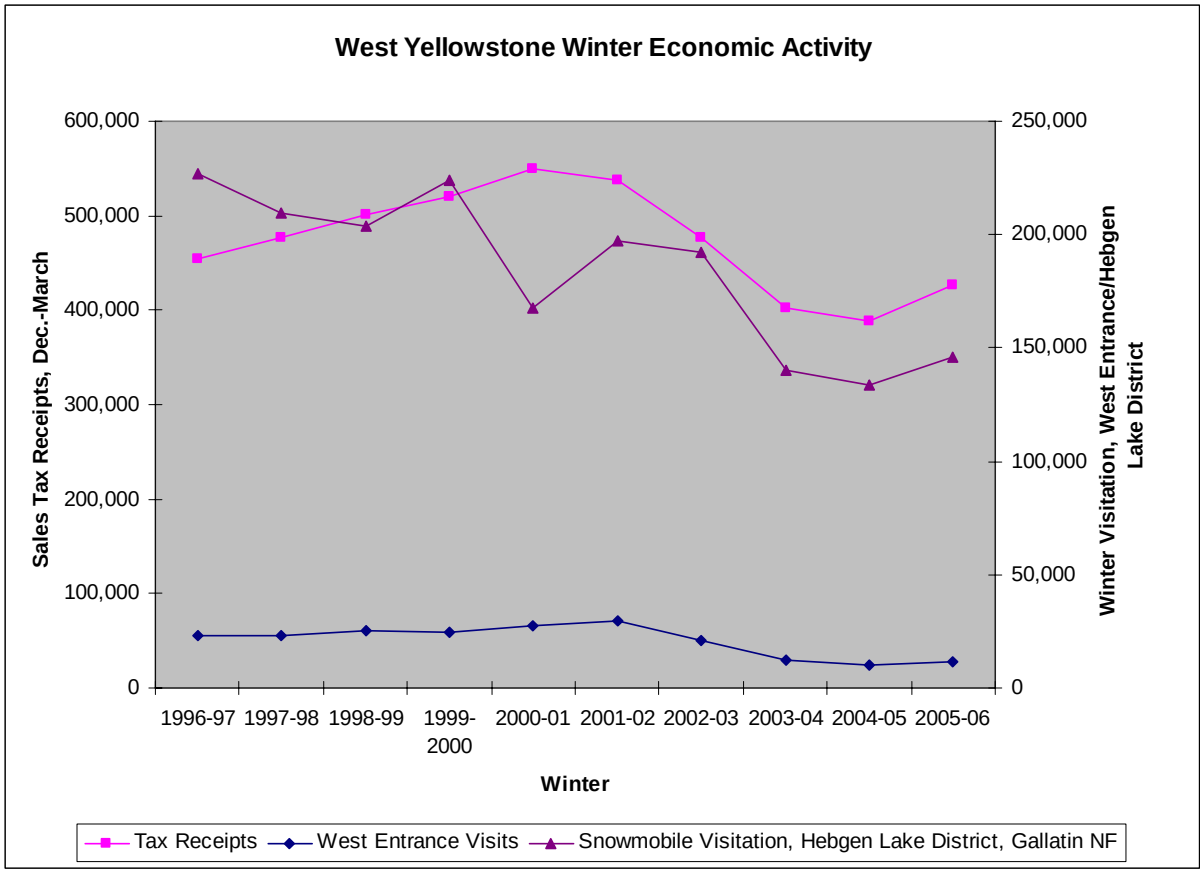


Figure 3-3: West Yellowstone Winter Resort Tax Collections, Hebgen Lake District Snowmobile Use, and Yellowstone West Entrance Winter Visits, 1996-1997 through 2005-2006

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 3-4 and Figure 3-3 also present data for snowmobile use on the Hebgen Lake District of the Gallatin National Forest.[2] This district includes many miles of groomed snowmobile trails that are accessed 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 the drought and relatively low snow pack in recent years, including the winter of 2004-2005. In any case, these data suggest

[2] Ron Neighbors, Hebgen Lake District Office of the Gallatin National Forest, personal communication with John Duffield of the University of Montana, telephone and fax, 2002; Claude Coffin, Assistant District Ranger of Gallatin National Forest, personal communication with John Duffield, telephone 2006.

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 in an annual winter monitoring report for 2005-2006 (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.[3] 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 3-5, and show an increase in 2004-2005 and 2005-2006.

Table 3-5: 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 3-6. 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 3-7 for 1993-1994 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.[4]

The Greater Yellowstone Coordinating Committee has undertaken a winter use monitoring strategy on the six national forests adjoining YNP.[5] 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.

[3] Bill Davis, Ashton-Island Park Ranger District of Targhee National Forest, telephone conversation with John Duffield, 2006.

[4] Susan Marsh, Recreation Planner for Bridger-Teton National Forest, telephone conversation with John Duffield, 2006.

[5] Mary Maj, Executive Coordinator for Greater Yellowstone Coordinating Committee, telephone conversation with John Duffield, 2006.

Table 3-6: 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 3-7: 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 3-4 and Figure 3-3 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 2003a), 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 3-4 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.

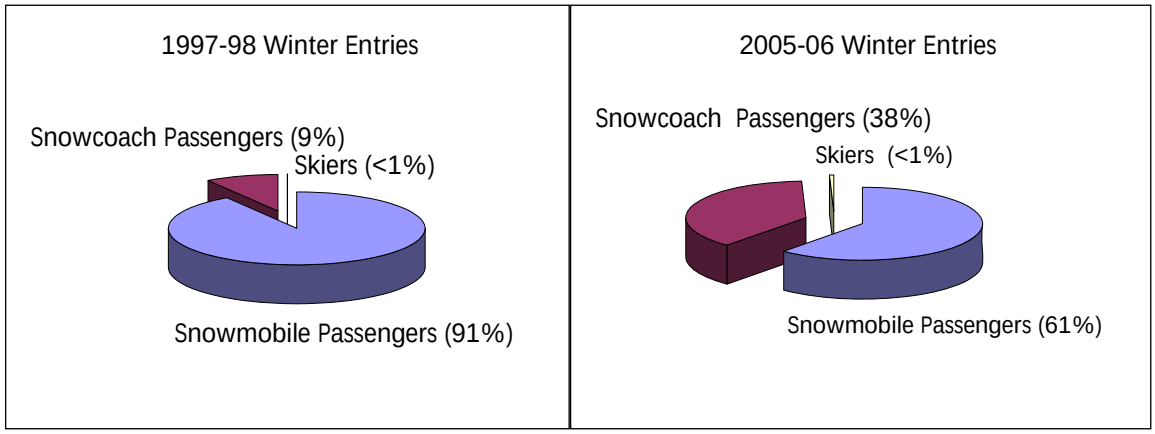


Figure 3-4: Comparison of West Entrance Use Distribution, 1997-1998 vs. 2005-2006

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.

3.4 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 air quality-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.

3.4.1 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 2006b: 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 (PM_{10} and $PM_{2.5}$), sulfur dioxide (SO2), and lead. The NAAQS of primary concern for this analysis (CO, PM_{10} and $PM_{2.5}$) are shown in Table 3-8.

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. HCs include air toxics or hazardous air pollutants such as benzene, formaldehyde, and 1,3 butadiene. 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.

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. 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 3-9 and 3-10, below.

Table 3-8: National Ambient Air Quality Standards

Pollutant	Primary		Secondary	
	PPM (parts per million)	ug/m3 (micro-grams per cubic meter)	PPM	ug/m3
Carbon Monoxide (CO) Maximum 8-Hour Concentration[1] Maximum 1-Hour Concentration[1] Maximum 1-Hour Concentration (Montana)[1]	 9 35 23			None
Respirable Particulates (PM10) Annual Arithmetic Mean[2] Maximum 24-Hour Concentration[1]		 50 150		Same as Primary
Respirable Particulates (PM2.5) Annual Arithmetic Mean[3] Maximum 24-Hour Concentration[4]		 15 65		Same as Primary

Notes:

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

[2] 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/m3.

[3] 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/m3.

[4] 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/m3.

PPM = parts per million; ug/m3 = micrograms per cubic meter

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

3.4.2 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 work also supports snowmobile BAT and the development of snowcoach BAT, and the data from this work was used in the modeling for this EIS (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 winters 2004-2005 and 2005-2006 for CO and $PM_{2.5}$ indicates that both pollutants were well below the level of national standards. Additionally, the historical decreasing trend in the number of snowmobiles is mimicked by decreasing CO concentrations and is the primary reason for the lower ambient CO concentrations. Sources of PM2.5 other than snowmobiles contribute to observed PM at Old Faithful. Summer traffic with wheeled-vehicles contributes a much smaller amount of CO and PM than winter activity by snowmobiles and snowcoaches (Ray 2005; Ray 2006; Ray 2007). Finally, 2005 results from the U.S. Geological Survey's ongoing snowpack chemistry research and trend analyses indicate that snow-

packed roadways used heavily by OSVs have higher concentrations of ammonium and sulfate than non-roadway areas (Ingersoll et al. 2005).

3.4.3 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 $PM_{2.5}$ are located at both the West Entrance and Old Faithful. The West Entrance monitors are operated throughout the year, while the Old Faithful monitors are typically operated from mid-December through mid-March. CO and $PM_{2.5}$ monitors were operated for the past two years at both locations and CO monitoring has been conducted at the West Entrance since 1998. Monitors were also operated for the 2002–2003 season at Flagg Ranch. A longer term trend for CO is provided in Figure 3-5 below, which shows trends in both snowmobile counts and maximum 1-hour CO concentrations since the 1998–1999 season. Tables 3-9 and 3-10 below provide a summary of the monitoring results for these locations. Since monitoring began in 1998 for CO and in 2002 for $PM_{2.5}$ at YNP, measured pollutant concentrations have steadily decreased, consistent with the decrease in number of snowmobile visits and the recent snowmobile technology emission requirements under the temporary plan. 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 0.8 ppm in 2006-2007 (Ray 2007). 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 2006-2007.

The highest measured 24-hour average $PM_{2.5}$ concentrations at the West Entrance have declined from 15 micrograms per cubic meter (ug/m3) in the 2002-2003 winter season to 8.8 ug/m3 in 2006-2007. At Old Faithful the highest measured 24-hour average PM2.5 concentrations have declined from 37 ug/m3 in the 2002-2003 winter season to 6.6 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.

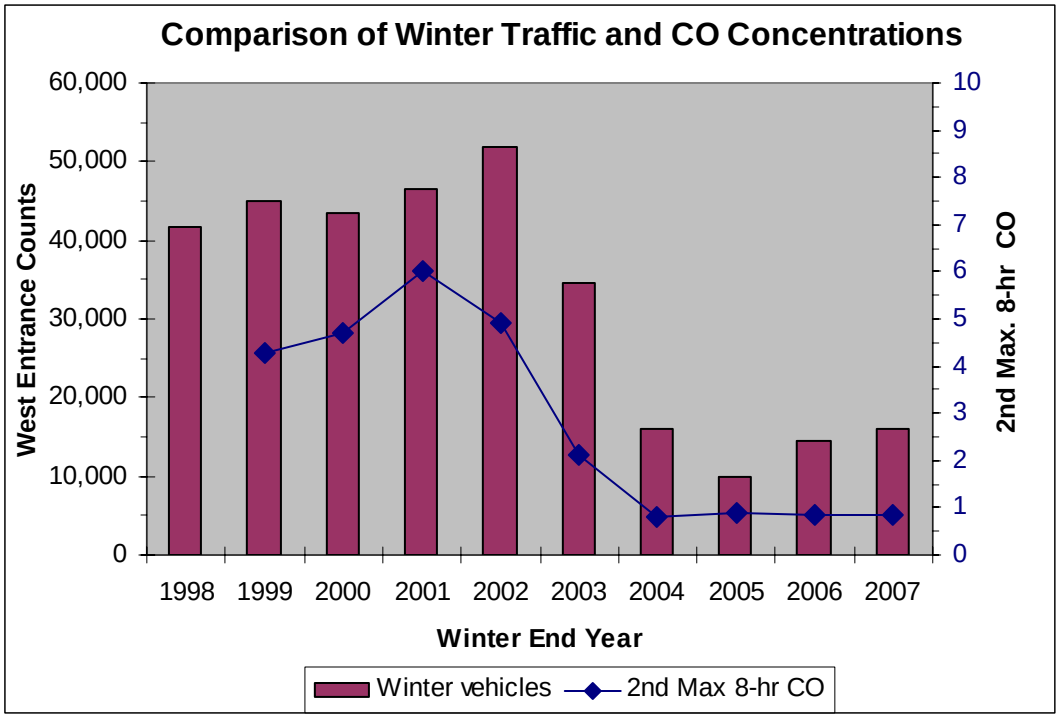
In addition to snowmobile and snowcoach emissions, an important driver of air quality is meteorological conditions. Days where inversions occur, with little or no wind, tend to facilitate the accumulation of pollution in areas where snowmobiles congregate, such as the West Entrance. This phenomenon was 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.

For comparative purposes, spring, summer, and fall CO levels are almost always less than 2 ppm (Coefield 2002). Other than one hour in August of 2000, all of the CO values measured at the West Entrance through March 2004 that exceeded 3 ppm were recorded during the winter and associated with snowmobile traffic. Historically, two-stroke snowmobiles have been the source of the vehicle emission and health-related complaints in YNP. Under historical conditions, increases in the number of snowmobiles in the parks intensified concerns regarding air pollution and its effects on the health of park employees, operators and riders of snowmobiles, and other visitors. A two-stroke engine that provides a high

power/weight ratio was the typical power plant used, and these engines produce relatively high emissions of CO, unburned hydrocarbons (HC), and fine particulate matter ($PM_{2.5}$) compared to modern automobile engines and they did not incorporate pollution control equipment. During the 2003–2004 season, two-stroke snowmobiles were largely replaced by four-stroke snowmobiles that met the BAT requirements for HC and CO. Since then, all recreational snowmobiles have met the BAT requirements, resulting in at least a 90% reduction in HC and a 70% reduction in CO emissions as compared to two-stroke snowmobiles. This change, combined with an overall reduction in snowmobiles from previous years and use of ethanol-enhanced fuels led to a marked reduction in ambient pollution levels.

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 3-5: 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 .

Table 3-9: Carbon Monoxide Concentration, in parts per million (ppm), 2002-2003 through 2006-2007

Location	Old Faithful					West Entrance				
Winter season Statistic CO	2006-2007 #	2005-2006	2004-2005	2003-2004	2002-2003	2006-2007	2005-2006	2004-2005	2003-2004	2002-2003
Max 1-hr	0.9	1.6	1.6	2.2	2.9	3.7	2.1	2.8	6.4	8.6
% of Std	3%	4%	4%	6%	8%	11%	6%	8%	18%	25%
Max 8-hr	0.4	0.5	0.8	0.9	1.2	0.8	0.9	1.0	1.3	3.3
% of Std	4%	6%	7%	10%	13%	9%	10%	11%	14%	37%
Average	0.27	0.18	0.12	0.26	0.24	0.19	0.23	0.24	0.26	0.57
90th percentile	0.19	0.26	0.29	0.5	0.5	0.27	0.40	0.43	0.5	1.3

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

Table 3-10: PM2.5 in micrograms per cubic meter (ug/m3), 2002-2003 through 2006-2007

Location	Old Faithful					West Entrance				
Winter season Statistic PM2.5	2006-2007 #	2005-2006	2004-2005	2003-2004	2002-2003	2006-2007	2005-2006	2004-2005	2003-2004	2002-2003
Max 1-hr	20	56	38	151	200	40	44	21	29	81
Max Daily (24-hr)	6.6	9	6	16	37	8.8	7	6	8	15
98th percentile[&]	6.4	9	9	9	21	8.7	6	6	7	17
% of Std	18%	13%	14%	14%	33%	25%	10%	9%	11%	26%
Average	3.3	3.5	4.0	4.9	6.9	2.1	1.9	2.9	4.0	8.2

[&] Based on NAAQS standard at the time of the measurement (65 ug/m^3)
The visitor parking and the monitoring station moved because of construction at Old Faithful
Source: Ray 2007. Standards are provided in Table 3-8: 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/m3.

3.5 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.

3.5.1 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 2006b: 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 2006b: 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 2006b: 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).

3.5.2 New Research and Monitoring

A 2005 study by Spear and Stephenson (2005) evaluated exposures at the West Entrance of Yellowstone for aldehydes, volatile organic compounds, total hydrocarbons, elemental and organic carbon, oxides of nitrogen, carbon monoxide, and respirable particulate matter. Spear and Stephenson, collaborating with Hart, conducted a similar study in 2006; the results of these studies and earlier work are discussed in this section.

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).

Chapter III air quality (3.4) and natural soundscapes (3.7) sections include recent monitoring data and analyses.

3.5.3 Existing and Historic Conditions

Although conditions are improved from 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. Information about each of these health and safety issues is addressed here. Avalanche control operations are also reviewed and analyzed 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.

In 1997, personal exposure measurements for carbon monoxide were conducted at the West Entrance (Radtke 1997). The 8-hour, time-weighted average[6] for carbon monoxide was between 2 and 4 parts per million (ppm). The OSHA permissible exposure limit[7] is 50 ppm and the threshold limit value[8] is 25 ppm. The more restrictive 8-hour National Ambient Air Quality Standard[9] 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. 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[10] 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[11] standard for benzene is 0.006 ppm for intermediate-duration inhalation exposures (15-364 days/year).

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[6] TWA- time weighted average, an allowable exposure concentration averaged over a normal 8-hour workday or a 40-hour workweek.

[7] 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.

[8] 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.

[9] National Ambient Air Quality Standards (NAAQS) are designed to include protection for sensitive populations including children, asthmatics, and the elderly.

[10] REL- recommended exposure limit set by NIOSH for an 8- or 10-hour time-weighted-average exposure.

[11] 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.

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).

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 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 (mean concentration of 0.0032 ppm). The MRL for chronic-duration (365 days/year) inhalation exposure is 0.003 ppm for benzene; the intermediate-duration inhalation exposure is 0.006 ppm and the PEL is 1.0 ppm. While the two benzene samples averaged slightly higher than the MRL, employees would have to be exposed to these levels every day of the year (which they are not) for a concern to be present. Rather, the two samples that were higher than 0.003 ppm were short term samples collected to minimize dilution effects and thereby portray potential worst case exposures. In addition, one of the tradeoffs in converting to BAT is that four-stroke machines produce more benzene (and some other hazardous air pollutants) than the two stroke engines used historically (Air Resource Specialists, Inc. 2006). Although 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. As noted below in Table 3-11, however, recent benzene exposures levels are an order of magnitude lower than they were when two-strokes were allowed in the parks—a decrease possibly attributable to fewer numbers of snowmobiles. Overall, emissions are well below federal safety levels; monitoring and adaptive management will continue.

Tables 3-11 through 3-15 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 3-11: 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 ppm[12] (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	

Table 3-12: 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 C)
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	

[12] ppm – parts per million

Table 3-13: 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 – average of 180 sleds, primarily four-strokes through west entrance	0.0065 ppm	No personal samples taken	Not used during 2005	
Spear, Hart, and Stephenson 2006 – average of 216 sleds, primarily four-strokes through west entrance	0.0063 ppm	No personal samples taken	Not used during 2006	

Table 3-14: 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 entrance	0.031 mg/m^3	No personal samples taken	Not used during 2006	

Table 3-15: 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 2005. 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[13] to 82.0 dBA. These levels are below the action level[14] 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.

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 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.[15]

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 3-16 and 3-17 below.

[13] 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.

[14] 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.

[15] 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 3-16: 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
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.'				

Table 3-17: 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 improved 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 closer to total summer emissions.

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 (the first time in Yellowstone's history). As shown in Figure 3-6, 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 turns, and when to turn the snowmobile on or off.

Figure 3-6 illustrates the declining number of law enforcement cases in the last four winters. After adjusting for reduced numbers, moving violations are down 78% from 2002-2003 to 2006-2007 (11 total last winter), total cases are down 48%, and there have been only 1-3 arrests each of the past four winter seasons as compared to 21 in 2002-2003 (72,560 OSV visitors in 2002-2003 and 52,155 OSV visitors in 2006-2007).

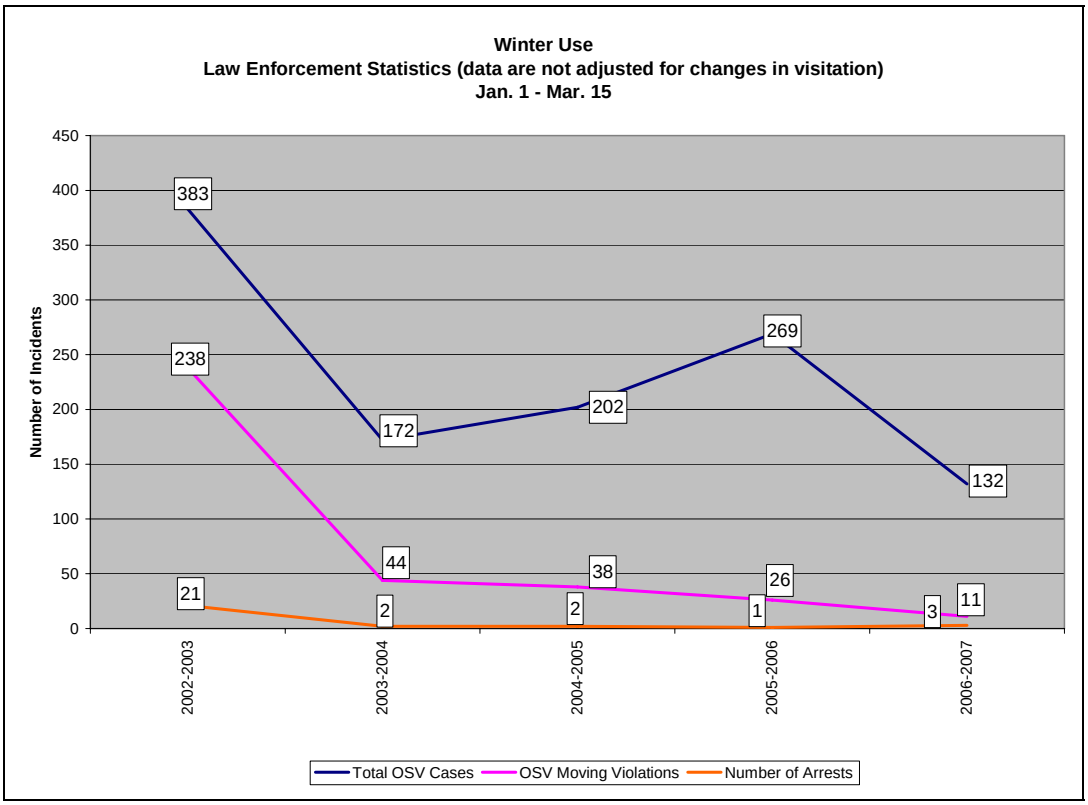

Figure 3-6: Winter Law Enforcement Statistics, January 1-March 15, 2002-2003 through 2006-2007

3.5.4 Avalanche Hazard Mitigation in Yellowstone National Park

NPS staff conducts avalanche control operations in YNP as needed. Routine forecasting and control occurs only on the East Entrance road to maintain Sylvan Pass for OSV travel; additional forecasting and control work may occur as a component of the spring road opening process, such as at Dunraven Pass, and in emergencies such as search and rescue operations. Although spring road opening operations and park emergencies may require avalanche control, those operations are outside the scope of this EIS. This discussion focuses on operations at Sylvan Pass, but also discusses parkwide operations and the Talus Slope area on the South Entrance Road. Additional information is found in Appendix H.

Sylvan Pass is an approximately one mile long portion of the East Entrance Road that splits the Absaroka mountain range near the eastern edge of YNP. The pass connects the park's East Entrance with Lake Village and goes between Top Notch Peak on the south and Hoyt and Avalanche Peaks on the north. Sylvan Pass is situated at an elevation of 8,530' and

receives a great deal of snow in the fall, winter, and spring. It is extremely windy and the nearly 45˚ slopes are prone to avalanches (Comey 2007) as indicated in Figure 3-7. 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 and swept down the slope, almost certainly to their deaths.

Figure 3-7: Sylvan Pass Area Avalanche Paths (marked by arrows).
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.

Since 1973, avalanche hazard mitigation work has been conducted on Sylvan Pass to accommodate snowmobile and snowcoach traffic (Yochim 2005). After an avalanche control mission is complete, a groomer smoothes the road surface to allow for tracked vehicle travel. Avalanche control methods have included a military howitzer, avalauncher, and helicopter dispensed explosives. Current control operations utilize both a 105mm howitzer on loan from the U.S. military and a contracted helicopter-dispensed explosives program (Ross et al. 2005; Keator 2006a; Comey 2007). Approximately two percent of winter visitors to YNP enter or exit the park via Sylvan Pass. Some interior-based employees travel the pass for weekend access to their homes in the Cody area.

As documented in the Winter Use Plans Final EIS (NPS 2000b), Final SEIS (NPS 2003a), and EA (NPS 2004b), the health and safety risks of operating an avalanche control program in YNP at Sylvan Pass are considerable. These risks have become better known in recent years, with at least two outside agencies (OSHA 2001; State of Montana 2004) examining and explaining some of the risks NPS incurs in its avalanche control program (in both cases, after completion of the 2000 EIS (NPS 2000b), which considered closing Sylvan Pass). Consequently, the NPS has adopted several mitigation measures to reduce the dangers to its employees and visitors, including installing a radio repeater on Top Notch Peak to improve

communications in the pass area, providing extensive and ongoing avalanche and howitzer training so that skilled staff perform control missions, conducting avalanche forecasting on site, constructing a berm above the howitzer platform to catch rock and cornice fall from the cliff behind it, and traveling to the pass in an ambulance on tracks to have safety equipment on site as well as a place for staff to warm themselves (National Park Service 1998a and 2003b).

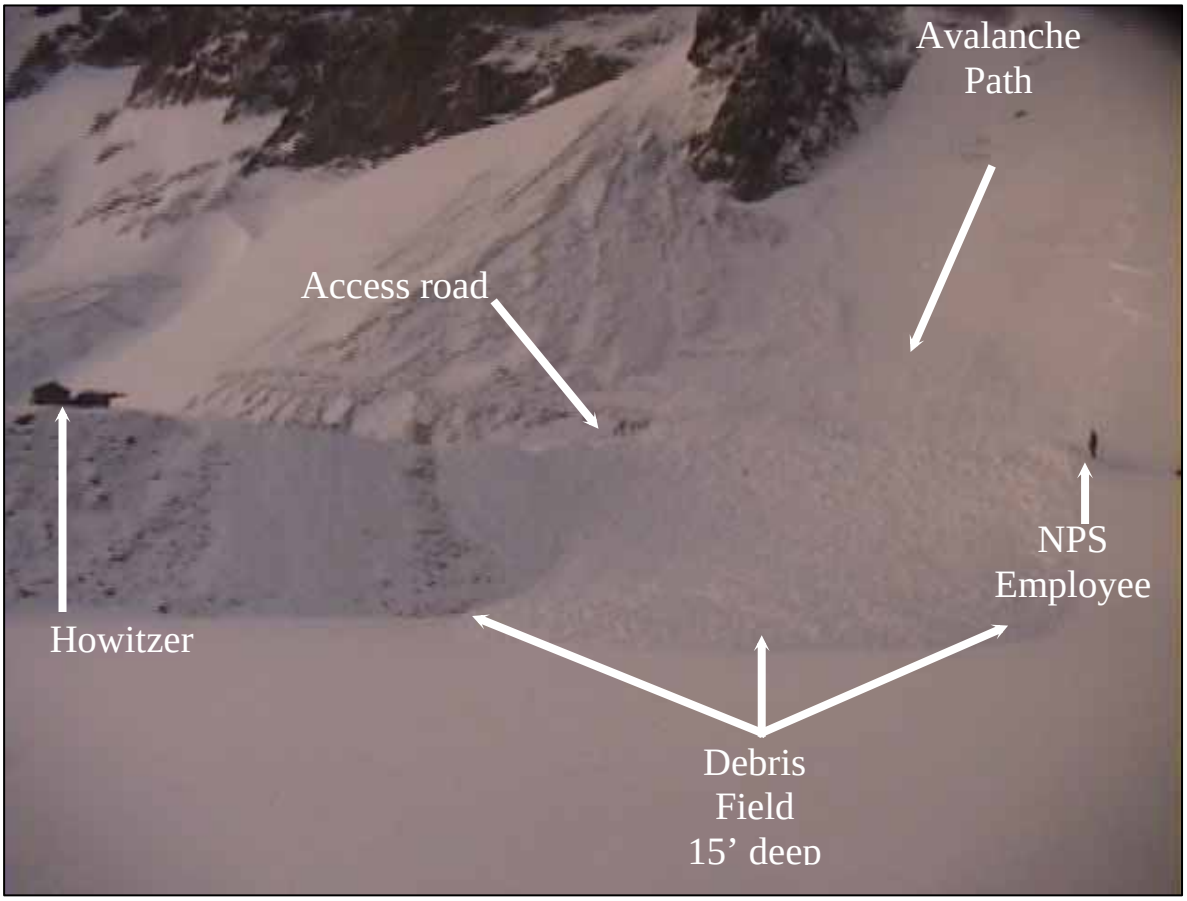

Figure 3-8: Avalanche that Crossed the Access Road to the Howitzer Platform

Even with these mitigations, the risks remain extreme and unavoidable. In a typical winter, about ten missions (not including missions for spring plowing) are required to control twenty avalanche paths at the pass (Figure 3-9 below highlights these paths). A single avalanche control mission requires a 10-hour work day for five to seven specially trained employees (Ross et al. 2005). They must pass through four active, uncontrolled avalanche zones to reach the howitzer. The howitzer location itself is still vulnerable to both avalanches and rock fall, since the howitzer platform sits below a corniced vertical face of unstable rock (Swanke 2004a). The howitzer and ammunition storage site present security concerns and the primary and backup howitzers are stored outside year-round, exposed to extreme temperatures (Ross et al. 2005). The howitzer cannot be moved without removing its ability to reach all slide zones. Employees have come within mere feet, several times, from being hit by large avalanches while working at the howitzer platform or traveling to or from it (Ross et al. 2004; Swanke 2004a). Finally, natural avalanches can occur even after howitzer or helicopter discharge (Ross et al. 2004; Keator 2006b).

In 2004, the NPS began a pilot program utilizing a helicopter to discharge avalanches at the pass (which was described and analyzed in the 2004 EA) (Swanke 2004b). While helicopter operations were themselves successful, use of a helicopter requires adequate flight weather, which may complicate or delay opportunities for avalanche control work. Indeed, multi-day closures are possible with any avalanche control method, and they are more likely under a scenario which utilizes only helicopter dispensed explosives (McClung and Schaerer 2006; National Research Council 1990; NPS 2005). Further, mountain flying is inherently dangerous, and use of a helicopter displaces risks to a contractor rather than to NPS employees.

Additional hazards, not limited to howitzer operations, include risks to equipment operators as well as reliability problems associated with road conditions and possible closures. During the 2003-2004 season, an NPS groomer was struck by two small avalanches (Swanke 2004a). Drifting, poor visibility and severe winter road conditions frequently occur at the pass. Ranger Robert E. Mahn died in a white-out en route to check Sylvan Pass road conditions from the East Entrance on January 19, 1994. Snowcoaches are less able to travel over snow drifts that snowmobiles can and do safely negotiate.

Closing Sylvan Pass for avalanche hazard mitigation necessitates road closure for one-half to one full day of control work. An extreme avalanche hazard, such as that caused by a winter storm, may close the pass for multiple days. When the pass is unexpectedly closed, snowcoaches and snowmobilers may be stranded at Lake or at the East Entrance without ready access to important visitor services such as lodging or meals, both of which are unavailable or limited at those locations during the winter season. Additionally, scheduled trips departing from East Entrance, or from other entrances en route to East Entrance, must be canceled.

Unexploded ordnance (UXO) at Sylvan Pass presents many more concerns, both for public safety and regarding homeland security. Over the years, unexploded ordnances have accumulated, primarily from past use of a 75mm recoilless rifle for control work. The total number of unlocated UXO is estimated at three hundred. Six UXO have occurred in the past two winters from both helicopter and howitzer operations; three were recovered and three have not been recovered. The ammunition used contains a mixture of explosives that are highly toxic to humans and the environment. Both exploded and unexploded ordinance have the potential to release toxic materials (State of Montana 2004). The fate of the partial and unexploded ordnance and its toxic filler is unknown, but of concern in the Sylvan Pass area. Visitors may contact the duds; for example, in 1997 a visitor picked up a round and transported the live shell into the Fishing Bridge Visitor Center to give to a ranger. Duds have also fallen onto the roadway (Comey 2007). When one did in 2006, the roadway had to be closed for 24 hours while a military team was brought in to remove the hazard. On a larger scale, before the July 2004 mud and rock slide on Sylvan Pass could be removed from the road, the 10,000 cubic yards of material had to be laboriously searched for UXO.

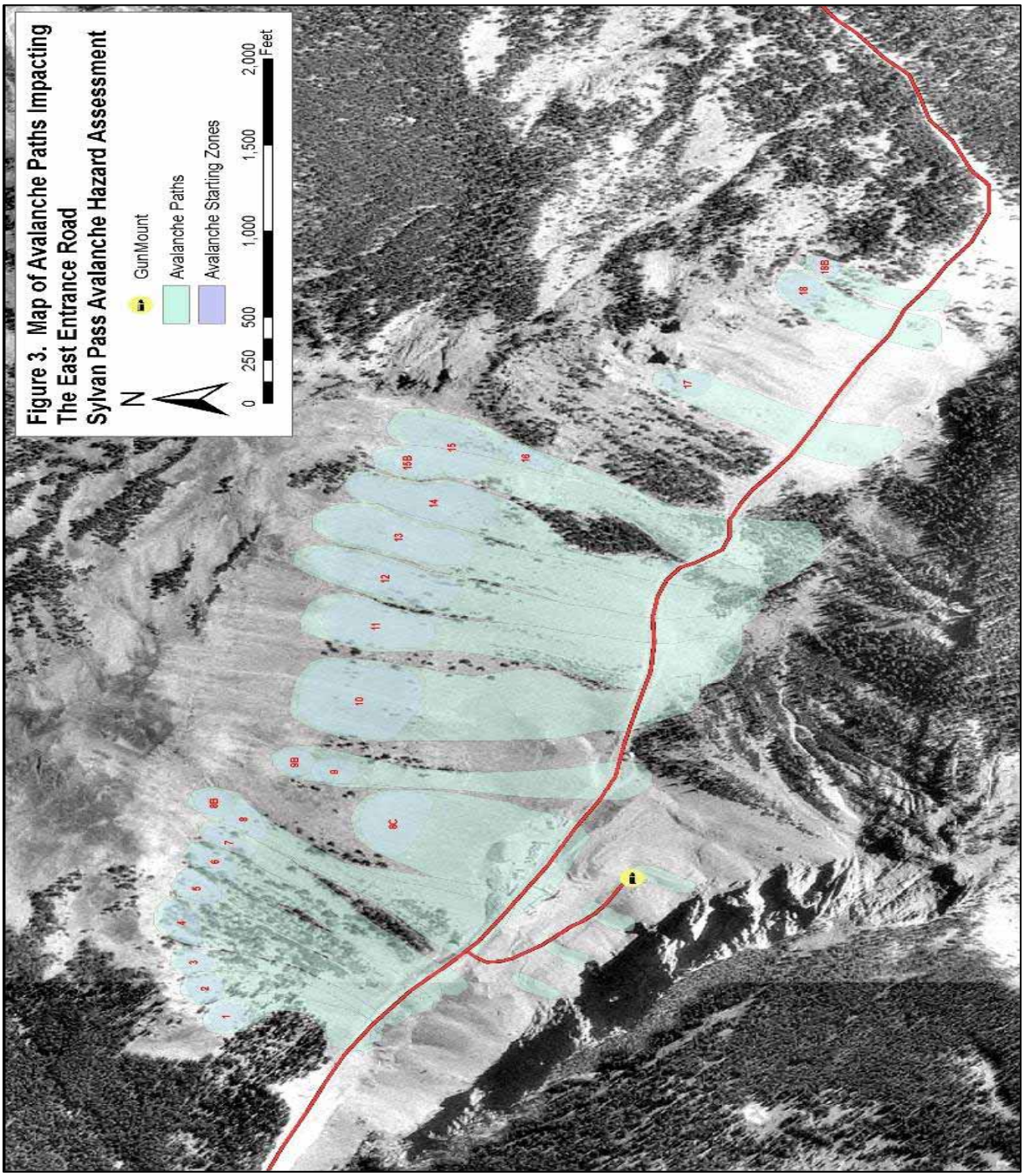

Figure 3-9: Map of Sylvan Pass (avalanche paths indicated by number)

Overshooting the target zone has also occurred, which places shells onto national forest lands outside the park. The Shoshone National Forest backcountry is not secured from human entry prior to avalanche shooting, and no program is in place for dud recovery there (Swanke 2004a).

It was for similar reasons that the NPS closed Dunraven Pass to oversnow vehicle travel. Historically the pass was open, providing visitors the opportunity to snowmobile the road from Tower Falls to Canyon. However, due to growing concern about the pass's avalanche danger and because it was lightly used by oversnow vehicles, the NPS closed it in the 1980s (the road from Washburn Hot Springs Overlook to Canyon Junction remains open to snowcoach travel and non-motorized uses).

The "Talus Slope" area on the South Entrance Road also contains some avalanche zones. In contrast to those at Sylvan Pass, though, there are only seven such zones, averaging less than a 200 vertical foot drop, and the zone is only about a third the linear distance of the Sylvan Pass zone (1,700 feet versus a mile at Sylvan Pass). The South Entrance Road does not cross the avalanche paths, but rather the runout zones where the slides come to a stop. If a vehicle were pushed off the roadway by a slide there—an event that has never occurred because slides there do not have the potential there to do this—it would drop about five or ten feet further, a fall unlikely to be fatal. In all cases where a vehicle has been caught in a slide at the Talus Slope, the slide has merely moved around the vehicle without moving it or even coming close to covering it (Johnson 1999; NPS 2007a; Mossman 2003).

In the late 1990s, following a series of winters with above average snowfall, several avalanche-related deaths in the park, and the death of a ski-patroller at Big Sky related to hand-charge use (Livingston Enterprise 1997), park staff evaluated options for avalanche management at Talus Slope and elsewhere. The review recommended use of an avalauncher (rather than the hand-charges that had historically been employed) ([National Park Service] 2002a). After 2-3 seasons of avalauncher use (which included considering its use at Sylvan), further reviews of the avalanche situation at Talus occurred ([National Park Service] 2002b). Those extensive reviews, which included input from avalanche experts outside of the NPS, concluded that the risk of substantial avalanche activity at Talus Slope was low under normal conditions (Mossman 2003; Johnson 1999) and that the risk to employee safety of avalaunchers misfiring substantially exceeded the expected risk of a life-threatening avalanche discharging at Talus Slope (Keator 2004). The review also concluded that avalanche risk there would be best managed through careful observation of snow and weather conditions, signage to the visiting public prohibiting stopping in the avalanche zone, possible structural designs, and use of helicopter-dropped explosives (Johnson 1999; NPS 2003b). In accordance with the review, park staff has continued to review the avalanche risk reduction program and, coincidentally, winters have brought lower snowfall amounts, producing little to no avalanche activity at Talus Slope.

For these reasons, park staff determined that avalanches in the Talus Slope area do not pose the same level of real and substantial risk to park employees and visitors as those at Sylvan Pass (Keator 2004; NPS 2007a). Even so, Yellowstone park staff monitor the Talus Slope area just as regularly, and with just as much vigilance, as they do other infrequent slide zones in the park. Should a heavy storm produce severe avalanche conditions, or should such conditions develop in other ways (as was documented in the 1999 report by Alan Sumeriski), park staff would close the roadways until conditions improved or until such avalanches could be discharged. The same policy applies to the numerous other slopes in the park along roads that are prone to slide given the right snow and wind conditions. The park policy is uniform to all locations: monitor (using both regional and site-specific information), close the road if unsafe, control for avalanches (currently with helicopter-dispensed explosives),

and reopen when safe (NPS 2003b). No management changes are proposed for the Talus Slope, Dunraven Pass, other road segments, or for park backcountry areas with avalanche hazards; therefore, the analysis is only carried forward for Sylvan Pass where changes are proposed.

3.5.5 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.

3.6 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.

3.6.1 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 2006b: 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 (NPS 2006b: 4.4.1) provide general principles for managing wildlife, including restoration and preservation dictates. The NPS will maintain (as parts of natural ecosystems of parks) all plants and animals native to those ecosystems and will minimize human impacts on animals, populations, communities, ecosystems, and processes that sustain them. Further emphasis is placed on the management of threatened or endangered species (NPS 2006b: 4.4.2.3). In 36 CFR § 2.18, snowmobiles are prohibited except where designated and only when, among other things, they will not disturb wildlife.

3.6.2 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 section 3.6.2.1 below. Four of the studies (Borkowski et al. 2006, Bruggeman et al. 2006, Fuller et al. 2007, 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 the 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 section 3.6.2.2 below. That entire report is available at http://www.nps.gov/yell/parkmgmt/gates.htm, and is hereby incorporated by reference. Along with studies performed in the last decade by other researchers and those performed previously by Mary Meagher and others, 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 bison in this EIS is based.

3.6.2.1 Recent studies

Borkowski et al. 2006: This study utilized multinomial logits models in more than 6500 interactions of bison and elk with groups of OSVs during five recent winters in YNP to identify conditions leading to behavioral responses. Borkowski found that elk responded three times as often (52%) as bison (19%) during interactions with OSVs due to increased vigilance responses. However, the frequency of higher-intensity movement responses by bison and elk were similar (6–7%, travel; 1–2%, flight; 1%, defense) and relatively low compared to other studies of ungulates and snowmobile disturbance. The likelihood of active responses by bison and elk increased if animals were on or near roads, groups of animals were smaller, or humans approached. The likelihood of an active response by bison decreased within winters having the largest visitation, suggesting some habituation to snowmobiles and snowcoaches. Also, using data from the past 35 years, the authors found no evidence that snowmobile use has affected the population dynamics or demography of bison or elk. They suggest that the regulations restricting levels and travel routes of OSVs have been effective at reducing disturbances to bison and elk below a level that would cause measurable fitness effects and further recommend that park managers consider maintaining OSV traffic levels at or below those observed during the study. Borkowski and his colleagues suggest that differing interpretations of the behavioral and physiological response data will continue to exist because of the diverse social values of the various constituencies concerned with YNP.

Bruggeman et al. (2006): This study examined various landscape features and groomed roads and their relationship to probable bison travel routes. Bruggeman concluded that multiple topographic and habitat attributes—including slope, landscape roughness, elevation, habitat, and distances to streams, roads, foraging areas, and forested habitats—influenced the probability of bison travel and spatial distribution of travel corridors during winter and summer throughout the central herd's range. In central Yellowstone, though, the bison travel network was spatially defined largely by the presence of streams that connected foraging areas. The probability of bison travel and corridor use was also higher in regions with topography that would constrain wildlife movements, such as canyons like those in the Madison, Gibbon, and Firehole drainages. Pronounced travel corridors exist both in close association with roads and distant from any roads, and results indicated that roads may have facilitated bison travel in certain areas (e.g., Firehole Canyon). However, bison road travel was negatively correlated with road grooming and the authors found no evidence that bison preferentially used groomed roads during winter. Overall, the amount of bison travel, both on and off roads, was reduced during winter, likely because bison decreased movements as snowpack accumulated to conserve energy.

Coughenour 2005: Michael Coughenour at Colorado State University evaluated if Yellowstone bison had reached a food-limited carrying capacity by using a spatially-explicit ecosystem simulation model for the Yellowstone ecosystem that integrated data from site water balance, plant biomass production, plant population dynamics, litter decomposition

and nitrogen cycling, ungulate herbivory, ungulate spatial distribution, ungulate energy balance, ungulate population dynamics, predation, and predator population dynamics submodels. The overarching model simulated the two Yellowstone bison herds, two resident wintering elk herds, and the summer immigrant elk, and included GIS data for soils, vegetation, topography, and other variables. The model was driven by weather data from 29 different climatological and SNOTEL sites located in and near the park. Precipitation and temperature maps were generated using elevation-corrected spatial interpolation, and a validated snow model simulated the accumulation and melting of snow. When the model was run for 50 years without removals or migrations outside the park, the northern herd increased to a mean of 2417 bison (range = 1820-3530) over 8 simulations using stochastic weather. The central herd increased to a mean of 3776 bison (range = 2430-5630). Maximum counts of Yellowstone bison were 3531 bison in the central herd and 1484 bison in the northern herd during summer 2005. According to this model, neither the central or northern bison herds have yet reached their estimated food-limited carrying capacities in the park.

After culling in the park ceased (1968), the central bison herd grew to a density where nutritional stress elicited increased competition for key resources and subsequent behavioral responses to search for additional range. Carrying capacity increased once new ranges were found, which resulted in a positive feedback cycle of increased bison numbers, nutritional stress, and further range expansion. Grooming snow-covered roads for snowmobiles may have contributed to the *rate* at which this process occurred because an increased proportion of travel on packed snow could provide minor energetic savings that, cumulatively over the course of many winters, could compound to accelerate population growth. In addition, there could be an effect on instantaneous decision-making by bison because individual animals decide to travel or not based upon the immediate stress imposed by deep snow conditions. However, bison also reached levels of increased nutritional stress when they were limited to their historical Hayden and Pelican valley winter ranges within the interior of the park. This intolerable nutritional stress, combined with their nomadic nature and ability to travel through deep snow, makes it likely that migration to the upper Madison drainage and beyond was an inevitable outcome whether roads were groomed for OSVs or not.

Fuller et al. (2007): This study performed demographic analyses of bison growth rates, population dynamics, and historic bison population counts in YNP to determine whether their growth rates were appreciably higher following the initiation of road grooming in 1971. Growth rates for the central herd did not differ drastically between the pre-grooming (1936-1954) and post-grooming (1970-1981) periods of analysis. Furthermore, the population growth rate for the central herd actually decreased after 1981, after which time Meagher (1993) contended that bison used the groomed roads most frequently. Fuller also examined bison management removals, expecting that the heaviest removals would have occurred from the central herd along the western boundary (where road grooming predominantly occurs) if groomed roads indeed act as a conduit to direct bison movement toward park boundaries. Instead, removals were more frequent and involved many more bison on the northern herd at the northern boundary. Fuller concluded that demographic analyses provided no support for the purported increased demographic vigor of the central Yellowstone bison herd due to the grooming of snow on roads for public access by oversnow vehicles.

Wagner (2006): This analysis of bison count data (which is in some respects similar to Fuller (2006)) found no evidence supporting the prediction that road grooming contributed to increased survival or decreased energy expenditure. Wagner stated his agreement with similar conclusions from the National Research Council (Cheville et al. 1998): "the available evidence indicates there has *not* been such an effect" of groomed roadways upon bison populations and distribution (2006:157).

White et al. (2006): In a statistical analysis similar to Borkowski et al. (2006—the separate study summarized above), this study examined over 5500 records of interactions between OSVs and wildlife collected by the NPS during the last four winters (2002-2003 through 2005-2006) for bison, elk, trumpeter swans, bald eagles, and coyotes. Utilizing this data, multinominal logits models were evaluated to determine if variables related to winter recreation (for example, snowpack characteristics, levels of OSV traffic, distance of the wildlife group from the road, the number of animals in the group, habitat type, etc.) were associated with changes in the behavior of wildlife. This analysis is of particular value because of its robust statistical methodology, the consistent sampling methodology over those years, and the recognition of year-to-year variability. White et al. found that these animals exhibited varying behavioral responses to OSVs in association with human activities. Specifically, animals exhibited an increased vigilance response (in which they focused their attention on the human activities) or a movement response (in which they moved away from the human activity) when they were in close proximity to or on roads, and when groups of wildlife were smaller. White et al. found the same result for bison, elk, and swan groups when they were approached by humans and when their movements were impeded or hastened by vehicles. Overall, the intensity of wildlife group responses differed across the five species in this study, with the percentage of observing a response (either movement or vigilance) being 83.3% for bald eagles, 60.5% for coyote, 52.4% for elk, 42.5% for swans, and only 19.6% for bison. As stated previously, the variability in these percentages is fairly well correlated with the varying vigilance responses of each animal to human disturbance: eagle 72.8% (meaning that 72.8% of eagle responses to human presence were vigilance), coyote 36.7% elk 44.3%, swan 32.5%, and bison 12.5%.

In general, animals tend to respond to threats using as little energy as possible. In many cases, their response is merely to direct 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 general, 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).

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.

As noted previously, 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. By repeatedly surveying groomed or plowed road segments in YNP, the NPS monitored the behavioral responses of wildlife to motorized winter recreation. Emphasis has been on monitoring responses of bison, elk, and trumpeter swans, although responses by bald eagles and coyotes were also recorded. 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).[16]

Table 3-18 compares the wildlife responses to motorized winter recreation as analyzed in two of the most comprehensive wildlife studies to date. 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 3-18: Wildlife Responses to Human Recreationists

Study[1]	% No Visible Response[2]	% 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%

[1] These two studies used somewhat different methods and grouped responses differently. Borkowski et al. 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.
[2] 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.

3.6.2.2 Summary of Gates Report

In 2004, the NPS commissioned an interdisciplinary study to assess the science and literature of bison movement and dispersal in the Yellowstone ecosystem. This report, the Gates Report, was the result of a collaborative agreement between the University of Calgary, Faculty of Environmental Design and the Rocky Mountains Cooperative Ecosystems Studies Unit (RM-CESU) at the University of Montana, commissioned by the NPS. Led by Dr. Cormack Gates of the University of Calgary, Canada, the team included Brad Stelfox, Tyler Muhly, Tom Chowns, and Robert J. Hudson, all members of the Faculty of Environmental Design there. The team issued their report in April 2005, entitled "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."

The goal of the report was to provide a thorough, independent assessment of the state of knowledge of the ecology of bison movements and distribution within the context of current published concepts and theories. Another important goal was to provide recommendations for adaptive management of uncertainties and gaps in reliable knowledge within an adaptive environmental assessment and management framework, which involves organizing people to link science to management.

[16] Wildlife monitoring reports are available on the NPS website at: http://www.nps.gov/yell/parkmgmt/winterusetechnicaldocuments.htm.

The report drew exhaustively upon all known bison literature (including those of Mary Meagher), over 30 bison "informants" (including Mary Meagher, Robert Garrott, Mark Taper, and Dan Bjornlie, and almost 30 others), and extensive modeling efforts. The report began by summarizing the bison management history of YNP. In 1968, the park moved from a 33-year (1934-1967) period of culling ungulate populations to achieve predetermined stocking levels, to a regime of ecological management. Under this regime, populations of bison and other ungulates are allowed to fluctuate in the park without human intervention. Bison populations have grown continuously under this regime. With growing numbers of bison, management has become dominated by two major linked controversies:

- the perceived risk to livestock from brucellosis infection when bison move beyond the park boundary, a concern since the 1920's; and
- the debate over the effects of winter recreation (specifically, grooming roads for oversnow vehicle traffic) on bison ecology, including range expansion, transboundary movements, bison condition, and population dynamics.

The report entailed review of 1) literature on ungulate distribution, including YNP publications and planning documents, 2) key informant interviews for gaining rapid understanding of the system and unpublished knowledge, 3) development of a strategic level bison population and winter distribution model, and 4) key informant technical workshops to refine the model. In addition, a workshop was held with non-governmental organizations to review the concepts and knowledge upon which the assessment and model are based.

The report gives key findings derived from 1) informant knowledge and interpretation of empirical data on population and spatial ecology, and 2) a systems model. Additionally, the report outlines key uncertainties and data gaps that may be addressed through monitoring and basic research.

Key Findings based on Interviews, Empirical Data, and Historical Records

History

Bison populations have been affected by widely varying influences in recent history including hunting and captive breeding. They are part of a larger system that is best understood at long time scales and at a spatial scale larger than YNP.

Ranges and Movement Corridors

Bison occupy five winter ranges in YNP. The Central herd uses Pelican Valley, Mary Mountain (e.g. Hayden/Madison-Firehole), and West Yellowstone. The Northern herd occupies Lamar Valley and Gardiner Basin. As defined by key informants, these ranges are interconnected by five primary movement corridors including Firehole to Mammoth, Firehole to West Yellowstone, Gardiner Basin to Lamar, Mirror Plateau, and Pelican to Hayden.

Range Expansion

In a finding highly applicable to the winter use debate, the Gates report stated that all YNP bison ranges provide environmental conditions supporting long term growth and persistence of bison populations. Furthermore, there was no evidence to suggest that groomed roads have changed population growth rates relative to what may have happened in the absence of road grooming.

As the number of bison increased, the area they utilized expanded and distributions eventually coalesced. Presently, the authors recognize that the Yellowstone population is composed of two subpopulations, the Central and Northern herds. These herds are defined

by differences in ecological conditions and use of space between ranges, genetic differences, fetal growth rates, and tooth wear patterns. For both the Northern and Central bison ranges, mid-winter survey data and history provide strong evidence that range expansion is density driven; more bison require more resources.

It was suggested that groomed roads could promote energy savings and exploratory routes that caused the bison population to increase 'unnaturally.' The authors, however, suggest that bison distribute themselves in an attempt to maintain a certain level of resources per individual. Range expansion, then, is driven by an interaction between population size, forage production, and forage availability. Exploratory movements and knowledge of productive destinations also influence range expansion.

Population Ecology

Generally, YNP is a forage-limited system. Bison in YNP attempt to compensate for declining per capita food resources by range expansion, thus maintaining a relatively stable instantaneous density. However, compensation is not exact; population growth rate declines with density because high quality foraging patches are limited in overall area, are patchily distributed and depleted first, forcing bison to shift to poorer quality patches as density increases. Bison in different areas of YNP experience different ecological conditions, including but not limited to forage, climate, refugia, topography, and predation.

Key Findings Based On Systems Modeling

The Gates report clearly states that bison population and spatial dynamics are expressions of complex interactions best understood using a systems approach. Based on the systems dynamics paradigm, a strategic-level model was developed to facilitate collaborative learning about bison population, range use dynamics, and management alternatives. Key informants were asked to rank the importance of the system model variables. Using the resulting stakeholder contributions, the model was refined into a 'majority average model' and used to model bison population change over time with varying inputs, including the inputs of winter road grooming and no winter road grooming. The model was also run using the inputs of "Key Informant Group #4," which included Mary Meagher and Mark Taper.

The model identifies key knowledge gaps and easily accommodates new empirical data and relationships emerging from existing and future research. Forage availability was a sensitive driver of bison movements in the model. In turn, the three key variables determining winter forage availability were previous summer precipitation, snowpack characteristics, and elk and bison density (i.e., forage demand).

Bison Road Use

The model indicated that inter-range movements of bison were generally not constrained by winter snowpack in non-road grooming scenarios during most winters. The notable exception to this rule was the Firehole-Mammoth corridor that was a barrier during all non-road grooming scenarios.

According to the modeling, road grooming had a greater influence on movement of bison between interior ranges (Lamar-Mary Mountain, Mary Mountain-Pelican) than to the boundary ranges (West Yellowstone, Gardiner Basin).

Modeling scenarios of bison movement between winter ranges projected from 100 to 4,000 animals, influenced most by per capita forage availability. An average movement of ~1,000 bison occurred in non-road grooming scenarios, and 1,200 in road-grooming scenarios.

Modeling found that cumulative culls during ten 100-year stochastic runs ranged between annual average culls of 50-90 bison for the non-grooming scenario and 60-100 for road grooming scenarios. On average, 75 bison would be culled each year from boundary ranges with or without road grooming. The model predicted maximum cull under current boundary management would periodically exceed 500 animals and rarely exceed 750 animals.

Of note was the finding that increasing bison habitat exterior to YNP is an effective strategy to increase the total regional population, but such a strategy would *not* reduce the number of bison that would need to be culled annually in the regional landscape surrounding the park. Unless the landscape is completely permeable to bison, management culling will always occur at the margins of bison ranges. In fact, more habitat would allow for bison population growth, which would eventually drive more bison range expansion. While the *percentage* of the bison population affected would likely decrease, the number of individual animals removed would increase with more habitat.

The issue of how frequently bison use groomed roads and how that use affects their population dynamics and distribution has been contentious. The Gates report, using historical records, interviews and systems modeling, strongly indicates that population growth and range expansion in the Central herd is driven primarily by biotic factors as opposed to the groomed roads. Specifically, the authors state that groomed road segments facilitate movements *within* the Central Range during winter, but the authors found that such movements would likely have developed in the absence of road grooming as the density of bison increased, because road segments are aligned with natural movement pathways.

However, the Gates report did draw attention to one groomed route that may not be aligned with natural movement pathways. Since the early 1990s Central Range bison have migrated in increasing numbers north to Blacktail Deer Plateau and the Gardiner basin in winter using the road between Madison Junction and Mammoth. The authors suggest that this migration of Central Range bison to the Northern Range might not have developed in the absence of the groomed road between Madison Junction and Mammoth. The suggestion was that snow conditions (depth, SWE, etc.), topography (particularly in the Gibbon Canyon) and other factors might prevent bison from moving from Madison to Mammoth if the groomed road surface was unavailable to them. Given the unique importance of this road corridor in the park's road system, the authors suggested that management manipulations on the Madison to Mammoth road could be used as a de facto experiment to test hypotheses about bison road use.

Key Uncertainties

The authors state that bison population and spatial dynamics are sensitive to variation in several key variables and interactions between variables. Among them is a subset for which the least amount of empirical data is available. They identified 'Key Uncertainties' deserving further research.

One such uncertainty is the extent of the interchange between the Northern and Central bison herds. This information is important for understanding how to conserve the spatial and genetic structuring of this population and maintenance of bison on the Northern Range under current boundary management.

Recommendations from the Gates Report

Monitoring and Science

- Yellowstone National Park should implement an internally funded bison population monitoring program that collects and manages data on population size, vital rates, and winter distribution in the long-term. (Such bison monitoring is underway.)
- Yellowstone National Park should define a minimum viable bison population for the Northern Range.
- Yellowstone National Park should encourage and coordinate research focused on reducing key uncertainties over a full range of densities as the population fluctuates in response to environmental stochasticity or management actions (the workshop summarized below and research proposal by Garrott and White, discussed below, provided the foundation for this work).
- An adaptive management experiment should be designed to test permeability of the Firehole to Mammoth corridor under variable snow conditions with a specific focus on the road section between the Madison Administrative Area and Norris Junction. (see discussion in section 2.5.6).
- Yellowstone National Park should install a SNOTEL or snow-course station in the Pelican Valley, monitor snow conditions in the Pelican-Hayden Corridor, and re-evaluate the two existing snow models. (These steps are underway.)
- Yellowstone National Park should continue to utilize GPS collars to gather data concerning key questions about movement ecology to be addressed, including the timing and extent of movements in relation to plant phenology, snow conditions, forage production and utilization. (This is part of the monitoring being done as part of the first bullet above.)

Adaptive and Collaborative Management Structures and Processes

- The NPS should engage the U.S. Institute for Environmental Conflict Resolution in an independent situation assessment that includes advice on designing an integrated agency and public planning strategy to represent the common interest. (The NPS did engage this group and is currently using the services of Cadence, Inc., to foster and facilitate public engagement on this EIS.)
- The Yellowstone Center for Resources should play a lead role among agencies and researchers in coordinating data sharing, research, and monitoring of bison and other research relevant to bison ecology and management by developing a stable collaborative science and management framework.
- The NPS should develop or refine appropriate systems models and other decision support tools to help agencies and other stakeholders to understand key uncertainties and system properties and to evaluate outcomes of management scenarios defined through value-based decision processes. (This research is underway, partly through the adaptive management experiment discussed above.)
- The NPS should increase its support for the appropriate agencies to secure agreements for key winter range for bison and other wildlife adjacent to the park in the Northern Range.

3.6.3 Existing Condition: Ungulates of Concern

Bison and Elk

YNP 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 boundary). 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.[17] Since 1980, the population has fluctuated between about 2,500 and 4,900 animals, with the 2006 late summer population estimated at 3,900 animals. Generally, bison occur in two large herds within YNP, the Central and Northern populations. 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.

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 to YNP 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 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 parks (NPS 1998b). Bison carcasses are especially important as a high-quality protein source for species of concern such as grizzly bears, bald eagles, and gray wolves (Swenson 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. Because many of these incidents were not documented in case incident reports at the time, rangers were asked in the early 2000s to provide narrative accounts of their experiences dealing with oversnow motorized use and wildlife in YNP.[18] Of the rangers (one of whom had a doctorate in zoology) who provided written accounts, all emphasized the frequent, often daily, occurrence of conflicts among ungulates (primarily bison) and oversnow motorized use, particularly snowmobiles. The most commonly cited problems involved snowmobilers unsafely passing bison. As snowmobilers attempted to pass through herds of bison, the animals often bolted and ran and as a consequence were "herded" down the road until they were pushed off the roadway. The experience was especially difficult for the animals when snow berms were high or they were forced into deep soft snow.

[17] While bison culling stopped in 1966, elk culling continued for two more years.
[18] These accounts are included in the administrative record of the Supplemental EIS, in the Management Assistant's Office at Yellowstone National Park.

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 nowhere to go. 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 and snowmobilers who lacked the patience to wait for animals to cross or exit the roadway.

In addition, poor lighting conditions and weather would exacerbate all of the above conflicts, with bison sometimes resting on the roads at these times. Several nighttime collisions in the 1990s involving bison and snowmobilers resulted in severe injuries, two human fatalities, and some bison fatalities. Although harassment was not the intent of most interactions, the juxtaposition of heavily used groomed motorized routes and ungulate winter range rendered it virtually inevitable along some road segments.

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 (Tabor 2006). Because guides are trained in part by the NPS, they can also provide tips 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.

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 2003a: 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 (Fuller 2007; Gates et al. 2005; Coughenour 2005). 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 (Bruggeman 2006, Borkowski et al. 2006, White et al. 2006, Hardy 2001). 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).

The conclusion that bison populations and distribution are more affected by natural factors than road grooming is generally supported by the Gates study (Gates et al. 2005), as summarized above in section 3.6.2.2. According to Gates, the primary possible exception is the road from Madison Junction through the Gibbon Canyon to Norris Junction (and possibly to Mammoth Hot Springs as well). This road may have served, and may continue to serve, as a travel corridor between the Madison-Gibbon river valleys and the northern range. Gates does not provide conclusive findings regarding this route's effects on Yellowstone's bison population and ecology, instead suggesting the NPS perform a management experiment to determine if indeed it does enable bison travel between those areas in a manner which would not otherwise occur. That experiment is suggested as an action common to all alternatives (see section 2.5.6).

Acting upon Gates' suggestion, the NPS invited the Big Sky Institute at Montana State University to organize a two-day workshop to evaluate the assertion that the Madison to Norris groomed road would serve as a barrier to bison movements between the Central and Northern winter ranges if grooming on that road were to cease. The workshop had the objective of identifying, through a coarse-filter analysis, a focal suite of hypothesis-driven questions which could serve as a foundation for research and management experiments that can be practicably implemented. Held in January 2006, the workshop involved a wide array of bison researchers, biologists, and interested stakeholders representing all the major positions in this debate.

Workshop participants first created an "impact hypothesis diagram," which is a conceptual graphical model illustrating how the physiographic, ecological, and/or anthropogenic factors in a system interact and influence the likelihood of a resulting environmental action (in this case, inter-range winter bison movements in YNP). The purpose of the diagram was to conceptualize the state of knowledge regarding Yellowstone bison, their winter ecology, their movement patterns, and the various causes or reasons for movement. The diagram is included in the summary of the workshop, which is included as Appendix G (the summary includes a list of participants as well). Four clusters of elements influence bison movements in the park: herd size, bison energetics, human use, and edaphic variables such as weather.

Workshop participants then moved to the task of developing a hypothesis to serve as the foundation for research and management experiments regarding the bison-road grooming issue. The central hypothesis was stated: "With termination of a groomed over snow road surface, the cumulative ecological costs of bison movement from the Central Range to the Northern Range would exceed the advantage of doing so and winter movements along the Madison to Mammoth road corridor would significantly decline." Based upon this hypothesis, participants then discussed general recommendations for a suite of adaptive management and control experiments. The main adaptive management experiment the

group discussed was to cease grooming the road from Madison Junction to Norris[19] and to measure bison responses and predictor variables. However, the group noted that the proposed adaptive management experiment does not have a control area against which observational data could be compared. Consequently, the temporal change of terminating grooming can only provide observational data of a weak inferential nature on whether the advent of road grooming in the early 1970s has indeed altered bison distributions and migrations in YNP. Indeed, it is impossible to retrospectively determine if groomed roads initially facilitated increased abundance and range expansion by bison because no data on bison travel patterns existed prior to road grooming and bison are now familiar with destination ranges in their expanded range (Garrott and White 2007; see also Fuller 2006).

Additionally, while Telfer and Kelsall (1984) point out that bison trail-making behavior is highly adaptive to living in snow, there is general agreement that at some point snow can impede bison. Clarifying this amount of snow remains a source of uncertainty and disagreement, and was another topic of discussion for the workshop group. They discussed experiments to determine the maximum snow threshold for bison movements – the minimum depth and density of snow that would preclude bison from using a desired path. If this threshold could be determined, it would then be possible to ascertain whether the Madison-Mammoth corridor ever receives such snow levels, and by inference, whether bison would utilize this road corridor in the absence of grooming. Participants also recommended utilizing current road construction efforts in the Gibbon Canyon to alternately close or open a road corridor to determine whether bison would continue to utilize a route familiar to them but ungroomed.

While these suggestions helped the NPS better understand potential general experimental approaches, workshop participants did not develop detailed experimental designs that would be necessary to fully implement a meaningful adaptive management experiment. Indeed, some believed that a scientific experiment is impossible because of the extreme number of variables.

Nevertheless, in spring 2007, the NPS contracted with Dr. Robert Garrott at Montana State University-Bozeman to develop experimental designs to test the key uncertainties identified at the Big Sky Institute workshop. Garrott, in combination with Dr. P.J. White, an NPS wildlife biologist at Yellowstone National Park, submitted "Evaluating Key Uncertainties Regarding Road Grooming and Bison Movements" to the NPS on May 15, 2007. The NPS sought peer review of the proposal from up to twelve wildlife experts, with two agreeing to perform the review. The NPS also posted the draft proposal on its website for cooperators, stakeholders, and other interested parties to review (the website is http://www.nps.gov/yell/parkmgmt/winterusetechnicaldocuments.htm). As of the publication of this FEIS, the peer review was complete and the NPS had forwarded the reviews to Drs. Garrott and White, requesting their consideration of comments received in the same manner as any peer-reviewed journal would do. Garrott and White will then submit their final proposal to the NPS in October 2007, in time for consideration in the Record of Decision for this FEIS.

In their draft proposal, Garrott and White (2007) considered various types of study designs and statistical approaches to evaluate three overriding uncertainties regarding road grooming and bison movements in Yellowstone: 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? They developed

[19] Some believed the road closure should extend to Mammoth Hot Springs, but the group was unable to reach agreement on the full extent of the proposed closure.

testable predictions, proposed study designs and statistical analyses, and identified strengths of inference and potential pitfalls. They recommended a tiered approach to gain reliable knowledge regarding the effects of road grooming on bison movements. To evaluate the influence of snow and terrain on bison movements, they recommended using data from Global Positioning System (GPS) collars deployed on more than 30 bison during 2003-2007 to evaluate their odds of occupancy or movement given certain snow pack levels. To determine the drivers of bison spatial dynamics and population vital rates, they recommended integrating available data sets and formulating response variables describing variation in bison migration, foraging movements, adult survival, and calf survival with potential drivers of the variation evaluated within a multiple regression framework. To evaluate the effects of road grooming on bison travel, they recommended that a progression of studies be implemented during a succession of winters (these would be increasingly intrusive to park operations and visitors): 1) maintain a sample of 50-60 bison with GPS collars distributed between the central and northern breeding herds for at least five years to gain insights into the spatial and temporal factors influencing bison movements across the landscape; 2) deploy camera systems along the Firehole Canyon, Gibbon Canyon, and Mary Mountain trail to collect baseline data on the direction, frequency, magnitude, and timing of movement through major travel corridors; 3) perform experimental manipulations of bison movements through the Firehole Canyon by using metal gates or temporary cattle-guard bridges and fencing to deny bison access to the main groomed road and evaluate their use of alternate ungroomed routes; 4) manipulate bison movements through the Gibbon Canyon using gates/bridges and fencing to deny bison access to the new bridge and road (once construction is completed), while evaluating their use of an alternate ungroomed route; and 5) close the road between Madison and Norris junctions with no grooming of the roadway.

This study is intended to provide insights regarding key uncertainties about the bison-groomed road issue. The fact that the numerous studies into this concern have provided partial support for competing views, rather than the unambiguous rejection of one over another, is not surprising because ecological interactions are complex at the landscape scale (Hobbs and Hilborn 2006). The best available evidence now suggests that the observed changes in bison distribution over time were consequences of natural population growth and range expansion in a population recovering from near extirpation that would have occurred with or without access to snow-packed roads, though perhaps not at the same rate (Coughenour 2005, Gates et al. 2005, Bruggeman 2006).

This understanding differs from the tentative, mechanistic explanation (i.e., hypothesis) proposed by Dr. Meagher (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. We can never know what bison may have done if the packed road system never existed. Also, many other attributes of the system have changed in recent decades due to massive fires, climate changes and effects on plant phenology, wolf reintroduction and related effects on

bison and elk, control actions for bison at the park boundaries, and invasions of exotic plants. All of these interactive factors prohibit a retrospective analysis of historic distribution data and a conclusive answer to this question.

One study may have lent some support to Meagher's hypothesis (Coughenour 2005, whose model simulations suggested an increased proportion of bison travel on packed snow that could possibly provide minor energetic savings that, cumulatively over many winters, could compound to accelerate population growth), but these findings could be inaccurate or spurious due to uncertainties introduced by parameters not developed with actual data from bison (see also Taper et al. 2000). Again, it is not possible to replicate the conditions of the past upon which Meagher bases her hypothesis. For that reason, recent bison research efforts have focused on gaining insights into how road grooming and other factors currently affect bison travel.

In the last decade, the NPS has supported a large number of scientific studies that were designed to further the efforts of Meagher et al. by developing testable predictions based on her findings and hypotheses. They also addressed some key uncertainties regarding bison movement dynamics and the effects of road grooming on bison. These studies have used all of the data available, including data collected by Dr. Meagher as well as many other more recent intensive studies. Summarized in detail in section 3.6.2.1 above, these studies constituted rigorous investigations in that they presented testable predictions and evaluated the support in the data through formal statistical analyses or model selection techniques. The results and conclusions from these studies were widely disseminated for expert peer review by the scientific community and accepted for publication in some of the highest quality, international, scientific journals in the world.

These findings generally support the hypothesis that the bison range expansion that occurred in Yellowstone between 1970 and the 1990s was largely a result of bison population growth occurring in that time period. Simply put, the park's bison would have expanded their population in this period in the absence of road grooming (though perhaps not at the same rate), and more bison need more room. More specifically, road grooming did not appear to 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). Temporal patterns in the amount of bison road travel were negatively correlated with the road-grooming period, and there was no evidence that bison preferentially used groomed roads during winter (Bjornlie and Garrott 2001, Bruggeman et al. 2006). Instead, the observed increase in winter range by bison was likely a natural response to increasing population density (Bjornlie and Garrott 2001, Gates et al. 2005). Nutritional stress, combined with their nomadic nature and ability to travel through deep snow, made it likely that the historic bison migration to the upper Madison drainage and beyond, as noted by Meagher and confirmed by other researchers, was an inevitable outcome with or without groomed roads (Coughenour 2005). Streams were the most influential natural landscape feature affecting bison travel between foraging areas, though roads may facilitate bison travel in certain areas (e.g., Firehole and Gibbon canyons). Road segments used as travel corridors generally appeared to be overlaid on what were likely natural travel pathways. Thus, 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).

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). 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.

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.

The best available evidence, then, supports the hypothesis that bison range expansion in Yellowstone was density-dependent, caused by growth in the bison population that would have occurred in the absence of road grooming. It is for this reason that the NPS moves forward accepting the current density-dependent explanation for the changes in bison distribution since 1970.

Still, to further complete our knowledge of the relationship between groomed roads and bison movements, the NPS will implement the Garrott-White research proposal as the agency formulates a decision. As outlined in that proposal and the summary above, the Madison to Norris Road may or may not ever be closed for this research if implemented, depending on the outcome of the first phases of that research proposal. If the road closure occurs, though, it will likely be for a period of several years so that the study encompasses the full range of winter weather conditions and other such variables.

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. FWS 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. By the early 1890s, elk populations were decimated by commercial harvest, competition with livestock, and habitat change (Clark 1999). As with bison, the GYA served as refuge for the remaining large herds. 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 20,000 and 30,000 since 1980. Recently, the population of the northern herd has 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).[20] 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 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) (recall that 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. Elk are either preyed upon or their carcasses scavenged by many wildlife species. Carcasses provide an important source of protein for several key predator species including grizzly bears, bald eagles, and gray wolves. Over 90% of the diet of most GYA wolves consists of elk and grizzly bears are influential predators of young elk (Swenson et al. 1986; Green et al. 1997; Smith et al. 1998; Barber et al. 2005).

[20] Yellowstone has suffered a continuous drought from 1999 to 2006.

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 bothered 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 contains 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 multiple 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. 2007; Bruggeman 2006; Wagner 2006).

3.6.4 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).

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. 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 bison control 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 are doing so well in the Yellowstone area that they 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. Specifically, an average of 75 bison would be culled each year from boundary ranges with or without road grooming. Such modeling suggests that road grooming is not the primary factor leading bison out of the park—that bison would be leaving the park anyway, making their carcasses unavailable to grizzlies in the park in any situation, and that grizzlies adequately cope with that situation. 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) will be addressed 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 either the current rules or any of those considered in this document, has little potential to disturb them. Consequently, the discussion of the effects of winter use upon grizzly bears is not carried forward.

Gray Wolf (Canis lupus)

Although wolves within the Yellowstone area are classified as a nonessential, experimental population,[21] 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 136 in YNP in thirteen packs and 26-27 adults in three packs in GTNP and the Parkway; there are about 370 distributed throughout the GYA in about forty-eight packs. 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.

[21] Pursuant to section 10(j) of the Endangered Species Act.

As with grizzly bears, the USFWS is considering removing wolves from the endangered species list, but again has not issued a final decision, awaiting the outcome of litigation with the State of Wyoming over its wolf management plan.[22]

Wolves were seen by winter road monitoring crews eight times in 2002-2003, twice in 2003-2004, once in 2004-2005, and twice in 2005-2006. Of this total, nine sightings involved 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).

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 1999a; 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.[23]

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,' 4% 'travel,' and 6% 'flight.' 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

[22] Yellowstone Science 2006 and personal communication by Kerry M. Murphy (Grand Teton) with M. Yochim 2006.

[23] Terry McEneaney and Kerry Murphy personal communication with M. Yochim 2006.

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, a pair of bald eagles successfully nested and fledged young eaglets within 55 meters of the heavily-used West Entrance Road of YNP.

3.6.5 Existing Condition: Other Species of Concern

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. Since 1990, researchers have seen 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

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 are dependent on in-migration, such as from Paradise Valley to the north of Yellowstone or 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 for the past several winters, trumpeter swan responses to OSVs were characterized as 57% "no response," 21% "look/resume," 12% "attention/alarm," 9% "travel," and 1% "flight." 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

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 virtually 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 (Tabor 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 (Tabor 2006).

3.6.6 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 to 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 1995a).

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. This group, the Teton herd, is composed of two sub-populations: one in the north, west of Jackson Lake; and one in the south, west of Phelps Lake. The entire herd is a marginally viable, remnant population that is geographically isolated from other herds and persists in a harsh environment. There may be limited interchange between the two sub-populations. A separate, small population occurs on the Bridger-Teton National Forest in the Gros Ventre River drainage (NPS 1995).

Some herds of bighorn sheep use different ranges in winter and summer. Winter range is more limited than summer range and typically occurs at lower elevations. Sheep use traditionally formed migration patterns. Any alteration to these routes or habitats could be detrimental for a population group of sheep (Legg 1998). To protect bighorn sheep from human disturbance, several of their wintering areas are closed to public entry.

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

The bull snake *(Pituophis catenifer sayi)*, the prairie rattlesnake *(Crotalis viridis viridis)*, and the northern sagebrush lizard *(Sceloporus graciosus graciosus)* occur in the parks, with the lizard commonly associated with thermal areas up to 8,300 feet in elevation (NPS 1998b). Semi-aquatic species include the valley garter snake *(Thamnophis sirtalisfitchi),* the wandering garter snake *(Thamnophis elegans vagrans)*, and the rubber boa *(Charina bottae)*.

Several species of amphibians occur in the parks. Common species include the Columbia spotted frog *(Rana luteiventris),* boreal chorus frog *(Pseudacris maculata),* blotched tiger salamander *(Ambystoma tigrinum melanostictum),* and the bullfrog. Amphibian species of special concern in the parks are the boreal toad *(Bufo boreas boreas)* and the northern leopard frog *(Rana pipiens).* The boreal toad is known to have declined in abundance in the parks, and the northern leopard frog, historically documented to breed in the parks, is now rarely seen (Koch and Peterson 1995). Both of these species inhabit a wide range of aquatic habitats, including ponds, lakes, and wetlands. Amphibians hibernate and, therefore, are not directly affected by winter use.

Fish are an important component of aquatic ecosystems, linking the transfer of energy between aquatic and terrestrial environments. Over twenty species of fish including several

non-natives are found in the parks; game species include trout and other salmonids. Fish species of special concern in the parks include the arctic grayling *(Thymus arcticus);* the Snake River cutthroat *(Oncorhynchus clarki);* the Yellowstone cutthroat trout *(Oncorhynchus clarki bouvieri);* the westslope cutthroat trout *(Oncorhynchus clarki lewisi);* and the leatherside chub *(Gila copei)*.

The arctic grayling inhabits lakes in YNP (Clark et al. 1989). It prefers cold, clear water with abundant vegetation, and spawning occurs from April to mid-June. Young grayling feed on zooplankton, switching to invertebrates as they mature. Threats to the arctic grayling include competition from exotic fish, habitat alteration, and water pollution. The Snake River cutthroat trout is only found in the Jackson Hole area of the Snake River. Spawning occurs in tributaries where success is highly dependent on local conditions. Threats to the Snake River cutthroat trout populations include barriers to migration, turbidity, lack of cover, livestock pollution, water and flood control development, irrigation, and fishing pressure (NPS 1997).

Considered by the Wyoming Game and Fish Department to be a distinct subspecies from the Snake River cutthroat, the Yellowstone cutthroat trout inhabits Yellowstone Lake and its tributaries, and may occur into the alpine zone. They are adapted to cold temperatures but have been found in geothermally influenced waters (Clark et al. 1989). Spawning occurs in streams, in the latter part of April through early August. Depending upon their age, these trout consume plankton or invertebrates. In YNP, the Yellowstone cutthroat is threatened by the nonnative lake trout *(Salvelinus namaycush)* and whirling disease, which is caused by a parasite that attacks the cartilage of young fish.

Occurring in YNP, the westslope cutthroat trout inhabits mountain streams and mainstem river systems (Clark et al. 1989). Adult westslope cutthroats prefer large pools and other low velocity areas. They are migratory, traveling up tributaries to spawn from April to July depending upon elevation and spring runoff. All westslope trout in YNP show some degree of hybridization with other cutthroat trout species and rainbow trout. Hybridization can lead to the loss of locally adapted populations (Clark et al. 1989). Other threats to the westslope cutthroat include predation and competition from nonnative fish, and fishing pressure. A number of projects are underway in YNP to promote restoration of the westslope cutthroat.

The leatherside chub exists in the Snake River near the mouth of the Buffalo Fork River (Maret 1995; NPS 1998b). Although native to other parts of the state, the leatherside chub may have been introduced to the Snake River during the last sixty years.

Within YNP, aquatic invertebrates are abundant in both species and in total number, in part because of the wide variety of habitats, including thermally influenced wetlands. Invertebrate productivity in the Snake River in GTNP is slightly above average compared to other western rivers. About 170 species have been collected and identified. Species diversity is much lower on the Snake River between Jackson Lake Dam and Pacific Creek than in areas downstream (NPS 1997).

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.

3.7 The Natural Soundscape

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

3.7.1 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 2006b: 8.2.3). 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 2006b: 4.9; see 2006 Management Policies duplicated in Appendix A, in particular Soundscape Management and the Use of Motorized Equipment (8.2.3)). 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 2006b: 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.

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 entailed in providing for human enjoyment of a park.

3.7.2 New Research and Monitoring

Soundscapes monitoring has been conducted since the winter of 2002-2003 for YNP and GTNP. This effort is the basis for characterizing existing and historic soundscape conditions summarized here. 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 2004, 2005, 2006, and 2007) for more detailed and additional information on park soundscapes. A related short-term study (Ambrose et al. 2006) using specialized low noise instrumentation 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. At several other monitoring locations the lowest minimum sound levels were clearly below the range (noise floor) of the instrumentation for many hours of the day. Including these efforts, the best available information has been used to describe and model 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. The related study is reproduced in the appendix of the 2006 monitoring report.

Another acoustic metric in development may provide park managers additional indicators and decision tools based on the purposes, values, and management objectives of the park. The Listening Area Reduction metric indicates a reduction in the audibility horizon of park visitors and wildlife due to the masking effect of noise. In general, increased ambient sound levels will reduce the distance at which desired or appropriate sounds are audible. Additionally, a sound intensity index is in development that will provide a description of soundscape impact levels. This sound intensity index will combine several existing acoustic metrics into one composite value.

3.7.3 Historic and Existing Soundscape Condition

During the winter, the natural soundscapes of the parks 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. The 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. 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.

Some of the quietest sound levels ever measured in natural environments have been recently documented during the winter in YNP (Ambrose et al. 2006). Superimposed upon these natural soundscapes are non-natural sounds generated by human activity, including non-motorized activities as skiing. Motorized winter-use related sounds are loudest and most common near developed areas and travel corridors.

The percent time that vehicles are audible primarily depends upon their numbers on any given day. Vehicle type and speed largely determine the maximum sound levels. Plowing activity can occur anytime during the day or night, but wheeled traffic occurs primarily during the daylight and early evening hours. 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 higher farther from the road corridor due to the additive effects of multiple vehicles separated along the travel corridor.

Snow-covered groomed roads share many of the same acoustic properties of plowed roads. Groomers 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 not present in large numbers. The ambient soundscapes along travel corridors depends on terrain features and especially on the number and type of OSVs using the corridor. In recent winters, OSVs 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). 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. 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. The average percent time audible of OSVs was about 30% during the day the last two winters along the boardwalk beyond Old Faithful Geyser in the Upper Geyser Basin. This compares to about 50-60% over the last two winters within the West Thumb Geyser Basin.

The natural soundscape is often uninterrupted in park backcountry areas beyond the effects of travel corridors and developed areas. These human-caused sounds may extend beyond four miles, but areas beyond two miles often have very low sound levels of OSV sounds and only during certain atmospheric conditions.

In addition to the sounds related to the winter use activity, aircraft sounds are often audible and at sound levels which 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. In GTNP, the percent time audible and sound levels generally increase at locations closer to the Jackson Hole Airport.

Figures 3-10 and 3-11 below show natural ambient sound levels, developed from data collected with conventional instrumentation, in the two park units (US DOT/Volpe 2006).

Acoustic data were collected during the past four winter seasons in YNP and GTNP. Soundscapes are highly variable over time, both in minutes and seasons. Current soundscape statistics do not fully explain this inherent variability. Nevertheless, the acoustic data collected pursuant to the winter use planning efforts is one of the most extensive national park acoustic datasets in existence.

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 by 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.

A-weighted decibels or dBA express the relative loudness of sounds in air as perceived by the human ear in which sounds at low frequencies are reduced, compared with unweighted decibels (dB), in which no correction is made for audio frequency. A 10 dB 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 3-19 provides a listing of common sounds and includes some actual sounds monitored in the parks. The threshold of healthy human hearing is near 0 dB sound pressure level (SPL) for sounds between 1000 and 4000Hz.

Table 3-19: Decibel Levels of Commonly Known Sound Sources[24]

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
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	

[24] Table adapted from the National Institute on Deafness and Other Communication Disorders at http://www.nidcd.nih.gov/staticresources/health/education/teachers/common_sounds.asp.

Figure 3-10: Yellowstone National Park Natural Ambient Sound Levels (Volpe Report Figure 1)

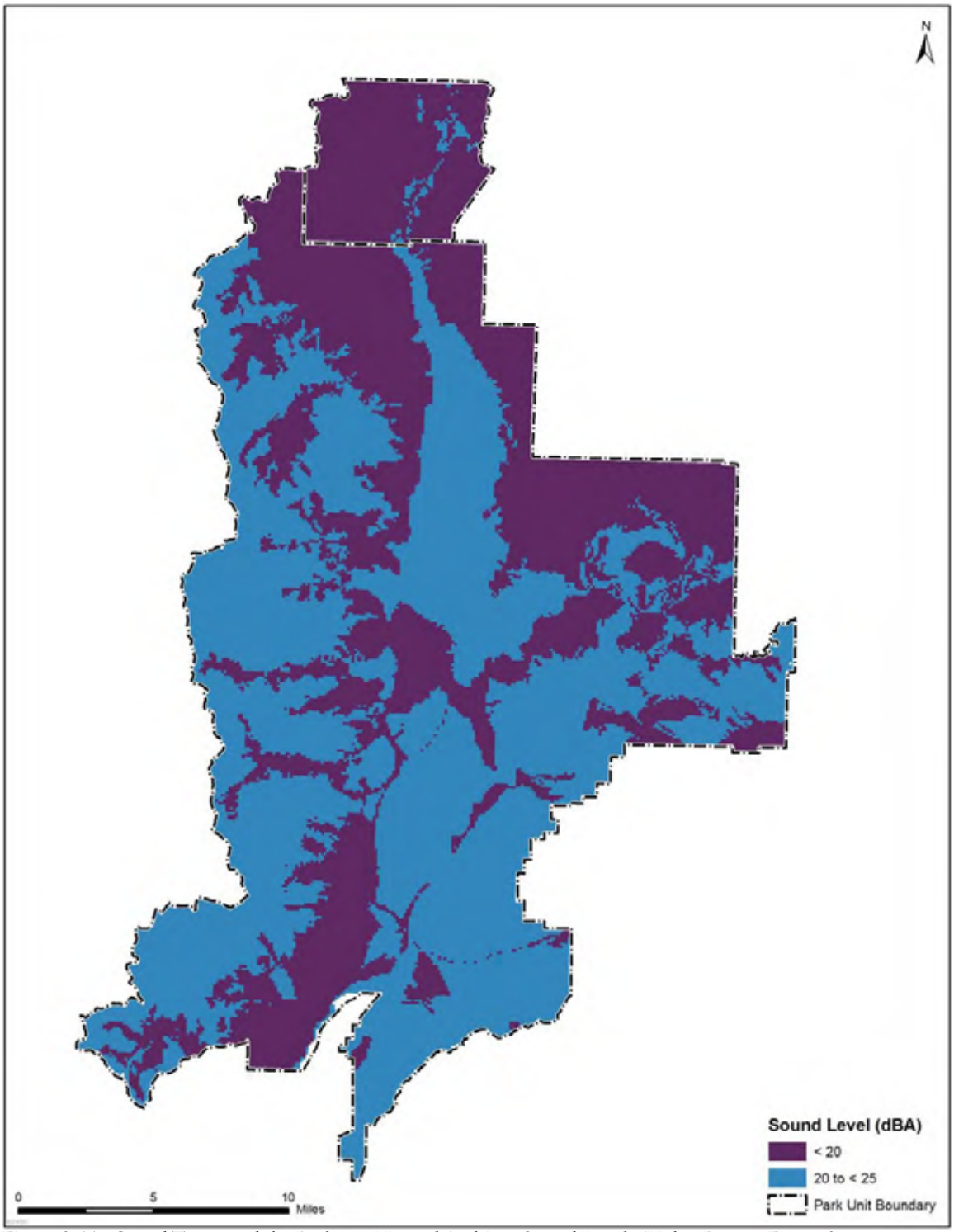

Figure 3-11: Grand Teton and the Parkway Natural Ambient Sound Levels (Volpe Report Figure 2)

3.7.4 Monitoring Data

During the 2005-2006 winter use season, the focus for acoustic monitoring was on five Yellowstone sites representative of developed area and travel corridor management zones: Old Faithful Weather Station, Old Faithful Upper Basin, Spring Creek, West Thumb Geyser Basin, and a point 2.3 miles west of Madison Junction. From December 21, 2005 to March 12, 2006, acoustic measurements were collected to monitor the natural soundscape relative to the standards and thresholds outlined in the temporary winter use plan. The average daily use by OSVs at these monitoring sites during the season was about 256 snowmobiles and 32 snowcoaches. Results for Old Faithful Weather Station (Figures 3-12 and 3-13) and near Madison Junction (Figures 3-14 and 3-15) are provided to illustrate data for each management zone. Sections 3.7.4.1 and 3.7.4.2 provide a narrative summary of the monitoring results. 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). Similar monitoring continued for the 2006-2007 winter season, but the report had not been finalized before the EIS went to press. The reader may view this draft report (in its current form and soon in its final form) at the NPS website referenced above. In general, the findings from the past winter were similar to those from the previous winter, but with slightly increased levels of impacts from oversnow vehicles.

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, although there was increased audibility at two locations. The number of OSVs that entered the park increased slightly during the 2005-2006 season. Consistent with acoustic data collected during the previous two winter seasons, the sound level and the percent time OSVs were audible remained substantially lower than during the 2002-2003 winter use season. The reduced sound and audibility levels were largely explained by fewer snowmobiles, the change from two- to four-stroke engine technology, and the guided group requirements.

Soundscapes monitoring data includes all sources of human-caused sound; these are measured and compared against goals. When goals are not met, an evaluation of the impacts needs to occur, such as that presented in this document. One contribution to the overall impact on the natural soundscape is administrative OSV travel. Importantly, and as described in 3.7.5 below, administrative travel is not accounted for in the modeling data analyzed in Chapter IV. Monitoring results indicate that administrative vehicles clearly contribute to soundscapes impacts: although administrative snowmobiles operated by NPS, concession, and contractor employees comprise 12% of the individual snowmobiles, they are heard 29% of the time during an 8 a.m. to 4 p.m. period. Many are operated individually, rather than in groups, and they include some non-BAT administrative snowmobiles (Burson 2007).

3.7.4.1 Conditions in the Old Faithful Area

Acoustic data were collected at the Old Faithful Weather Station site in 2005-2006 for the fourth winter. Within the developed area at Old Faithful, the average daily percent time audible for snowmobiles and snowcoaches was 67% (Fig. 3-12). This compares to 69% during the previous winter use season and 61% during 2003-2004. The average daily percent time audible of OSVs during the last two winter use seasons was essentially the same. The increase in audibility from 2003-2004 may be explained in part by the addition of contractors commuting to work at the Old Faithful Inn, 600 feet from the monitoring site. Contractors accounted for 9% of the total number of groups and 5% of the total number of snowmobiles audible in the Old Faithful area during observations in 2004-2005 and 2005-2006. During the

winter of 2005-2006, OSVs were audible on a daily basis consistently between 60% and 80% of the time. Three (12.5%) of the 24 days analyzed exceeded the temporary plan audibility threshold of 75% for developed areas.

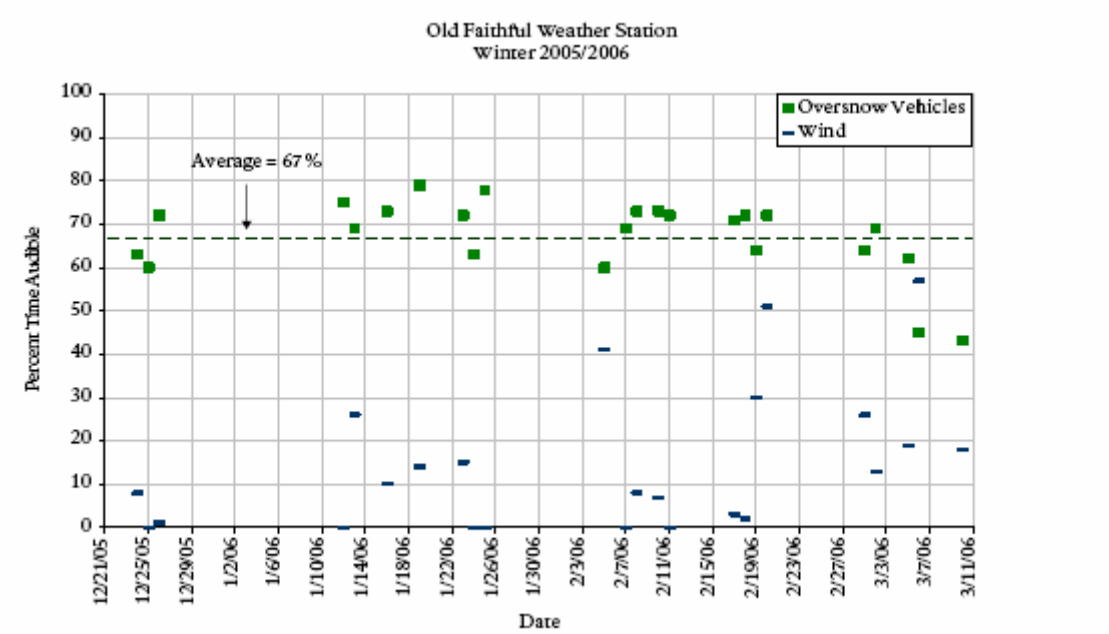

Figure 3-12: OSV Percent Time Audible (squares) and Wind (dashes) by Date at Old Faithful Weather Station, from 8 a.m. to 4 p.m., December 21, 2005 to March 12, 2006

OSVs traveling on the main road and within the Old Faithful developed area were audible at the weather station site. In comparing the most recent winter to prior seasons, the following should be noted: there were periods of restricted oversnow road use during both the early and late portions of the 2004-2005 season, whereas all days were open during the season of 2005-2006. The daily percent time audible values reflect those usage patterns. Wind, depending on direction and speed, can increase the distance sounds are audible or mask other sounds. In general, OSVs are heard at greater distances during calm wind conditions, and there appears to be no strong association between typical wind conditions and OSV percent time audible at locations near the developed areas or travel corridors.

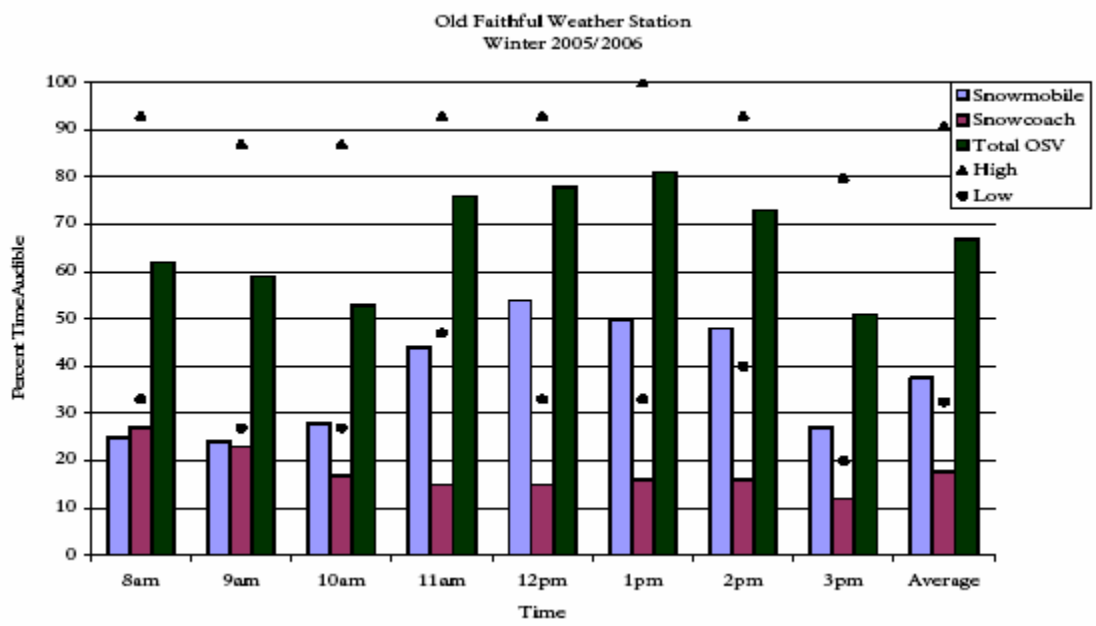

Figure 3-13: Average Percent Time Audible by Hour (8 a.m. to 4 p.m.) of Snowmobiles, Snowcoaches, and Combined Category, with High and Low OSV Values at Old Faithful Weather Station, December 21, 2005 to March 12, 2006.
Note: Original figure is in color; printing costs precluded use of color. The reader may obtain the color version at http://www.nps.gov/yell/parkmgmt/winterusetechnicaldocuments.htm.

For the second winter, acoustic data were 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 and was in place from December 24, 2005- January 2, 2006 and February 16-20, 2006. The sounds of the thermal features such as nearby geysers and steam vents often masked distant sound of OSVs. Data collected at the Upper Basin provide a useful comparison to data collected at the Old Faithful Weather Station (about 2600 feet (1/2 mile) away). Audibility data were analyzed at both sites for seven of the same days. For those days the percent time 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.

3.7.4.2 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 2005-2006 (and again in 2006-2007). Snowmobiles and snowcoaches were audible for an average of 55% of the time during the winter use season (Fig. 3-14). This exceeds the temporary plan audibility threshold of 50% for travel corridors (Table 3-20). The percent time audible for 18 (75%) of 24 days analyzed exceeded 50%. According to NPS data, commercially guided snowmobiles account for about 62% of groups and about 90% of individual snowmobiles along travel corridors (Burson 2006).

The bimodal distribution (Fig. 3-15) 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.

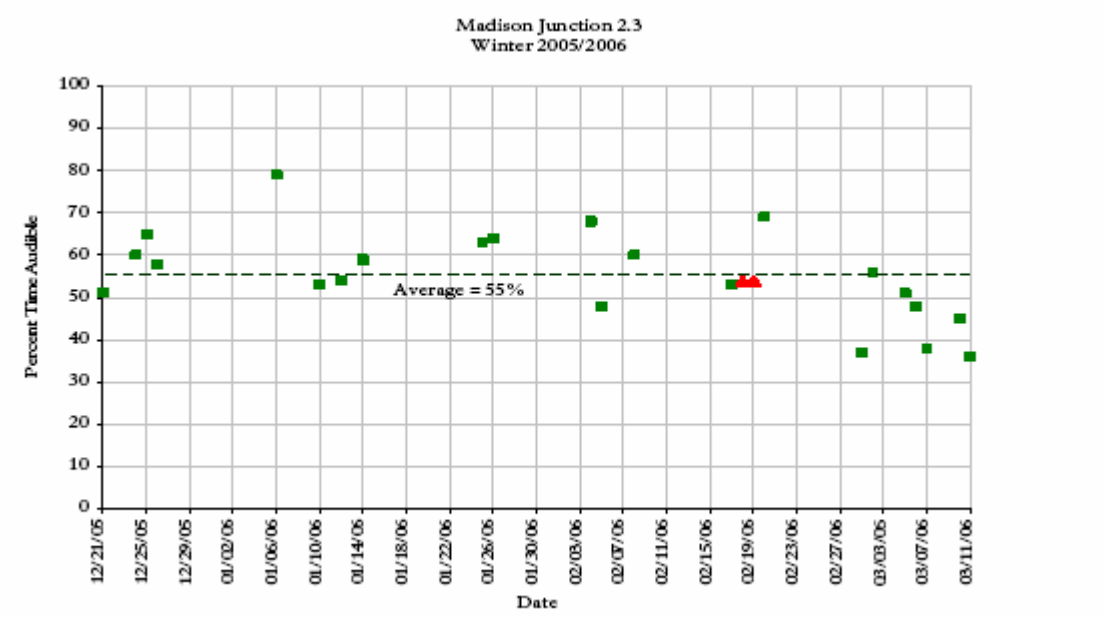

Figure 3-14: Average Percent Time Audible by Date of Snowmobiles and Snowcoaches, 2.3 Miles West of Madison Junction, 8 a.m. to 4 p.m., December 21, 2005 to March 12, 2006. (The dotted lines indicate the average over the winter and the triangles indicate Presidents Day weekend.)

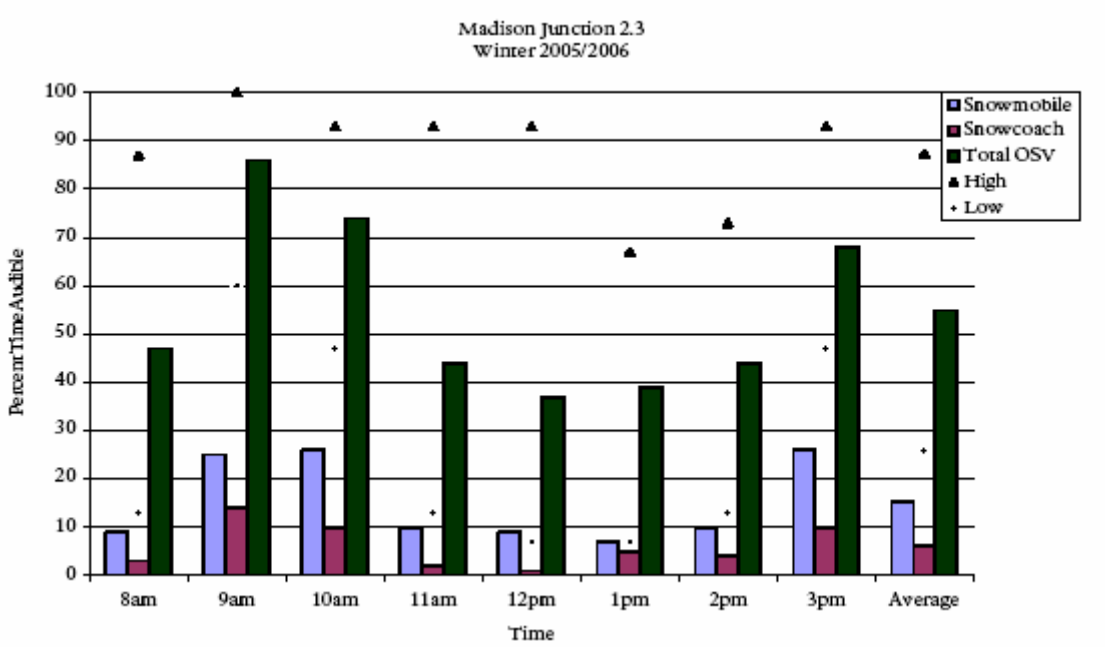

Figure 3-15: Average Percent Time Audible by Hour (8 a.m. to 4 p.m.) of Snowmobiles and Snowcoaches, 2.3 Miles West of Madison Junction, December 21, 2005 to March 12, 2006

3.7.4.3 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 microphone distortion. Oversnow vehicles were often used outside the period covered by the WUP measurement periods, even in the middle of the night. The lowest sound levels (about 25 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 most of the hours of the measurement day (8 a.m. to 4 p.m.) in 2005-2006. The total duration of those exceedances averaged less than 1 minute per day, or less than 1% of the eight hour day. The 129 measured exceedances between December 2005 and March 2006 are attributed to the following type of vehicle: 100 snowcoaches, 20 snowmobiles, 2 that were either a snowcoach or snowmobile, and 7 groomers.

The Spring Creek monitoring site was along a travel corridor east-southeast of Old Faithful and away from any developed areas. It was within a forest of large lodgepole pines and was consistently very quiet with few loud events. As with Sylvan Lake, the lowest sound levels were below the measurable level of the instrumentation. Wind and OSVs increased the sound levels during the day. Snowcoaches traveling at maximum cruising speeds passed this monitoring site, thereby generating events with relatively high sound levels. Overall at this site, high exhaust Bombardier snowcoaches were the loudest non-natural sources of sound during the day and snow grooming equipment was the loudest non-natural source of sound outside the 8 a.m. to 4 p.m. period.

3.7.5 Monitoring versus Modeled Results

For any comparison between the modeling results for alternatives' effects in Chapter IV and monitoring results summarized here in Chapter III, it should be noted that the sound model used for this analysis ignored all administrative vehicle traffic, and other ambient sounds, while the monitoring includes it. The alternative modeling allows comparison of the alternatives between each other relative to the volume and type of recreation use allowed. In order for the monitoring results to provide context for modeled impacts, it is imperative to develop a statistical relationship between the two. This relationship is developed in Chapter IV under a similar heading.

3.8 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.

3.8.1 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 2006b: 8.1.1, 8.2, 8.2.2, 8.2.3, and 8.2.3.2). See also section 3.3.1, in Socioeconomics.

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 which 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."

3.8.2 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. See also the area map of the three parks in the Summary (Figure S-1).

3.8.3 Park Roadways, Trails, and Winter Facilities

3.8.3.1 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.

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).

3.8.3.2 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 Chapter I) 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[25] during the winter of 2005-2006. In addition, the park issued 87 backcountry camping permits during the same time period.

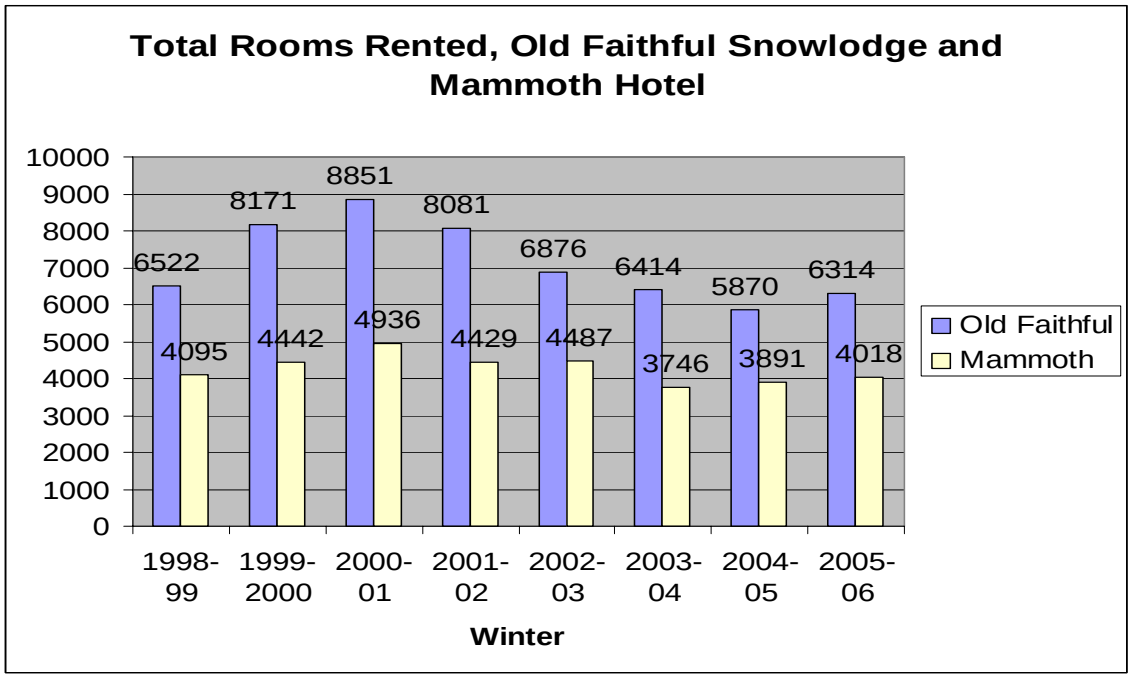

Figure 3-16: Total Rooms Rented per Winter at Yellowstone Hotels, 1998-1999 through 2005-2006

3.8.3.3 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 Chapter I).

In addition to roads that are maintained for use by automobiles, during the winter the NPS provides several snowmobile routes on or alongside roads that are available to automobiles during other seasons. The Grassy Lake Road extends west 7.6 miles from Flagg Ranch to the west boundary of the Parkway, and connects with an extensive network of snowmobile trails on the Caribou/Targhee National Forest. A portion of the Continental Divide Snowmobile Trail (CDST) is located within GTNP and the Parkway, extending from the east boundary to Moran Junction and northward as far as Flagg Ranch. The CDST is located along the shoulder of the road, and provides a connection between portions of the CDST and other snowmobile trails on the Shoshone and Bridger-Teton national forests east of GTNP, and snowmobile trails in the Targhee National Forest west of the Parkway, via the Grassy Lake Road. 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

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

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. Under the temporary winter use plan that was in effect for the past three winter seasons, 40 snowmobiles per day meeting NPS Best Available Technology requirements were allowed to access the lake for fishing. Snowplanes were permanently prohibited prior to the 2002-2003 season.

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. An NPS visitor contact station is also located at Flagg Ranch. 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.

3.8.4 Modes of Transportation

3.8.4.1 Snowcoach Visitation and the New Yellow Bus

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 experimented with various other snowcoaches, primarily using 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. They are slow in some conditions, as when a blanket of heavy, wet snow falls upon the park. 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, although some companies have fewer coaches than

they are authorized to run. The total visitor capacity of the 2005-2006 authorized snowcoach fleet is approximately 825.

Since 2001, the NPS has been working with a variety of partners to develop a new generation snowcoach for use in the parks (figure 3-17). The new snowcoach is a 16- to 24-passenger mid-sized bus with a quiet diesel engine that can use either petro-diesel or bio-diesel fuel and is capable of meeting 2007 clean diesel requirements. In the summer, the vehicle operates on wheels; in the winter, tracks replace the wheels. As a wheeled vehicle, it complies with the Americans with Disabilities Act; its low floor eliminates the need for steps and it has an entry ramp that can be extended to accommodate passengers in wheelchairs. In the winter, accessing the vehicle requires only one step rather than the three or four typical of most snowcoaches. On tracks, the vehicles are still accessible (even though they sit up higher) with the use of a manual ramp to supplement the bus's mechanical one. The vehicle has large windows on the sides and roof for excellent viewing, and enhanced heating and air conditioning systems to keep it fog-free and ventilated in summer and winter. Finally, it has an enhanced audio system for communication between the driver and passengers.

The vehicle chassis and power train are designed for the medium duty bus market, and market analysis indicates that a low emission, fuel efficient vehicle will have broad application in municipal transit and private-sector transportation. Seating configuration and materials and all other interior amenities are options depending on the end user's needs. This is making it possible to develop a vehicle at much lower cost than a park-specific bus. Funding was provided by Congress in Fiscal Year 2004 to purchase six vehicles along with support infrastructure. In 2006, YNP received the vehicles. These initial vehicles are used as administrative vehicles by the NPS at YNP, and will continue to be used for further testing and refinement.

Figure 3-17: A New Yellow Bus on Tracks

3.8.4.2 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 the machines 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 in most areas open to snowmobiling. Guided snowmobile service is available from a total of 22 different companies at the various park entrances.

A winter visit to Yellowstone has always been expensive; in recent years, with the advent of restrictions on use to address the concerns related to historic snowmobile use, the cost has risen further. This has been especially true for residents near the parks who previously brought their private snowmobiles in the parks. With the BAT restrictions imposed in the last three winters, residents and others who do not own BAT machines can no longer bring their own sleds into Yellowstone. The guiding requirements are an additional burden for some, both financially and logistically. Further, some guide and outfitters have chosen not to operate during the Temporary Plan implementation, limiting use more. The uncertainties brought on by court decisions and the short duration of the temporary plan have prevented the NPS from offering a business opportunity to other companies who might be interested in operating and providing guide services in the winter. When a long-term decision is reached, business opportunities commensurate with the decision of that plan can be offered, and businesses will be chosen though a competitive process.

3.8.5 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 four winters (2003-04 through 2006-07), snowmobile numbers have averaged between 250 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 Temporary EA provision to use commercial guides may discourage 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 increased 20% in the winter of 2005-2006 and another 10% last winter. These increases have been due partly to good snowmobiling conditions in those winters as compared to the winter of 2004-2005, when dry and warm conditions meant that the NPS was unable to open the park's westside roads to snowmobiles until after the normally busy Christmas season had already ended. During the same time period (2001-2002 and 2006-2007), the number of visitors touring YNP by snowcoach rose 72.0%, averaging 34 coaches per day (with ridership averaging about 8 passengers per coach). For the winter of 2006-2007, 39 percent of OSV passengers in YNP traveled by snowcoach, with about 61 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 10-year average of just over 40,000 visitors enjoying YNP's northern area by wheeled vehicles.

Although visitation to YNP is still below that of the 2001-2002 winter and previous winters, it has risen 26.3% 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. Regional Chambers of Commerce, State Tourism Bureaus, interest groups, and the NPS have all emphasized (over the past several years in brochures, web sites, and public presentations) that the parks are open for the winter and that visitors can enjoy them in several ways. Table 3-20 displays YNP visitation for the past ten winters.

Figure 3-18 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 3-19 suggests that some variability in winter visitation is typical when visitation trends are viewed in a 20-year time frame.

Table 3-20: Mode of Winter Arrivals in Yellowstone National Park, 1997-1998 through 2006-2007

Winter Season	Number of Visitors Entering the Park						Total Visitors[2]
	Auto	RV	Bus	Snow-mobile	Snowcoach	Skiers[1]	
1997-1998	35,704	81	305	72,834	9,897	453	119,274
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	99,765
Season Average	41,712	150	1,075	57,289	14,029	373	114,628
% of Total	36.4%	0.1%	0.9%	50.0%	12.2%	0.3%	100%
Average Last 4 Winters	43,734	139	1,310	28,781	18,062	366	92,392
% of Total Last 3 Winters	47.3%	0.2%	1.4%	31.1%	19.5%	0.4%	100%

[1] 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).
[2] 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%.

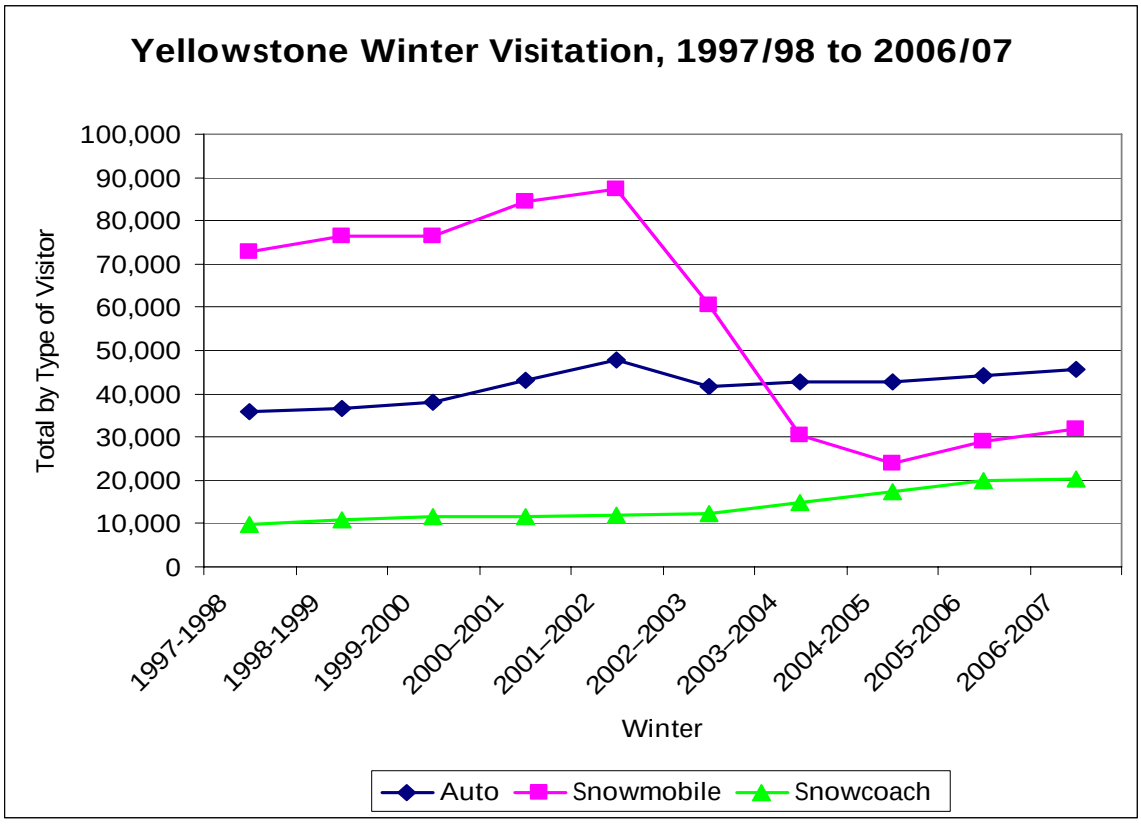

Figure 3-18: Yellowstone Winter Visitation by Mode of Travel, 1997-1998 through 2006-2007 (December to March each winter)

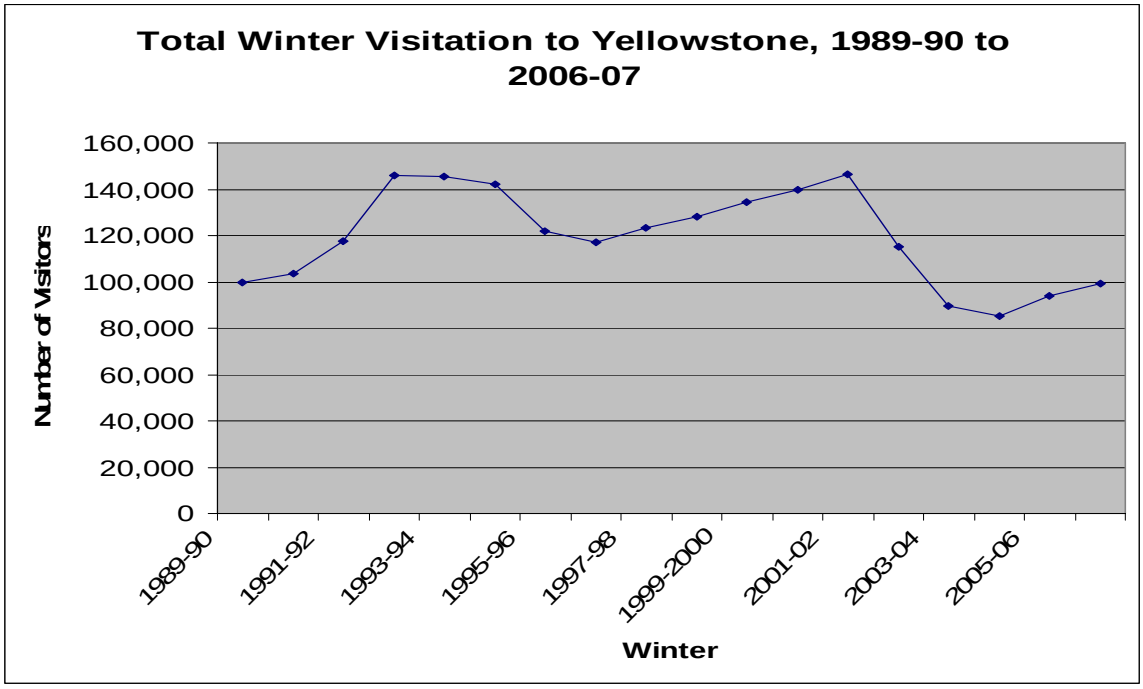

Figure 3-19: Total Yellowstone Winter Recreation Visitation, 1989-1990 through 2006-2007

Examining visitation by entrance, the North Entrance is the busiest in the winter because it is open for automobile travel. Almost 50% 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 17% of park visitation, with the East Entrance admitting 0.6%. 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).

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. Table 3-21 shows visitor counts by activity at the North Entrance. Note that residential traffic from Mammoth Hot Springs and Cooke City is not included in this table. Figure 3-20 displays automobile visitation through the North Entrance by winter for the past ten years. The stability of this form of visitation is evident.

Table 3-21: Winter Visitation by Activity, Yellowstone North Entrance

Winter Season	Auto	Recreation Vehicle (RV)	Bus	Skiers	Snow-mobile	Snowcoach	Total Visitors[1]
1997-1998	35,704	81	305	10	2,119	2,278	40,497
1998-1999	36,450	90	173	17	2,196	2,081	41,007
1999-2000	37,872	140	747	21	1,617	2,506	42,903
2000–2001	38,538	139	543	7	1,758	2,241	43,226
2001–2002	47,750	215	417	5	1,225	2,012	48,387
2002–2003	41,666	278	796	4	878	2,003	45,625
2003–2004	42,767	181	1,141	3	944	2,508	47,544
2004-2005	42,639	138	1,153	3	356	2,074	46,363
2005-2006	44,136	92	1,288	1	522	5,236	51,275
2006-2007	45,519	144	1,658	22	580	3,510	51,433
10-Year Total	413,041	1498	8,221	93	12,195	26,449	458,260
% of Total	90.1%	0.3%	1.8%	0.02%	2.6%	5.8%	100%
Season Average	41,304	149	822	9	1,220	2,645	45,826

[1]In some years in this table, visitors may be double-counted, as they usually enter the north entrance by automobile but then sometimes participate in snowmobile or snowcoach tours.

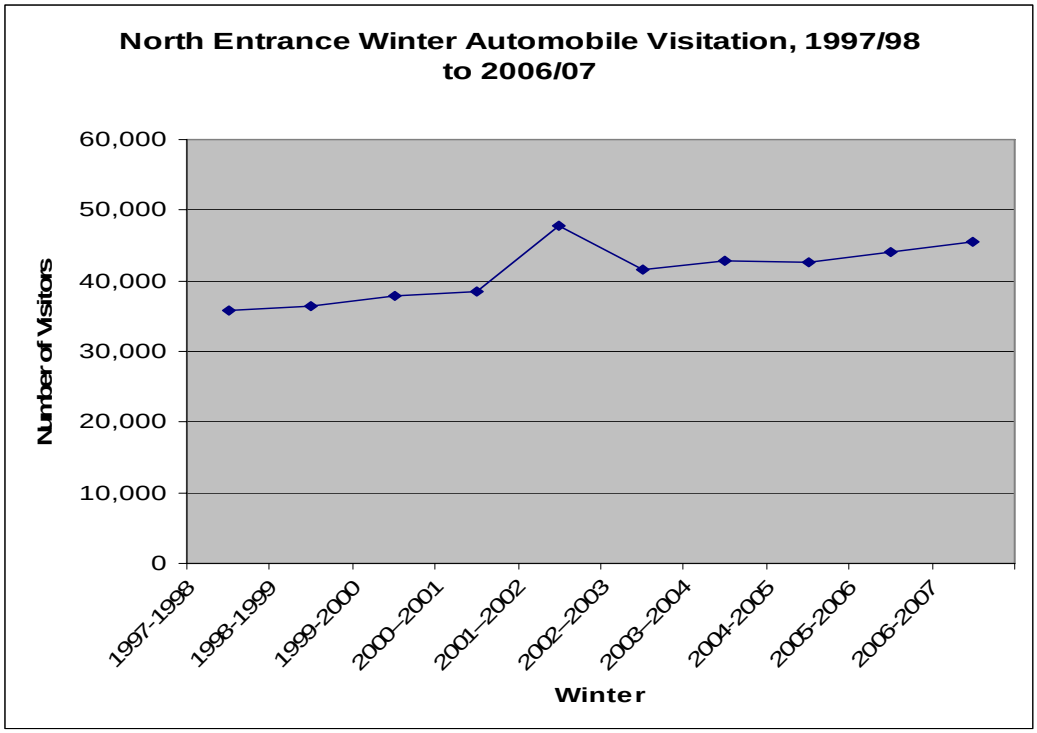

Figure 3-20: North Entrance Winter Automobile Tourism, 1997-1998 to 2006-2007

As shown in Table 3-22, the West Entrance has more oversnow visitation than any other YNP entrance. In the past, as much as 90% of the oversnow visitors at this entrance rode a snowmobile; for the past four winters, that average has been 61% with snowcoach visitation growing accordingly, from around 10% to 38% of total West Entrance visitation. Figure 3-21 displays the two most common forms of visitation to the West Entrance of YNP, snowmobile and snowcoach visitation. Although snowmobile visitation remains the most common form, snowcoach visitation is now quite close numerically.

Table 3-22: Winter Visitation by Activity, Yellowstone West Entrance

Winter Season	Snowmobile	Snowcoach	Skiers	Total Visitors
1997-1998	49,776	5,065	18	54,859
1998-1999	53,980	5,921	27	59,928
1999-2000	52,575	5,558	21	58,154
2000–2001	58,292	8,109[1]	67	66,468
2001–2002	64,063	6,302	6	70,371
2002–2003	42,540	7,094	69	49,703
2003–2004	20,038	8,749	103	28,880
2004-2005	12,917	11,453	140	24,510
2005-2006	17,362	10,759	121	28,242
2006-2007	19,262	12,381	43	31,686
10-Year Total	390,805	81,391	615	472,801
% of Total	82.6%	17.2%	0.1%	100%
Season Average	39,081	8,139	62	47,280

[1]This number includes visitors who arrived by bus in March after the road was plowed; the West Entrance was closed to oversnow traffic on February 25 because of unsafe conditions (roads were melting out).

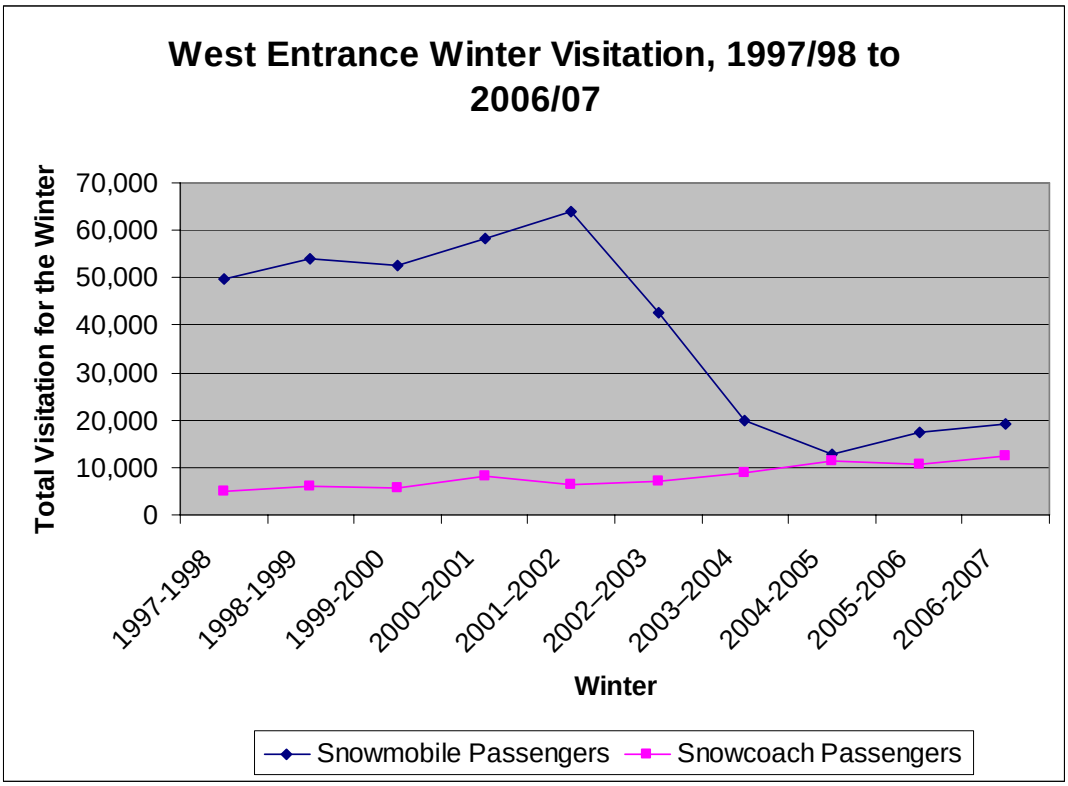

Figure 3-21: West Entrance Winter Visitation, 1997-1998 through 2006-2007

YNP's East Entrance has always been, and remains, its least-used winter entrance. Visitation there has varied substantially in the last ten years. Both snowmobile visitation and snowcoach visitation are down, in part because NPS used only helicopter-dispensed avalanche control methods without use of the howitzer and also because an authorized guide

and outfitter chose not to offer winter tours and closed nearby lodging. An opportunity for cross-country skiing in the area brings more skiers to this entrance than any other entrance. As previously noted, it can be assumed that 20% of visitors to all entrances participate in cross-country skiing.

Table 3-23: Winter Visitation by Activity, Yellowstone East Entrance

Winter Season	Snowmobile	Snowcoach	Skiers	Total Visitors
1997-1998	3,077	9	346	3,432
1998-1999	2,620	6	329	2,955
1999-2000	3,105	57	234	3,396
2000–2001	4,183	0	197	4,380
2001–2002	4,064	0	236	4,300
2002–2003	2,720	0	196	2,916
2003–2004	1,006	159	255	1,420
2004-2005	498	146	273	917
2005-2006	754	193	112	1,059
2006-2007	253	101	189	543
10-Year Total	22,280	671	2367	25,318
% of Total	88.0%	2.6%	9.3%	100%
Season Average	2,228	67	237	2,532

Table 3-24 indicates that the South Entrance is second only to the West Entrance in numbers of OSV park users. Similarly, snowmobile passengers continue to account for the majority through this entrance, but the percentage of total entrance traffic there constituted by snowmobile passengers has fallen from 82% to 72.7% in the last five winters. Figure 3-22 displays the two most common forms of visitation to the South Entrance of YNP, snowmobile and snowcoach visitation. Although snowmobile visitation remains the most common form, snowcoach visitation has remained stable.

Table 3-24: Winter Visitation by Activity, Yellowstone South Entrance

Winter Season	Snowmobile	Snowcoach	Skiers	Total Visitors
1997-1998	17,862	2,545	79	20,486
1998-1999	17,475	2,771	139	20,385
1999-2000	19,274	3,578	105	22,957
2000–2001	20,736	3,861	119	24,718
2001–2002	17,854	3,518	60	21,432
2002–2003	14,268	3,057	53	17,378
2003–2004	8,222	3,407	77	11,706
2004-2005	10,278	3,545	52	13,875
2005-2006	10,195	3,668	37	13,900
2006-2007	11,710	4,358	35	16,103
10-Year Total	147,874	34,308	756	182,940
% of Total	80.8%	18.7%	0.4%	100%
Season Average	1,479	3,431	76	18,294

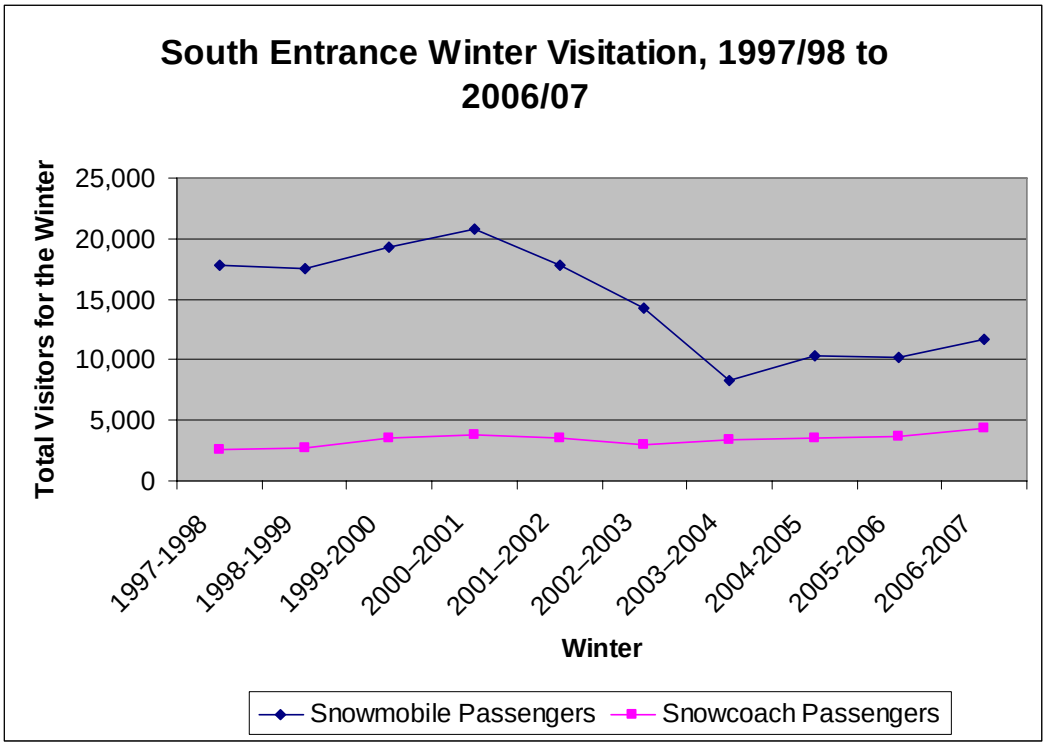

Figure 3-22: South Entrance Winter Visitation, 1997-1998 through 2006-2007

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 2006-2007

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)
1997–1998	19,597	1,857	3,951	1,485	1,185	4,151	176,601
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[4]	3,421	1,299	1,842	7,346	217,999
2002–2003	23,062	1,752[4]	2,305	0[1]	2,099	7,007	227,964
2003–2004	9,217	139	1,939	0	1,389	8,000[2]	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
Average	17,907	n/a[3]	n/a	n/a	1,546	6,900	196,692

Source: Data obtained from NPS visitation records.
[1] Snowplanes were prohibited from GTNP beginning with this winter season.
[2] Exact count is unavailable; this figure represents a best estimate.
[3] No average given for CDST because use has been highly variable.
[4] Estimate based upon previous average percentage of Parkway users.

3.9 Visitor Experience

This section describes visitor profiles and measures of visitor experience and satisfaction and the experience of the visitor to Yellowstone and Grand Teton national parks, beginning with a description of the typical park visitor and his/her activities in the parks. Next, the section describes the diverse values, attitudes, and opinions held by visitors. The section concludes by examining whether visitors are satisfied with their experience(s) in the parks – something that depends to a large degree on their values, attitudes, and opinions. Section 3.8.1, Regulatory and Policy Overview for Visitor Access and Circulation, also applies to this visitor experience discussion.

3.9.1 Winter Visitor Profile

All winter visitor profile data comes from surveys performed in 2003 or earlier with the exception being a survey of snowcoach users completed by the University of Montana in 2006. That survey and the results from a 2003 report summarizing many earlier surveys are discussed below. To further our knowledge of the contemporary winter visitor, the NPS has entered a cooperative agreement with The University of Montana to perform a visitor survey in the winter of 2007-2008.

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).

A number of winter visitor surveys were conducted from the mid-1990's through 2003.[26] These surveys have found that in terms of demographics, winter visitors to YNP come primarily from western states. Specifically, about a third come from four local states (Montana, 20%; Wyoming, 6%; Idaho, 6%; and Utah, 6%), while another 10% come from the Upper Midwest (Minnesota, Wisconsin, and Michigan). As expected, the country's more populous states are 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 survey 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 WDGF 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

[26] RTI International, under contract with MACTEC Engineering and Consulting, Inc., BBL Sciences, conducted a winter visitor survey which complemented others done previously, as summarized in a 2001 report by Drs. Wayne A. Freimund and William T. Borrie of the University of Montana.

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.

3.9.2 Values, Attitudes, and Opinions of Visitors

Values are deeply-held, stable, and long-lasting forms of public judgment reflecting an individual's ideals and goals. One does not acquire values quickly or easily; rather, they are "enduring conceptions of the good and desired human condition" (Borrie, Freimund, and Davenport 2002: 43). Flowing from values are attitudes, less central beliefs about humanity and its approaches to social and natural issues. Attitudes, in turn, give rise to opinions, a person's thoughts about specific issues, such as one's views on the Yellowstone snowmobile controversy. For example, one may value nature, which gives rise to the attitude that parks should preserve nature in an unimpaired form, which engenders the opinion that motorized vehicle access to parks should be curtailed or even eliminated. Alternatively, one may value freedom more highly, which produces the attitude that social policies should allow the maximum expression of individual liberties, and the opinion that one should be able to travel through national parks at his/her will.

Scholars from three separate academic disciplines have, independently of each other, examined the Yellowstone snowmobile controversy in light of this understanding of values, attitudes, and opinions. All of these scholars agree that the ongoing Yellowstone snowmobile controversy is a contest over deeply-held values. Moreover, they generally agree that it is the same two divergent sets of values behind the debate – two sets that are broadly held by Americans (often the very same people hold both sets of values dear, although one set of values will usually be stronger than the other).[27]

The first set of values are those most commonly (but not exclusively) held by environmentalists or conservationists. This group of people values nature as sacred or quasi-spiritual. From this perspective, national parks should preserve nature in as unimpaired a form as possible, and snowmobiles (and for some, all OSVs) should be banned from the parks (Layzer 2006; Yochim 2004; Borrie, Freimund, and Davenport 2002). The other set of values are labeled "Cornucopian," "freedom," or "recreation and tourism resource values" by these same authors (respectively). Persons who hold this set of values place great value on individual liberty and tend to view with suspicion attempts to limit personal freedoms. To them, national parks should provide opportunities for recreation (and to a lesser degree, business) and snowmobiles should continue to be allowed because they are recreational in nature, are embodiments of personal freedom, and stimulate economic activity (most are rented in nearby communities).

While these are the two most strongly-held sets of values, these and other scholars identify three other sets of values at play in the controversy. A number of stakeholders uphold pro-business values, which gives rise to the attitude that parks should enhance local and regional economies. Generally, this set of constituents feels that the NPS should retain snowmobiling in order to boost the Yellowstone-area economy, although some believe that a snowmobile

[27] Judith Layzer (2006) reached this conclusion from a political scientist's understanding of the issue; Michael Yochim (2004) reached nearly the same conclusion from the position of a historical geographer; and William Borrie, Wayne Freimund, and Mae Davenport (2002) produced similar findings from the natural resource social psychology school of thought. See also Davenport and Borrie 2005, Freimund and Borrie 2001, McBeth et al. 2005, and McBeth and Shanahan 2004 for other articles discussing the same value conflict.

ban could boost business more than continuing snowmobiling. Another set of values at stake in the controversy is the profound American faith in science and its ability to enable sound decision-making. Americans who value science highly believe that natural resource policies should be based upon science, and that winter use policies should be based upon objective research findings. Those findings, though, may present conflicting direction to park managers, and are often the subject of extensive stakeholder debate. All the same, these science values play into the controversy. Still another set of values are what may be called "heritage values," the feeling that the parks are a symbol of America's identity that must be seen by all (Freimund and Borrie 2001; Borrie, Freimund, and Davenport 2002; Yochim 2004: 23; Dustin and Schneider 2005 (the last mainly discuss the role of science in policy-making)).

3.9.3 Measures of Visitor Experience and Satisfaction

Values, attitudes, and opinions are linked with people's motivations for visiting and the expectations they bring to their visit. These topics were studied in YNP visitors in the late 1990s and will be studied again in the winter 2007-2008. Overall, the two primary reasons people visit YNP in the winter are to view natural scenery and to view wildlife (Littlejohn 1996; Freimund and Borrie 2001; Davenport and Borrie 2005). Specifically, regarding wildlife, visitors value the opportunity to see abundant and diverse wildlife in a natural setting (Freimund and Borrie 2001:17). Similarly, visitor motives to see scenery focus upon the aesthetic beauty and geological features of YNP (Freimund and Borrie 2001:18). Clearly, visitors want to experience those attributes of YNP's scenery and charismatic megafauna which define it in the American imagination. For many others, having fun is an additional motive almost as frequently cited as the other two (Littlejohn 1996; Davenport et al. 2000). Another important finding from past research is that these criteria are independent of the mode of transportation chosen by the visitor. Other important reasons visitors come to the parks include pursuing both motorized and non-motorized recreational activities, relaxing, learning about nature, enjoying the peace and quiet, experiencing excitement, and enjoying the company of friends and family.

Visitors tended to evaluate their experiences based on eight primary criteria, summarized below from the various studies. Recent NPS efforts to improve the visitor experience are also summarized.

- **Opportunities to view wildlife**. Winter visitors consistently rated wildlife viewing as a primary reason for visiting the parks.
- **Opportunities to view scenery**. As with wildlife, winter visitors rated viewing scenery as a primary reason for visiting the parks.
- **The safe behavior of others**. Both snowmobilers and skiers rated this as important and indicated that it has an influence on the enjoyment of their visit. Largely due to the requirement to hire commercial guides, arrests and moving vehicle citations are both down considerably in the last three winters.
- **Quality of the groomed surface**. More than 80% of winter visitors rated the quality of the snow surface as very important, whether traveling by snowmobile or snowcoach. In part due to the reduction in snowmobile numbers and improved snow-grooming equipment purchases and utilization, YNP's oversnow roads are generally smoother and more enjoyable to tour than they were prior to 2003.
- **Availability of motorized access to winter activities or experiences**. Nearly all winter visitors surveyed by Davenport et al. (2000) supported oversnow mechanized access; few wished the parks to be closed. Which form of motorized access – snowmobile, snowcoach, or wheeled vehicles – continues to be the subject of extensive debate.

- **Availability of information**. Most respondents were highly supportive of management actions that provided readily available information about winter opportunities or conditions for safe travel. Because all visitors must currently travel with commercial guides, who generally enjoy providing educational commentary about the park as they tour it with their groups, the availability of information has increased substantially. Furthermore, the NPS has continued to work with local communities to educate visitors about winter natural and cultural history and travel opportunities in the last three years.
- **Quiet and solitude**. Most survey respondents felt that natural quiet and solitude were important to their park visit. All three restrictions implemented in the last three winters (commercial guiding, BAT technology for snowmobiles, and numerical limits) have improved the ability to find quiet and solitude (see below for more detail).
- **Clean air**. Clean air was important to most visitors surveyed, a finding that is supported by past national survey results indicating that recreationists highly value clean air in their visits to public lands. The implementation of the BAT snowmobile requirement has reduced air pollution concerns in YNP in the last three winters (Ray 2005, 2006, and 2007).

Of these eight criteria, the desire and ability to experience quiet and solitude was, at the time of the studies, most commonly evaluated as unsatisfactory by survey respondents. Specifically, a 2000 survey showed respondents ranking "experienc[ing] the tranquility" sixth in overall importance as something they expected to find in the parks (of 40 different criteria), but they ranked their satisfaction with that characteristic of their actual visit 18th. Similar disparities were seen between the importance of "experience peace and quiet" (14th in importance) and "get away from crowds" (17th in importance) and visitors' satisfaction with these elements of their visit (25th and 40th, respectively) (Davenport et al. 2000).

Anecdotal evidence in the last four years suggests that visitors are now more satisfied with this element of their visit than they were during the 2000 survey. As one measure of increasing satisfaction, there has been a substantial reduction in complaints received by the NPS from members of the public upset about elements of their winter experience in the parks. Many believe the reduction in snowmobile numbers, conversion to Best Available Technology machines, and the implementation of guiding have partially resulted in greater opportunity to experience tranquility, peace and quiet, and solitude. Additionally, because all visitors travel with knowledgeable guides, the opportunities for learning are increased.[28]

Scoping comments and other anecdotal information also indicate that a percentage of the public does not wish to be guided. Some who visited the parks under historic conditions may now choose to snowmobile only outside the parks, principally because of guiding requirements. Further research to be conducted in the winter of 2007-2008 will help to update an understanding of visitor experiences and expectations.

3.10 Adjacent Lands

The affected environment for impacts to lands adjacent to the parks is discussed below.

[28] Mary Tabor, "In Praise of Guides," 2006; and Weekly Interpretation Division reports for the last two winters, both in the Management Assistant's Office files, National Park Service, Yellowstone National Park, Wyoming.

3.10.1 Regulatory and Policy Overview

It is necessary for the NPS to evaluate in a NEPA document the potential for a proposed action to affect the plans of adjacent jurisdictions, or the cumulative effect of park actions on lands and resources beyond park boundaries. Apart from these analysis necessities, the 2006 NPS Management Policies set out a framework for cooperation and communication with other local, state and federal agencies (see specifically NPS 2006b: 1.6, Cooperative Conservation Beyond Park Boundaries, and NPS 2006b: 1.7, Civic Engagement). The former policy grows out of an acknowledgement 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 NPS welcomes people to enjoy parks through sustainable and appropriate ways.

3.10.2 Regional Perspective

The Greater Yellowstone Area (GYA) was initially delineated and described in the Greater Yellowstone Coordinating Committee (GYCC) report, An Aggregation of National Park and Forest Management Plans (1987). In all, the area now recognized as the GYA or Greater Yellowstone Ecosystem (GYE) encompasses more than four million acres of designated wilderness, two national parks (with over two million acres of recommended wilderness within), and an additional four million roadless acres not protected by designation. In addition to the two national parks (YNP, GTNP) and the Parkway that connects them, there are six national forests and three wildlife refuges that define the region. Each national forest within the GYA as well as the three surrounding states and five adjacent counties participated in the development of this plan and EIS. Figure 1-1 in the Summary illustrates the regional geography.

About 95% of the perimeter of GTNP, YNP and the Parkway abuts national forest lands. A high percentage of the National Forest System along this common boundary is in congressionally designated wilderness, and inventoried or other roadless areas.

Mostly private lands abut the parks near the gateway communities of Jackson and Teton Village, Wyoming and West Yellowstone, Gardiner, and Cooke City, Montana. The gateway community of Cody, Wyoming lies 50 miles from the east entrance and 70 miles from the northeast entrance of YNP via corridors of mixed land ownership.

Within GTNP, several private land inholdings exist, mostly east and south of Moran, and along the Snake and Gros Ventre River corridors. There are isolated sections of state land near, in, or abutting the southern portion of GTNP, and the northwest corner of YNP.